

# Control and Automation

## Main switches



GE imagination at work

	Plug-in relays and Auxiliary contactors	A
	Motor protection devices	B
	Contactors and Thermal overload relays	C
	Motorstarters	D
	Control and signalling units	E
	Electronic relays	F
	Limit switches	G
	Speed drive units	H
	<b>Main switches</b>	<b>I</b>
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**Series ML - Main switches & Emergency-stop switches for machinery**

- I.3 Mounting possibilities
- I.4 Standard programme
- I.6 Accessories
- I.7 Enclosed switches
- I.8 Technical data
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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.

A

## Standards

- Complying with:
- IEC 947-3
  - DIN VDE 0660
  - low voltage directive 73/73 EEC
  - low voltage directive EMC 89/336 EEC

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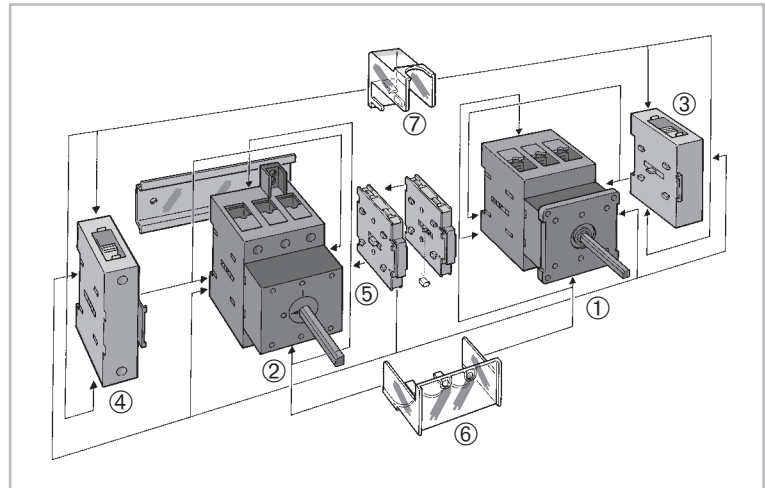
## Emergency-stop equipment

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.

## Approvals

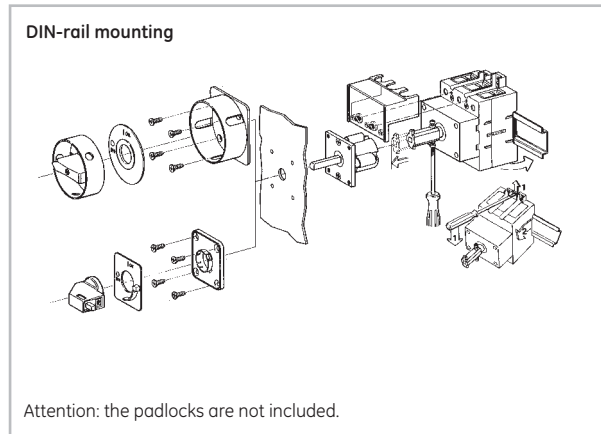
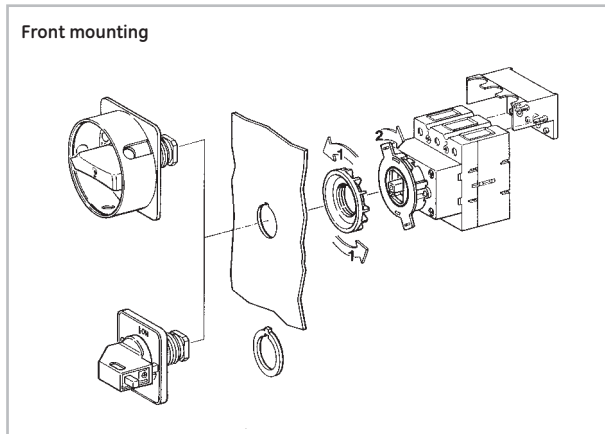


- ① Front mounting (flush mounting)
- ② Rear mounting
- ③ Main contact and PE-or N-terminals for ①
- ④ Main contact and PE-or N-terminals for ②
- ⑤ Auxiliary switch 1NO/1NG for ① and ②
- ⑥ Terminal cover triple for ① and ②
- ⑦ Terminal cover single for ③ and ④

- Mounting possibilities ● pg. I.3  
 Accessories ● pg. I.6  
 Technical data ● pg. I.8  
 Dimensions ● pg. I.9


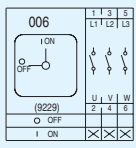

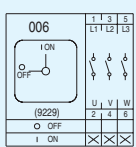

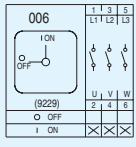

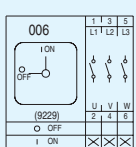

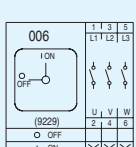
Mounting possibilities

	lth	25A	40A	63A	80A	125A
	Series	ML 1	ML 1	ML 2	ML 2	ML 3
	Type	640	650	660	670	680
<b>Front mounting (flush mounting)</b>	Colour					
<b>Central fixing</b>						
Ø 22.5/30.5 mm for 3 padlocks	red/yellow	789178	789179			
Ø 22.5/30.5 mm for 3 padlocks	black	789180	789181			
Ø 22.5/30.5 mm for 1 or 2 padlocks	red/yellow	789174	789175			
Ø 22.5/30.5 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	789122	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



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## Standard programme - Front mounting

Central fixing Ø 22.5/30.5 mm		Diagram	Protection	Ithe	Type	Red/yellow	Black/gray	Pack
						Ref. no.	Ref. no.	
 <p>Locking handle by 1 or 2 padlocks</p>		With terminal cover	IP65	25A	640	<b>789174</b>	<b>789176</b>	1
		With terminal cover	IP65	40A	650	<b>789175</b>	<b>789177</b>	1
 <p>Locking handle by 3 padlocks</p>		With terminal cover	IP65	25A	640	<b>789178</b>	<b>789180</b>	1
		With terminal cover	IP65	40A	650	<b>789179</b>	<b>789181</b>	1
4-hole fixing								
 <p>Locking handle by 1 or 2 padlocks</p>		With terminal cover	IP55	25A	640	<b>789182</b>	<b>789184</b>	1
		With terminal cover	IP55	40A	650	<b>789183</b>	<b>789185</b>	1
 <p>Locking handle by 3 padlocks</p>		With terminal cover	IP55	25A	640	<b>789186</b>	<b>789191</b>	1
		With terminal cover	IP55	40A	650	<b>789187</b>	<b>789192</b>	1
		With terminal cover	IP55	63A	660	<b>789188</b>	<b>789193</b>	1
		With terminal cover	IP55	80A	670	<b>789189</b>	<b>789194</b>	1
		With terminal cover	IP55	125A	680	<b>789190</b>	<b>789195</b>	1
 <p>With standard black handle</p>			IP55	25A	640		<b>789239</b>	1
			IP55	40A	650		<b>789240</b>	1
			IP55	63A	660		<b>789241</b>	1
			IP55	80A	670		<b>789242</b>	1
			IP55	125A	680		<b>789243</b>	1

Accessories see I.6

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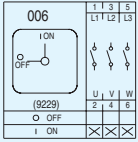

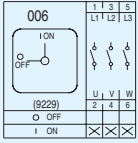

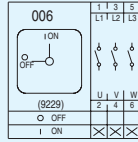

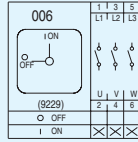

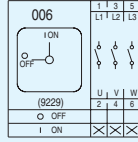

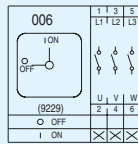
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Standard programme - Rear mounting

DIN-rail mounting						Red/yellow	Black/gray	
		Protection	Ithe	Type		Ref. no.	Ref. no.	Pack
 <p>Locking handle by 1 or 2 padlocks</p>		With terminal cover	IP30	25A	640	789224	789229	1
		With terminal cover	IP30	40A	650	789225	789230	1
		With terminal cover	IP30	63A	660	789226	789231	1
		With terminal cover	IP30	80A	670	789227	789232	1
		With terminal cover	IP30	125A	680	789228	789233	1
 <p>With standard black handle</p>			IP30	25A	640		789234	1
			IP30	40A	650		789235	1
			IP30	63A	660		789236	1
			IP30	80A	670		789237	1
			IP30	125A	680		789238	1
 <p>Locking handle by 1 or 2 padlocks</p>		With terminal cover	IP55	25A	640	789210	789212	1
		With terminal cover	IP55	40A	650	789211	789213	1
 <p>Locking handle by 3 padlocks</p>		With terminal cover	IP55	25A	640	789214	789219	1
		With terminal cover	IP55	40A	650	789215	789220	1
		With terminal cover	IP55	63A	660	789216	789221	1
		With terminal cover	IP55	80A	670	789217	789222	1
		With terminal cover	IP55	125A	680	789218	789223	1
 <p>Locking handle by 1 or 2 padlocks</p>		With terminal cover	IP65	25A	640	789196	789198	1
		With terminal cover	IP65	40A	650	789197	789199	1
 <p>Locking handle by 3 padlocks</p>		With terminal cover	IP65	25A	640	789200	789205	1
		With terminal cover	IP65	40A	650	789201	789206	1
		With terminal cover	IP65	63A	660	789202	789207	1
		With terminal cover	IP65	80A	670	789203	789208	1
		With terminal cover	IP65	125A	680	789204	789209	1

Accessories see I.6

Main switches

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## Accessories - Fitable contactblocs <sup>(1)</sup>

	Neutral switched			Fixed neutral module		
	Front	Rear		Front	Rear	
	789244	789245	1	789262	789263	1
	Series ML1 - Type 640/650					
	789246	789247	1	789264	789265	1
Series ML2 - Type 660/670						
789248   789249   1						
Series ML3 - Type 680						
	Switching contact			Auxiliary contact NO+NC Ith = 16A		
	Front	Rear		Front	Rear	
	789250	789251	1	789268	789269	1
Series ML1 - Type 640/650						
789252   789253   1						
Series ML2 - Type 660/670						
789254   789255   1						
Series ML3 - Type 680						
	PE-terminal (Fixed)					
	Front	Rear				
	789256	789257	1			
Series ML1 - Type 640/650						
789258   789259   1						
Series ML2 - Type 660/670						
789260   789261   1						
Series ML3 - Type 680						

## Accessories - Terminal cover

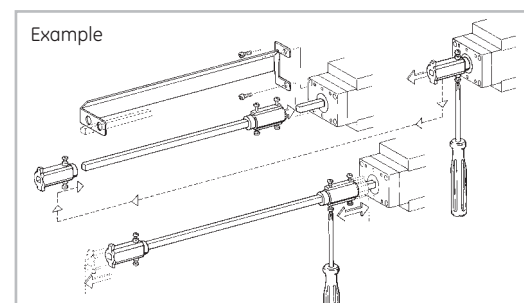
	Single terminal cover (HS1)			Triple terminal cover (HS3)		
	Front	Rear		Front	Rear	
	789270   1			789272   1		
	Series ML1 - Type 640/650					
	789271   1			789273   1		
Series ML2 - Type 660/670						
789271   1						
Series ML3 - Type 680						
Same cover for front- or base mounting						

## 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. Switches type 640 (3 and 4-pole) are provided with an additional N-terminal.

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

**Enclosed switches**

	Diagram	Type	Ithe	Type of enclosure	Red/yellow 3 padlocks	Black/grey 3 padlocks	Pack
					Ref. no.	Ref. no.	
Three poles		640	25A	E2	789280	789285	1
		650	32A	E3	789281	789286	1
		660	50A	E4	789282	789287	1
		670	63A	E5	789283	789288	1
		680	100A	E7	789284	789289	1
Four poles		640	25A	E2	789290	789295	1
		650	32A	E3	789291	789296	1
		660	50A	E4	789292	789297	1
		670	63A	E5	789293	789298	1
		680	100A	E7	789294	789299	1
Three poles + (1 NO + 1 NC)		640	25A	E2	789300	789305	1
		650	32A	E3	789301	789306	1
		660	50A	E4	789302	789307	1
		670	63A	E5	789303	789308	1
		680	100A	E7	789304	789309	1
Four poles + (1 NO + 1 NC)		640	25A	E2	789310	789315	1
		650	32A	E3	789311	789316	1
		660	50A	E4	789312	789317	1
		670	63A	E5	789313	789318	1
		680	100A	E7	789314	789319	1
Six poles		640	25A	E2	789320	789325	1
		650	32A	E3	789321	789326	1
		660	50A	E4	789322	789327	1
		670	63A	E5	789323	789328	1
		680	100A	E7	789324	789329	1
Six poles + (1 NO + 1 NC)		640	25A	E2	789330	789335	1
		650	32A	E3	789331	789336	1
		660	50A	E4	789332	789337	1
		670	63A	E5	789333	789338	1
		680	100A	E7	789334	789339	1

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## Technical data

### Main switches - According to IEC 947-3, EN 60947-3, DIN VDE 0660 part 107, UL and CSA

Series			ML 1	ML 1	ML 2	ML 2	ML 3
<b>Types</b>			<b>640</b>	<b>650</b>	<b>660</b>	<b>670</b>	<b>680</b>
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 operational switching	3 x 400V	(kW)	7.5	11	22	30	37
	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 (Main switches for machinery)	3 x 400V	(kW)	11	15	30 <sup>(1)</sup>	37 <sup>(2)</sup>	45
	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

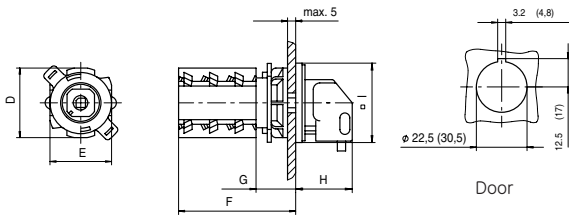
### Auxiliary contact for ML 1/2/3 - According to IEC 947-5-1

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

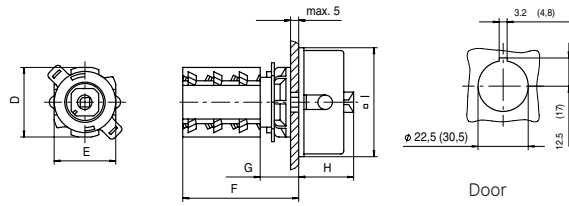
### Front mounting - Central fixing $\varnothing$ 22.5/30.5 mm

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



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

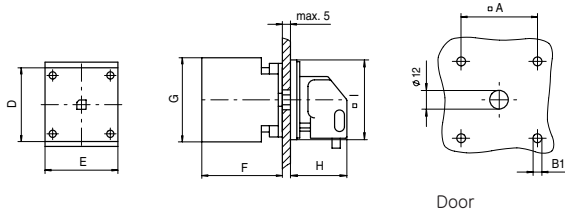
For 3 padlocks,  $\varnothing$  max. 9 mm



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

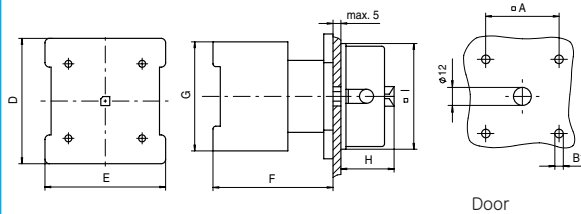
### Front mounting - 4-hole fixing

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



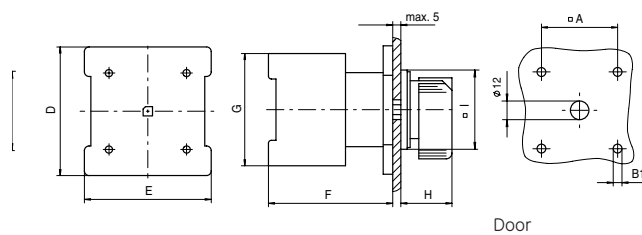
Series	A	B1	D	E	F	G	H	I
ML1	36	4.5	44	44	50	55	35	48

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

A

B

C

D

E

F

G

H

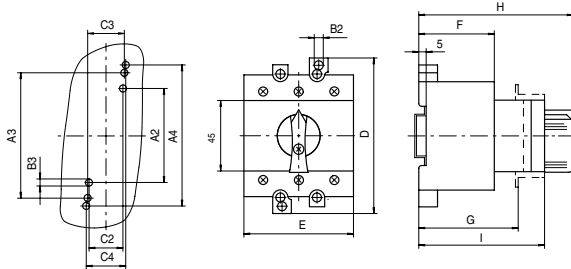
I

X

## Dimensional drawings

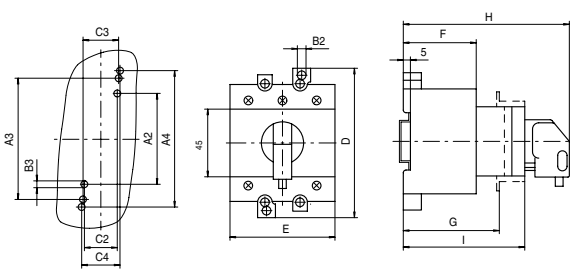
### Rear mounting - DIN-rail mounting

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

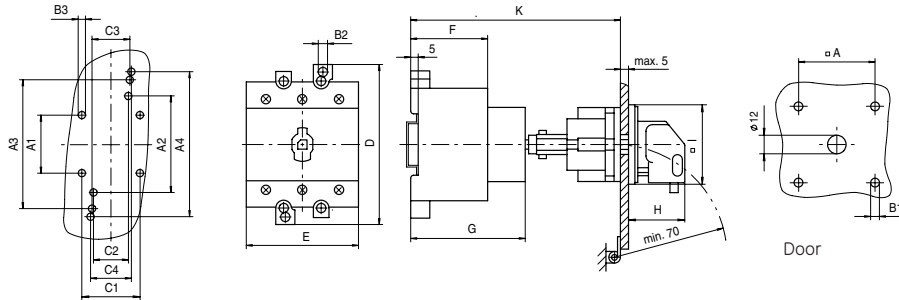
For 1 or 2 padlocks, Ø max. 5 mm



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

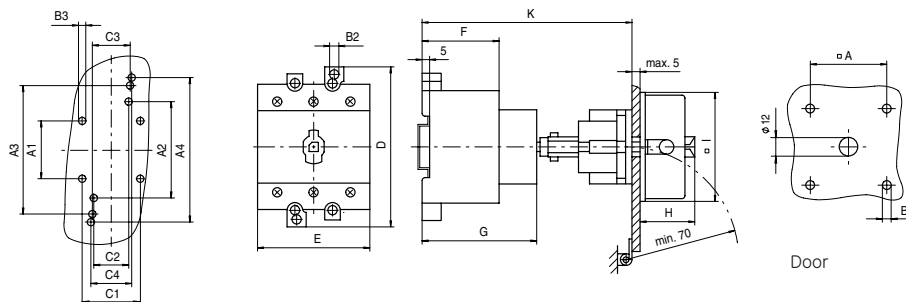
### Rear mounting - With door coupling

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

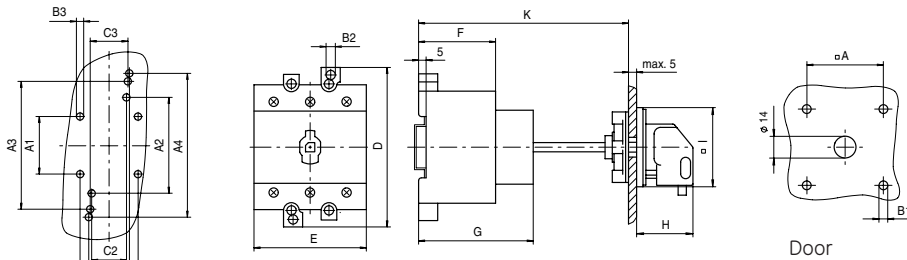
For 3 padlocks, Ø max. 5 mm



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

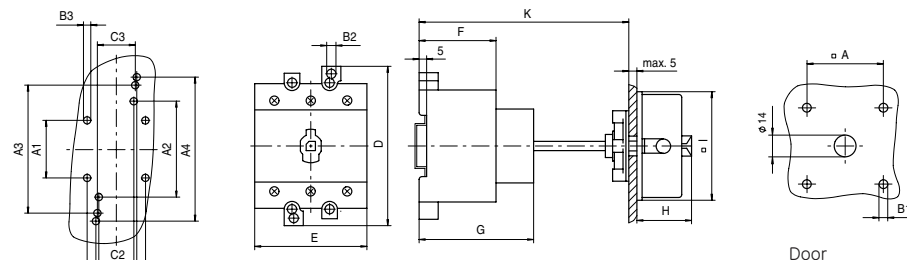
### Rear mounting - With cover coupling

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



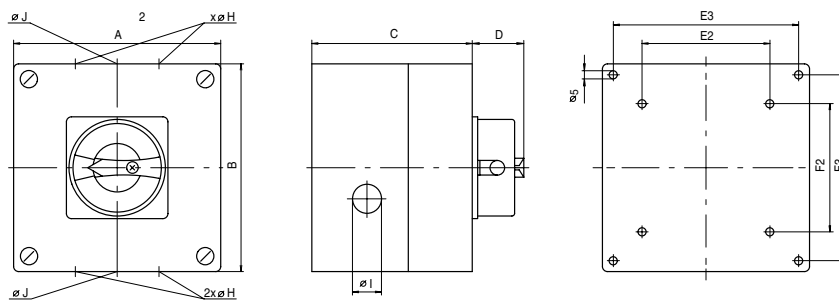
Series	A	A2	A3	A4	B1	B2	B3	C2	C3	C4	D	E	F	G	H	I	K
ML1	36	60	65	70	4.5	4.2	3.8	22	30	25	78	45	42	55	35	48	105-135

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	-

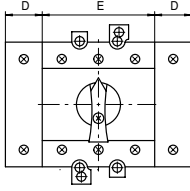
Cable entry					
Type	H (1)	I (1)	H (2)	I (2)	J (2)
E2	PG 16/11	PG 11	-	-	-
E3	PG 21/16	PG 16	-	-	-
E4	-	-	PG 21	PG 11	-
E5	-	-	PG 29	-	PG 11
E6	-	-	PG 29	PG 11	-
E7	PG 36/29	PG 29	-	-	-

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

## Dimensional drawings

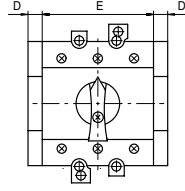
### Accessories

N-module and PE-terminal



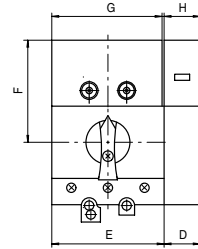
Series	D	E
ML1	14.5	45
ML2	23	53.5
ML3	23	70

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

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