



FLOHE

# RAILWAY TECHNOLOGY

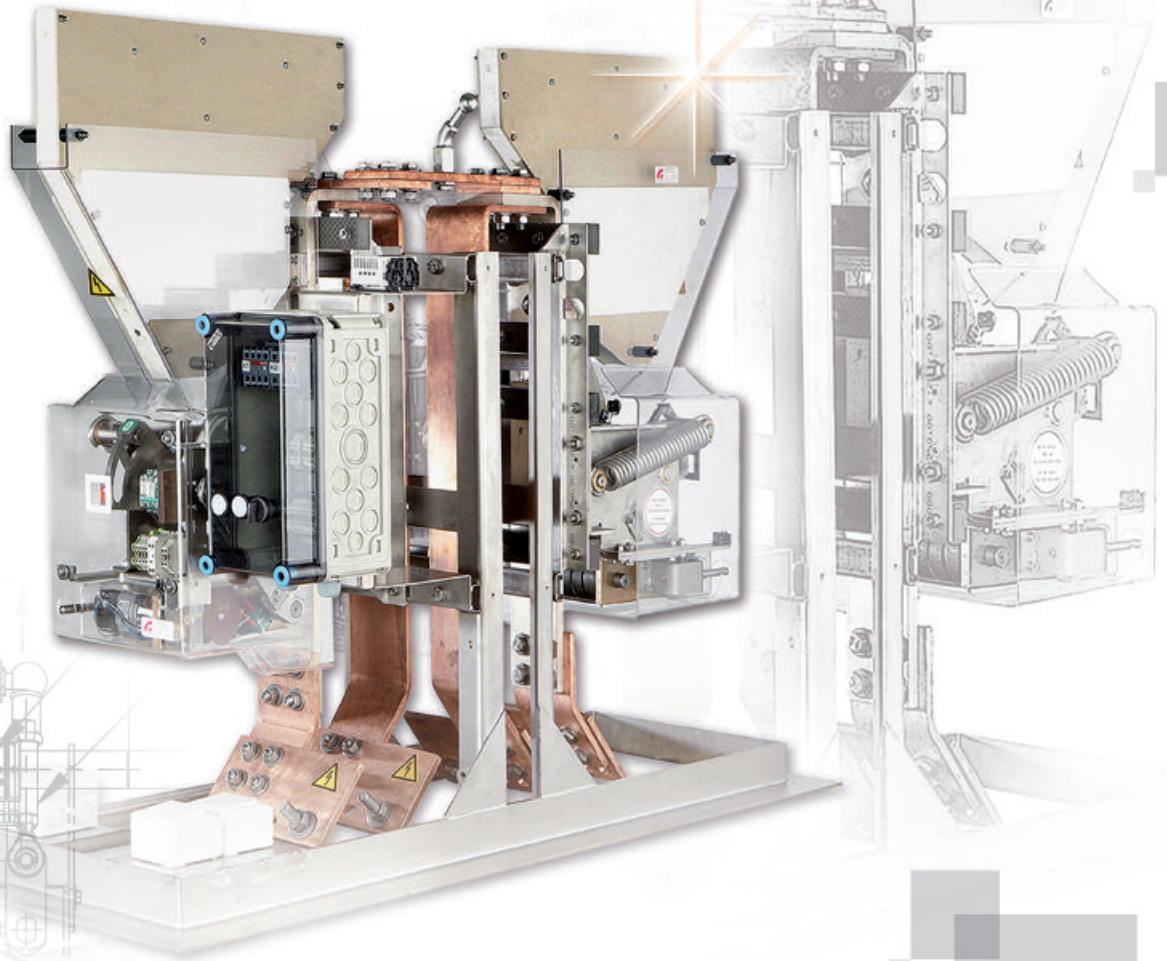


BERG



## SINCE 1906 THE NAME FLOHE HAS BEEN SYNONYMOUS WITH HIGH-QUALITY PRODUCT GERMANY AND FRANCE

IN THE FIELD OF LOW- AND MEDIUM-VOLTAGE TECHNOLOGY

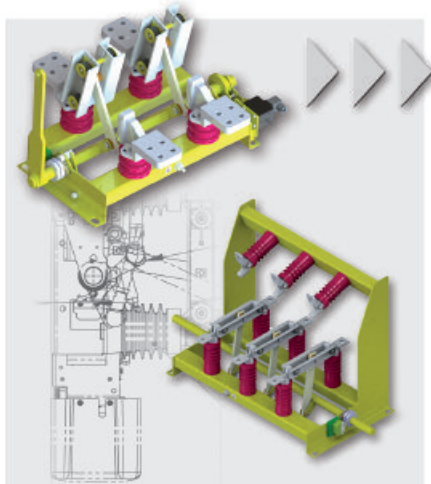


THE RAILWAY TECHNOLOGY DIVISION IS THE LOGICAL ADVANCEMENT  
OF MEDIUM-VOLTAGE TECHNOLOGY AT FLOHE

- From the acquisition of a small, central German company, in recent years it has grown into an independent and significant part of the group. The acquisition of a French production plant allowed considerable expansion of the division.
- Today our activities in the railway technology sector include both isolator switches and circuit breakers. Our range includes 750 V to 27.5 kV with maximum currents of 12000 A. In addition to the individual equipment, we also offer various system solutions.
- Our technology is based on a modular system. We achieve application- and customer-specific solutions in each of our contracts.

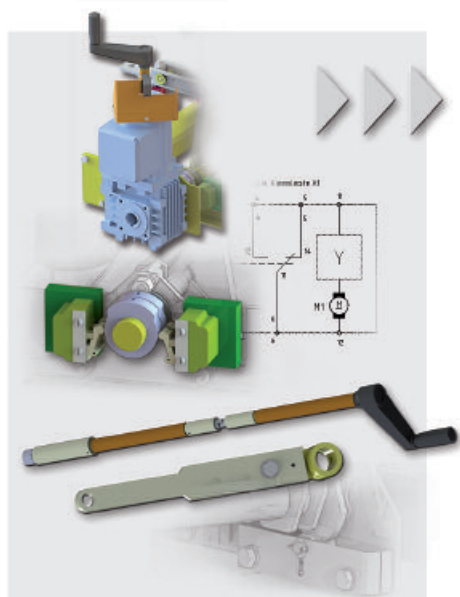
THE CATALOGUE GIVES YOU A BRIEF OVERVIEW OF THE  
TECHNICAL SCOPE. GET IN TOUCH!

# CONTENT



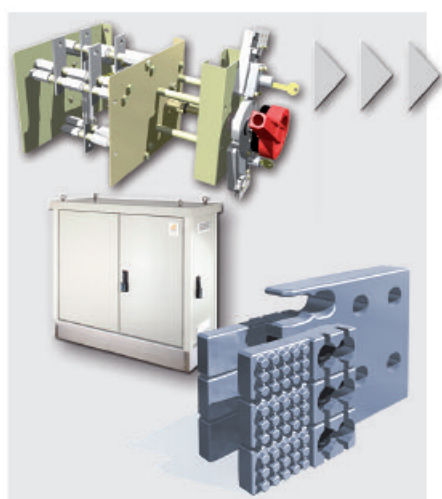
## SWITCHING EQUIPMENT...

With tradition into the future .....	4 - 5
Isolators DC .....	6 - 9
Isolators AC .....	10 - 15
Changeover switches .....	16 - 17
Earthing switches .....	18 - 23



## ATTACHMENTS...

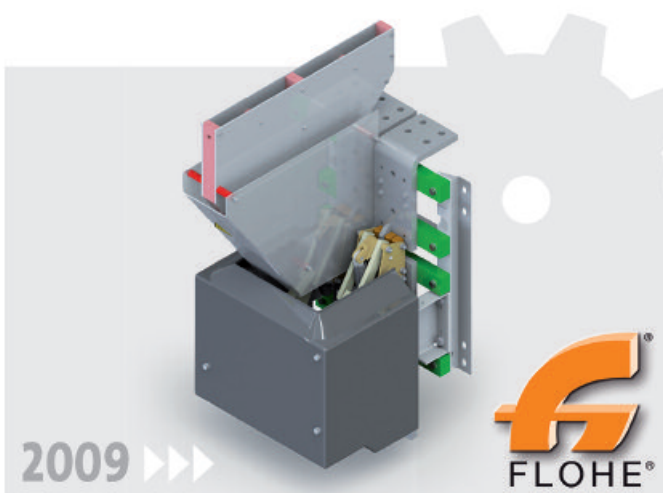
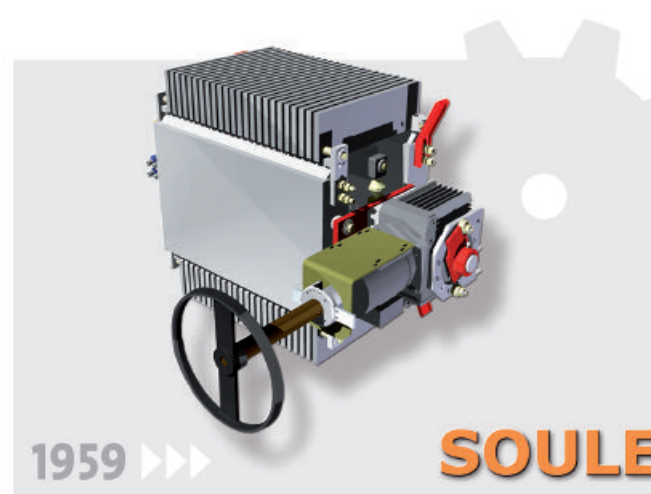
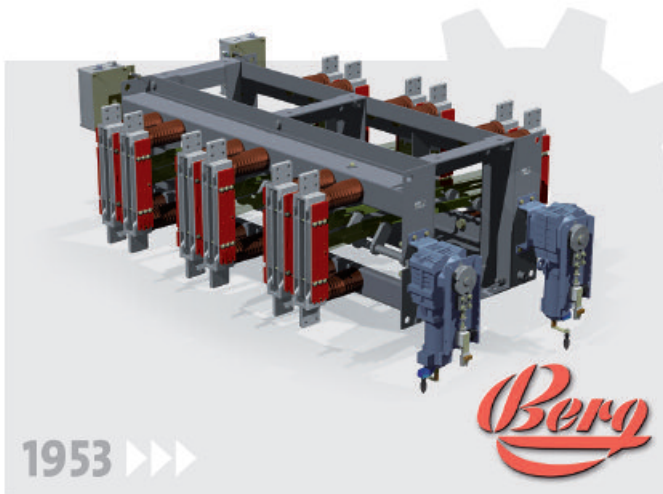
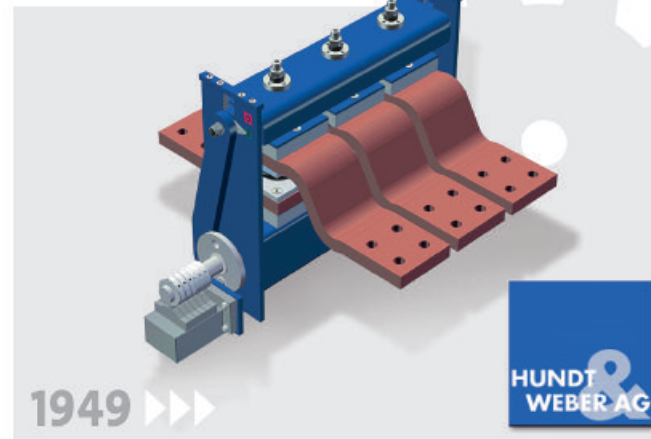
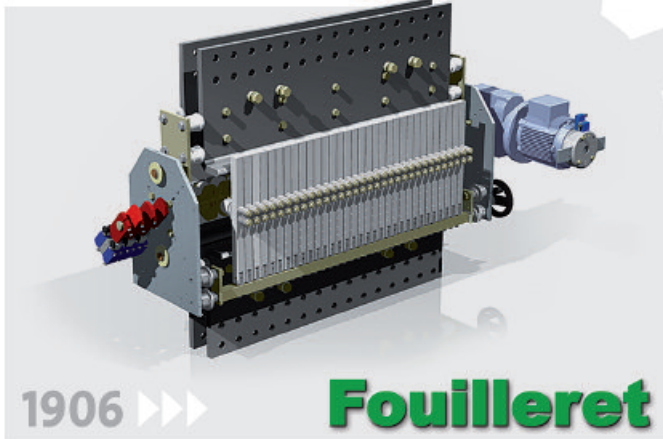
Motor drives .....	24 - 25
Circuit diagrams .....	26
Auxiliary switches .....	27
Hand levers / Emergency hand cranks .....	28
Locking mechanisms .....	29



## SYSTEM SOLUTIONS

FA .....	30- 33
Switch cabinets FLS .....	34 - 36
DC disconnectors FGS .....	37
HAK MOVING CONTACT .....	38- 39

# With tradition...



## FOR MORE THAN 110 YEARS



## EXPERT TEAM FOR SWITCHING EQUIPMENT

FLOHE can build on the experience and know-how in switching equipment of the renowned traditional companies and develop these products with an experienced team.

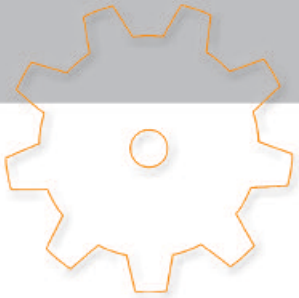
The range of services of our new companies includes the engineering, manufacturing of components and systems, and on-site service.

This covers the entire service spectrum of electrolysis (power rails, switches, flexible connections, installation and on-site maintenance), medium voltage (isolator switches, earthing switches, flexible connections), railway technology (circuit breakers, switch cabinet system solutions).

HIGH CURRENT

MEDIUM VOLTAGE

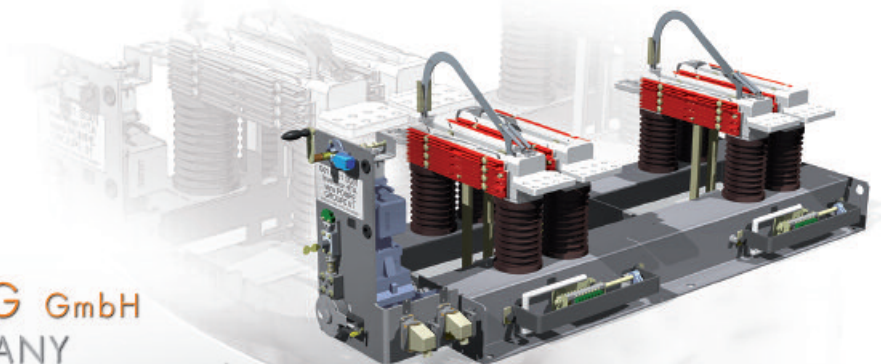
RAILWAY  
TECHNOLOGY



# ...into the future

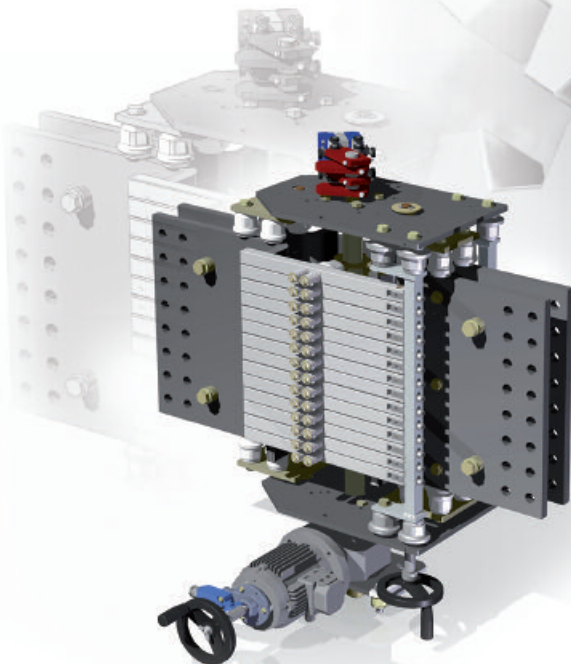


**BERG GmbH**  
GERMANY



MEDIUM VOLTAGE  
& TRACTION

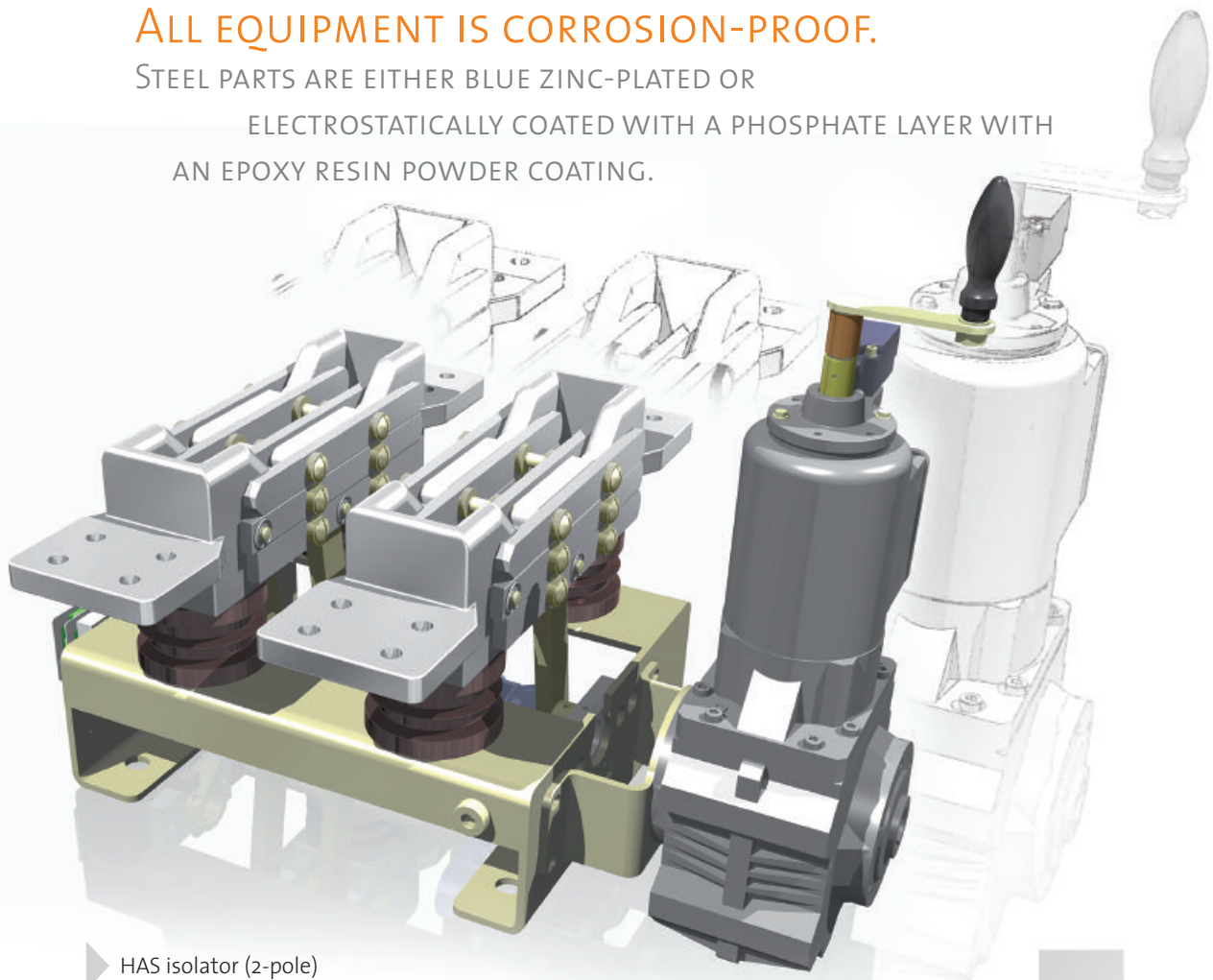
HIGH POWER  
SWITCHES



**FOUILLERET SAS**  
FRANCE

## ALL EQUIPMENT IS CORROSION-PROOF.

STEEL PARTS ARE EITHER BLUE ZINC-PLATED OR ELECTROSTATICALLY COATED WITH A PHOSPHATE LAYER WITH AN EPOXY RESIN POWDER COATING.

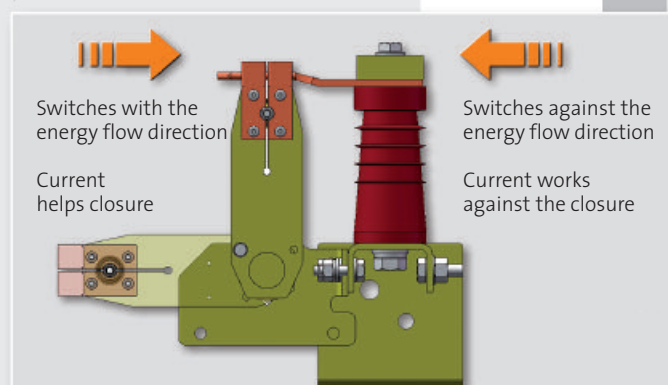


▶ HAS isolator (2-pole) with motor drive

## SHORT-CIRCUIT CURRENT CAPABILITY

- The short-circuit resistance of active isolator switches is tested in accordance with VDE/IEC. Due to the direct current flow, the isolator switches do not need to be locked against being opened by short-circuit forces.
- Earthing switches attached to isolator switches or as independent devices must be locked for surge currents exceeding 50 kA if the earthing switch is installed in such a way that the surge current (according to the diagram on the right) flows through the earthing switch with the energy flow direction. Strong opening forces are active in this direction.
- Sufficient locking is guaranteed for the motor drive as well as for self-locking manual drives (e.g. ball-joint drive).
- For earthing switches that are attached to isolator switches, the mechanical locking between isolator and earthing switches is a simple mechanism to eliminate the disadvantages of the energy flow direction with open force impact.

▶ Direction of the current



# TYP GT/HAS

## THE ISOLATOR SWITCHES ARE SUITABLE FOR INDOOR INSTALLATION FROM 1.5 kV TO 40.5 kV.

### NAMEPLATE DETAILS

FLOHE BERG GmbH			
GT1.25-12.0-01-M1-A19-E06			
Serien-Nr. A12468/S203471		-001	
IEC 62271-102	Zg-Nr.:	WF16_15808	
U <sub>i</sub> 12.0 kV	I <sub>p</sub> 1.25 kA	fr	50/60Hz
U <sub>s</sub> 75 kV	I <sub>p</sub> 80 kA	Bj	2016
U <sub>y</sub> 28 kV	I <sub>p</sub> 31.5 kA /1s	M	19 kg

#### Note:

the following four details are required for queries regarding spare parts, subsequent deliveries etc.:

- Type designation
- Factory no.
- Model name
- Construction year



Thanks to the use of corrugated isolators made of cast resin, the isolator switches can be used even in areas of high humidity and occasional condensation e.g. in tropical climates. The equipment is corrosion-proof. Steel parts are either blue zinc-plated or electrostatically coated with a phosphate layer with an epoxy resin powder coating.

The switches can be installed in any location where the shaft is horizontal. Models for installation with vertical shafts are also available.

### SERVICE LIFE

Normally isolator switches are seldom actuated. Therefore, they are not built for a high number of switching cycles. The standard mechanical service life and the switching service life are:

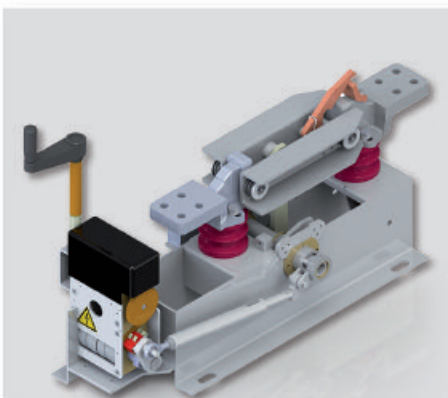
- 5,000 switching cycles for isolator switches.  
Up to 25,000 switching cycles can be achieved on demand.

### SWITCH FUNCTIONS

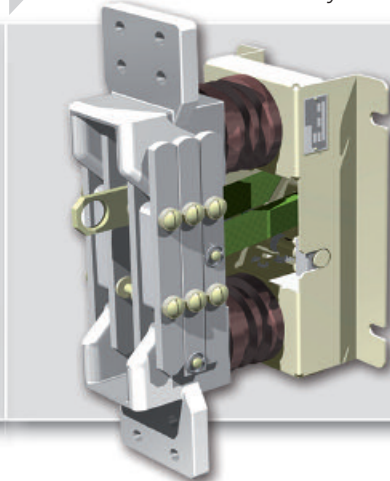
ISOLATOR SWITCHES HAVE THE FOLLOWING TASKS:

- To open and close circuits when either negligibly small currents should be interrupted or activated, or when there is no significant voltage difference between the circuits to be isolated and/or connected.
- To create separation between the connections of any one pole in the open position.

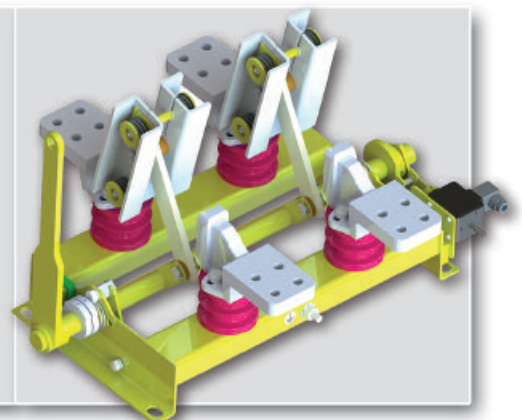
GT isolator with pluggable contact

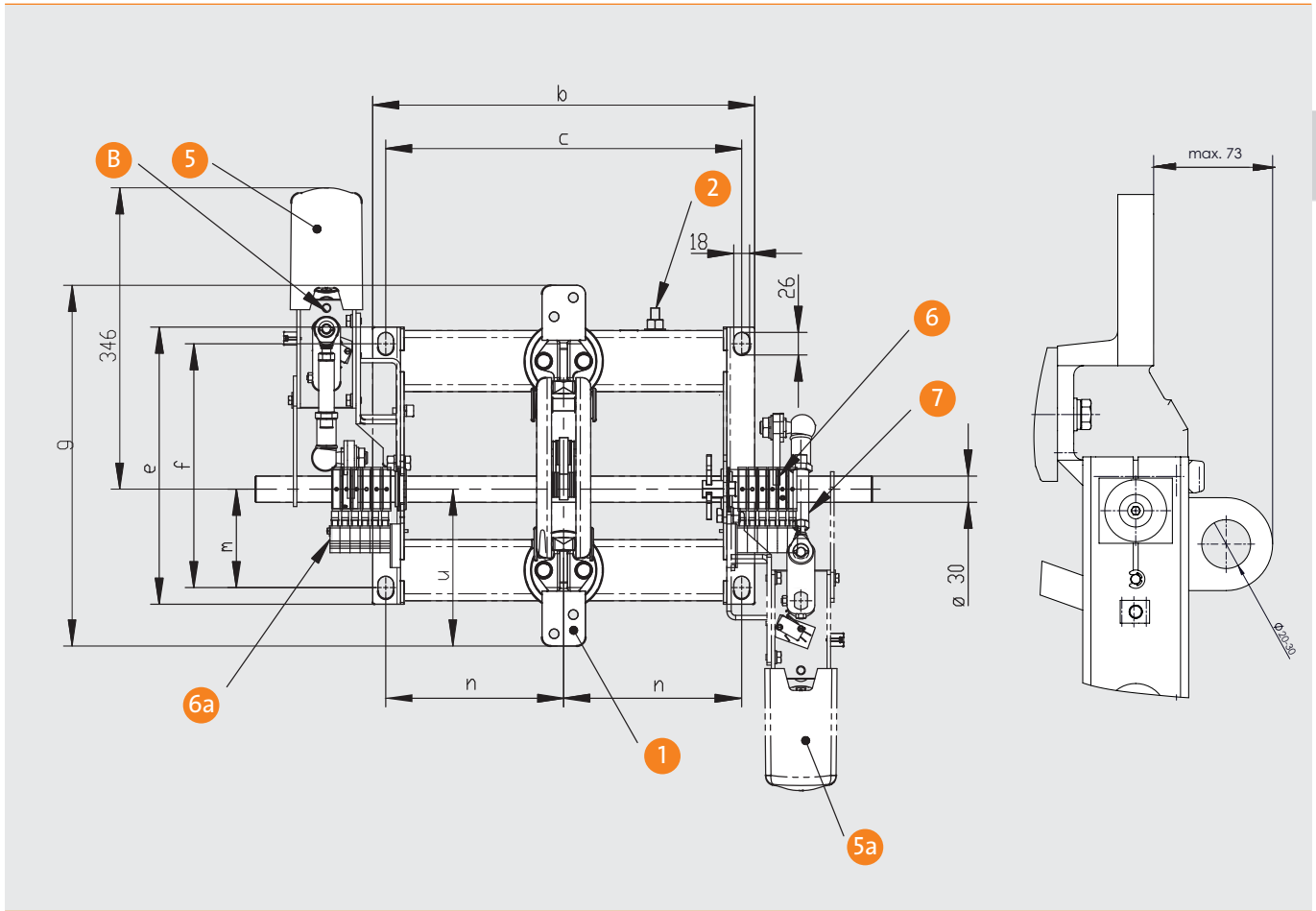


HAS isolator with drawbar eye



GT isolator (2-pole)



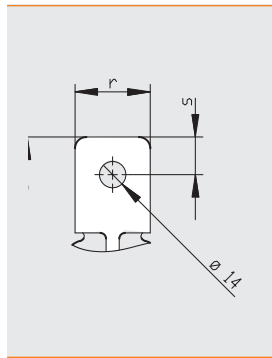
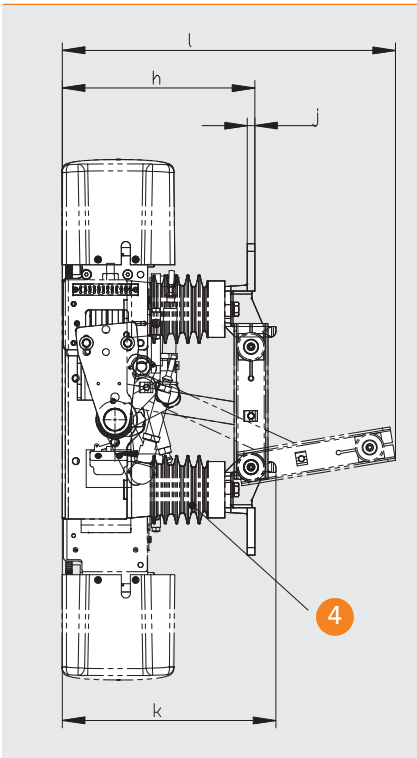


▶▶▶ e.g. – other types GT/HAS, see Page 10-11

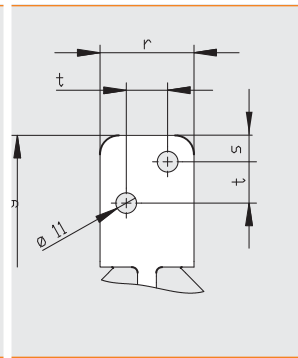
Number of poles	Typ	$U_n$ [kV]	$U_p$ [kV]	$U_d$ [kV]	$I_n$ [kA]	$I_{th}$ [kA]	$I_{dyn}$ [kA]	Weight [kg]	PA	a	b	c	d
1,5 kV 1-pole	GT0.63-1.50-01-L1	1,5	12	4	630	20	50	7	--	--	162	132	--
	GT1.25-1.50-01-M1	1,5	12	4	1250	31,5	80	10	--	--	162	132	--
	GT1.60-1.50-01-M1	1,5	12	4	1600	31,5	80	12	--	--	162	132	--
	GT2.50-1.50-01-M1	1,5	12	4	2500	31,5	80	15	--	--	198	160	--
	HAS3.15-1.50-01-K1	1,5	12	4	3150	67	168	18	--	--	150	120	--
3,6 kV 1-pole	GT0.63-3.60-01-L1	3,6	40	10	630	20	50	8,5	--	--	230	200	--
	GT0.63-3.60-01-M1	3,6	40	10	630	31,5	80	8,5	--	--	230	200	--
	GT1.25-3.60-01-M1	3,6	40	10	1250	31,5	80	14	--	--	210	180	--
	GT1.60-3.60-01-M1	3,6	40	10	1600	31,5	80	17	--	--	210	180	--
	GT2.50-3.60-01-M1	3,6	40	10	2500	31,5	80	35	--	--	198	160	--
	GT3.15-3.60-01-M1	3,6	40	10	3150	31,5	80	38	--	--	238	200	--
	HAS3.15-3.60-01-KD1	3,6	40	10	3150	71	168	32	--	--	110	--	--
	HAS4.00-3.60-01-KD1	3,6	40	10	4000	71	168	35	--	--	220	190	--
	HAS6.30-3.60-01-TF1	3,6	40	10	6300	71	168	40	--	--	220	190	--
7,2kV 1-pole	GT0.63-7.20-01-L1	7,2	60	20	630	20	50	20,5	--	--	210	180	--
	GT0.63-7.20-01-M1	7,2	60	20	630	31,5	80	20,5	--	--	210	180	--
	GT1.25-7.20-01-M1	7,2	60	20	1250	31,5	80	36	--	--	210	180	--
	GT1.60-7.20-01-M1	7,2	60	20	1600	31,5	80	36	--	--	210	180	--
	GT2.50-7.20-01-M1	7,2	60	20	2500	31,5	80	64	--	--	198	160	--
	GT3.15-7.20-01-M1	7,2	60	20	3150	31,5	80	66	--	--	238	200	--
	HAS3.15-7.20-01-KD1	7,2	60	20	3150	71	168	35	--	--	162	92	--
	HAS4.00-7.20-01-KD1	7,2	60	20	4000	71	168	40	--	--	190	130	--
	HAS6.30-7.20-01-TF1	7,2	60	20	6300	81	168	50	--	--	190	130	--



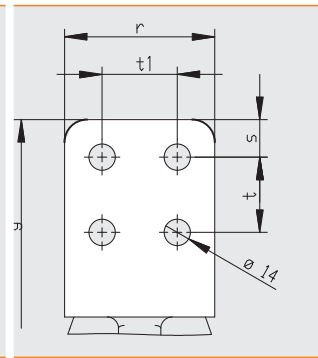
# TYP GT/HAS



▶ 630 A



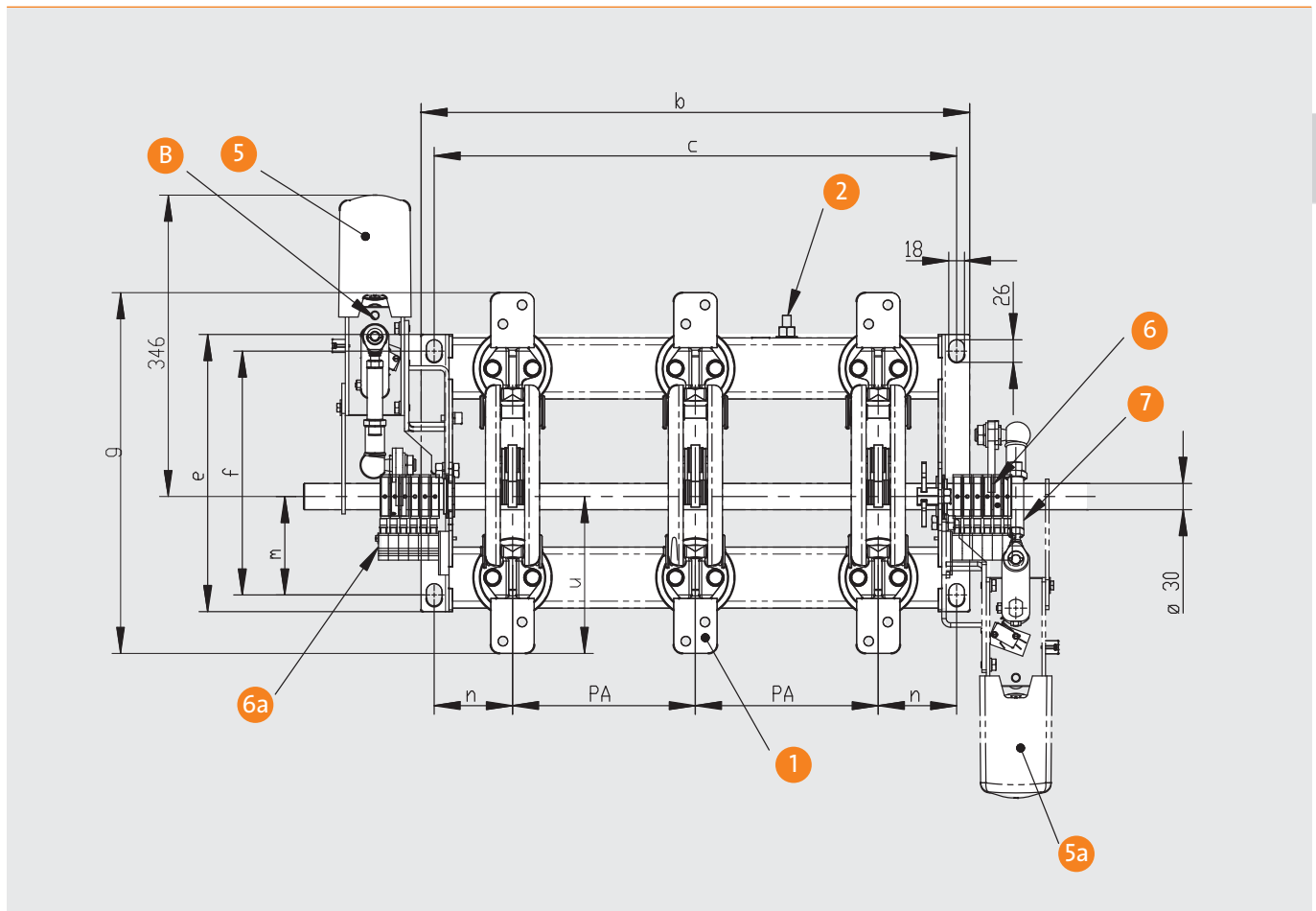
▶ 1250 A / 1600 A



▶ 2500 A / 3150 A

- 1 Connection screws  
630 A: M12  
1250 A / 1600 A: M10  
2500 A / 3150 A: M12
  - 2 Earthing screw  
1x M12 630A / 1250 A / 1600 A  
2x M12 2500 A / 3150 A / 4000 A  
6300 A
  - 4 Supports
  - 5 Motor drive
  - 5a Motor drive  
Optional position
  - 6 Auxiliary switches
  - 6a Auxiliary switches  
Optional position
  - B Connection  
Hand crank
- Actuating voltage indicated upon order

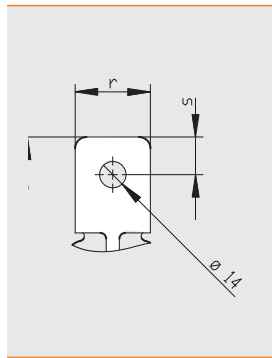
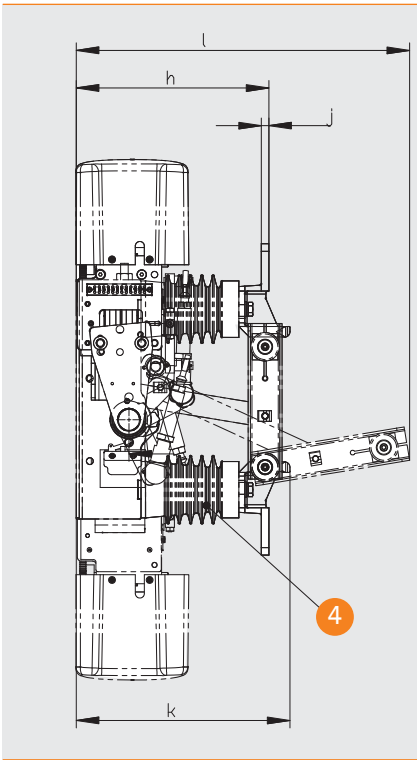
e	f	g	h	j	k	l	m	n	r	s	t	t <sub>1</sub>	u	Typ	Number of poles
318	280	370	177	6	205	372	113	66	40	20	--	--	158	GT0.63-1.50-01-L1	1,5 kV 1-pole
318	280	414	191	10	235	391	113	90	50	14	22	22	180	GT1.25-1.50-01-M1	
262	224	357	182	10	210	299	105	90	50	14	22	22	172	GT1.60-1.50-01-M1	
408	340	570	224	22	255	444	113	80	80	20	40	40	228	GT2.50-1.50-01-M1	
330	262	492	224	22	255	360	120	80	80	20	40	40	228	GT3.15-1.50-01-M1	3,6 kV 1-pole
310	280	430	135	18	175	294	111	60	100	20	40	50	189	HAS3.15-1.50-01-K1	
318	280	370	177	6	205	371	113	100	40	20	--	--	158	GT0.63-3.60-01-L1	
318	280	370	177	6	205	371	113	100	40	20	--	--	158	GT0.63-3.60-01-M1	
318	280	414	191	10	219	375	113	90	50	14	22	--	180	GT1.25-3.60-01-M1	7,2kV 1-pole
318	280	414	191	10	219	375	113	90	50	14	22	--	180	GT1.60-3.60-01-M1	
318	340	570	224	22	255	449	113	80	80	20	40	--	228	GT2.50-3.60-01-M1	
318	340	570	289	22	395	360	113	80	80	20	40	--	228	GT3.15-3.60-01-M1	
365	325	446	198	18	240	385	133	55	100	20	40	50	194	HAS3.15-3.60-01-KD1	
325	240	498	205	20	260	420	88	110	120	20	40	60	217	HAS4.00-3.60-01-KD1	
325	260	538	225	20	281	480	108	110	160	20	40	40	236	HAS6.30-3.60-01-TF1	
318	280	370	242	6	270	445	113	90	40	20	--	--	158	GT0.63-7.20-01-L1	
318	280	370	242	6	270	445	113	90	40	20	--	--	158	GT0.63-7.20-01-M1	
318	280	414	256	10	284	445	113	90	50	14	22	--	180	GT1.25-7.20-01-M1	
318	280	414	256	10	284	445	113	90	50	14	22	--	180	GT1.60-7.20-01-M1	
408	340	570	289	22	320	525	113	80	80	20	40	--	228	GT2.50-7.20-01-M1	
408	340	570	289	22	395	525	113	80	80	20	40	--	228	GT3.15-7.20-01-M1	
350	265	500	308	18	350	560	85	46	100	20	50	50	200	HAS3.15-7.20-01-KD1	
424	344	549	347	20	400	600	120	65	120	20	40	60	225	HAS4.00-7.20-01-KD1	
424	344	588	367	20	425	645	122	65	160	20	40	40	245	HAS6.30-7.20-01-TF1	



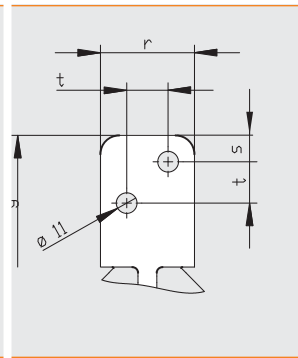
◀◀◀ e.g. – other types GT/HAS, see Page 8-9

Number of poles	Typ	U <sub>n</sub> [kV]	U <sub>p</sub> [kV]	U <sub>d</sub> [kV]	I <sub>n</sub> [kA]	I <sub>th</sub> [kA]	I <sub>dyn</sub> [kA]	Weight [kg]	PA	a	b	c	d
1,5 kV 3-pole	GT0.63-1.50-03-100-L1	1,5	12	4	630	20	50	15	100	--	362	332	--
	GT1.25-1.50-03-100-M1	1,5	12	4	1250	31,5	80	20	100	--	362	332	--
	GT1.60-1.50-03-100-M1	1,5	12	4	1600	31,5	80	22	100	--	362	332	--
	GT2.50-1.50-03-130-M1	1,5	12	4	2500	31,5	80	45	130	--	458	420	--
	GT3.15-1.50-03-150-M1	1,5	12	4	3150	31,5	80	52	150	--	498	460	--
	HAS3.15-1.50-03-180-K1	1,5	12	4	3150	31,5	80	54	180	--	574	534	--
3,6 kV 3-pole	GT0.63-3.60-03-150-L1	3,6	40	10	630	20	50	20	150	--	530	500	--
	GT0.63-3.60-03-150-M1	3,6	40	10	630	31,5	80	20	150	--	530	500	--
	GT1.25-3.60-03-150-M1	3,6	40	10	1250	31,5	80	22	150	--	510	480	--
	GT1.60-3.60-03-150-M1	3,6	40	10	1600	31,5	80	25	150	--	510	480	--
	GT2.50-3.60-03-170-M1	3,6	40	10	2500	31,5	80	50	170	--	538	500	--
	GT3.15-3.60-03-180-M1	3,6	40	10	3150	31,5	80	52	180	--	670	640	--
	HAS3.15-3.60-03-200-KD1	3,6	40	10	3150	71	168	96	200	--	665	615	--
	HAS4.00-3.60-03-250-KD1	3,6	40	10	4000	71	168	105	250	--	800	750	--
	HAS6.30-3.60-03-300-TF1	3,6	40	10	6300	81	168	120	300	--	904	850	--
7,2kV 3-pole	GT0.63-7.20-03-210-L1	7,2	60	20	630	20	50	20,5	210	--	630	600	--
	GT0.63-7.20-03-210-M1	7,2	60	20	630	31,5	80	20,5	210	--	630	600	--
	GT1.25-7.20-03-210-M1	7,2	60	20	1250	31,5	80	36	210	--	630	600	--
	GT1.60-7.20-03-210-M1	7,2	60	20	1600	31,5	80	36	210	--	630	600	--
	GT2.50-7.20-03-210-M1	7,2	60	20	2500	31,5	80	36	210	--	618	580	--
	GT3.15-7.20-03-210-M1	7,2	60	20	3150	31,5	80	36	230	--	658	620	--
	HAS3.15-7.20-03-300-KD1	7,2	60	20	3150	71	168	105	300	--	950	910	--
	HAS4.00-7.20-03-400-KD1	7,2	60	20	4000	71	168	120	400	--	1330	1270	--
	HAS6.30-7.20-03-400-TF1	7,2	60	20	6300	81	168	150	400	--	1330	1270	--

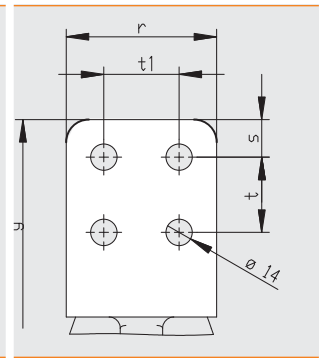
# TYP GT/HAS



▶ 630 A



▶ 1250 A / 1600 A

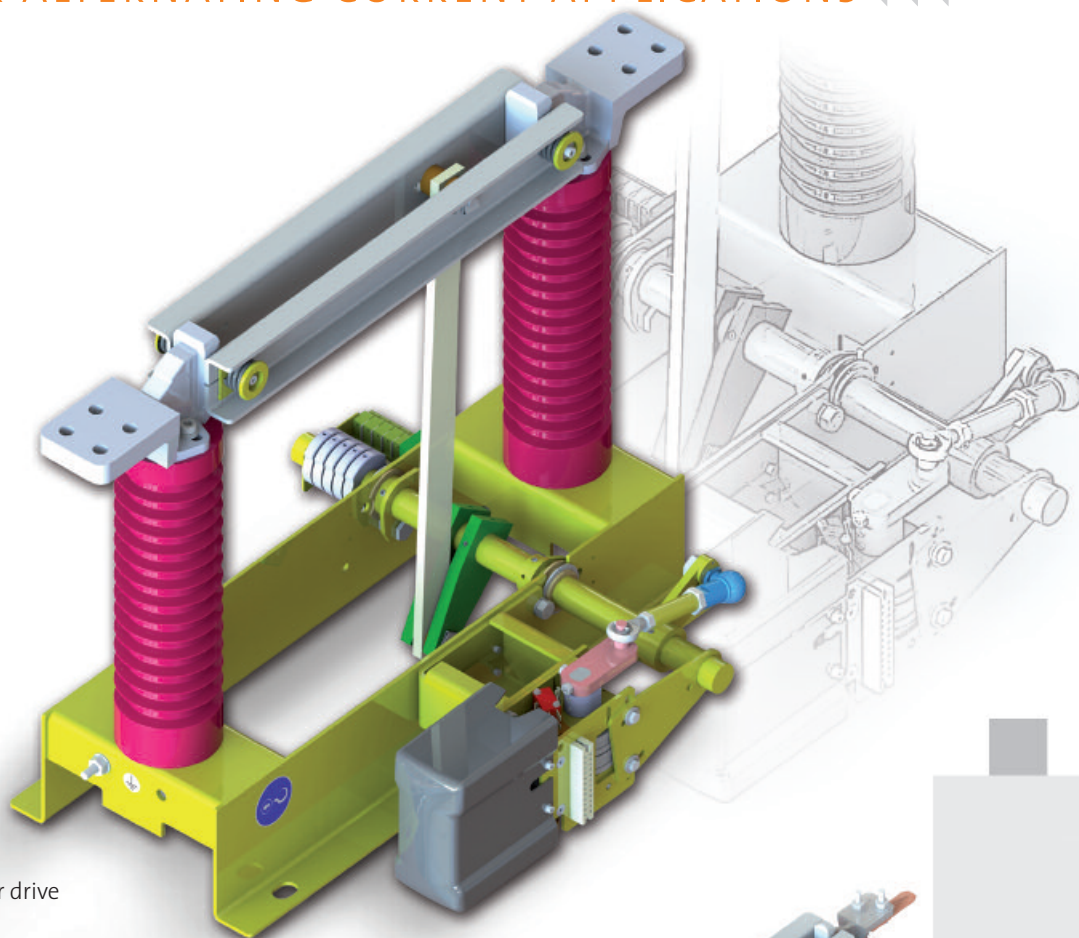


▶ 2500 A / 3150 A

- 1** Connection screws  
630 A: M12  
1250 A / 1600 A: M10  
2500 A / 3150 A: M12
  - 2** Earthing screw  
1x M12 630A / 1250 A / 1600 A  
2x M12 2500 A / 3150 A / 4000 A  
6300 A
  - 4** Stützer
  - 5** Motor drive
  - 5a** Motor drive  
Optional position
  - 6** Auxiliary switches
  - 6a** Auxiliary switches  
Optional position
  - B** Connection  
Hand crank
- Actuating voltage indicated upon order

e	f	g	h	j	k	l	m	n	r	s	t	t <sub>1</sub>	u	Typ	Number of poles
318	280	370	177	6	205	372	113	66	40	20	--	--	158	GT0.63-1.50-03-100-L1	1,5 kV 3-pole
318	280	414	207	10	235	391	113	90	50	14	22	22	180	GT1.25-1.50-03-100-M1	
262	224	357	182	10	210	299	105	90	50	14	22	22	172	GT1.60-1.50-03-100-M1	
408	340	570	224	22	255	444	113	80	80	20	40	40	228	GT2.50-1.50-03-130-M1	
330	262	492	224	22	255	360	120	80	80	20	40	40	235	GT3.15-1.50-03-150-M1	3,6 kV 3-pole
310	280	430	137	18	175	296	111	87	100	20	40	50	189	HAS3.15-1.50-03-180-K1	
318	280	370	177	6	205	371	113	90	40	20	--	--	158	GT0.63-3.60-03-150-L1	
318	280	370	177	6	205	371	113	90	40	20	--	--	158	GT0.63-3.60-03-150-M1	
318	280	414	191	10	219	375	113	90	50	14	22	--	180	GT0.63-3.60-03-150-M1	7,2kV 3-pole
318	280	414	191	10	219	375	113	90	50	14	22	--	180	GT0.63-3.60-03-150-M1	
408	340	570	224	22	255	449	113	80	80	20	40	--	228	GT2.50-3.60-03-170-M1	
492	300	262	210	22	241	360	113	80	80	20	40	--	228	GT3.15-3.60-03-180-M1	
365	325	446	208	18	--	395	--	107,5	100	20	40	50	194	HAS3.15-3.60-03-200-KD1	7,2kV 3-pole
325	240	498	215	20	--	430	--	125	120	20	40	60	217	HAS4.00-3.60-03-250-KD1	
325	260	538	235	20	--	465	--	125	160	20	40	40	236	HAS6.30-3.60-03-300-TF1	
318	280	370	242	6	270	445	113	90	40	20	--	--	158	GT0.63-7.20-03-210-L1	
318	280	370	242	6	270	445	113	90	40	20	--	--	158	GT0.63-7.20-03-210-M1	7,2kV 3-pole
318	280	414	256	10	284	445	113	90	50	14	22	--	180	GT1.25-7.20-03-210-M1	
318	280	414	256	10	284	445	113	90	50	14	22	--	180	GT1.60-7.20-03-210-M1	
408	340	570	289	22	320	525	113	80	80	20	40	--	228	GT2.50-7.20-03-210-M1	
408	340	570	289	22	395	525	113	80	80	20	40	--	228	GT3.15-7.20-03-210-M1	7,2kV 3-pole
350	265	500	308	18	350	560	85	155	100	20	50	50	200	HAS3.15-7.20-03-300-KD1	
424	344	549	347	20	400	614	120	235	120	20	40	60	225	HAS4.00-7.20-03-400-KD1	
424	344	588	367	20	425	654	122	235	160	20	40	40	245	HAS6.30-7.20-03-400-TF1	

▶▶▶ ISOLATOR/EARTH CONTACT COMBINATION  
FOR ALTERNATING CURRENT APPLICATIONS ◀◀◀



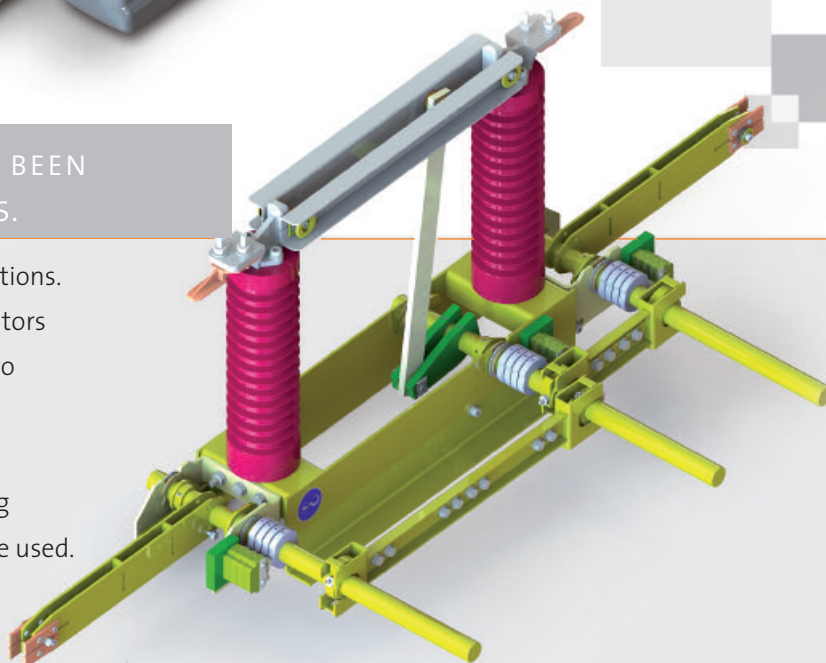
▶ GT isolator with motor drive

OUR GT/GTD/GTÖ/GTS DEVICES HAVE BEEN DEVELOPED FOR RAILWAY APPLICATIONS.

They cover a broad scope and allow diverse configurations. Anything is possible: from individual single-pole isolators to isolator/earth contact combinations with up to two earth contacts and two-pole design.

Various optional extras can also be selected.

In particular, a motor unit for the combined switching process of the isolator and a earth contact can also be used.



▶ GTS: Isolator with two earth contacts



## FEATURES

- Indoor use
- Customer-specific design
- Large separation between the contacts
- Visible separation
- Also available as an outdoor version
- Multiple variations

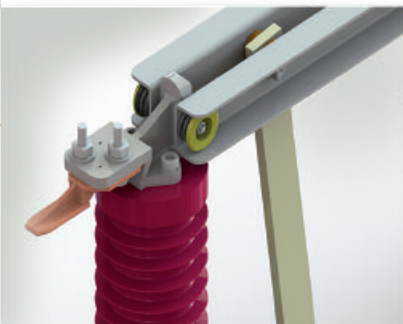
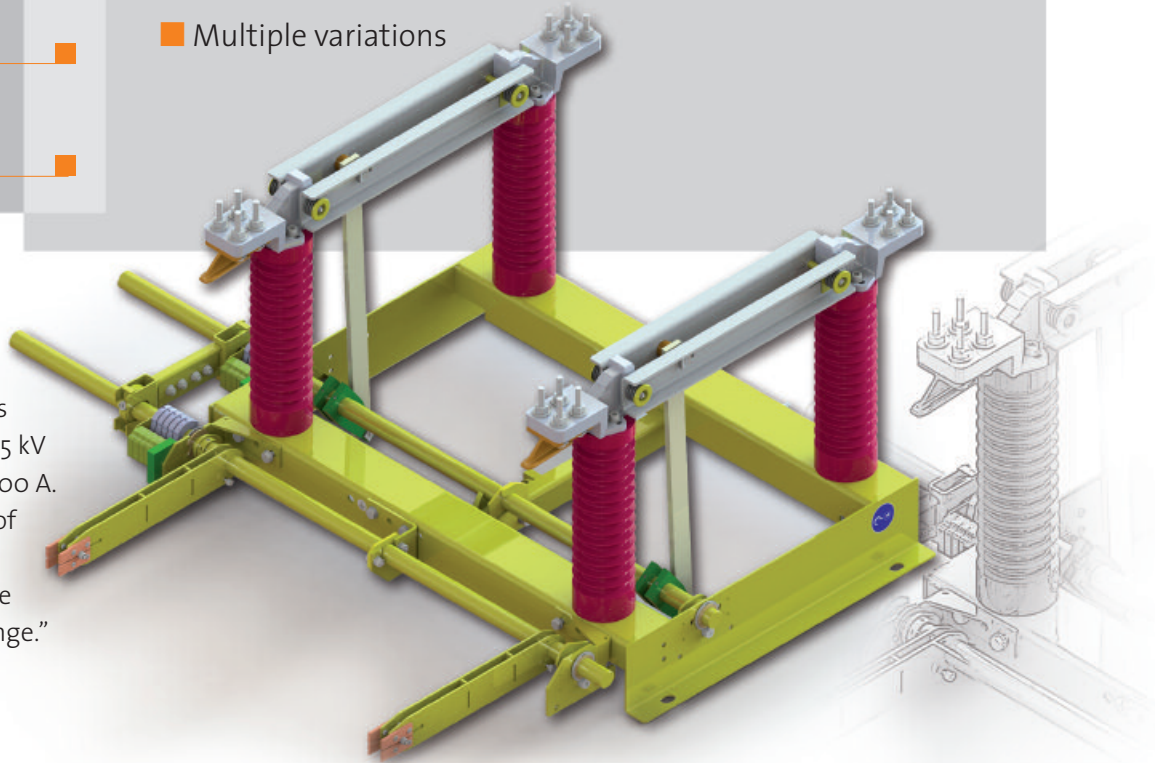
PURSUANT TO  
STANDARD:

IEC 62271-102

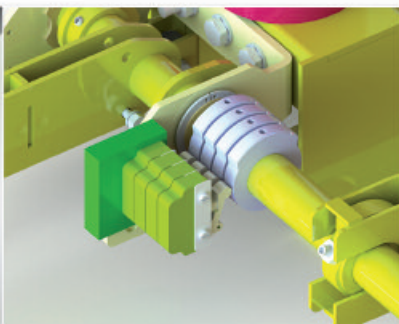
IEC 62505-2

EN 50123 TEIL 1,  
TEIL 3, TEIL 4

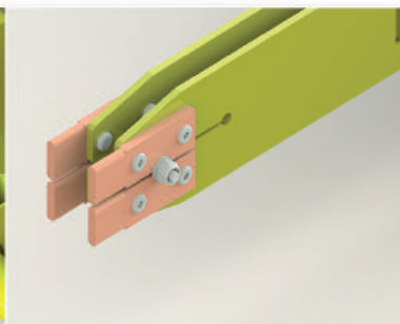
The standard range includes devices with a voltage of 27,5 kV and currents of 1250 A to 2500 A. There are also special sizes of 630 A and 3150 A. For currents above 3150 A we refer to our HAS product range.”



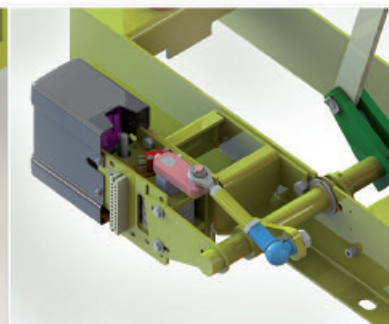
▶ Earth contact



▶ Auxiliary switches



▶ Earth contact gauge

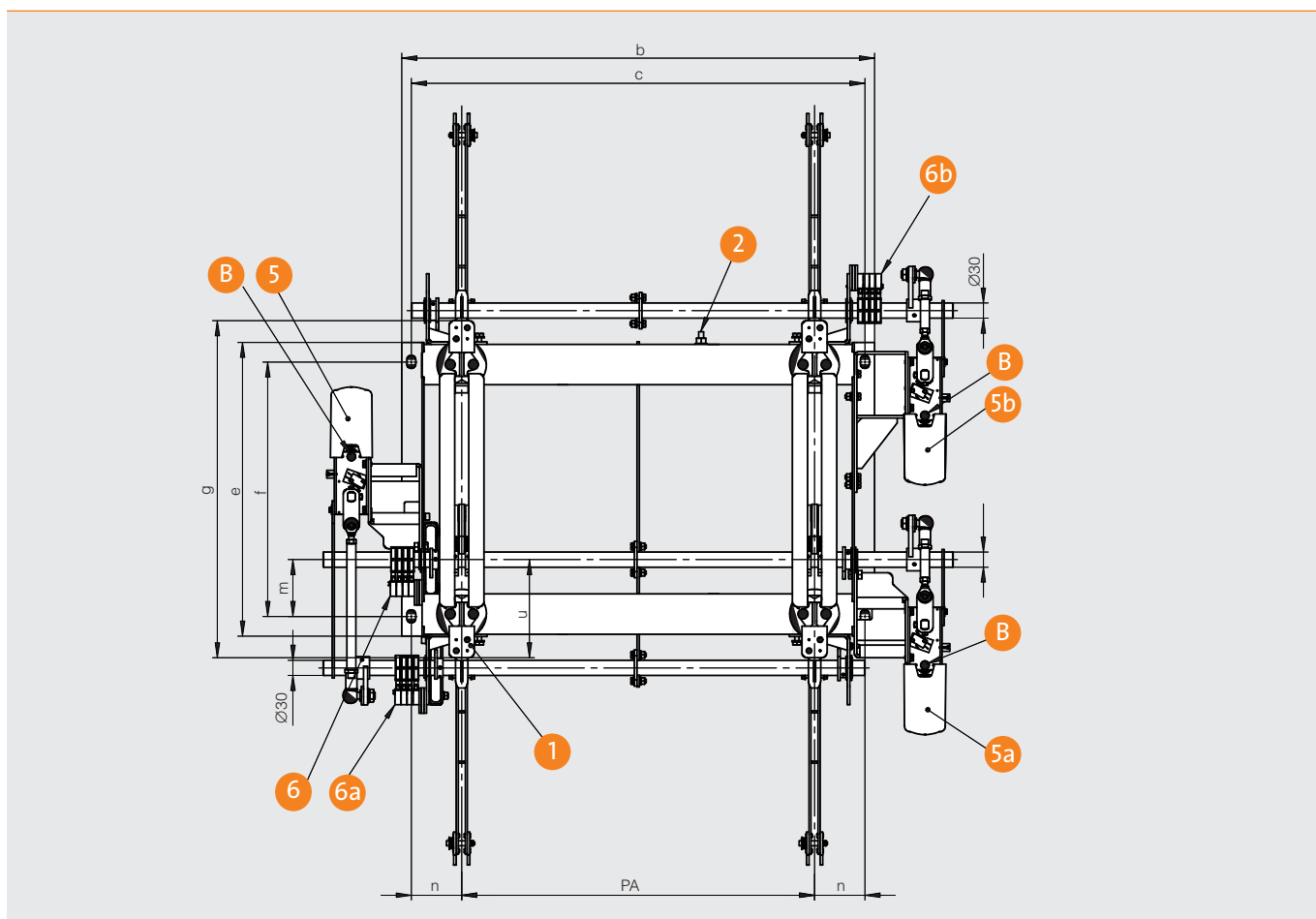


▶ Motor drive



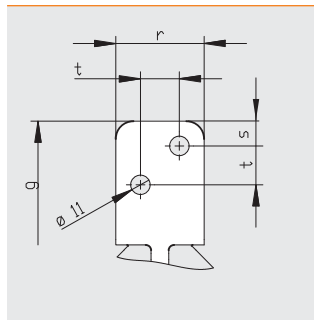
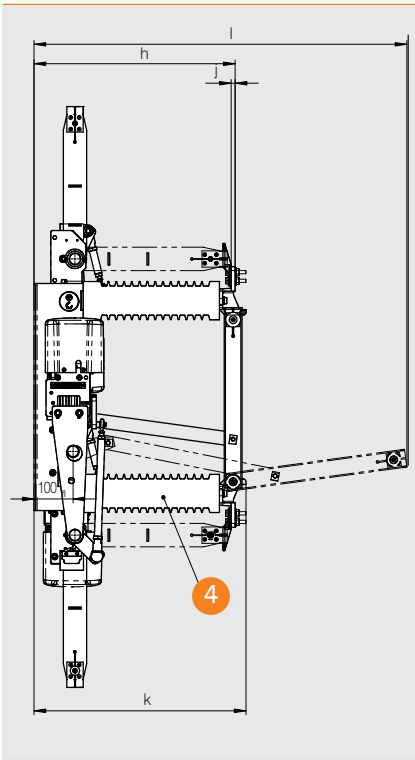
You will find detailed information  
in our THEMATIC BROCHURE

▶ **Medium-voltage switchgear**

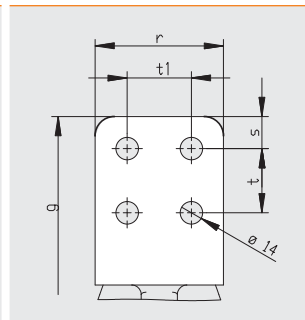


Number of poles	Typ GT	$U_n$ [kV]	$U_p$ [kV]	$U_d$ [kV]	$I_n$ [kA]	$I_{th}$ [kA]	$I_{dyn}$ [kA]	Gewicht [kg]	PA	b	c	e
27,5kV 1-pole	GT1.25-27.5-01-B1	27,5	200	95	1,25	25	62,5	32	--	238	200	583
	GT1.60-27.5-01-B1	27,5	200	95	1,60	25	62,5	32	--	238	200	583
	GT2.00-27.5-01-B1	27,5	200	95	2,00	25	62,5	42	--	288	250	635
	GT2.50-27.5-01-B1	27,5	200	95	2,50	25	62,5	42	--	288	250	635
	GTD.../GTÖ1.25-27.5-01-B1	27,5	200	95	1,25	25	62,5	46	--	238	200	583
	GTD.../GTÖ1.60-27.5-01-B1	27,5	200	95	1,60	25	62,5	46	--	238	200	583
	GTD.../GTÖ2.00-27.5-01-B1	27,5	200	95	2,00	25	62,5	57	--	288	250	635
	GTD.../GTÖ2.50-27.5-01-B1	27,5	200	95	2,50	25	62,5	57	--	288	250	635
	GTS1.25-27.5-01-B1	27,5	200	95	1,25	25	62,5	61	--	238	200	583
	GTS1.60-27.5-01-B1	27,5	200	95	1,60	25	62,5	61	--	238	200	583
	GTS2.00-27.5-01-B1	27,5	200	95	2,00	25	62,5	72	--	288	250	635
	GTS2.50-27.5-01-B1	27,5	200	95	2,50	25	62,5	72	--	288	250	635
27,5kV 2-pole	GT1.25-27.5-02-700-B1	27,5	200	95	1,25	25	62,5	55	700	938	900	583
	GT1.60-27.5-02-700-B1	27,5	200	95	1,60	25	62,5	55	700	938	900	583
	GT2.00-27.5-02-700-B1	27,5	200	95	2,00	25	62,5	77	700	988	950	635
	GT2.50-27.5-02-700-B1	27,5	200	95	2,50	25	62,5	77	700	988	950	635
	GTD.../GTÖ1.25-27.5-02-700-B1	27,5	200	95	1,25	25	62,5	78	700	938	900	583
	GTD.../GTÖ1.60-27.5-02-700-B1	27,5	200	95	1,60	25	62,5	78	700	938	900	583
	GTD.../GTÖ2.00-27.5-02-700-B1	27,5	200	95	2,00	25	62,5	101	700	988	950	635
	GTD.../GTÖ2.50-27.5-02-700-B1	27,5	200	95	2,50	25	62,5	101	700	988	950	635
	GTS1.25-27.5-02-700-B1	27,5	200	95	1,25	25	62,5	100	700	938	900	583
	GTS1.60-27.5-02-700-B1	27,5	200	95	1,60	25	62,5	100	700	938	900	583
	GTS2.00-27.5-02-700-B1	27,5	200	95	2,00	25	62,5	124	700	988	950	635
	GTS2.50-27.5-02-700-B1	27,5	200	95	2,50	25	62,5	124	700	988	950	635

# TYP GT/GTD/GTÖ/GTS



▶ 1250 A / 1600 A



▶ 2500 A / 3150 A

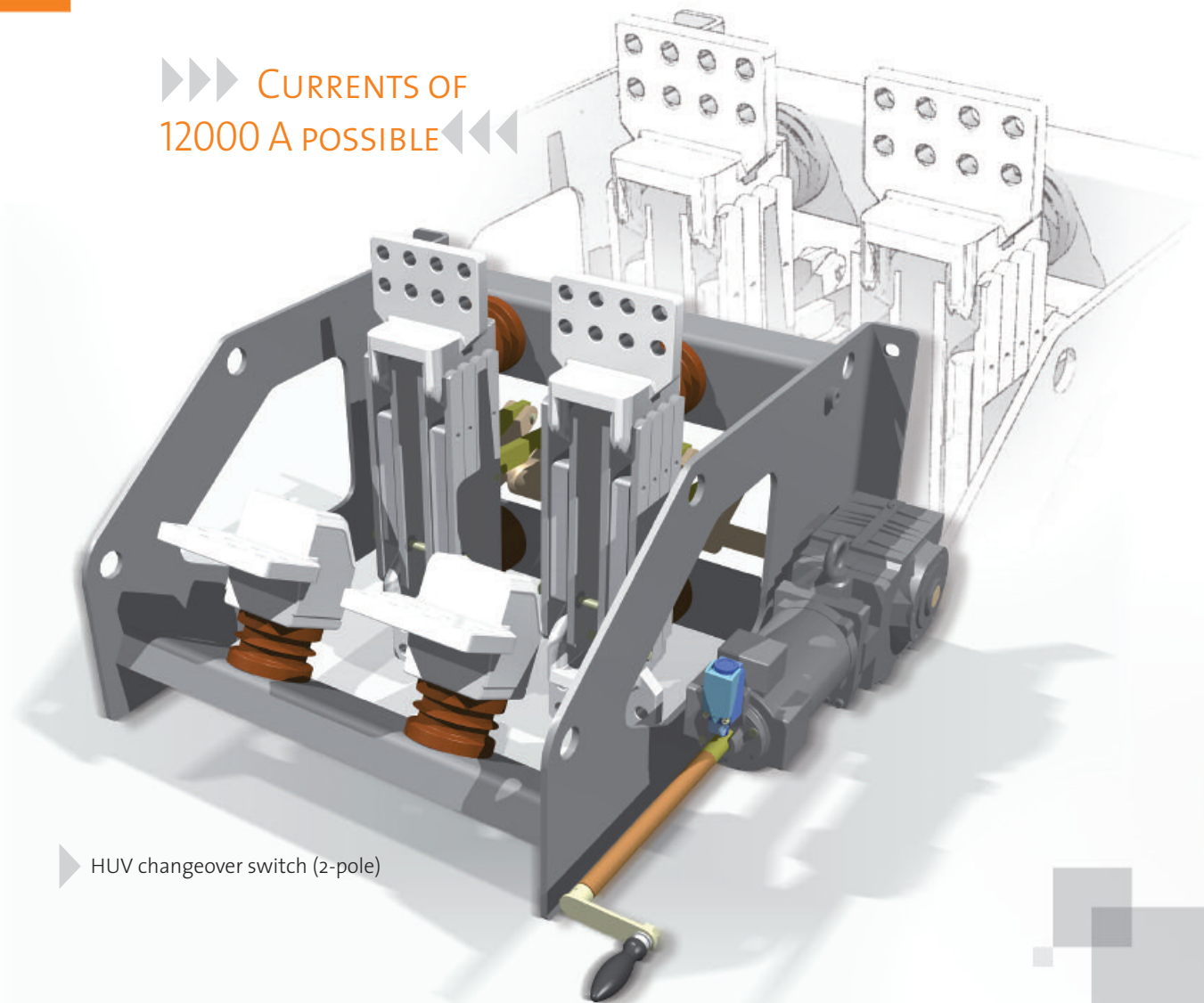
Actuating voltage indicated upon order

- 1 Connection screws  
1250 A / 1600 A: M10  
2000 A / 2500 A: M12
- 2 Earthing screw  
einpolig: M10  
zweipolig: M12
- 4 Supports
- 5 Position of motor drive-bottom left for isolator switches (without earthing switch) or for earthing switches-rotation-point side
- 5a Position of motor drive – bottom right isolator switches (with earthing switch/n)
- 5b Position of motor drive – top right for earthing switches, opening side
- 6 Auxiliary switches, isolator
- 6a Auxiliary switches, earth contacts, rotation-point side
- 6b Auxiliary switches, earth contacts, opening side
- B Hand crank connection

View without expansion strips

f	g	h	j	k	l	m	n	r	s	t	u	Typ GT	Number of poles	
505	669	516	10	544	957	113	100	50	14	22	195	GT1.25-27.5-01-B1	27,5 kV 1-pole	
505	669	516	10	544	957	113	100	50	14	22	195	GT1.60-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GT2.00-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GT2.50-27.5-01-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTD.../GTÖ1.25-27.5-01-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTD.../GTÖ1.60-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTD.../GTÖ2.00-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTD.../GTÖ2.50-27.5-01-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTS1.25-27.5-01-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTS1.60-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTS2.00-27.5-01-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTS2.50-27.5-01-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GT1.25-27.5-02-700-B1		27,5kV 2-pole
505	669	516	10	544	957	113	100	50	14	22	195	GT1.60-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GT2.00-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GT2.50-27.5-02-700-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTD.../GTÖ1.25-27.5-02-700-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTD.../GTÖ1.60-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTD.../GTÖ2.00-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTD.../GTÖ2.50-27.5-02-700-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTS1.25-27.5-02-700-B1		
505	669	516	10	544	957	113	100	50	14	22	195	GTS1.60-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTS2.00-27.5-02-700-B1		
497	797	535	22	566	988	103	125	80	20	40	253	GTS2.50-27.5-02-700-B1		

▶▶▶ CURRENTS OF  
12000 A POSSIBLE◀◀◀



▶ HUV changeover switch (2-pole)

## THERE ARE 4 VERSIONS

- **GTU/HUV** ▶ changeover switch without zero position: establishes a contact in any position
- **GTN/HUVN** ▶ changeover switch with zero position: : has 3 defined positions
- **GTP/HUVP** ▶ polarity changer without zero position: change from plus to minus
- **GTPN/HUVPN** ▶ polarity changer with zero position: change from plus to minus

The technical connection regulations apply for medium voltage. The technical data is based on blank isolators, type GT/HAS (Dimension sheets see Page 8 et seq.).

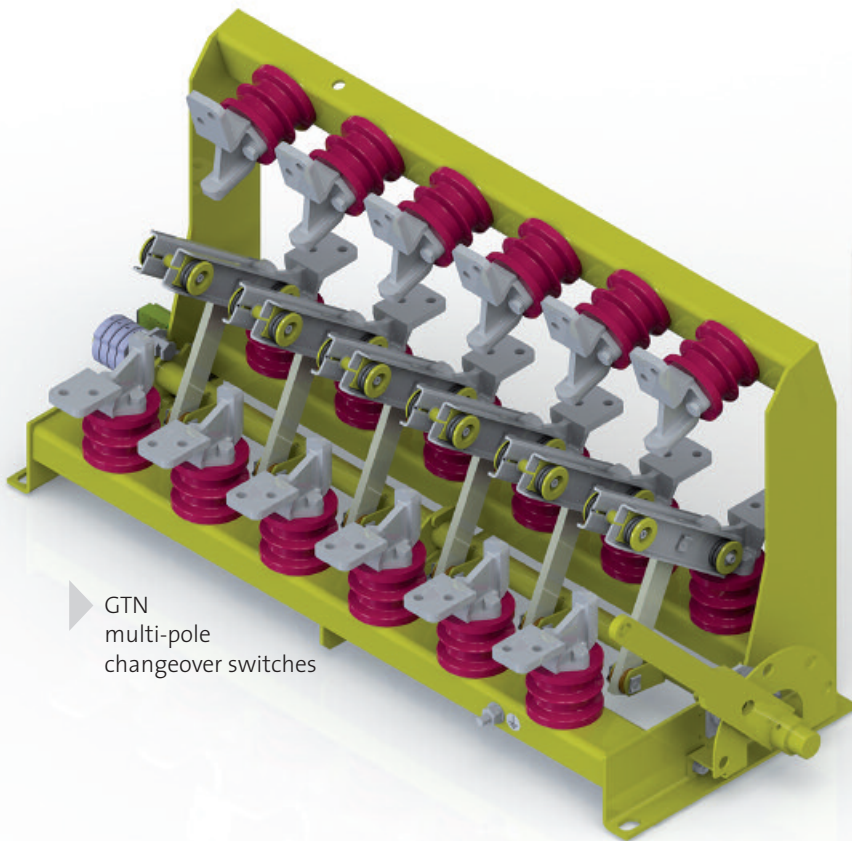
The equipment can be supplied in voltage levels from 500 V to 40.5 kV.  
Currents of up to 12000 A are possible.  
Equipment with more than 3 poles are always available upon request.



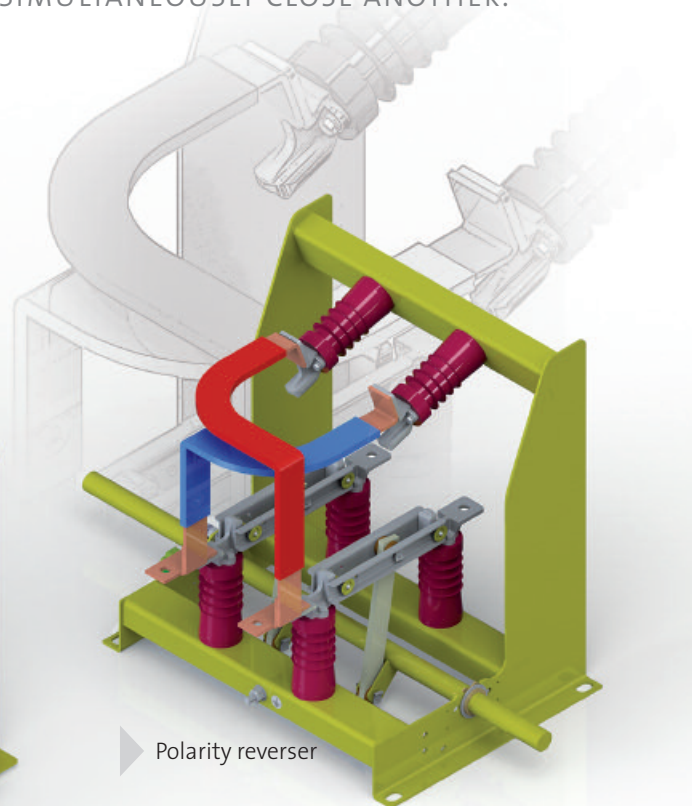
# TYP GTU/HUV

## CHANGEOVER SWITCHES (CHANGEOVER CONTACT) SINGLE-POLE OR MULTI-POLE

SWITCHES THAT OPEN A CIRCUIT WITH 3 OR MORE-  
CONNECTIONS AND SIMULTANEOUSLY CLOSE ANOTHER.

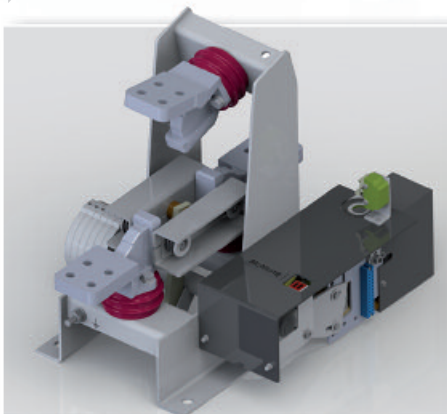


▶ GTN  
multi-pole  
changeover switches

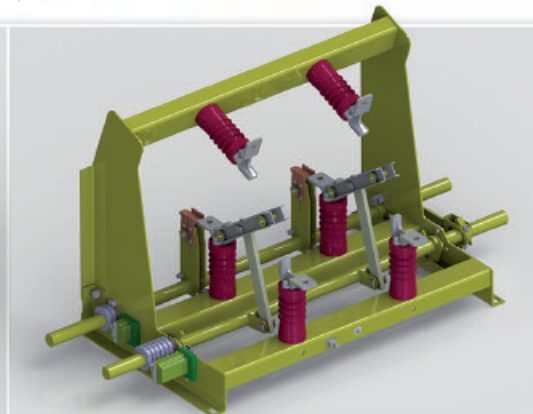


▶ Polarity reverser

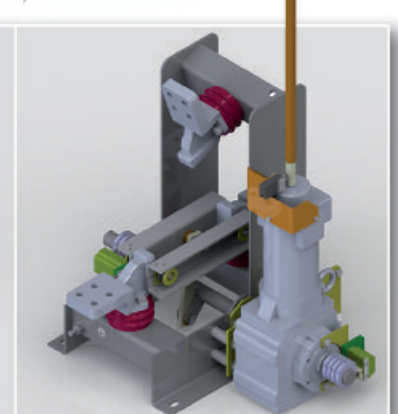
▶ GTU with position indicator

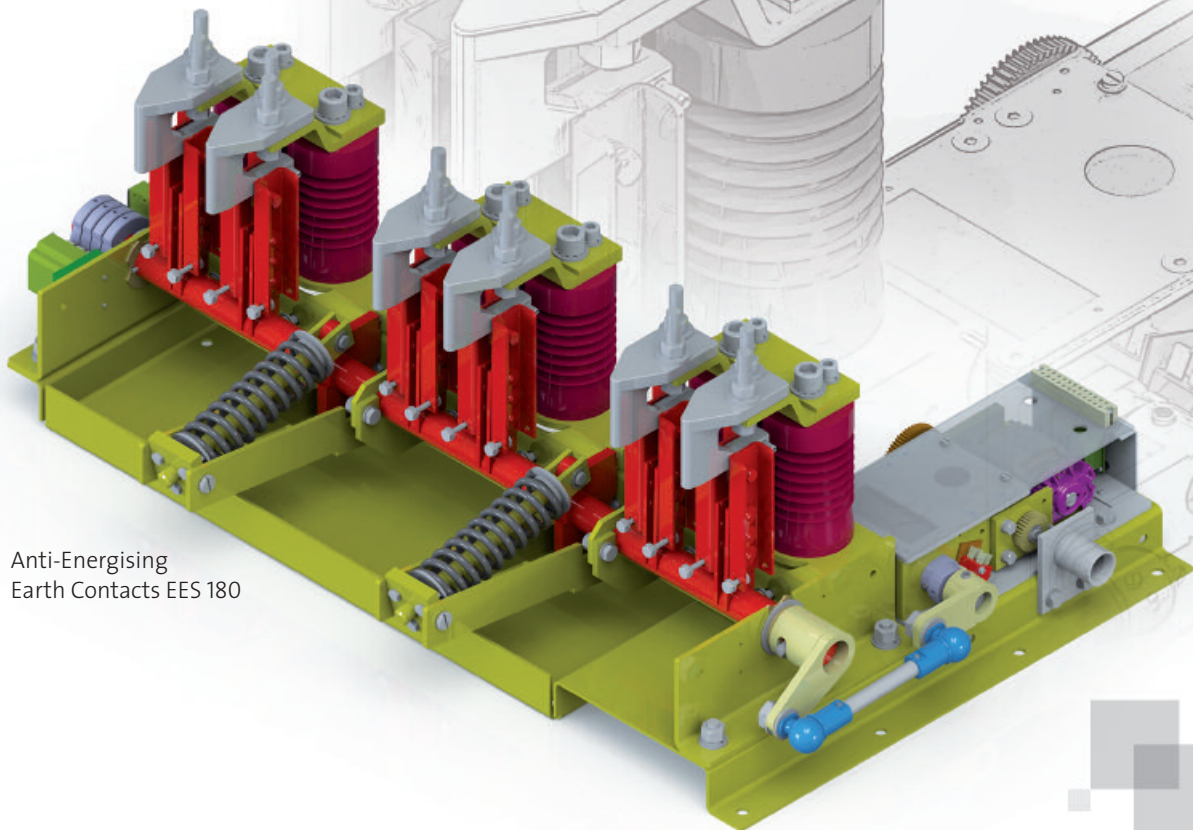


▶ GTUE changeover switch with earth contacts



▶ GTU with three-phase drive





▶ Anti-Energising  
Earth Contacts EES 180

## FEATURES...

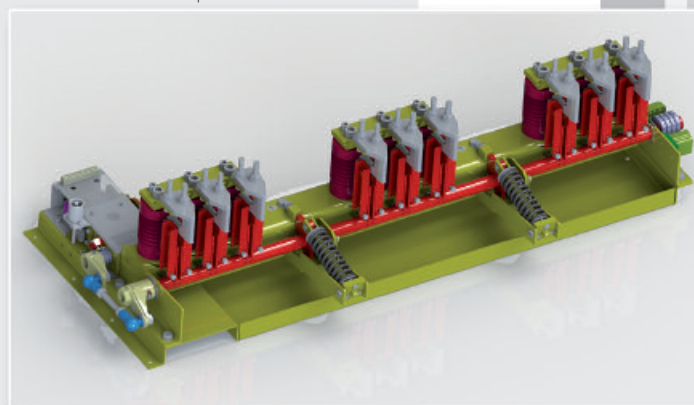
### SERVICE LIFE

- The earthing switches are normally switched relatively rarely. Therefore standard equipment does not allow for high operating cycles.

For anti-energising earth contacts the mechanical service life, which is primarily based on wear of the contact elements, is 5000 switching cycles.

Higher switching cycles (up to 25,000) are possible on request.

▶ Anti-energising  
earth contacts  $I_p=210$  kA



# TYP EES

## EARTHING SWITCHES

ARE ESSENTIAL FOR PERSONAL PROTECTION.

This type of switching equipment is used to protect personnel working on equipment that is normally live. Therefore, it must be very reliable and safe for operation – even under difficult operating conditions.

The task of the earth contact is to earth the circuit once this has been opened. In multi-pole earth contacts, the poles are also short-circuited together. The earth contacts differ by anti-energising earth contacts and non-anti-energising earth contacts. In the standard the differences are reflected in the name. In classes E1 and E2, these are anti-energising earth contacts that may be connected live.

The EES anti-energising earth contacts are three-pole switching devices with spring-loaded jump drive for actuation. Disconnection is normally performed manually.

The earth contacts are available for nominal voltages of 12 kV to 40.5 kV. The standard equipment is designed for use in indoor switchgear installations and tested according to VDE 0670 – Part 6, IEC 298, as well as VDE 0101.

In addition to the standard equipment, special designs are also available e.g. 1-pole, 2-pole or even 12-pole equipment that can be adapted to suit any requirements. The standard equipment can also be fitted with a motor drive.

### NAMEPLATE DETAILS

FLOHE BERG GmbH			
EES160.0-17.5-03-275-R-A64E58-G3-D			
Serien-Nr. A12458/S204955		-001	
IEC 62271-102	Zg-Nr.: WF16_2044		
$U_n$ 17,5 kV	$I_n$ 0,00 kA	fr	50/60Hz
$U_p$ 95 kV	$I_p$ 160 kA	Bj	2016
$U_s$ 38 kV	$I_s$ 63,0 kA	/ts	M 60 kg

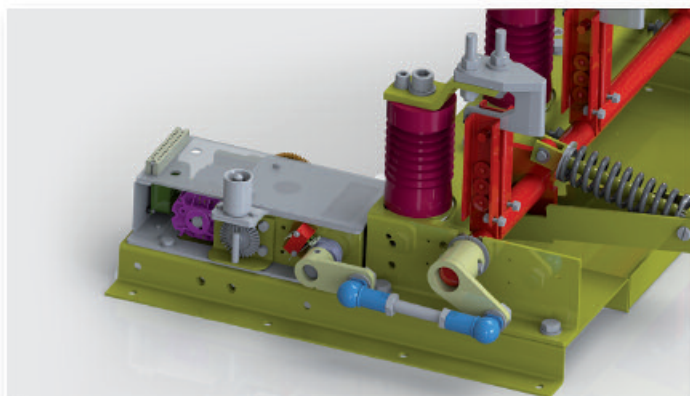
#### Note:

the following four details are required for queries regarding spare parts, subsequent deliveries etc.:

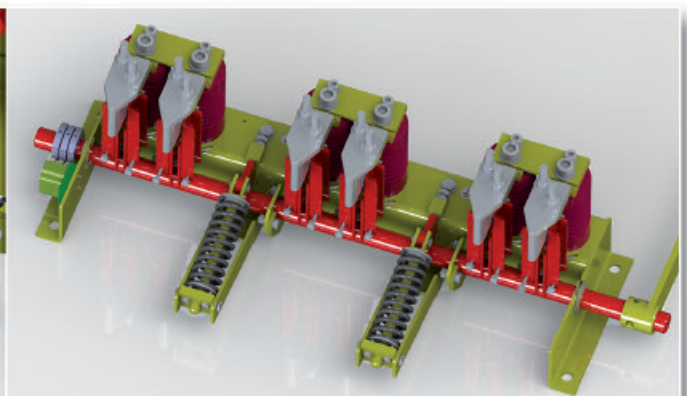
- Type designation
- Factory no.
- Model name
- Construction year

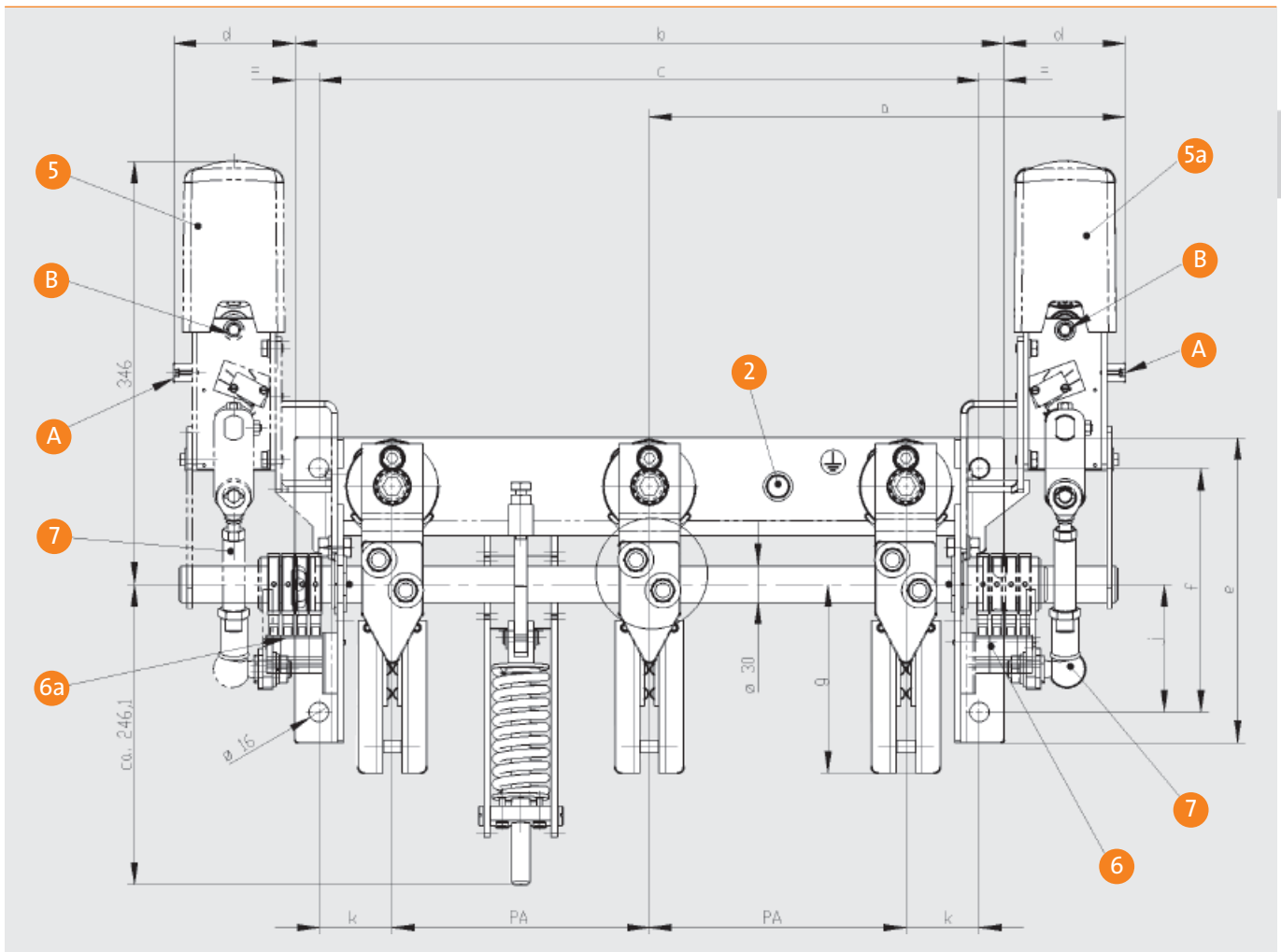


▶ Anti-energising earth contacts with motor drive  
Emergency hand crank operation from top/front



▶ Anti-energising earth contacts  
with hand lever



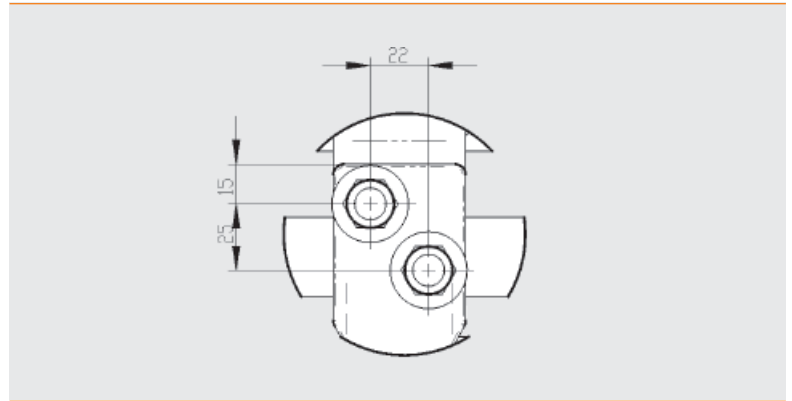
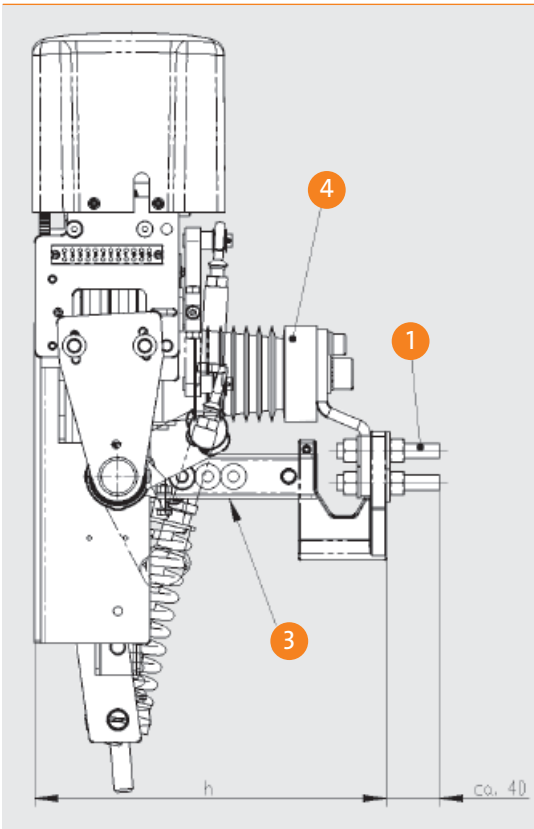


▶▶▶ e.g. – other types EES, see Page 22-23

Typ	$U_n$ [kV]	$U_p$ [kV]	$U_d$ [kV]	$I_{dyn}$ [kA]	$I_{th}$ [kA]	Weight [kg]	PA	a	
<b>12 kV</b>	EES 050.0-12.0-03-175-L	12	75	28	50	20	21	175	354
	EES 050.0-12.0-03-210-L	12	75	28	50	20	22	210	389
	EES 080.0-12.0-03-175-M	12	75	28	80	31,5	21	175	354
	EES 080.0-12.0-03-210-M	12	75	28	80	31,5	22	210	389
	EES 125.0-12.0-03-175-P	12	75	28	125	50	21	175	354
	EES 125.0-12.0-03-210-P	12	75	28	125	50	22	210	389
<b>17,5 kV</b>	EES 050.0-17.5-03-210-L	17,5	95	38	50	20	23	210	**
	EES 050.0-17.5-03-275-L	17,5	95	38	50	20	24	275	**
	EES 080.0-17.5-03-210-M	17,5	95	38	80	31,5	23	210	**
	EES 080.0-17.5-03-275-M	17,5	95	38	80	31,5	24	275	**
	EES 125.0-17.5-03-210-P	17,5	95	38	125	50	23	210	**
	EES 125.0-17.5-03-275-P	17,5	95	38	125	50	24	275	**
<b>24 kV</b>	EES 050.0-24.0-03-275-L	24	125	50	50	20	27	275	514
	EES 050.0-24.0-03-300-L	24	125	50	50	20	28	300	539
	EES 080.0-24.0-03-275-M	24	125	50	80	31,5	27	275	514
	EES 080.0-24.0-03-300-M	24	125	50	80	31,5	28	300	539
	EES 125.0-24.0-03-275-P	24	125	50	125	50	27	275	514
	EES 125.0-24.0-03-300-P	24	125	50	125	50	28	300	539
<b>36 kV</b>	EES 050.0-36.0-03-400-L	36	125	50	50	20	37	400	674
	EES 080.0-36.0-03-400-M	36	125	50	80	31,5	37	400	674
	EES 125.0-36.0-03-400-P	36	125	50	125	50	37	400	674

\*\* Measurements on request

# TYP EES

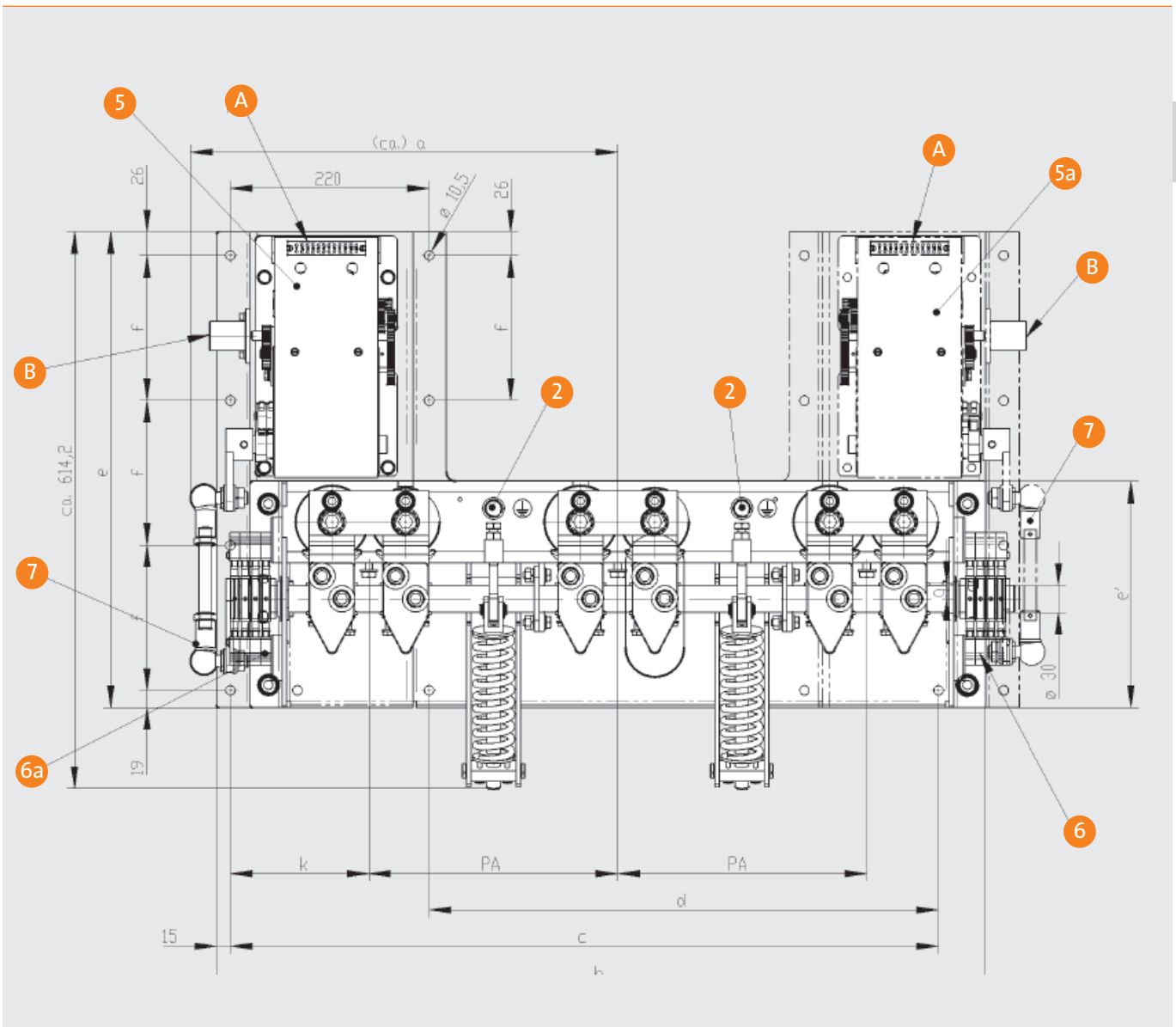


- |    |   |    |   |
|----|---|----|---|
| 1  | Connection screws<br>50kA / 80kA / 125kA: M12   | 6  | Auxiliary switches                        |
| 2  | Earthing screw<br>1x M12 50 kA / 80 kA / 125 kA | 6a | Auxiliary switches<br>Optional position   |
| 3  | Switching angle 90°                             | 7  | Coupling motor drive                      |
| 4  | Supports  | A  | Cable connection                          |
| 5  | Motor drive<br>Drive weight 4,8 kg              | B  | Connection hand crank                     |
| 5a | Motor drive<br>Optional position                |    | Actuating voltage<br>indicated upon order |

View without expansion strips

b	c	d	e	f	g	h	j	k	Typ	
510	470	99	250	200	155	274	105	60	EES 050.0-12.0-03-175-L	12 kV
580	540	99	250	200	155	274	105	60	EES 050.0-12.0-03-210-L	
510	470	99	250	200	155	274	105	60	EES 080.0-12.0-03-175-M	
580	540	99	250	200	155	274	105	60	EES 080.0-12.0-03-210-M	
510	470	99	250	200	155	274	105	60	EES 125.0-12.0-03-175-P	
580	540	99	250	200	155	274	105	60	EES 125.0-12.0-03-210-P	
580	540	**	250	200	185	304	105	60	EES 050.0-17.5-03-210-L	17,5 kV
710	670	**	250	200	185	304	105	60	EES 050.0-17.5-03-275-L	
580	540	**	250	200	185	304	105	60	EES 080.0-17.5-03-210-M	
710	670	**	250	200	185	304	105	60	EES 080.0-17.5-03-275-M	
580	540	**	250	200	185	304	105	60	EES 125.0-17.5-03-210-P	
710	670	**	250	200	185	304	105	60	EES 125.0-17.5-03-275-P	
760	720	134	250	200	235	354	95	85	EES 050.0-24.0-03-275-L	24 kV
810	770	134	250	200	235	354	95	85	EES 050.0-24.0-03-300-L	
760	720	134	250	200	235	354	95	85	EES 080.0-24.0-03-275-M	
810	770	134	250	200	235	354	95	85	EES 080.0-24.0-03-300-M	
760	720	134	250	200	235	354	95	85	EES 125.0-24.0-03-275-P	
810	770	134	250	200	235	354	95	85	EES 125.0-24.0-03-300-P	
1040	1000	154	250	200	325	444	95	100	EES 050.0-36.0-03-400-L	36 kV
1040	1000	154	250	200	325	444	95	100	EES 080.0-36.0-03-400-M	
1040	1000	154	250	200	325	444	95	100	EES 125.0-36.0-03-400-P	

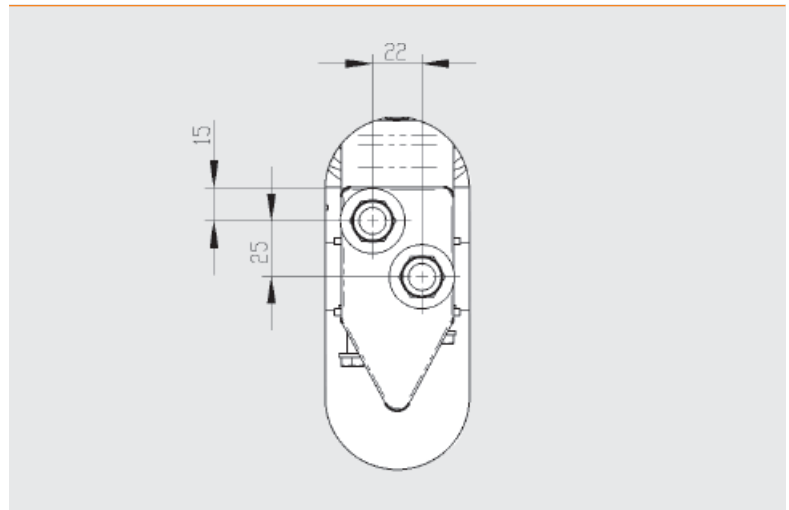
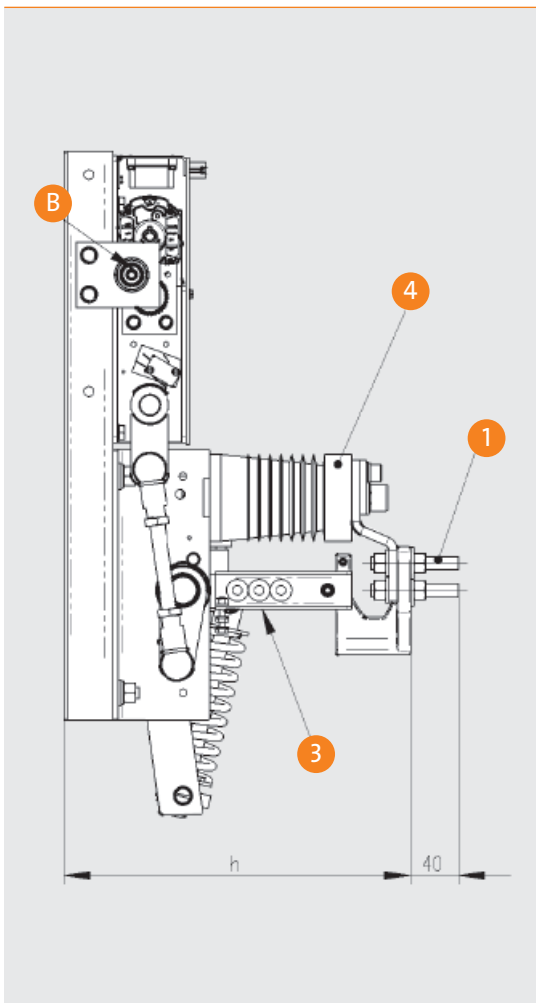
\*\* Measurements on request



◀◀◀ e.g. – other types EES, see Page 20-21

Typ	$U_n$ [kV]	$U_p$ [kV]	$U_d$ [kV]	$I_{dyn}$ [kA]	$I_{th}$ [kA]	Weight [kg]	PA	a	b	
<b>12 kV</b>	EES 160.0-12.0-03-275-R	12	75	28	160	63	50	275	472	849
	EES 160.0-12.0-03-300-R	12	75	28	160	63	52	300	497	899
	EES 180.0-12.0-03-275-S	12	75	28	180	72	50	275	472	849
	EES 180.0-12.0-03-300-S	12	75	28	180	72	52	300	497	899
	EES 200.0-12.0-03-275-T	12	75	28	200	80	50	275	472	849
	EES 200.0-12.0-03-300-T	12	75	28	200	80	52	300	497	899
	EES 210.0-12.0-03-350-W	12	75	28	210	85	69	350	591	1086
	EES 210.0-12.0-03-470-W	12	75	28	210	85	72	470	711	1326
<b>24 kV</b>	EES 160.0-24.0-03-360-R	24	125	50	160	63	60	360	557	1019
	EES 160.0-24.0-03-400-R	24	125	50	160	63	62	400	597	1099
	EES 180.0-24.0-03-360-S	24	125	50	180	72	60	360	557	1019
	EES 180.0-24.0-03-400-S	24	125	50	180	72	62	400	597	1099
	EES 200.0-24.0-03-360-T	24	125	50	200	80	60	360	557	1019
	EES 200.0-24.0-03-400-T	24	125	50	200	80	62	400	597	1099
	EES 210.0-24.0-03-470-W	24	125	50	210	85	80	470	711	1326

# TYP EES



- |    |  |    |   |
|----|--|----|---|
| 1  | Connection screws<br>160 / 180 / 200 / 210 kA: M12 | 6  | Auxiliary switches                        |
| 2  | Earthing screw<br>2x M12 160 / 180 / 200 / 210 kA  | 6a | Auxiliary switches<br>Optional position   |
| 3  | Switching angle 90°                                | 7  | Coupling motor drive                      |
| 4  | Supports   | A  | Cable connection                          |
| 5  | Motor drive<br>Drive weight 4,8 kg                 | B  | Connection hand crank                     |
| 5a | Motor drive<br>Optional position                   |    | Actuating voltage<br>indicated upon order |

View without expansion strips

c	d	e	e'	f	g	h	j	k	Typ	
782	572	525	250	160	155	319	95	153	EES 160.0-12.0-03-275-R	<b>12 kV</b>
832	622	525	250	160	155	319	95	153	EES 160.0-12.0-03-300-R	
782	572	525	250	160	155	319	95	153	EES 180.0-12.0-03-275-S	
832	622	525	250	160	155	319	95	153	EES 180.0-12.0-03-300-S	
782	572	525	250	160	155	319	95	153	EES 200.0-12.0-03-275-T	
832	622	525	250	160	155	319	95	153	EES 200.0-12.0-03-300-T	
1019	799	525	250	160	155	319	95	197	EES 210.0-12.0-03-350-W	
1259	1039	525	250	160	155	319	95	197	EES 210.0-12.0-03-470-W	
720	732	525	250	160	235	399	95	153	EES 160.0-24.0-03-360-R	<b>24 kV</b>
770	812	525	250	160	235	399	95	153	EES 160.0-24.0-03-400-R	
720	732	525	250	160	235	399	95	153	EES 180.0-24.0-03-360-S	
770	812	525	250	160	235	399	95	153	EES 180.0-24.0-03-400-S	
720	732	525	250	160	235	399	95	153	EES 200.0-24.0-03-360-T	
770	812	525	250	160	235	399	95	153	EES 200.0-24.0-03-400-T	
1259	1039	525	250	160	235	399	95	197	EES 210.0-24.0-03-470-W	

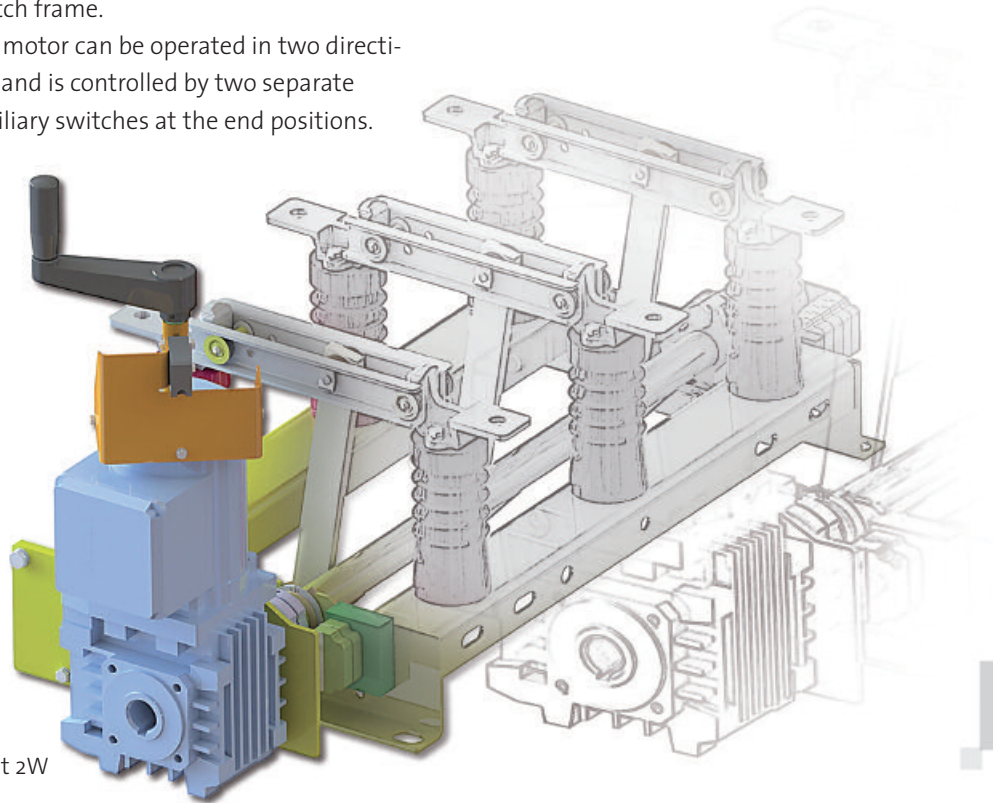
## FLOHE MOTOR DRIVES

ARE USED TO PROPEL THE MAIN SWITCHING SHAFT OF THE SWITCHING EQUIPMENT. THERE ARE TWO MAIN TYPES OF DRIVES:

- "2W": firstly the motor drive with clockwise/anti-clockwise rotation, i.e. the motor is pushed through the switching shaft using a parallel key and screwed to the switch frame.

The motor can be operated in two directions and is controlled by two separate auxiliary switches at the end positions.

- "1W": the alternative comprises a compact motor unit that only has one rotation direction. The de-energisation is controlled using two auxiliary switches installed in the motor unit.



with motor unit 2W

- The clockwise/anti-clockwise version varies significantly from the other standard drives. We custom-design these for customers and various options are available. Accordingly voltages between 24 VDC and 400 VAC can be obtained as standard.
- Other, diverse voltages and/or frequencies can also be achieved as bespoke designs. The motor units are supplied with IP54 as standard. Higher requirements can also be realised on request. For DC drives constructional brake modules must be considered, otherwise the motor cannot come to a clean stop at the end positions.
- External, industry-standard auxiliary switches are used for the controlled shut-down. Components with protection class IP40 are used as standard. Higher protection classes can also be implemented on request.
- Motor units equipped with a torque limiter are also available as an option. The advantage of this version is that in the event of switching equipment malfunction, the drive is shut down in such a way that serious damage is avoided.
- An emergency hand crank, which is simply inserted into the motor shaft, can be used for emergency operation. The motor unit can also be equipped with an additional optional auxiliary switch, which ensures that the motor can no longer be operated electronically.
- This motor unit can be supplied as a remote actuator. Thus the motor is installed separately and is connected using cardan shafts.



# MOTOR DRIVES Axx

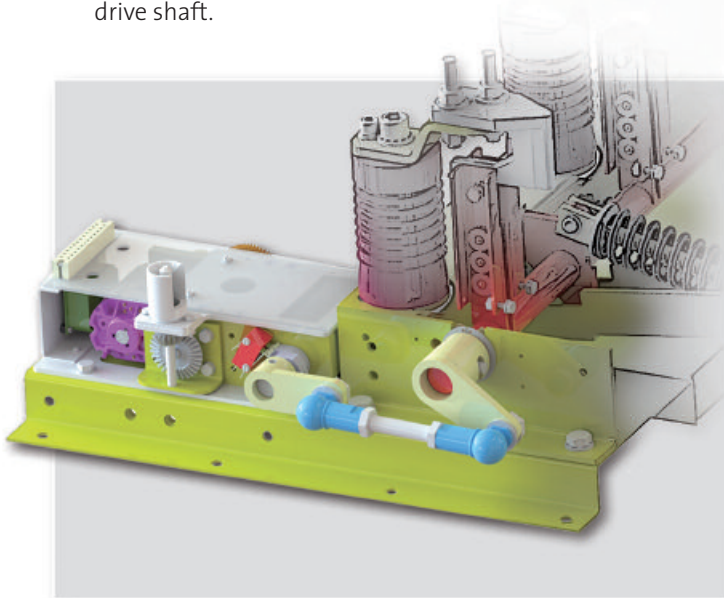
THE COMPACT MOTOR UNIT "1W" IS AVAILABLE IN TWO DESIGNS. THEY DIFFER BY CONSTRUCTION AND TORQUE.

- One is mounted upright on the switching equipment i.e. the drive is attached to the side of the base frame of the switching equipment,
- The other, second version is a horizontal drive that is mounted on the equipment behind the current paths. Due to its design, this version has a higher torque.
- All motor drive designs correspond to the VDE standards 0530, constructed with insulation class B. The protection class of the drives is IP54 pursuant to DIN 40050.
- The drives are available as standard with voltages between 24 VDC and 230 VAC.

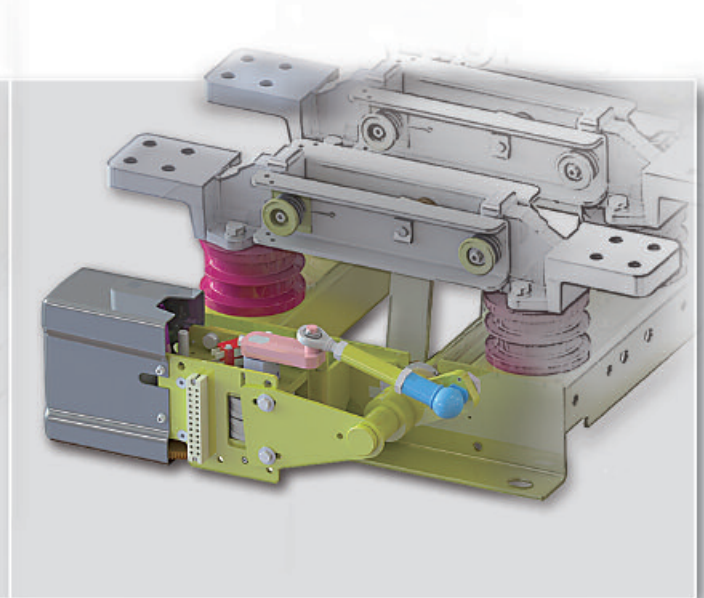
## THE FORCE IS GENERATED

ON THE DRIVE SHAFT, WHEREBY THE MOTOR PROPELS A PINION VIA A GEARWHEEL THAT IS DIRECTLY PINNED TO THE MOTOR SHAFT.

- The pinion then moves the eccentric shaft via a plastic gearwheel that engages with two rocker arms. If the eccentric shaft is rotated, both rocker arms create a pendulum movement. As the rocker arms enclose the drive shaft and are equipped with a freewheel, with each oscillating movement of the rocker arm the drive shaft rotates around a small area itself. As both rocker arms are installed inversely, one rocker arm is idle, i.e. moves backwards, while the second continues to rotate the drive shaft.
- The freewheels therefore transfer the force and/or the rotary movement to the drive shaft. As these motion sequences are performed very quickly, a rotary movement of the drive shaft is generated. The technical design also means that the drive only delivers the rotary movement in one direction.
- The motor drives are not designed for long-term operation i.e. only between individual operations

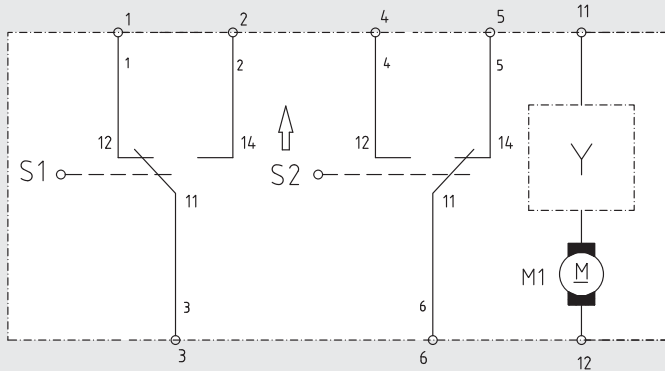


▶ Isolators with horizontal drive



▶ Isolators with vertical drive

## MOTOR DRIVE MA 1.2 + MA 2.2 WITH TERMINAL STRIP X1



Motor drive (MA1.2 / MA2.2) for switch "off" position of the disconnecting and grounding switch (Version 2 de-energising contacts)

Switch position isolator/ grounding connection	De-energising contact	
	-S1	-S2
OFF	x	↓
RUN	x	x
ON	↓	x

x non-actuated  
↓ actuated

M1 Motor  
S1, S2 Command release contact  
Y Motorbrake device

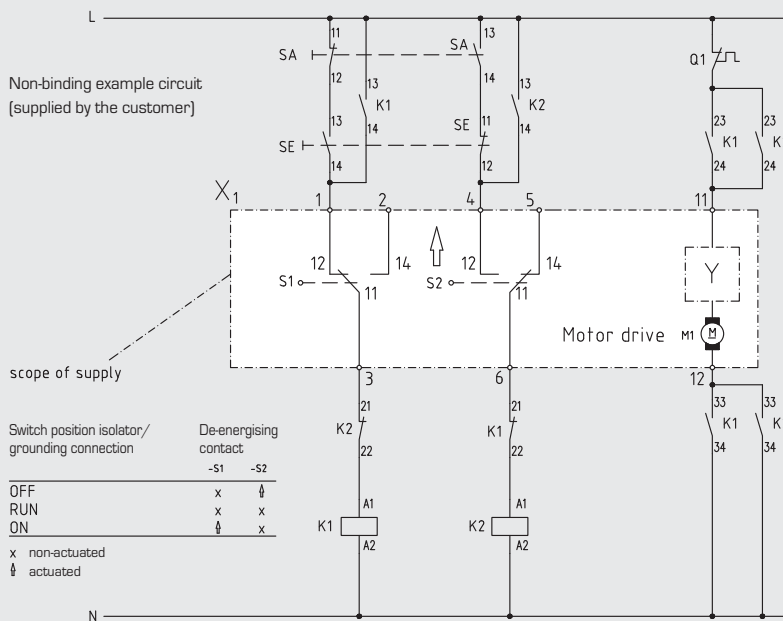
Circuit board connection motor MA1.2

green	white	blue	black
1	2	3	4

Circuit board connection motor MA2.2

green	white	blue	black
1	2	3	4

## NON-BINDING CIRCUIT EXAMPLE



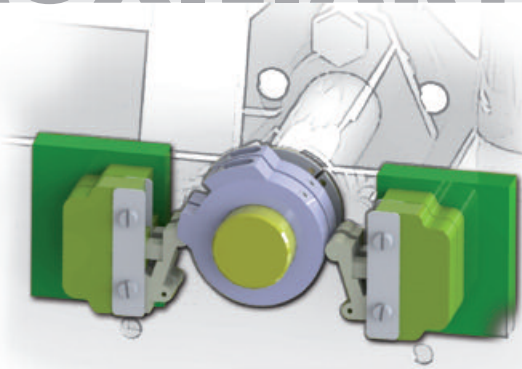
Motor drive (MA1.2 / MA2.2) for switch "off" position of the disconnecting and grounding switch (Version 2 de-energising contacts)

Switch position isolator/ grounding connection	De-energising contact	
	-S1	-S2
OFF	x	↓
RUN	x	x
ON	↓	x

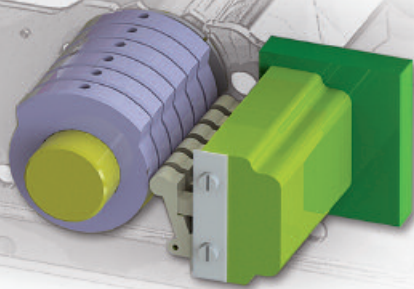
x non-actuated  
↓ actuated

M1 Motor  
S1, S2 Position switch on the motor drive  
Y Motor brake device  
SA Isolator/ Grounding connection off  
SE Isolator/ Grounding connection on  
Q1 Motor protection switch

# AUXILIARY SWITCH Exx



e.g. E54  
4 auxiliary switches with 2 cams



e.g. E06  
6 auxiliary switches with 6 cams

AUXILIARY SWITCH WITH  
**2S + 2Ö** OR **6S + 6Ö**  
CAN BE MOUNTED ON THE ISOLATOR  
AND EARTHING SWITCHES.

In the motor drive, the auxiliary switch  
is located on the side away from the motor.  
The rated current is 10 A.

## STANDARDS

The isolator and earthing switches  
satisfy the following provisions  
and recommendations:

- DIN VDE 0670 Part 2
- DIN VDE 0111 Part 1
- IEC 129
- IEC 62271-1 (formerly IEC 60694)

### Auxiliary switches GT/GTU/GTN/GE/EES

1S + 1Ö AM TRENNER	MIT 1 NOCKEN	E01
2S + 2Ö AM TRENNER	MIT 2 NOCKEN	E02
3S + 3Ö AM TRENNER	MIT 3 NOCKEN	E03
4S + 4Ö AM TRENNER	MIT 4 NOCKEN	E04
5S + 5Ö AM TRENNER	MIT 5 NOCKEN	E05
6S + 6Ö AM TRENNER	MIT 6 NOCKEN	E06
7S + 7Ö AM TRENNER	MIT 7 NOCKEN	E07
8S + 8Ö AM TRENNER	MIT 8 NOCKEN	E08
9S + 9Ö AM TRENNER	MIT 9 NOCKEN	E09
10S + 10Ö AM TRENNER	MIT 10 NOCKEN	E10
12S + 12Ö AM TRENNER	MIT 12 NOCKEN	E12
16S + 16Ö AM TRENNER	MIT 16 NOCKEN	E16
2S + 2Ö AM TRENNER	MIT 1 NOCKE	E52
3S + 3Ö AM TRENNER	MIT 2 NOCKEN	E53
4S + 4Ö AM TRENNER	MIT 2 NOCKEN	E54
5S + 5Ö AM TRENNER	MIT 3 NOCKEN	E55
6S + 6Ö AM TRENNER	MIT 3 NOCKEN	E56
7S + 7Ö AM TRENNER	MIT 4 NOCKEN	E57
8S + 8Ö AM TRENNER	MIT 4 NOCKEN	E58
9S + 9Ö AM TRENNER	MIT 5 NOCKEN	E59
10S + 10Ö AM TRENNER	MIT 5 NOCKEN	E60
12S + 12Ö AM TRENNER	MIT 6 NOCKEN	E62
16S + 16Ö AM TRENNER	MIT 8 NOCKEN	E66

### Auxiliary switches GTD / GTÖ

1S + 1Ö AM TRENNER	1S + 1Ö AM ERDER	MIT JE 1 NOCKEN	E01
2S + 2Ö AM TRENNER	2S + 2Ö AM ERDER	MIT JE 2 NOCKEN	E02
3S + 3Ö AM TRENNER	3S + 3Ö AM ERDER	MIT JE 3 NOCKEN	E03
4S + 4Ö AM TRENNER	4S + 4Ö AM ERDER	MIT JE 4 NOCKEN	E04
6S + 6Ö AM TRENNER	6S + 6Ö AM ERDER	MIT JE 6 NOCKEN	E06
8S + 8Ö AM TRENNER	8S + 8Ö AM ERDER	MIT JE 8 NOCKEN	E08
3S + 3Ö AM TRENNER	2S + 2Ö AM ERDER	MIT 3 + 2 NOCKEN	E21
6S + 6Ö AM TRENNER	2S + 2Ö AM ERDER	MIT 6 + 2 NOCKEN	E22
6S + 6Ö AM TRENNER	4S + 4Ö AM ERDER	MIT 6 + 4 NOCKEN	E23
8S + 8Ö AM TRENNER	2S + 2Ö AM ERDER	MIT 8 + 2 NOCKEN	E24
4S + 4Ö AM TRENNER	2S + 2Ö AM ERDER	MIT 4 + 2 NOCKEN	E25
2S + 2Ö AM TRENNER	2S + 2Ö AM ERDER	MIT JE 1 NOCKEN	E52
3S + 3Ö AM TRENNER	3S + 3Ö AM ERDER	MIT JE 2 NOCKEN	E53
4S + 4Ö AM TRENNER	4S + 4Ö AM ERDER	MIT JE 2 NOCKEN	E54
6S + 6Ö AM TRENNER	6S + 6Ö AM ERDER	MIT JE 3 NOCKEN	E56
8S + 8Ö AM TRENNER	8S + 8Ö AM ERDER	MIT JE 4 NOCKEN	E58
6S + 6Ö AM TRENNER	2S + 2Ö AM ERDER	MIT 3 + 1 NOCKEN	E71
6S + 6Ö AM TRENNER	4S + 4Ö AM ERDER	MIT 3 + 4 NOCKEN	E72
8S + 8Ö AM TRENNER	8S + 8Ö AM ERDER	MIT 4 + 8 NOCKEN	E73

## HAND CRANK...

DIRECT, MANUAL SHAFT ACTUATION

▶▶▶ HAND CRANK, METAL



▶▶▶ HAND CRANK, PLASTIC (insulated)



▶▶▶ SWITCHING ROD LEVER, METAL

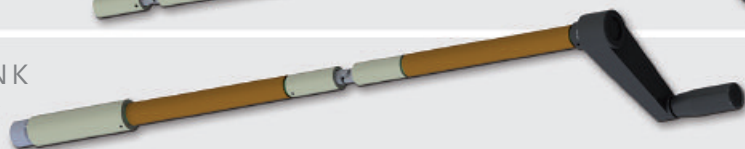


▶▶▶ SWITCHING ROD LEVER, PLASTIC (insulated)



## EMERGENCY HAND CRANKS...

FOR MOTOR DRIVES

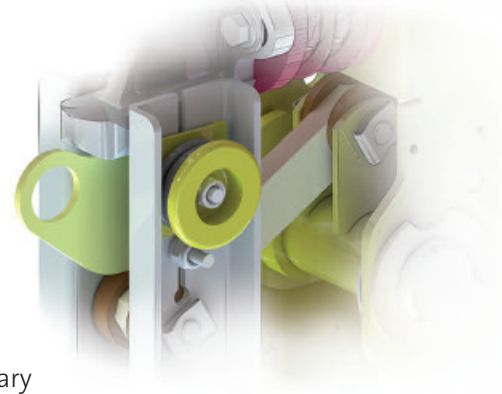
▶▶▶ EMERGENCY HAND CRANK  
NHL Ø20x600 · NHL Ø20x800  
NHL Ø20x1000▶▶▶ EMERGENCY HAND CRANK  
NHL Ø30x600 · NHL Ø30x800  
NHL Ø30x1500▶▶▶ EMERGENCY HAND CRANK  
NHL Berlin model▶▶▶ EMERGENCY HAND CRANK  
NHL Ø20x670  
1x universal joint▶▶▶ EMERGENCY HAND CRANK  
NHL Ø20x630 · 1x universal joint  
and square hole 12 x 12mm▶▶▶ EMERGENCY HAND CRANK  
NHL Ø20x1680 · 4x universal joint  
and square hole 12 x 12mm

# ADDITIONAL EQUIPMENT

## MANUAL DRIVES

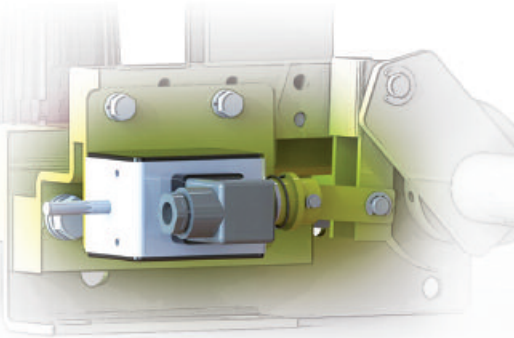
ACTUATION WITH THE HELP OF A SWITCHING ROD DEPENDS ON THE INSTALLATION POSITION AND ACCESSIBILITY.

- Switching rods can be used in systems with rated AC voltage exceeding 1 kV.
- These are used to actuate the switching rod lever mounted on the switching shaft (available as an accessory). Alternatively the isolator can also be actuated using a drawbar eye with the help of a switching rod.
- Switching rod levers made of insulating material are always used where the necessary minimum clearances are not achieved. For actuation using switching rods, a spring-loaded catch is always used to secure at the end positions (see locking mechanisms).



## ELECTROMECHANICAL INTERLOCK CXX

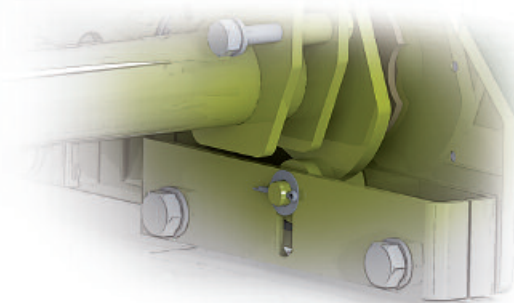
- Electromechanical interlocks can be mounted on all isolator and earthing switches without motor drive.
- When the solenoid is de-energised, the interlocks lock the switches in the end positions.  
The interlock is not effective in the interim position (fault position).



## LOCKING MECHANISMS

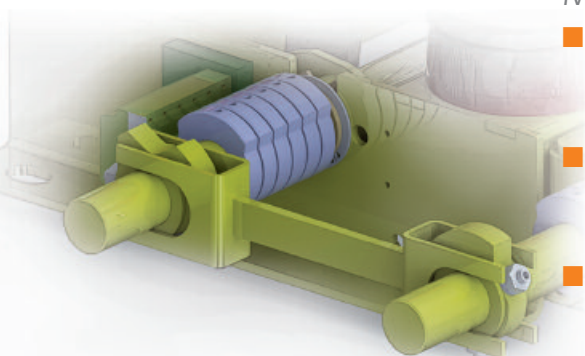
### CATCH BXX

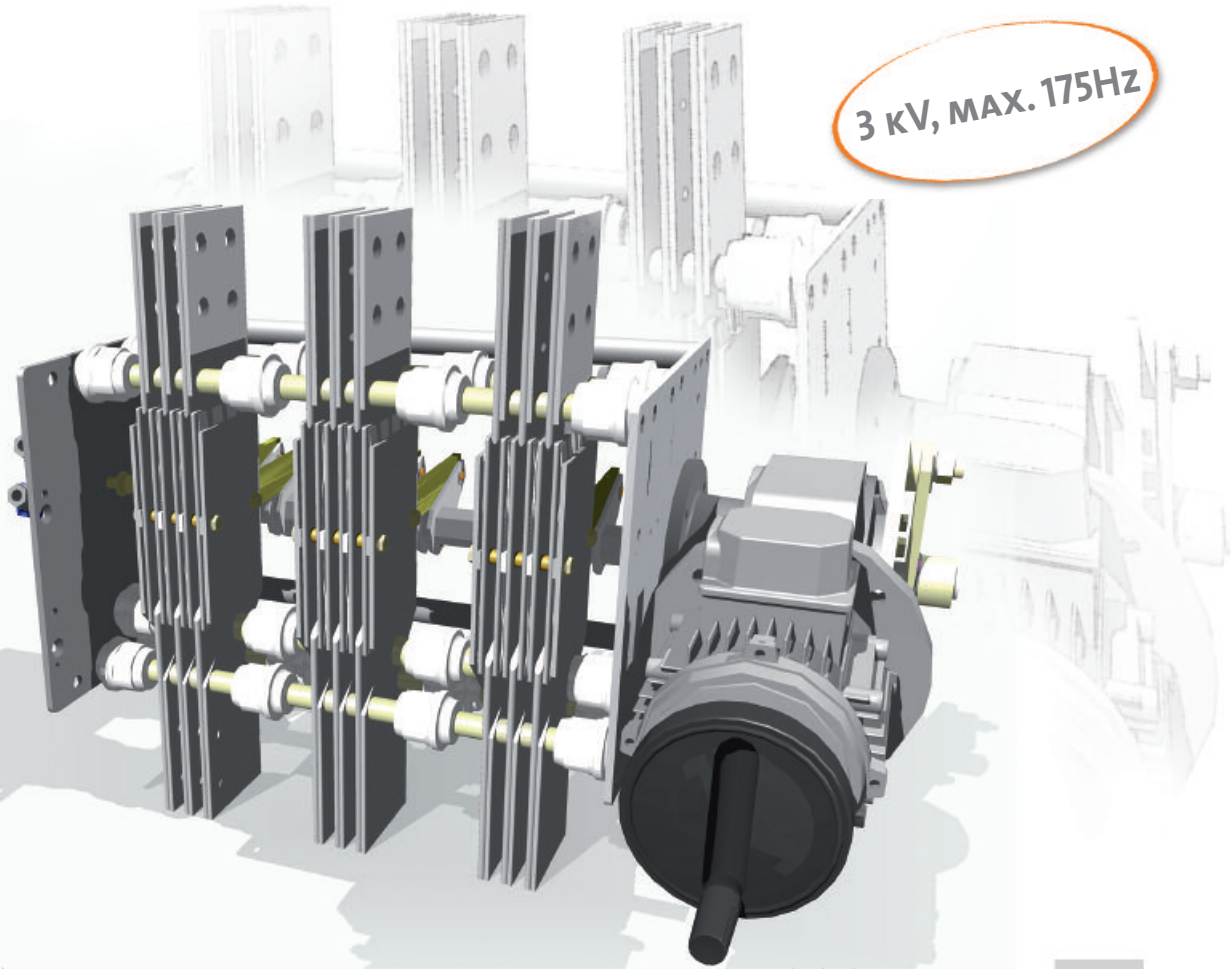
- For isolator and earthing switches, a catch that spring-locks into the end positions is available.
- This catch is required for manual actuation of the switch using a switching rod.



### MECHANICAL INTERLOCK FX

- Isolator switches with installed earthing switches can be furnished with a mechanical interlock if the earthing switch is actuated with the help of a switching rod.
- Switching equipment with power drive must be locked by means relevant to the drive, i.e. actuation must be prevented. For this purpose, an auxiliary switch is required on a part without a power drive.
- If neither isolator switch nor installed earthing switch have a power drive, the mechanical interlock can also be used in conjunction with an electromechanical interlock. The electromechanical interlock is then attached to the isolator switch.





▶▶▶ SMALL • COMPACT • COMPACT ◀◀◀

## CORE TECHNOLOGY OF THE FA PRODUCT RANGE

- Isolation between phases with the help of glass-fibre-reinforced, self-extinguishing polyester supports pursuant to UL94
- Thermal current pursuant to 60947-3 with maximum warming of 70 °C
- Switching only in Off-Load
- 140°C spot temperature without damage possible
- Rated withstand voltage: 20 kV – 50 Hz – 1 min to earth between the phases and contacts / between the live parts and auxiliary switches
- Rated withstand voltage: 2500 V, 50 Hz – 1 min between the auxiliary switches and earth
- Rated lightning impulse voltage: 20 kV – 1.2 / 50 µs pursuant to IEC 694
- Voltage drop: ~ 30 mV
- Maximum short-time current for one phase "per pole" (50 Hz):
  - $I_{th} = 500 \text{ A}$ , impulse current: 75 kA Ir.m.s = 28 kA für 1 s
  - $1250 \text{ A } I_{th} \leq 2000 \text{ A}$ , impulse current: 90 kA Ir.m.s = 35 kA for 1 s
  - $I_{th} \geq 2500 \text{ A}$ , impulse current: 150 kA Ir.m.s = 58 kA for 1 s

# TYP FA

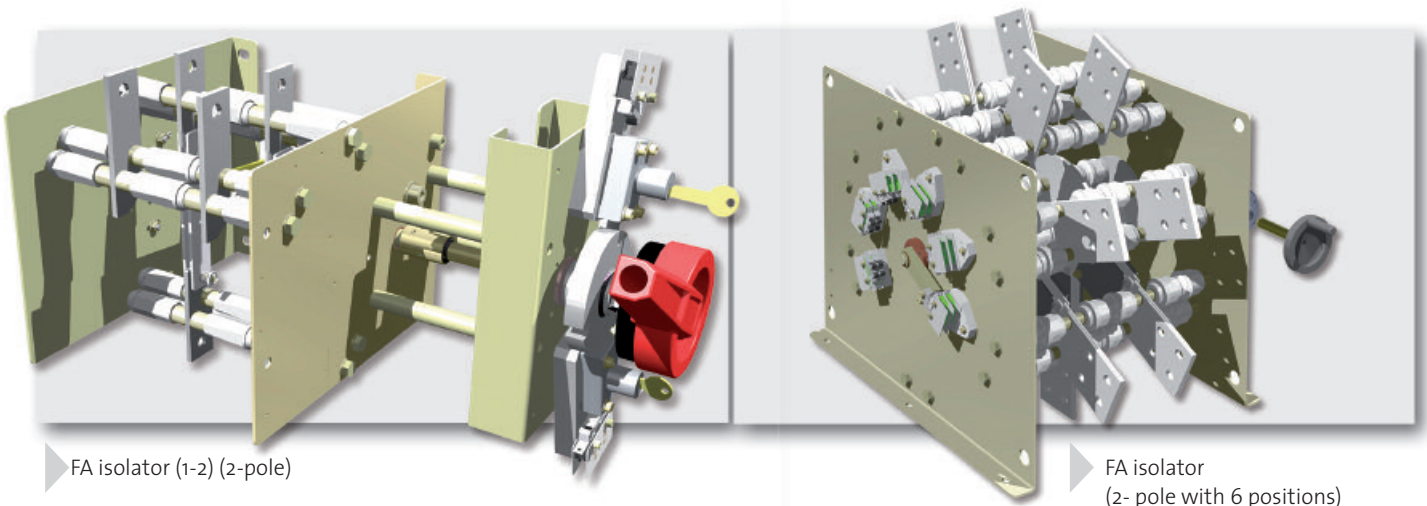
## APPLICATION/FEATURES

- Indoor use
- Large, visible separation between the contacts
- Self-cleaning contacts
- Reliable, high short-term currents
- Silver rivet contact for currents above 2500 A
- Also available in water-cooled design
- In accordance with standard IEC 62271-102.60694

● Isolator (1-0)	
● 2-position changeover isolator (1-2), allows (1-1). There is an insufficient air gap when switching from 1-2.	
● 3 position changeover isolators (1-0-2) Position (1-0-2) are individually run into. At zero position all insulation clearances are maintained.	
● 3 position changeover isolators (1-3-2) Pos. (1-3-2) are individually run into. Pos. 3 can be used as earthing contact.	

The FA product range includes all options between one and six poles. Thus the following combinations can be achieved:

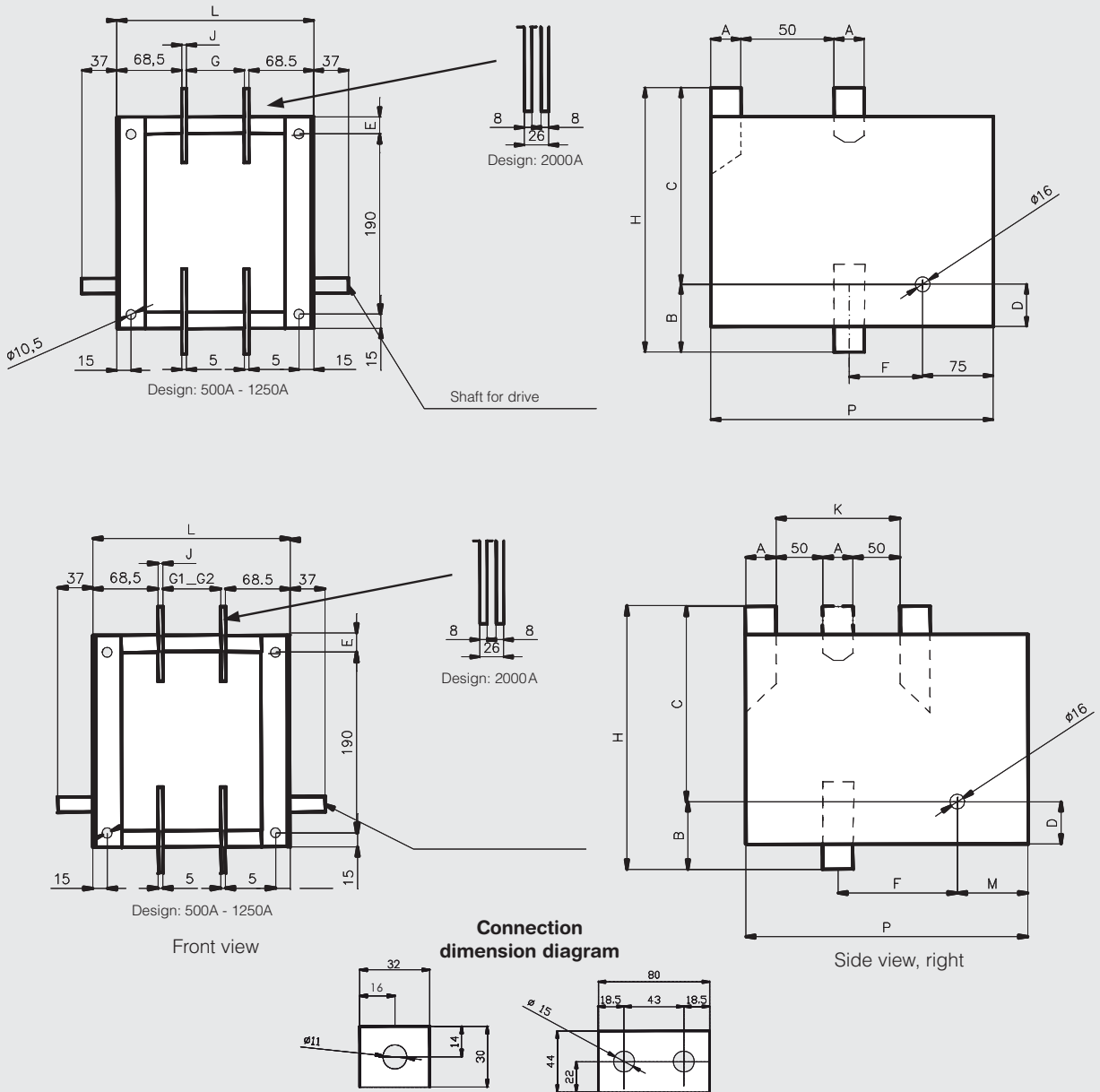
NOMINAL CURRENT (A)		VALID FOR (1-0) (1-2) (1-0-2) AND (1-3-2) EQUIPMENT					
~ 50/60 Hz	=	1 POLE	2 POLE	3 POLE	4 POLE	5 POLE	6 POLE
500	500	X	X	X	X	X	X
1250	1250	X	X	X	X	X	X
2000	2000	X	X	X	X	X	X
2500	2800	X	X	X	X	X	X
3200	4000	X	X	X	X	X	X
4000	5000	X	X	X	X		
5000	6300	X	X	X			
6300	8000	X	X	X			



FA isolator (1-2) (2-pole)

FA isolator (2-pole with 6 positions)

## Design: <math>\leq 2000A</math> - Operations 1-0-2, 1-3-2



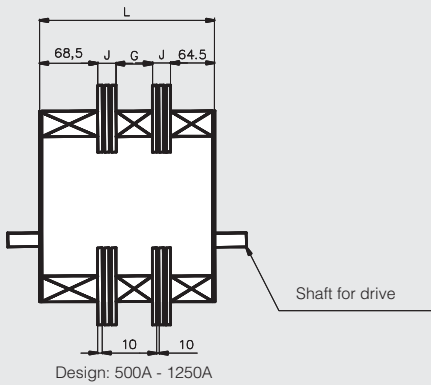
### Dimensions table FA (<math>< 2000A</math>)

NOMINAL CURRENT (A)		A	J	H	P	B	C	D	E	F	G	L1P	L2P	L3P	M	K	WEIGHT(KG) 1POLE	ADDITIONALWEIGHT PER POLE (KG)
OPERATIONS 1-2, 1-0 1250	500	32	5	280	285	127	153	97	15	76	82	142	229	316	4.5	2.5		
	80	5	356	334	126	230	76	51	89	82	142	229	316	75	3.5			
	2000	80	26	356	334	126	230	76	51	89	82	163	271	379	12	7		
OPERATIONS 1-0-2, 1-3-2	500	32	5	280	300	72	208	45	18	127	82	142	229	316	75	13	5.5	2.5
	1250	80	5	356	395	93	263	45	53	130	82	142	229	316	95	180	7.5	3.5
	2000	80	26	356	395	93	263	45	53	130	82	163	271	379	95	180	12	7

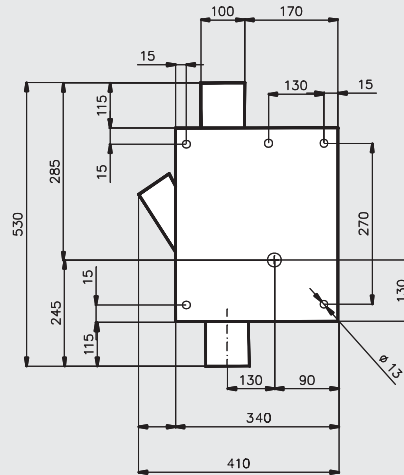


# TYP FA

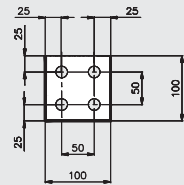
Design: > 2000A



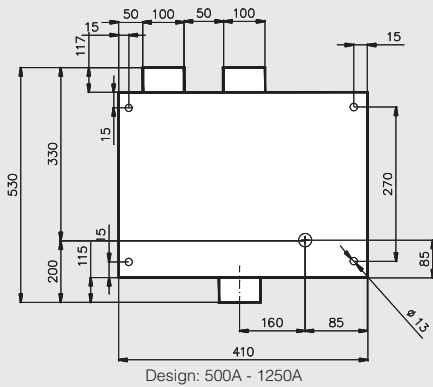
Operations 1-0



Connection dimension diagram

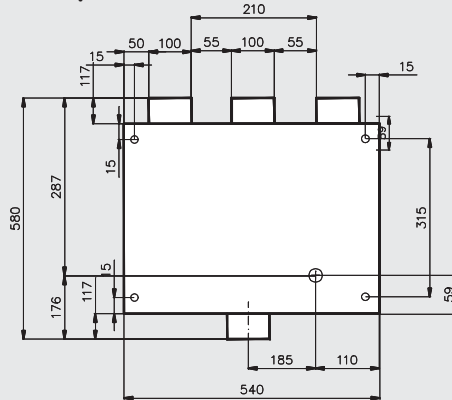


Operations 1-2

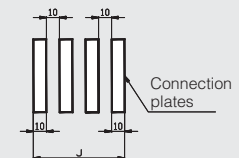


Front view

Operations 1-3-2



Side view, right



## Dimensions table FA (>2000A)

NOMINAL CURRENT		NUMBER POLE	G POLE		L				CONNECTION PLATES J PER POLE		WEIGHT (KG) 1-POLE	ADDITIONAL WEIGHT PER POLE
AC(A)	DC(A)				1	2	3	4				
2500	2800	1 TO 6	75	75	143	228	313	398	1	10	13±2	8±2
3200	4000	1 TO 6	80	80	163	273	383	493	2	30	19±4	14±3
4000	5000	1 TO 4	80	100	183	313	483	633	3	50	26±5	19±4
5000	6300	1 TO 3	80	120	203	353	583		4	70	33±7	26±5
6300	8000	1 TO 3	80	140	223	393	683		5	90	39±8	33±7

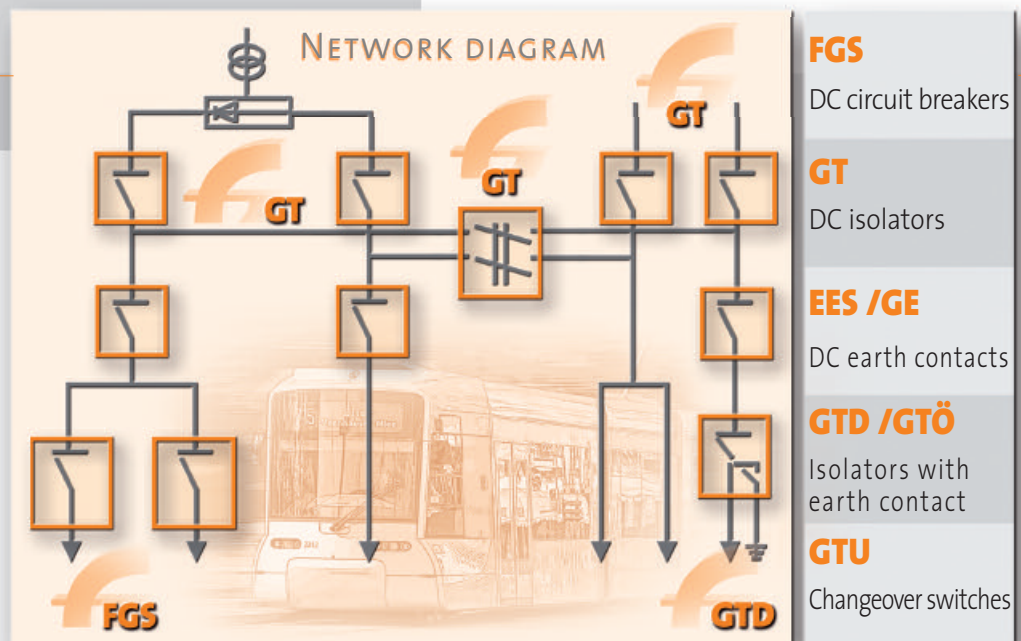


### IN RAILWAY TECHNOLOGY...

circuit breakers are required for activation and earthing, which must comply with standards **EN 50123-3** and **VDE 0115**.

The FLOHE DC circuit breaker has the prescribed making and breaking capacity in both directions.

Overtoltage category 4 according to EN 50124-1 is satisfied.





## SWITCH CABINETS

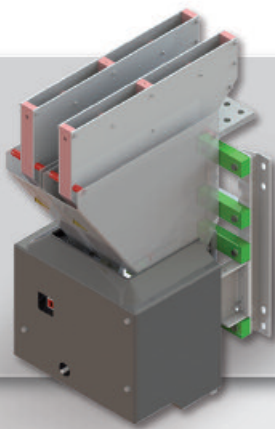
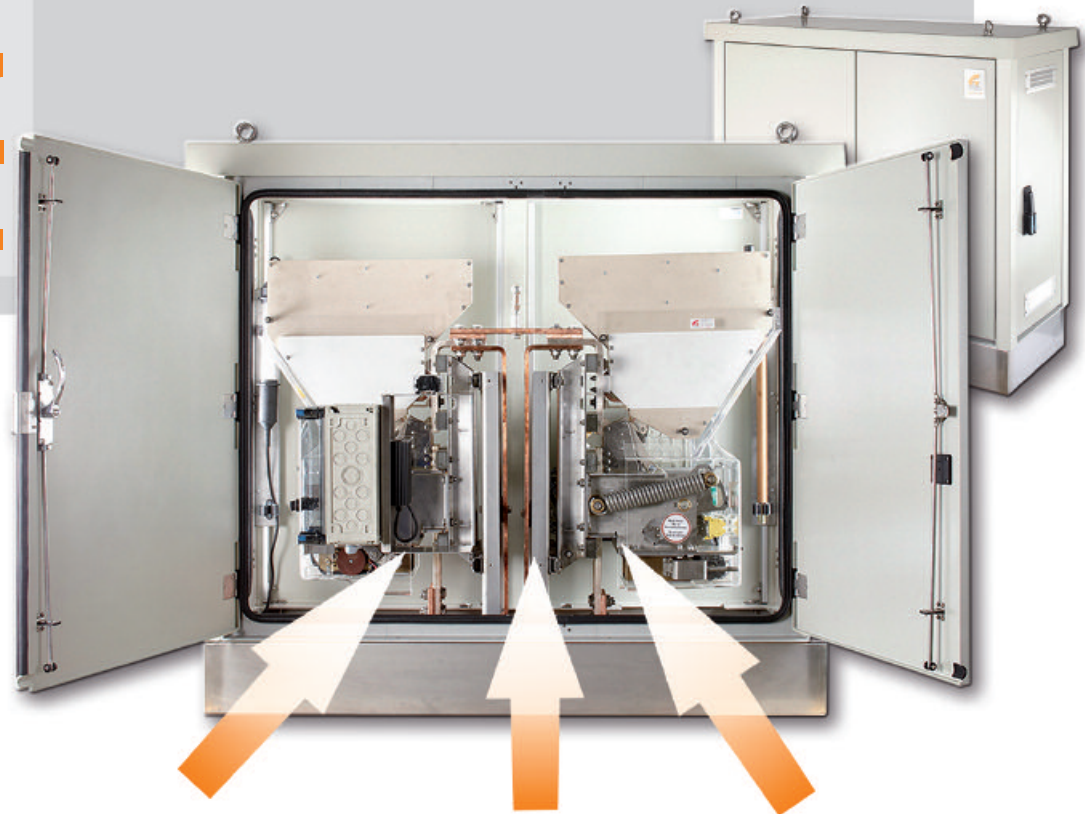
FLOHE develops and builds complete outdoor cabinets up to IP66.

ISOLATOR/EARTH CONTACT COMBINATION

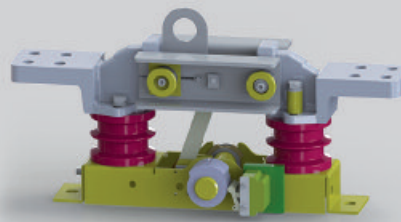
EARTH CONTACTS

ISOLATORS

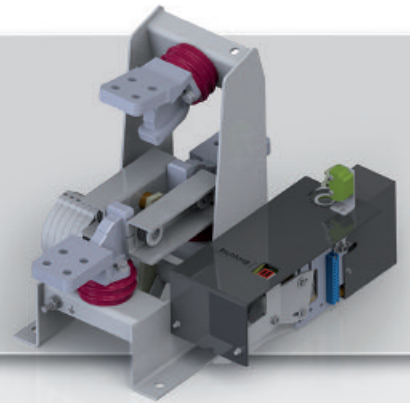
DC SWITCHES



FGS 6000A



GT isolators with drawbar eye



GTU changeover switches with position indicator

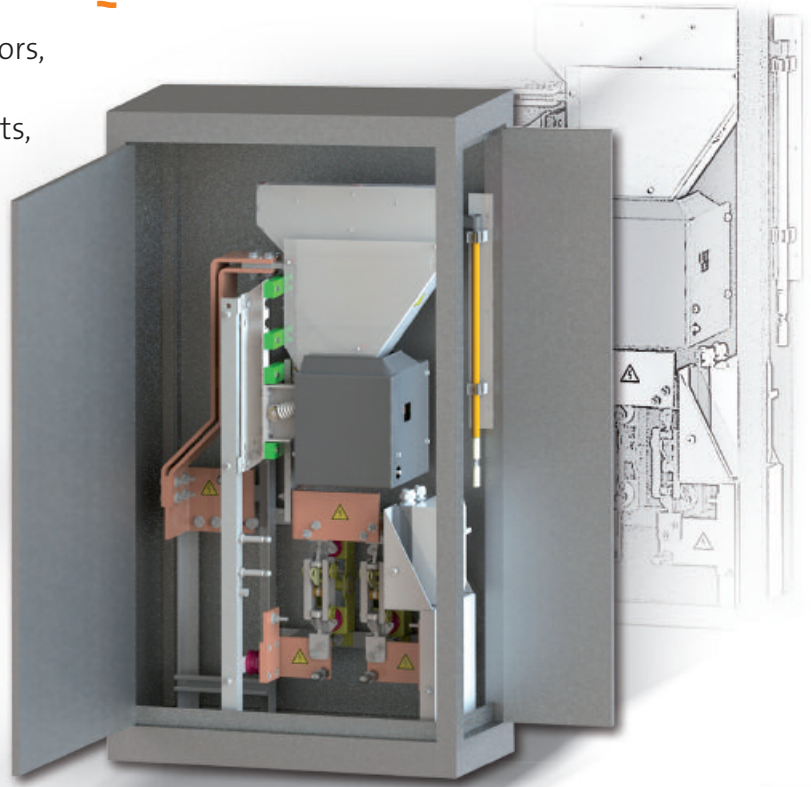
### Switch cabinet specifications by customer request...

with DC disconnectors, DC isolators, control element units, fuses, etc.



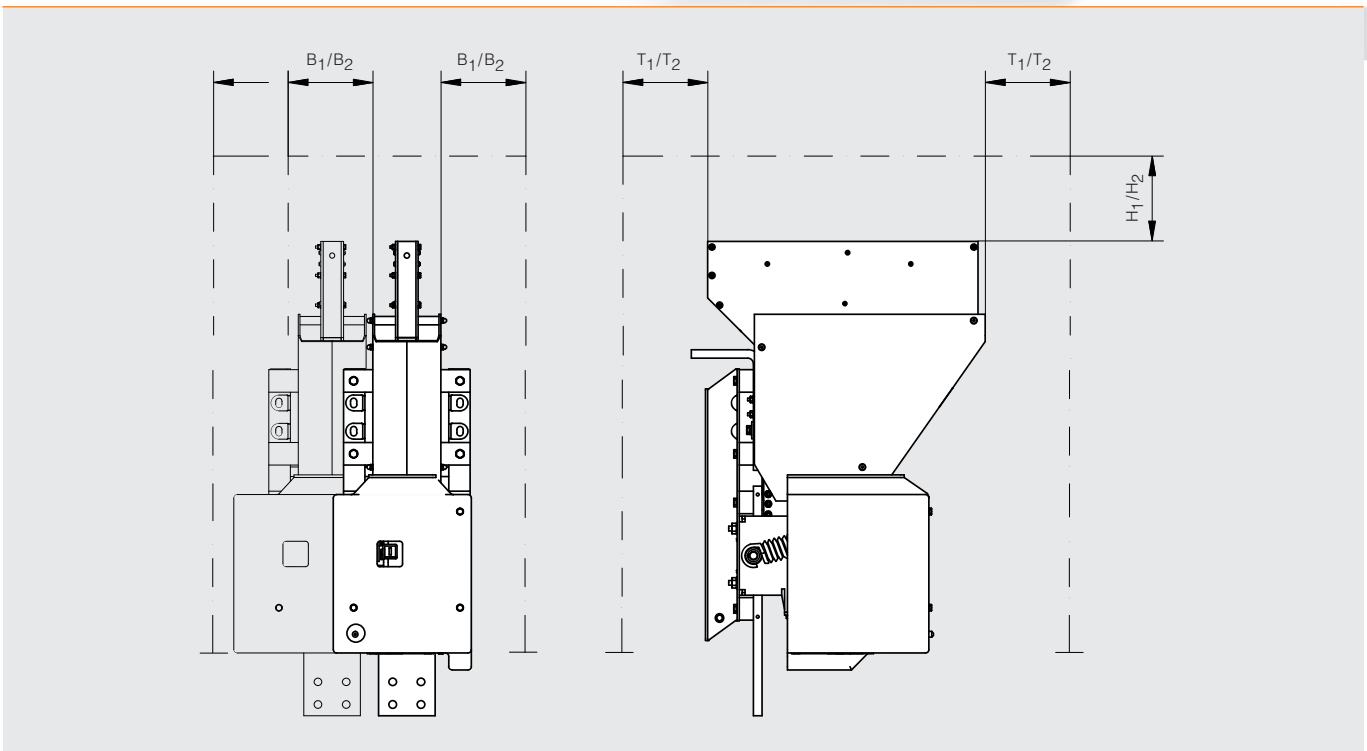
## SWITCH CABINET SPECIFICATIONS BY CUSTOMER REQUEST...

- With DC disconnectors,
- DC isolators,
- Control element units,
- Fuses, etc.



SPACING DC SWITCHES			750V	1500V
AGAINST ISOLATED PARTS	T <sub>1</sub>	[MM]	50	50
	H <sub>1</sub>	[MM]	250	250
	B <sub>1</sub>	[MM]	75	75
AGAINST EARTHED PARTS	T <sub>2</sub>	[MM]	150	150
	H <sub>2</sub>	[MM]	550	350
	B <sub>2</sub>	[MM]	150	150

### FGS clearances

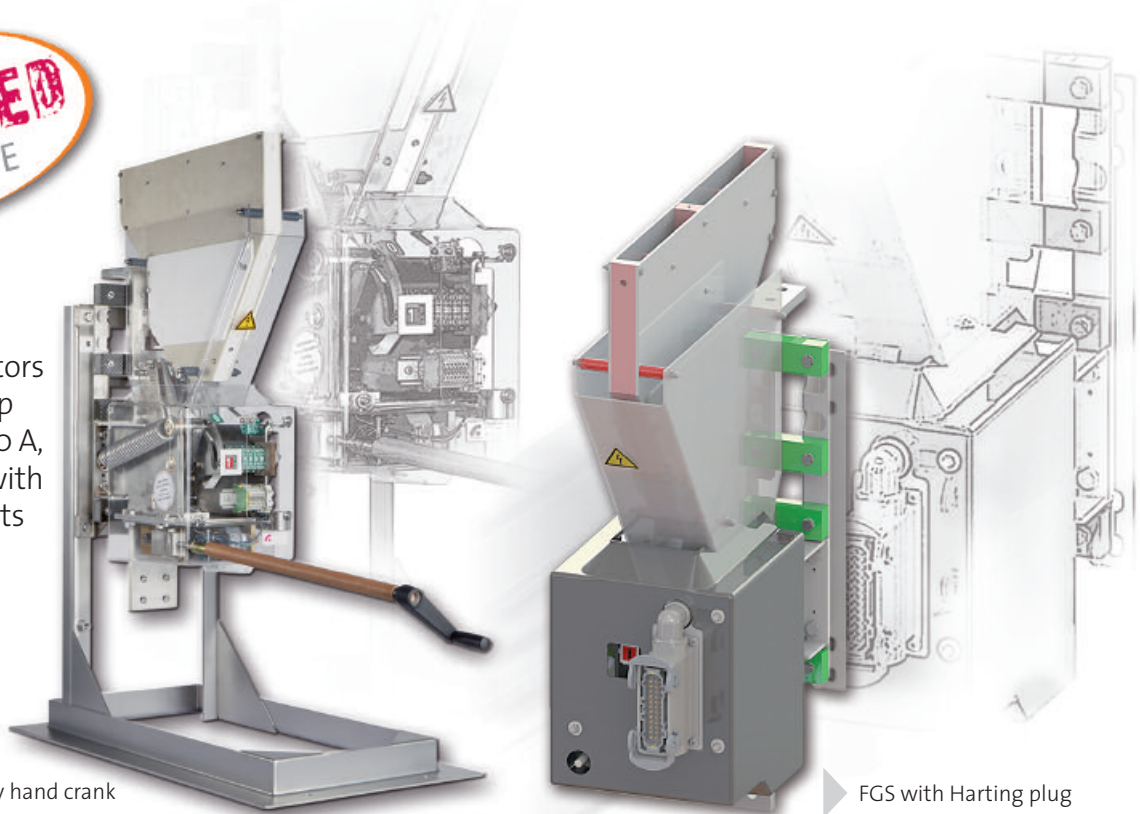


# TYP FGS

**ENHANCED**  
BY FLOHE

## FGS

The DC disconnectors for applications up to 1.8 kV and 8000 A, type-tested and with short-time currents of 80 kA/250 ms.



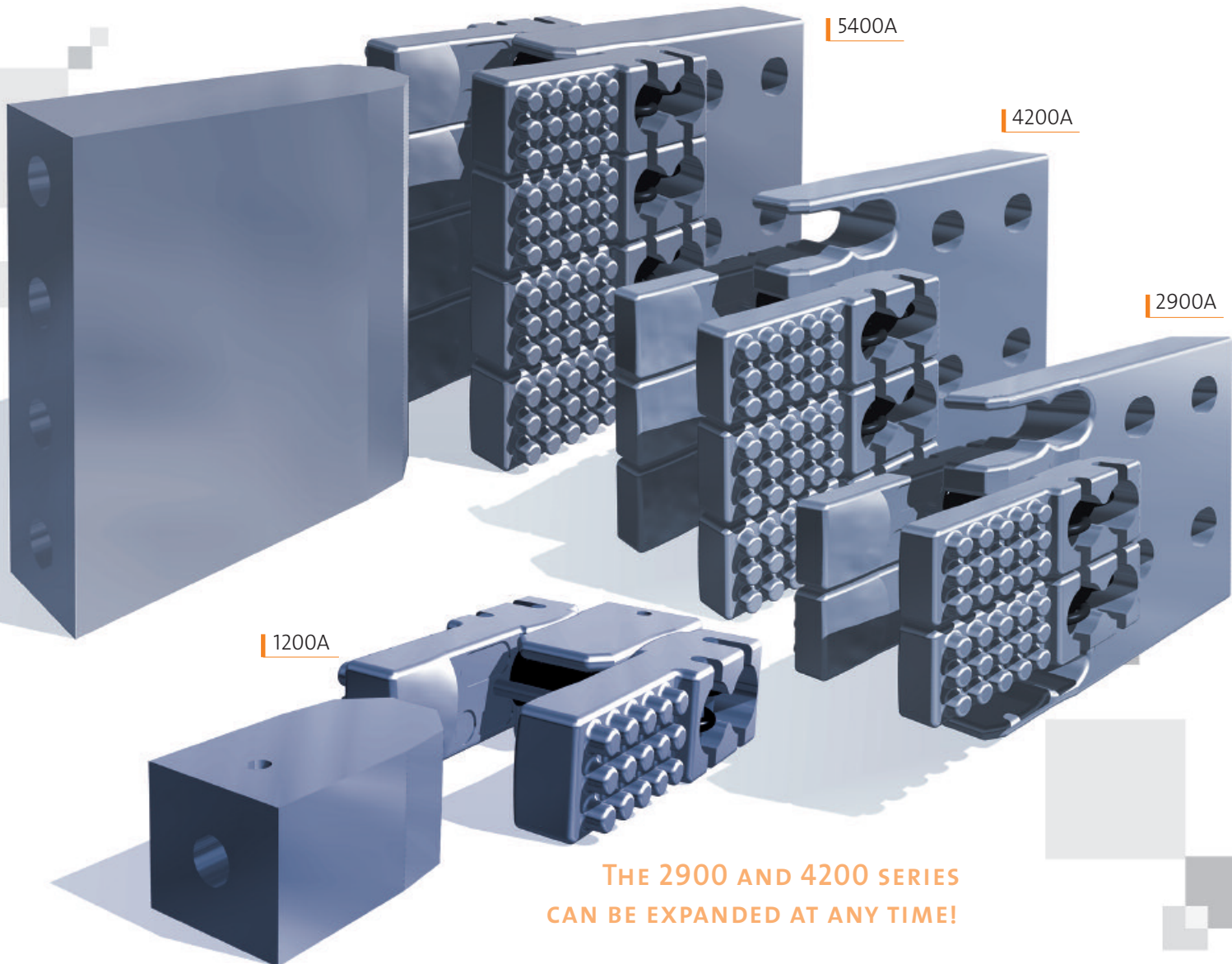
FGS with emergency hand crank

FGS with Harting plug

## DC disconnectors

Typ 750 V DC		FGS3.15-0.75-1P	FGS4.00-0.75-1P	FGS6.00-0.75-1P	FGS8.00-0.75-1P	FGS3.15-0.75-2P	FGS4.00-0.75-2P
NUMBER OF POLES		1-POLE	1-POLE	1-POLE	1-POLE	2-POLE	2-POLE
NOMINAL CURRENT	[A]	3150	4000	6000	8000	3150	4000
NOMINAL VOLTAGE	[V]	750	750	750	750	750	750
OVERVOLTAGE CATEGORY		OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4
MAKING CAPACITY	[kA]	30	30	30	30	30	30
BREAKING CAPACITY	[kA]	12	12	12	12	12	12
SHORT-TIME CURRENT	[kA/250ms]	50	50	50	50	50	50
CURRENT PATH WIDTH	[MM]	80	100	2x 100	2x100	2x 80	2x100
Typ 1500 V DC		FGS3.15-1.50-1P	FGS4.00-1.50-1P	FGS6.00-1.50-1P	FGS8.00-1.50-1P	FGS3.15-1.50-2P	FGS4.00-1.50-2P
NUMBER OF POLES		1-POLIG	1-POLIG	1-POLIG	1-POLIG	2-POLIG	2-POLIG
NOMINAL CURRENT	[A]	3150	4000	6000	8000	3150	4000
NOMINAL VOLTAGE	[V]	750	750	750	750	750	750
OVERVOLTAGE CATEGORY		OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4	OV3/OV4
MAKING CAPACITY	[kA]	30	30	30	30	30	30
BREAKING CAPACITY	[kA]	12	12	12	12	12	12
SHORT-TIME CURRENT	[kA/250ms]	80	80	80	80	80	80
CURRENT PATH WIDTH	[MM]	80	100	2x 100	2x100	2x 80	2x100
MOTOR DRIVE		OPERATING VOLTAGE: 230V 50Hz / 220V DC / 125V DC / 110V DC / 60V DC / 48V DC					
EMERGENCY ACTUATION		HAND LEVER					
AUXILIARY SWITCHES		4NC+4NO / 6NC+6NO / 2NC+2NO IN ANY POSITION / 3NC+3NO IN ANY POSITION					
SIGNALLING SWITCH – ARC CHAMBER		OPTIONAL					
SIGNALLING SWITCH – MANUAL DRIVE		OPTIONAL					
RELATIVE CONTACT		OPTIONAL					

▶▶▶ MODULAR SYSTEM ◀◀◀



THE 2900 AND 4200 SERIES  
CAN BE EXPANDED AT ANY TIME!

OUR DEVICES FROM THE HAK SERIES HAVE BEEN DEVELOPED FOR RAILWAY APPLICATIONS.

The HAK product range was developed to meet the requirements of the rail market and to limit the installation and maintenance times of cabinet equipment.

They are used in particular for quickly connecting circuit breaker systems and line switches to mobile running gear when idle. The HAK contacts are

maintenance-free thanks to their simple and robust construction. Its modular and evolutionary structure means it is extremely versatile.



## PROPERTIES

- Indoor use
- Custom-made version
- Multifaceted version
- Silver-plated version
- Modular structure
- Easy to maintain
- Simple and robust design
- Long service life
- 1200A to 5400A version

STANDARD:

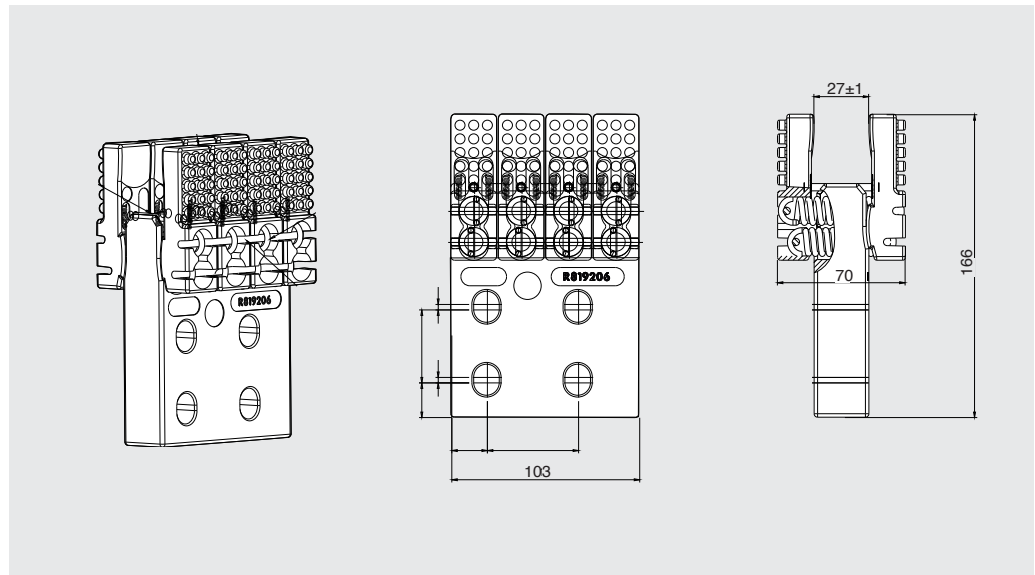
IEC 62271-102

IEC 62505-2

EN 50123 PART 1,  
PART 3, PART 4

### OUR DEVICES FROM THE HAK SERIES ARE FOR RAILWAY APPLICATIONS

In addition to the HAK moving contact, which consists of the contact piece and the individual contact fingers, the counter contact can also be ordered. The contact piece is available in different lengths.



SERIES	HAKV1200-L108-B25-G50	HAK2900-L166-B103	HAK4200-L166-B103	HAK 5400-L166-B103
NUMBER OF CONTACT FINGERS	1	2	3	4
RATED CURRENT	1250	2.500	3.750	5.000
RATED VOLTAGE	BIS 24 kV	BIS 24 kV	BIS 24 kV	BIS 24 kV
SHORT-TIME CURRENT	16 kA / 0,3 s	31,5 kA / 0,3 s	48 kA / 0,3 s	63 kA / 0,3 s
PEAK CURRENT	40 kA	81 kA	121,5 kA	162 kA
MAX. TEMPERATURE	105°C	105°C	105°C	105°C
SERVICE LIFE	23.000	23.000	23.000	23.000
WEIGHT	0,6 KG	3,5 KG	4,1 KG	4,7 KG
TENSILE FORCE	45 N	90 N	135 N	180 N
ELECTRICAL RESISTANCE	20 μΩ	10 μΩ	7,5 μΩ	5 μΩ
MOVEMENT	4 MM	4 MM	4 MM	4 MM
DRAWING NUMBER	WF19_14664_00	WF19_14668_00	WF19_15574_00	WF_19_15591_00

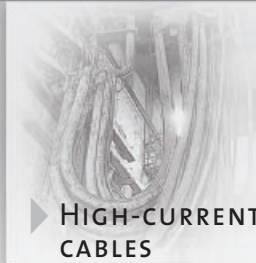
# FLOHE

## PRODUCT OVERVIEW

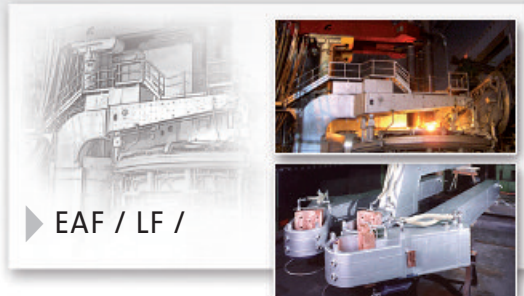
FOR MORE THAN 110 YEARS:

**EXPERTISE IN  
ENGINEERING + MANUFACTURING**

FROM INDIVIDUAL COMPONENTS  
TO COMPLEX HIGH-CURRENT SYSTEMS



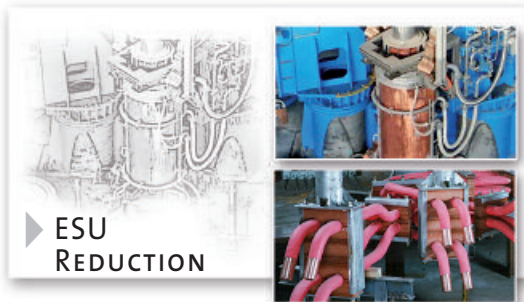
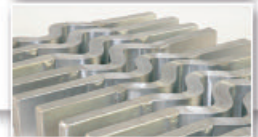
▶ HIGH-CURRENT  
CABLES



▶ EAF / LF /



▶ EXPANSION  
STRIPS



▶ ESU  
REDUCTION



▶ HIGH-CURRENT  
RAIL SYSTEM



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