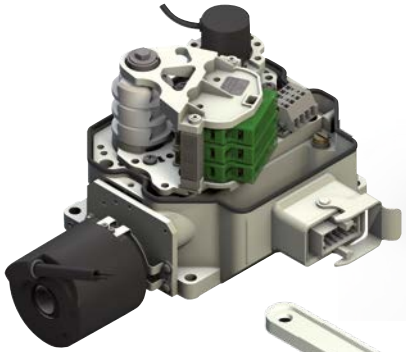
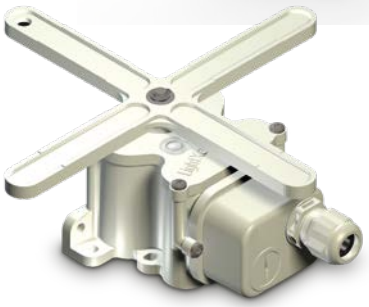
Geared Cam Limit Switches

For Crane, Wind and Stage Application





Stromag®
Altra Industrial Motion

Stromag

Founded in 1932, Stromag has grown to become a globally recognized leader in the development and manufacture of innovative power transmission components for industrial drivetrain applications. Stromag engineers utilize the latest design technologies and materials to provide creative, energy-efficient solutions that meet their customer's most challenging requirements.

Stromag's extensive product range includes flexible couplings, disc brakes, limit switches, an array of hydraulically, pneumatically, and electrically actuated brakes, and a complete line of electric, hydraulic and pneumatic clutches.

Stromag engineered solutions improve drivetrain performance in a variety of key markets including energy, off-highway, metals, marine, transportation, printing, textiles, and material handling on applications such as wind turbines, conveyor systems, rolling mills, agriculture and construction machinery, municipal vehicles, forklifts, cranes, presses, deck winches, diesel engines, gensets and stage machinery.

VISIT US ON THE WEB AT **STROMAG.COM**

Altra Motion

Altra is a leading global designer and producer of a wide range of electromechanical power transmission and motion control components and systems. Providing the essential control of equipment speed, torque, positioning, and other functions, Altra products can be used in nearly any machine, process or application involving motion. From engine braking systems for heavy duty trucks to precision motors embedded in medical robots to brakes used on offshore wind turbines, Altra has been serving customers around the world for decades.

Altra's leading brands include **Ameridrives**, **Bauer** Gear Motor, **Bibby** Turboflex, **Boston** Gear, **Delevan**, **Delroyd** Worm Gear, **Formsprag** Clutch, **Guardian** Couplings, **Huco**, **Jacobs** Vehicle Systems, **Kilian**, **Kollmorgen**, **Lamiflex** Couplings, **Marland** Clutch, **Matrix**, **Nuttall** Gear, **Portescap**, **Stieber**, **Stromag**, **Svendborg** Brakes, **TB Wood's**, **Thomson**, **Twiflex**, **Warner** Electric and **Wichita** Clutch.

VISIT US ON THE WEB AT **ALTRAMOTION.COM**

start

SOLUTIONS FOR EVERY APPLICATION

Stromag has been building Geared Cam and Spindle Limit Switches for over fifty years. With a wide range of gear systems, switching contacts, and housings of metal or synthetics, we can offer solutions for every application.

CONTENT

YOUR MARKET

CRANE MARKET

A must for every condition monitoring system!

Reliable deactivation at the end positions with additional feedback on absolute positions:

Bridge cranes

- Compact hoisting gear
- Open winches

Mobile cranes

- Crawler cranes
- Truck cranes
- Rail-Bound mobile cranes

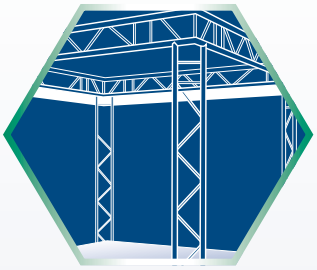
Tower cranes

- Top slewing cranes
- Bottom slewing cranes

Deck cranes

Harbour cranes

- Ship to shore
- RTGs
- Straddle Carriers



STAGE ENGINEERING

Plays an invisible, but key role

Sync tolerance in the most diverse structures adopts a key role in stage and theatre engineering.

This is the domain of the Stromag Series 51 complying with DGUV V17 (formerly BGV C1 / VBG70).

Its design purpose is reliable deactivation, e.g. in the following main categories:

- **Above stage machinery**
- **Below stage machinery**
- **Line sets**
- **Screw type hoist elements**
- **Hoisting and lighting installations**

WIND POWER

Assembly at wind turbine manufacturers must be highly effective and efficient and the employed sequences must be uncomplicated and fast. For this purpose, compact, preadjusted components are used as far as possible which can be assembled quickly and easily.

Stromag geared cam limit switches are especially designed to meet these requirements. These mechanical switches for reliable travel limitation and highly precise position feedback systems for exacting position control of the blades or nacelle are integrated in one housing. Supplying pre-adjusted components ensures that mechanical assembly is reduced to a few screws and electrical connection is quick and uses easy identification for plug connection.

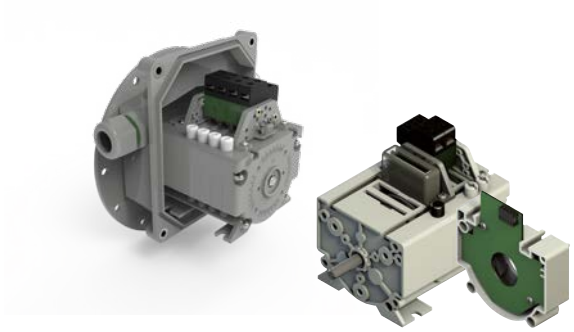
The mechanical mounting options and electrical connections are developed and optimised in close co-operation with the design departments of wind turbine manufacturers.

- **For pitch and yaw drives**

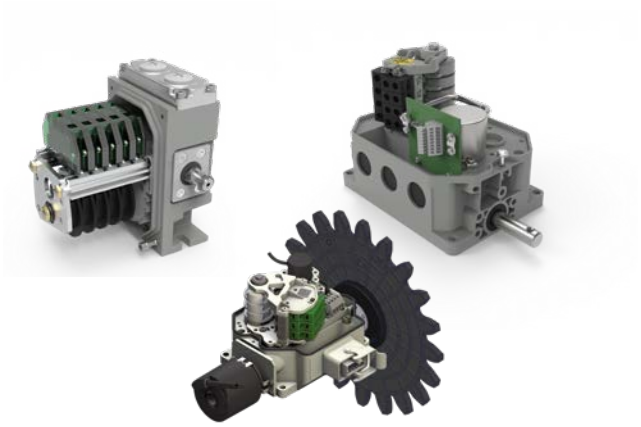
OUR SOLUTION!

Limit Switch Control Current

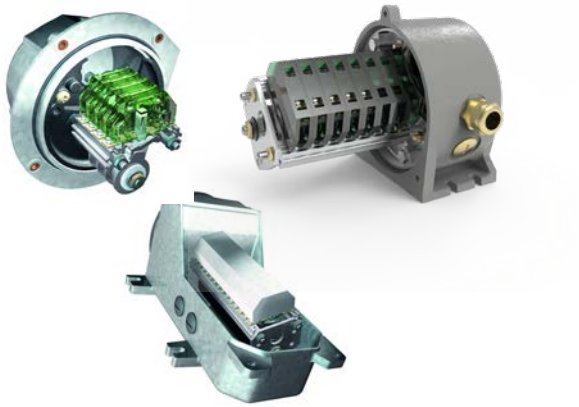
PLANETARY GEARS



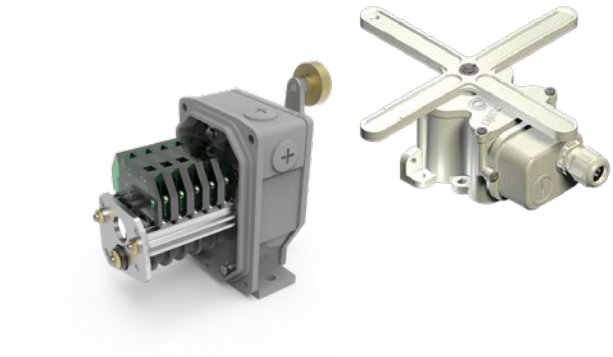
WORM GEARS



SPUR GEARS



LEVER TYPE

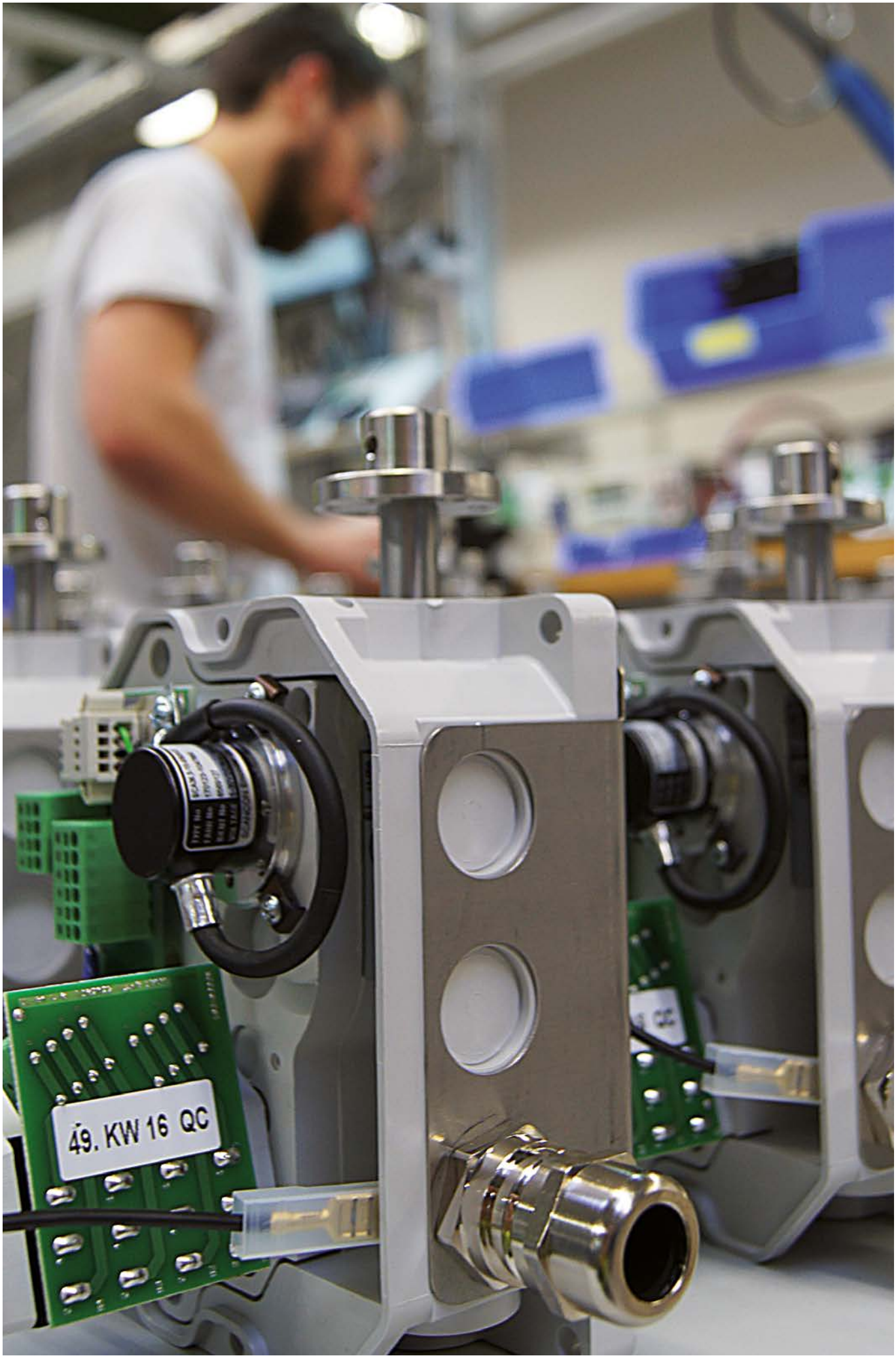


Limit Switch Main Current

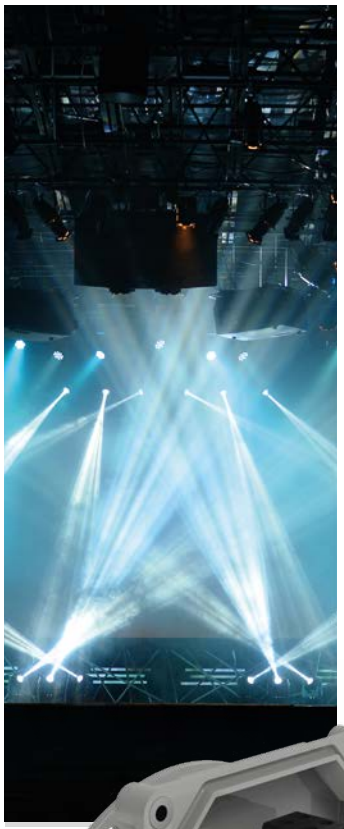
SPINDLE GEARS

LEVER TYPE

COUNTERWEIGHT


49. KW 16 QC

Serie 51 / 51 DZ
Geared Cam Limit Switches



Stromag®
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AT A GLANCE

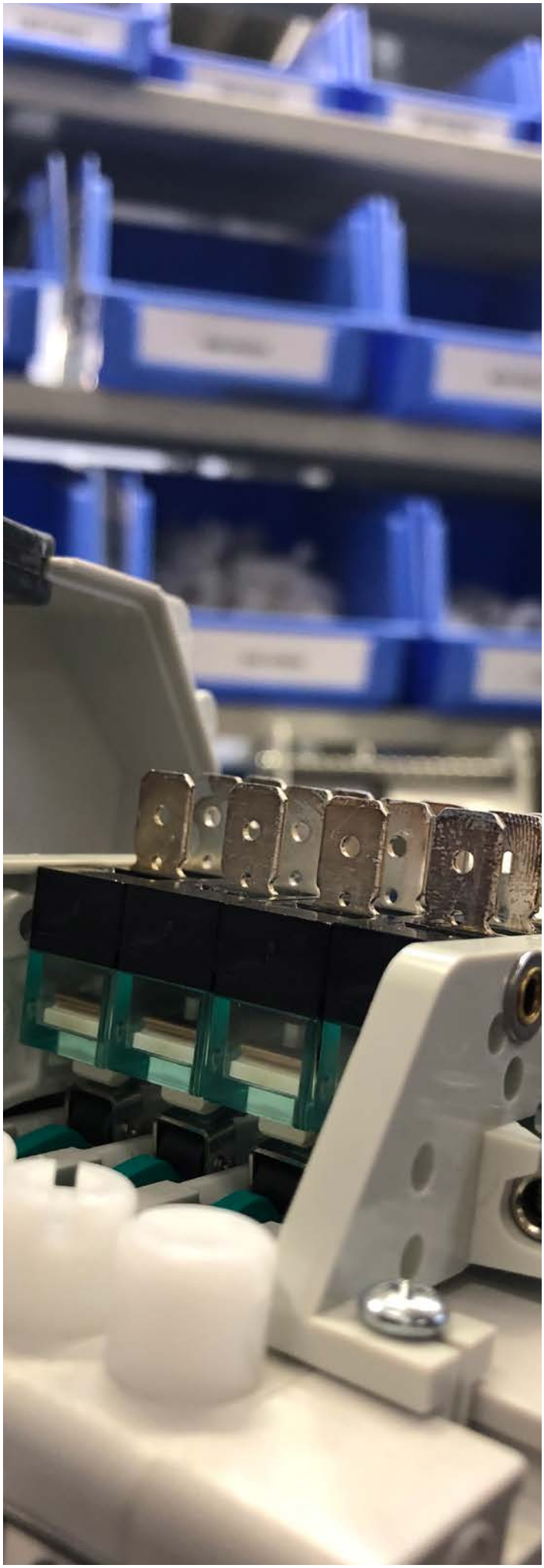
STROMAG SERIES 51

BENEFITS INCLUDE

- Cam adjustment at fixed position inside of the housing
- Large cam disc diameter
- Modular design
- Various housing designs
- Direct drive of incremental and absolute encoders possible

CONTENT

Catalog Series 51 / 51 DZ: **I**




DIN EN 60947-5-1
TÜV NORD geprüft
Zertifikat: 44 799 15103301
Geeignet für den Einsatz
nach DGUV V17 in der
Bühnentechnik

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Basic Limit Switch

Revision number: 3.1.1.1-02 **Revision date: 10.06.2020**

Features

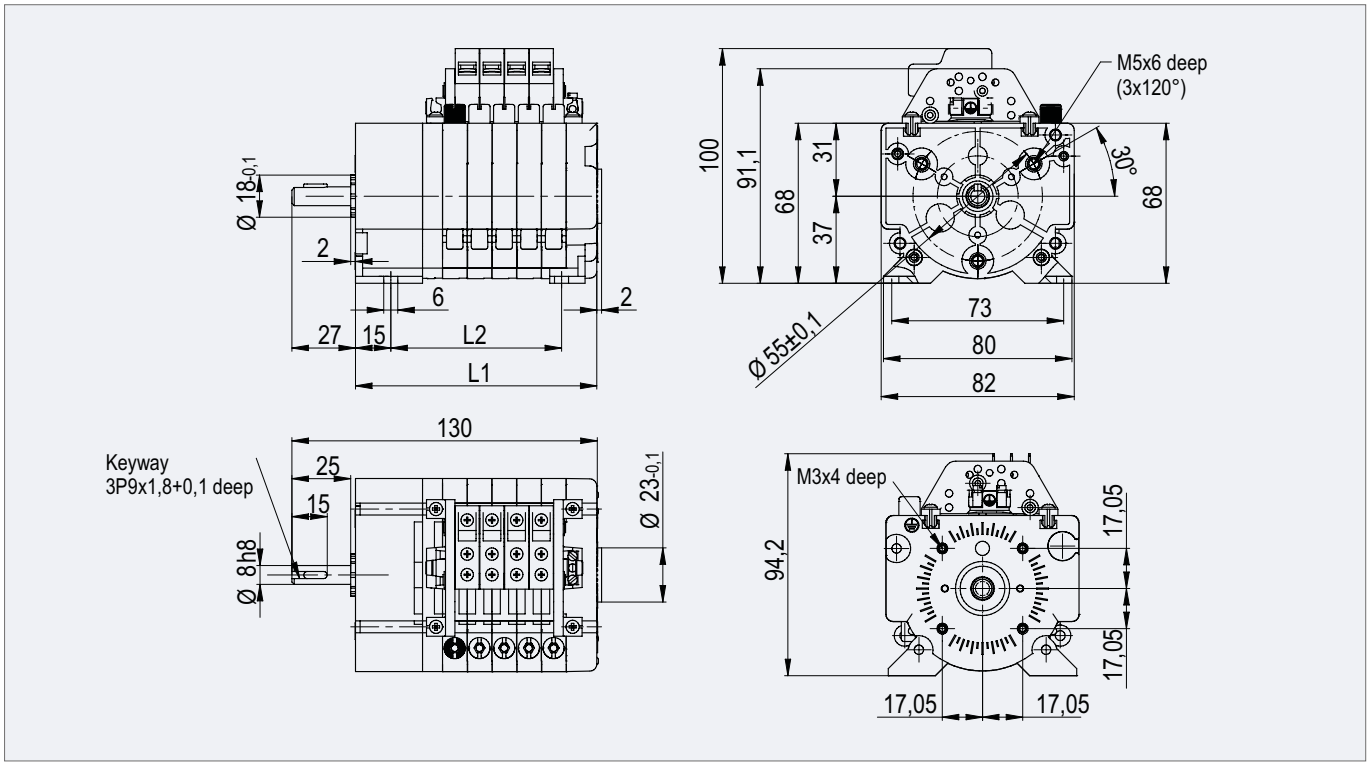
- Patented planetary gear form fit
- Modular design
- Large cam disc diameter 60 mm for high switching point repeatability

Application

- Crane
- Wind
- Stage

Additional information

- IP20 Protection
- For installation in customer housings
- High number of different gear possibilities



Standard gear	DZ gear	Gear size	2 Switching Contacts A		4 Switching Contacts B		6 Switching Contacts C		8 Switching Contacts D	
			L1 [mm]	L2 [mm]	L1 [mm]	L2 [mm]	L1 [mm]	L2 [mm]	L1 [mm]	L2 [mm]
4,1NM	67DZ	1	62,5	32,5	83,5	53,5	104,5	74,5	125,5	95,5
6,5NM	110DZ									
11NM	180DZ									
17,5BM	280DZ	2	73	43	94	64	115	85	136	106
29BM	470DZ									
48BM	770DZ									
75BM	1200DZ	3	81,5	51,5	102,5	72,5	123,5	93,5	144,5	114,5
125BM	2000DZ									
205BM	3300DZ									
323BM	5200DZ	4	90	60	111	81	132	102	153	123
540BM	8700DZ									
880BM	14200DZ									
1384BM	-	5	98,5	68,5	119,5	89,5	140,5	110,5	161,5	131,5
2288BM										
3735BM										
5900BM	-	6	107	77	128	98	149	119	170	140
9800BM										
16000BM										

Limit Switch Control Current

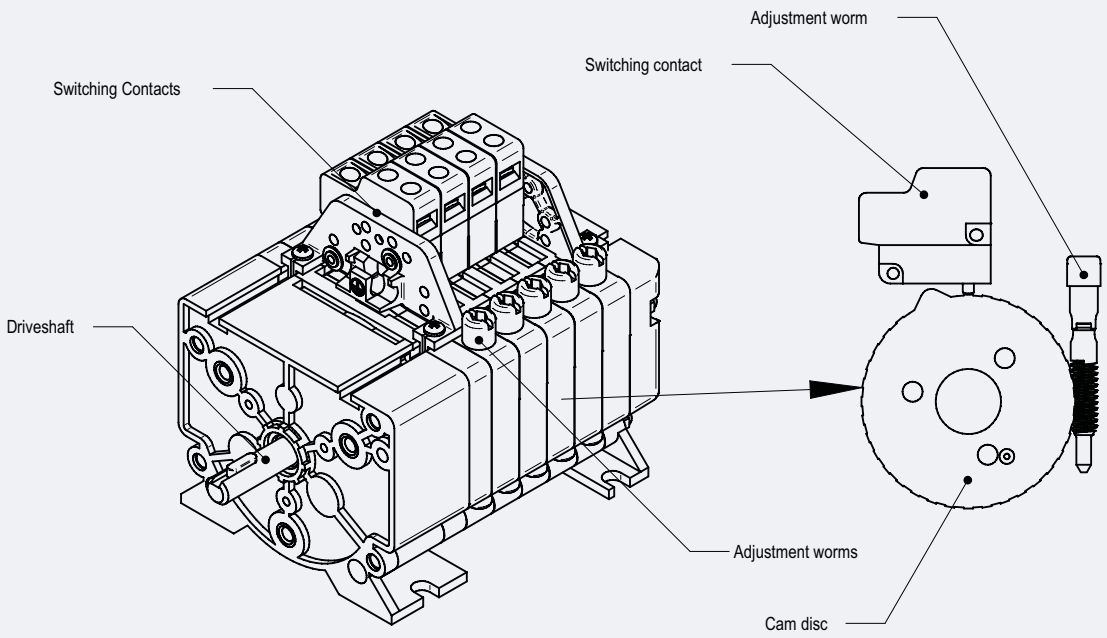
Planetary Gear Limit Switches

Series 51 – Gear Data

Revision number: 3.1.1.2-03 **Revision date: 05.02.2021**

Features

- 4.1 up to 16000 nominal revolutions
- Precise and low-wear design
- Usable up to 1800 rpm
- Block adjustment



Standard gear: One revolution of the adjustment worm corresponds to 2.464° on the cam disc
DZ gear: One revolution of the adjustment worm corresponds to 3.168° on the cam disc

Gear Data Standard Gear						
Gear size	Nominal revolutions (15° - cam disc)	Nominal revolutions (40° - cam disc)	Gear ratio	Mechanical hysteresis [revolutions at drive shaft]	Max. input speed [rpm]	Min. input speed [rpm] (only when used as a changeover)
1	4,1	3,8	4,286	0,01 – 0,02	1000	0,67
	6,5	6,2	7,085	0,01 – 0,02	1200	1,1
	11	10,2	11,567	0,02 – 0,04	1500	1,8
2	17,5	16,3	18,367	0,03 – 0,06	1800	2,9
	29	26,9	30,362	0,05 – 0,1	1800	4,7
	48	44	49,573	0,08 – 0,16	1800	7,7
3	75	69	78,717	0,13 – 0,3	1800	12,2
	125	115	130,124	0,21 – 0,42	1800	20,2
	205	188	212,456	0,35 – 0,68	1800	33
4	323	299	337,359	0,6 – 1,17	1800	52
	540	495	557,676	0,92 – 1,8	1800	87
	880	809	910,526	1,5 – 2,9	1800	141
5	1384	1285	1445,826	2,4 – 4,7	1800	224
	2288	2124	2390,039	3,9 – 7,7	1800	371
	3735	3468	3902,255	6,5 – 12,7	1800	606
6	5900	5507	6196,398	10,3 – 20,1	1800	-
	9800	9104	10243,025	17,0 – 33,3	1800	-
	16000	14865	16723,951	27,8 – 54,2	1800	-

Gear Data DZ Gear						
Gear size	Nominal revolutions (15° - cam disc)	Nominal revolutions (40° - cam disc)	Gear ratio	Mechanical hysteresis [revolutions at drive shaft]	Max. input speed [rpm]	Min. input speed [rpm] (only when used as a changeover)
1	67	62	70,000	0,11 – 0,22	1800	10,9
	110	102	115,714	0,19 – 0,4	1800	18
	180	167	188,929	0,31 – 0,6	1800	29,4
2	280	266	300,000	0,5 – 1,0	1800	46,7
	470	440	495,918	0,84 – 1,7	1800	77,1
	770	719	809,694	1,35 – 2,6	1800	125
3	1200	1142	1285,714	2,1 – 4,1	1800	199
	2000	1889	2125,364	3,5 – 10,3	1800	330
	3300	3084	3470,117	5,5 – 11,3	1800	539
4	5200	4897	5510,204	9,1 – 17,8	1800	856
	8700	8096	9108,705	15,1 – 29,5	1800	1415
	14200	13219	14871,928	24,7 – 48,2	1800	-

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Switching Contacts

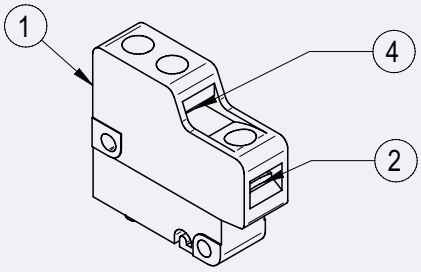
Revision number: 3.1.1.3-02 **Revision date: 11.11.2021**

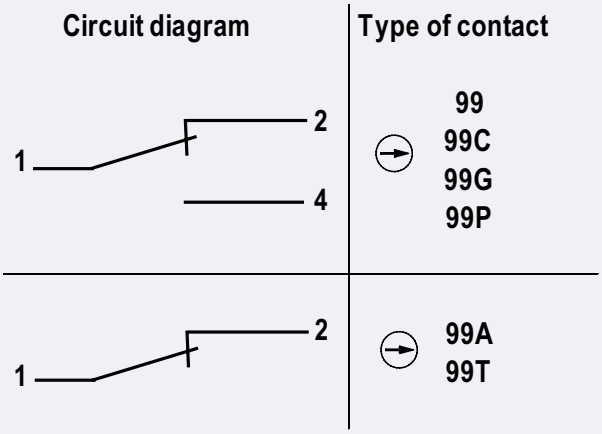
Features

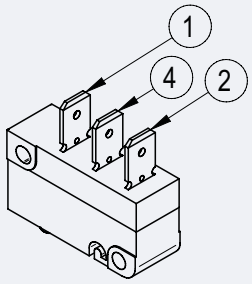
- Contacts with positive opening
- For up to 10 million switching operations
- Screw or flat plug connection
- Push or snap action contacts

Application

- Corrosion-free, gold-plated switching contacts with low contact resistances for smaller switching loads on request







Switching Contact			Contact Material		Switching System		Connection				Function		Electrical Data		
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC application)	Snap action switch	Push action switch	Screw terminals; 0.5 - 1.5 mm² / AWG 16 ... 22	Flat plugs 6.3 mm	Soldering pins	Stranded wire output	Positive opening acc. to EN 60947–5–1 Annex K	Short-circuit protection	Utilization category acc. to IEC 60947	Conventional thermal current Ith	Rated Insulation Voltage Ui
99	•		•		•		•				•	10 A gG	AC–15: 1.5 A, 230 V DC-13: 0.5 A, 60 V	10 A	250 V
99P	•		•		•			•			•	10 A gG			
99G	•			•	•		•				•	2A gR			
99T		•	•			•	•				•	10 A gG			
99A		•		•		•	•				•	2A gR			
99C	•		•		•					•	•	10 A gG			

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Protective Housing Compact (CxZ) IP65

Revision number: 3.1.1.4-01 **Revision date: 19.11.2019**

Features

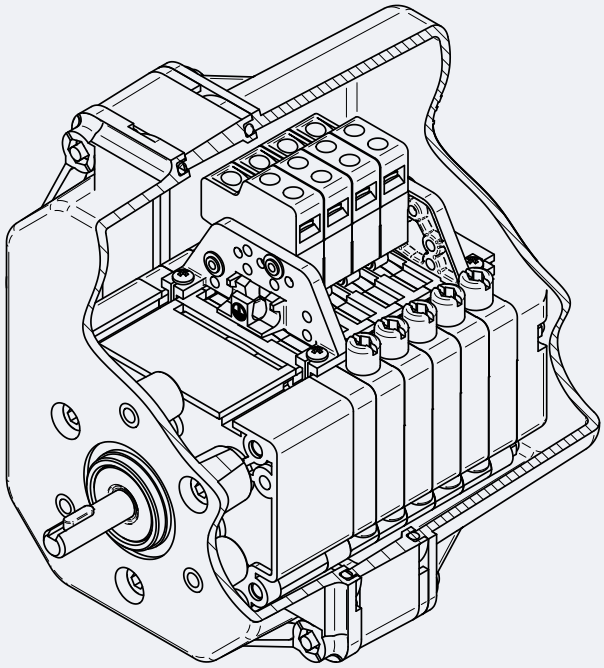
- Small modular housing for outdoor application
- Reinforced polycarbonate
- IP65 Protection

Application

- For crane and stage application

Additional information

- Possibility of integration of potentiometers, analog sensors, incremental encoders and small absolute encoders



Standard gear	DZ gear	Gear size	2 Switching Contacts A		4 Switching Contacts B		6 Switching Contacts C		8 Switching Contacts D	
			L1 [mm]	# Spacers	L1 [mm]	# Spacers	L1 [mm]	# Spacers	L1 [mm]	# Spacers
4,1NM	67DZ	1	106	0	106	0	131	1	156	2
6,5NM	110DZ									
11NM	180DZ									
17,5BM	280DZ	2	106	0	131	1	156	2	181	3
29BM	470DZ									
48BM	770DZ									
75BM	1200DZ	3	106	0	131	1	156	2	181	3
125BM	2000DZ									
205BM	3300DZ									
323BM	5200DZ	4	131	1	152	2	156	2	181	3
540BM	8700DZ									
880BM	14200DZ									
1384BM		5	131	1	152	2	181	3	206	4
2288BM										
3735BM										
5900BM		6	131	1	152	2	181	3	206	4
9800BM										
16000BM										

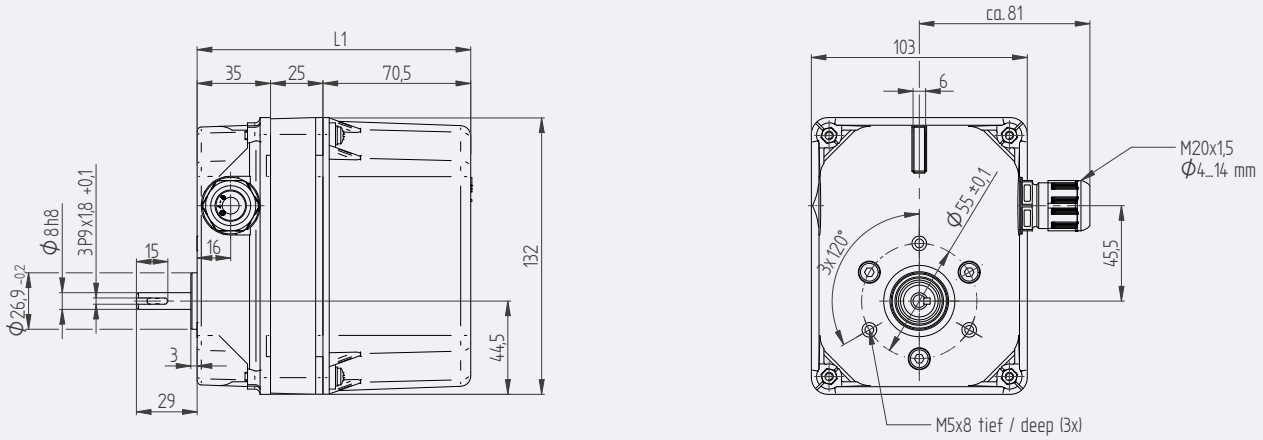
Limit Switch Control Current

Planetary Gear Limit Switches

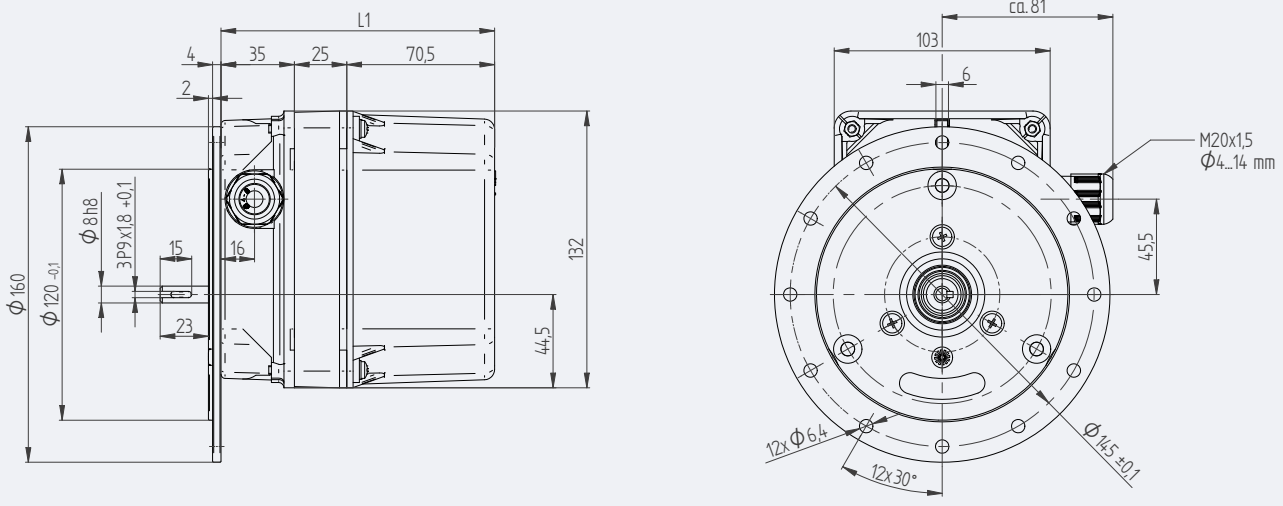
Series 51 – Protective Housing Compact (CxZ) IP65

Revision number: 3.1.1.4-01 **Revision date: 19.11.2019**

Type B14



Type B5



Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Protective Housing (MxZ) IP66

Revision number: 3.1.1.5-01 **Revision date: 19.11.2019**

Features

- Modular housing for outdoor application
- Reinforced polycarbonate
- IP66 Protection

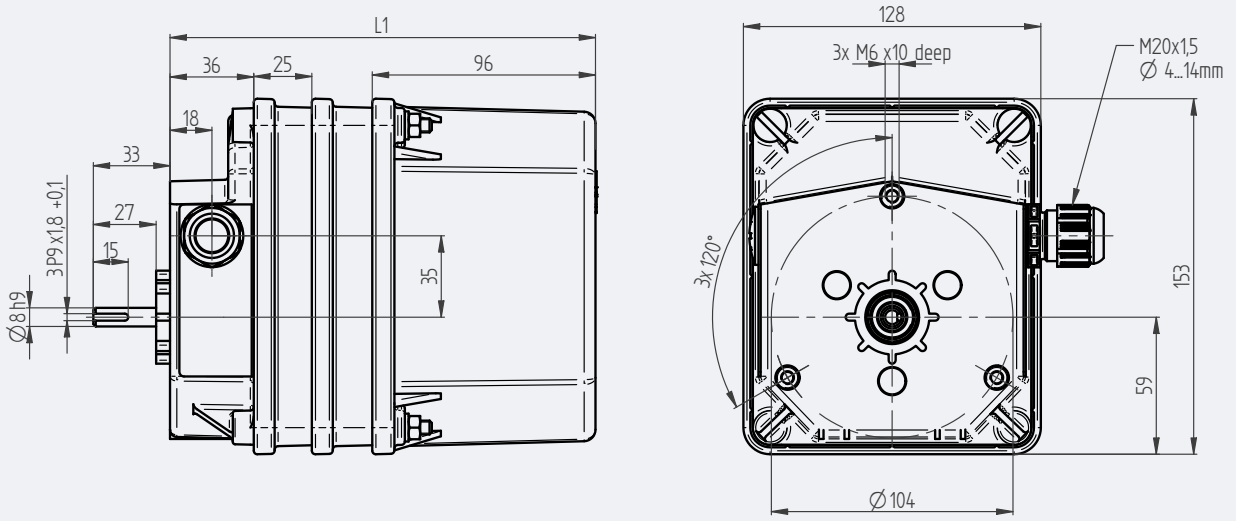
Application

- Crane
- Wind
- Stage

Additional information

- Possibility of integration of potentiometers, analog sensors, incremental encoders and absolute encoders
- Ball bearing for input shaft
- Additional cable glands on request

Type B14



Standard gear	DZ gear	Gear size	2 Switching Contacts A		4 Switching Contacts B		6 Switching Contacts C		8 Switching Contacts D	
			L1 [mm]	# Spacers	L1 [mm]	# Spacers	L1 [mm]	# Spacers	L1 [mm]	# Spacers
4,1NM	67DZ	1	132	0	132	0	132	0	157	1
6,5NM	110DZ									
11NM	180DZ									
17,5BM	280DZ	2	132	0	132	0	157	1	182	2
29BM	470DZ									
48BM	770DZ									
75BM	1200DZ	3	132	0	132	0	157	1	182	2
125BM	2000DZ									
205BM	3300DZ									
323BM	5200DZ	4	132	0	157	1	182	2	182	2
540BM	8700DZ									
880BM	14200DZ									
1384BM		5	132	0	157	1	182	2	207	3
2288BM										
3735BM										
5900BM		6	157	1	157	1	182	2	207	3
9800BM										
16000BM										

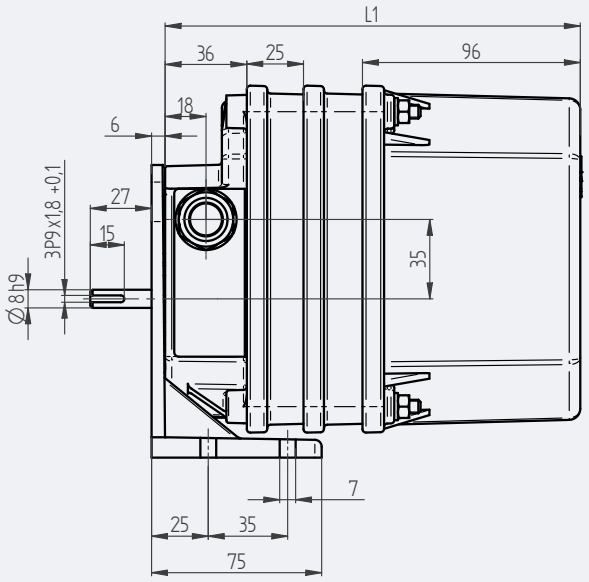
Limit Switch Control Current

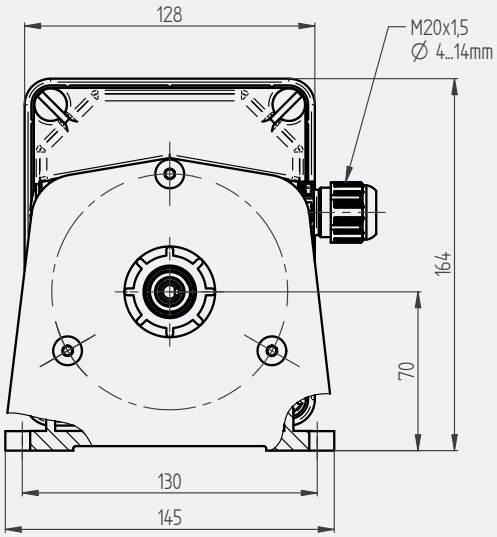
Planetary Gear Limit Switches

Series 51 – Protective Housing (MxZ) IP66

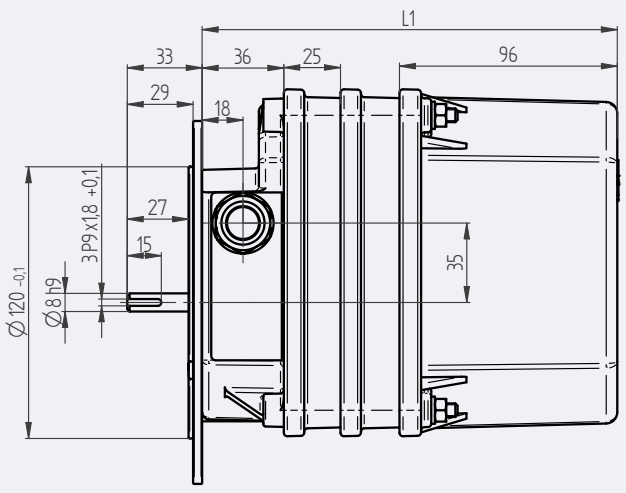
Revision number: 3.1.1.5-01 **Revision date: 19.11.2019**

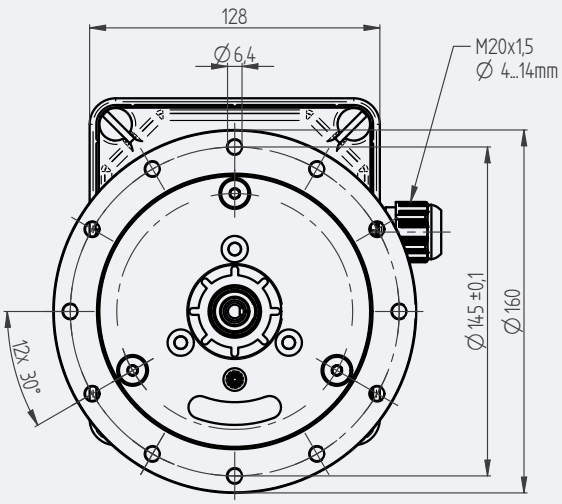
Type B3





Type B5





Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Protective housing “MH” (Aluminum IP65)

Revision number: 3.1.1.6-01 **Revision date: 19.11.2019**

Features

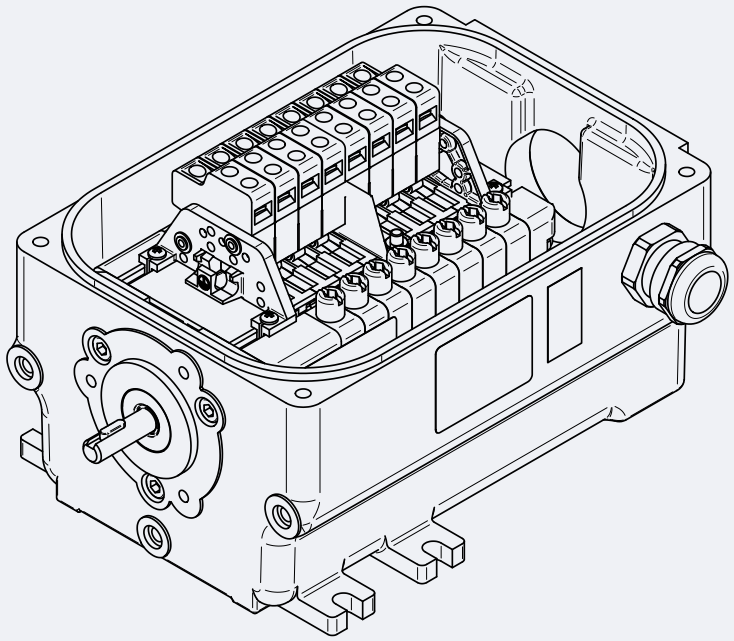
- Heavy duty aluminum housing
- IP65 Protection

Application

- Steel works

Additional information

- For external installation of large/heavy encoders
- Depending on size, installation of encoders inside is also possible



Standard-Gear	DZ-Gear	Gear size	2 Switching Contacts	4 Switching Contacts	6 Switching Contacts	8 Switching Contacts
4,1NM	67DZ	1	A	B	C	D
6,5NM	110DZ					
11NM	180DZ					
17,5BM	280DZ	2	A	B	C	D
29BM	470DZ					
48BM	770DZ					
75BM	1200DZ	3	A	B	C	D
125BM	2000DZ					
205BM	3300DZ					
323BM	5200DZ	4	A	B	C	not available
540BM	8700DZ					
880BM	14200DZ					
1384BM		5	A	B	C	not available
2288BM						
3735BM						
5900BM		6	A	B	not available	not available
9800BM						
16000BM						

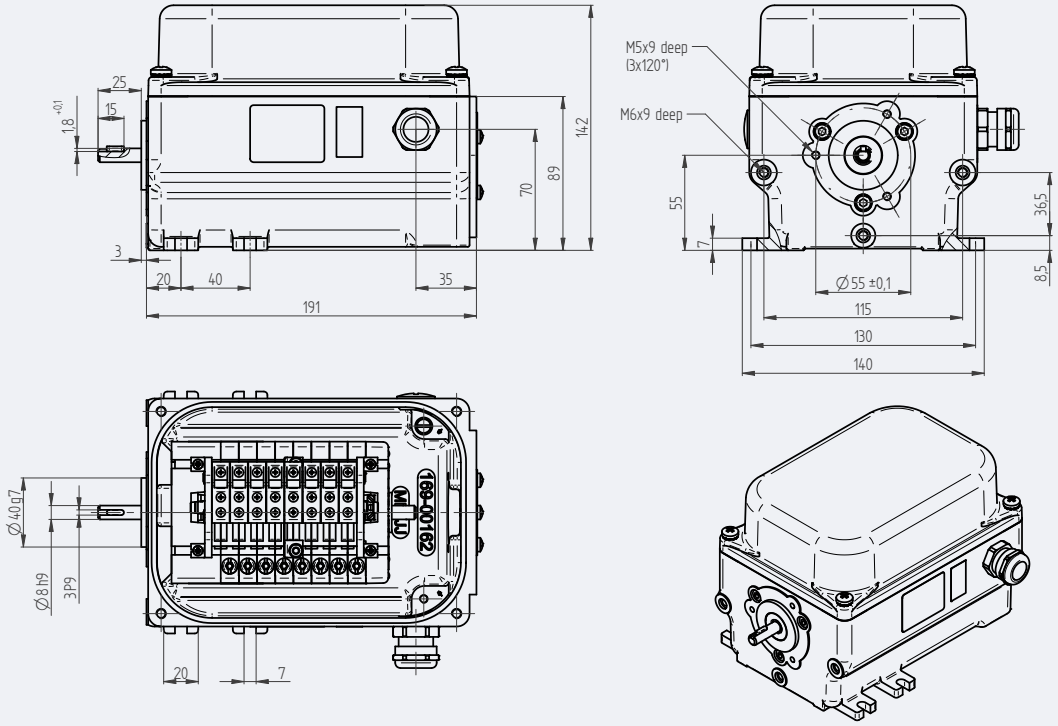
Limit Switch Control Current

Planetary Gear Limit Switches

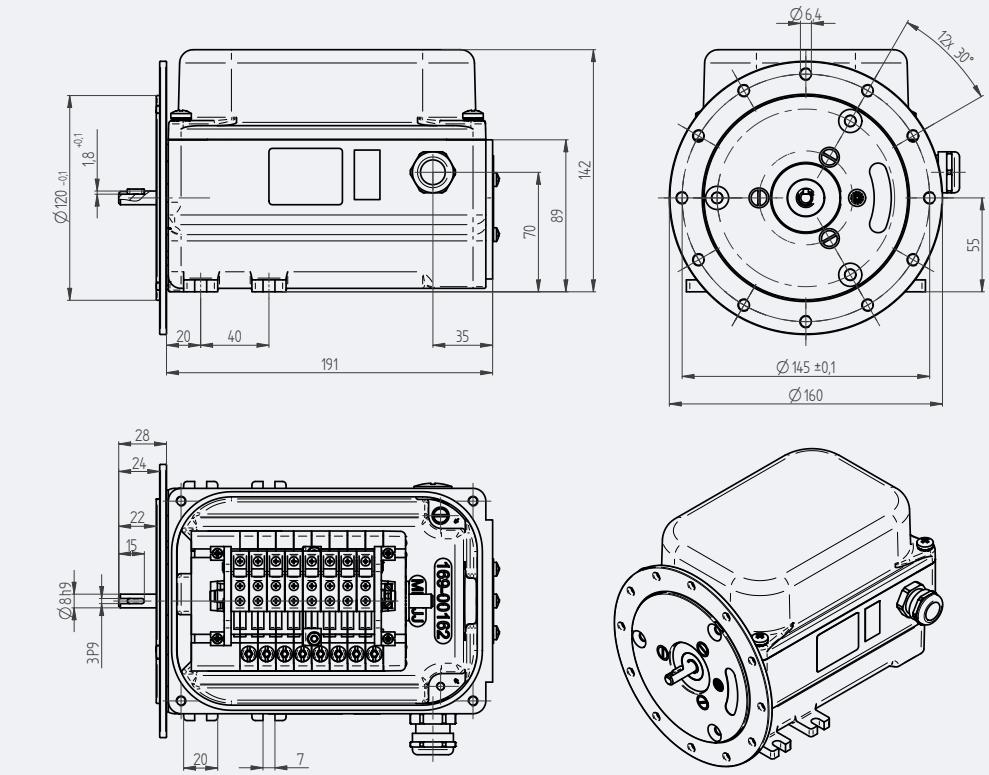
Series 51 – Protective housing “MH” (Aluminum IP65)

Revision number: 3.1.1.6-01 **Revision date: 19.11.2019**

Type B3



Type B3/B5



Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Anti-Condensation Heating

Revision number: 3.1.1.7-02 **Revision date: 22.03.2021**

Features

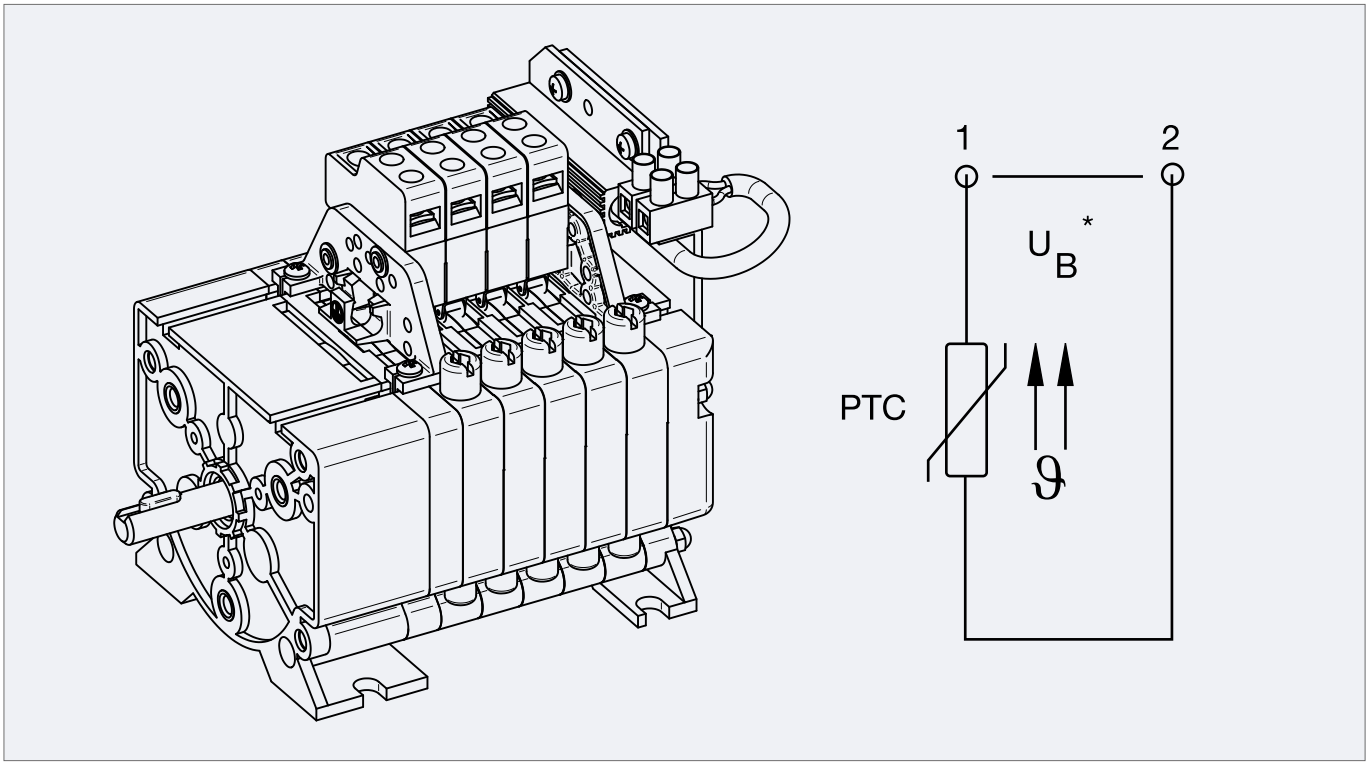
- PTC regulated heater
- 12 – 36 V or 110 -250 V AC/DC

Application

- For application with high humidity, or changing temperatures to avoid water condensation

Additional information

- Can be integrated in all housings of the Series 51



Design: U_B	12 – 36 V AC/DC	110 – 250 V AC/DC
Heat Output	ca. 2.5 Watts	ca. 4 Watts
PTC Cooling resistor (at 25 °C)	R25 = 20 Ω ± 35 %	R25 = 1500 Ω ± 35 %
PTC Reference temperature	50 °C	50 °C
Protection class (VDE 0100, 0160)	II	II
Radiator	Anodised aluminum	Anodised aluminum
Weight	approx. 40 g	approx. 40 g

Connector	
Solid conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Fine-stranded conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Strip length	ca. 4 mm / ca. 0.15 Inch

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Customizable Cam Discs

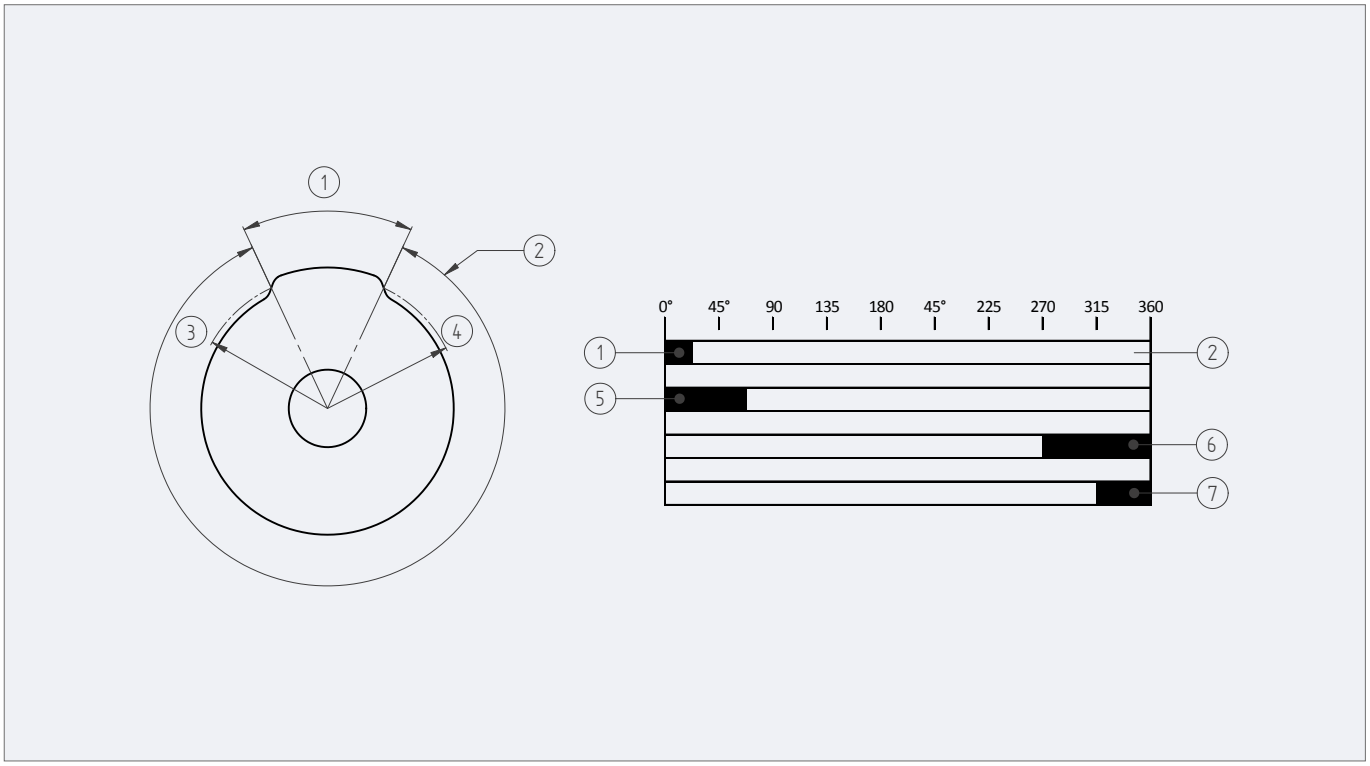
Revision number: 3.1.1.8-02 **Revision date: 15.09.2021**

Features

- 15 degree standard cam discs
- 40 degree cam discs free of charge on request
- Other cam angles on request

Application

- Cam discs with customized angles can be manufactured for different switching programs



A		B	
1	Effective cam angle	1	Effective cam angle 15°
2	Effective cam angle β	5	Effective cam angle 60°
3	Switching point radius	6	Effective cam angle 90°
4	Reset point radius	7	Effective cam angle 45°

The cam discs are named after the effective cam angle. For cam discs of Series 51, this corresponds to the switching point angle on the switching point radius of the cam disc. Standard cam angle for Series 51 is 15°.

Any cam angles (15° – 345°) can be supplied as a special design upon request.

The usable revolutions enabled by a cam disc on a GCLS drive shaft, result in the following:

$$\text{Usable revolutions} = \frac{360° - \text{Effective cam angle}}{360°} \times \text{gear ratio}$$

Example for 17,5... with agear ratio of i = 18,367 and usages of a 40° cam disc:

$$\text{Usable revolutions} = \frac{360° - 40°}{360°} \times 18{,}367 = 16{,}3$$ (see page 6)

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Drive Flange

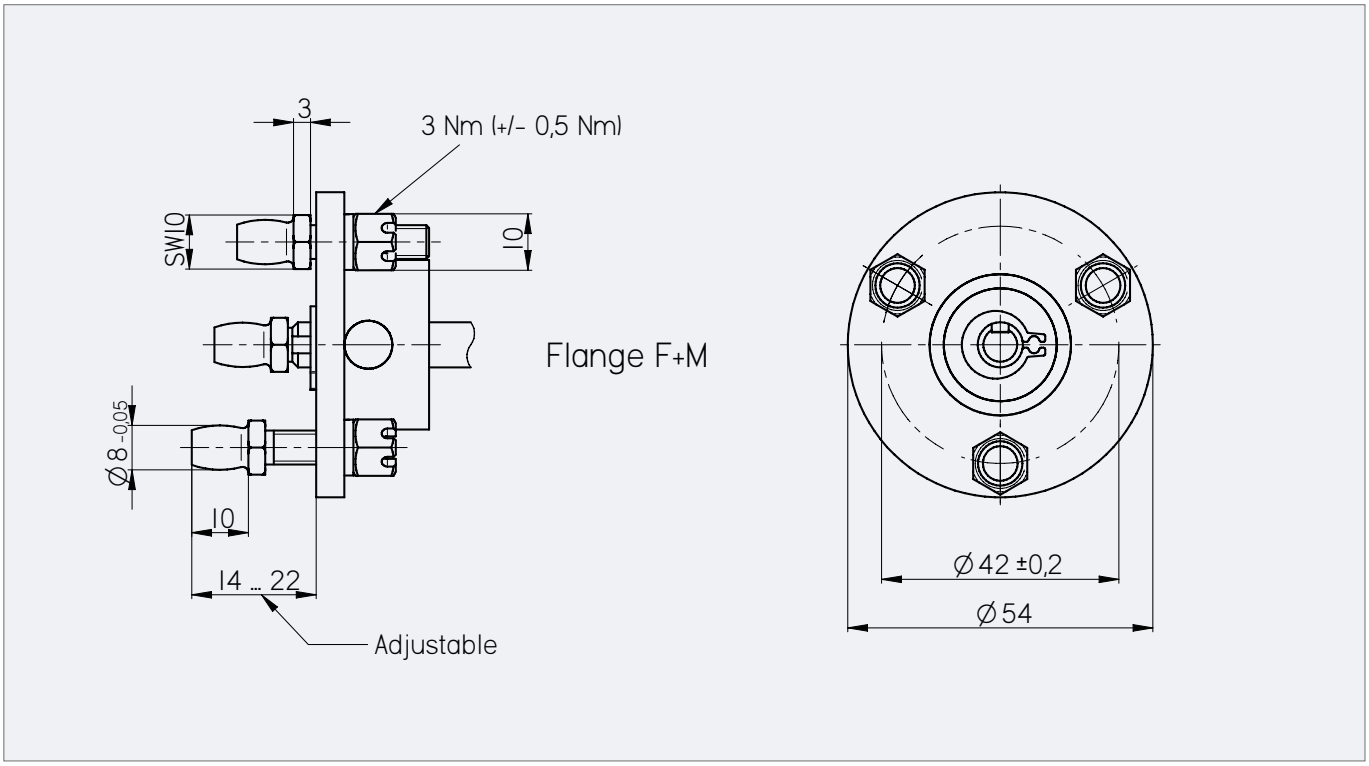
Revision number: 3.1.1.9-03 **Revision date: 27.09.2021**

Features

- Easy adaptation to crane hoists with flange F+M

Additional information:

- Flange F+M in elastic execution with positive drive



Use of flange F+M		
Operating speed	Torsion angle (with a torque of 5 Nm)	Comment
n_{max} = 1000 rpm	5 ± 0.5°	not for MC/MK

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Potentiometer

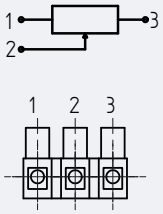
Revision number: 3.1.1.10-01 **Revision date: 19.11.2019**

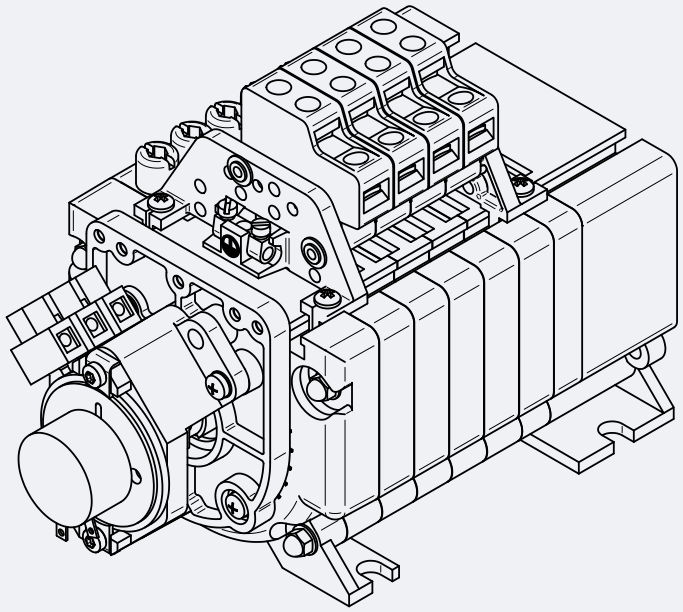
Features

- Cost effective solution for analog measurements
- Singleturn version or 5 turn version available
- Two couplings possible:
  - · “N” for max. 345° (turns synchronous with the cam discs)
  - · “S” for max. 1478° (turns 4,285 faster than the cam discs)

Application

- For simple measurements with less precise requirements





Connector	
Solid conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Fine-stranded conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Strip length	ca. 4 mm / ca. 0.15 Inch

Pin Assignment	
Pin	Color
1	red
2	blue
3	black

Technical data							
	Singleturn					5-Turn	
Driven by Limit switch poti coupling	Type "N"					Type "S"	
Technology	wirewound					wirewound	
Effective electrical angle of rotation*	355° ±5°					1800° ±5°	
Rotational noise (ENR)	100 Ohm					100 Ohm	
Max. / recommended wiper current	35 mA / 2 µA					35 mA / 2 µA	
Power rating @ 70°C	0,5 W					1W	
Insulation Voltage	1000 VAC, 1 min					1000 VAC, 1 min	
Insulation Resistance	1000 Mohm @ 1000 VDC					1000 Mohm @ 500 VDC	
Lifetime (90% el. eff. angle half sine)	1 Mio. rotations*					500.000 rotations*	
Operating temperature range	-20 … +80°C					-20 … +80°C	
Vibration (IEC 68-2-6, Test Fc)	15g 10..2000Hz x 12h					15g 10..2000Hz x 12h	
Shock (IEC 68-2-27, Test Ea)	49g @ 11 ms x 18					49g @ 11 ms x 18	
Total resistance [kOhm]	1	2	5	10	20	1	10
Resistance tolerance	±3%					±5%	
Independent linearity (best straight line)	±0,35%	±0,25%	±0,25%	±0,25%	±0,25%	±0,25%	±0,25%
Number of wire turns	570	740	1000	1270	1670	2510	3900
Theoretical resolution	0,18%	0,14%	0,10%	0,08%	0,60%	0,717°	0,462°

* Referring to potentiometer shaft

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Analog Encoders

Revision number: 3.1.1.11-01 **Revision date: 15.09.2021**

Features

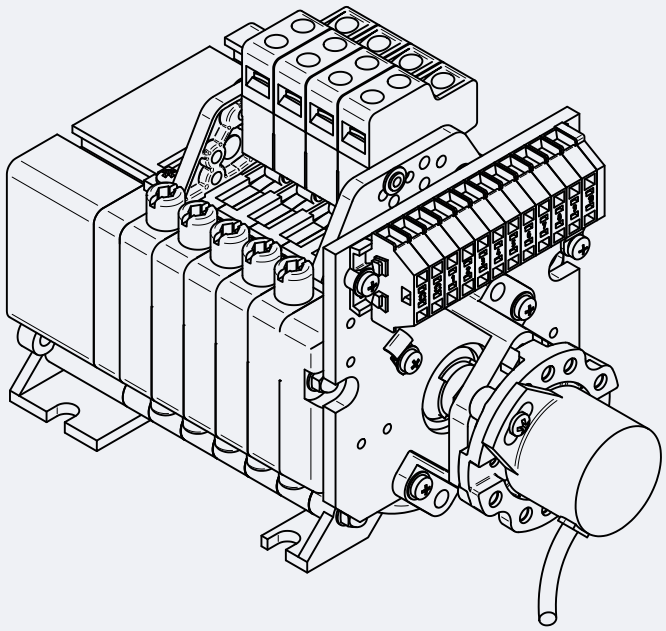
- Contactless measuring method
- Absolute position acquisition
- Long lifetime
- Turning synchronously with the cam discs

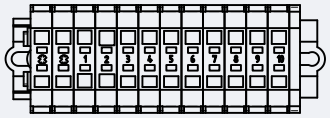
Application

- For simple measuring of absolute signals

Additional information

- Programmable type on request
- Adjustment via additional adjustment worm possible on request





Connector	
Solid conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Multi-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Fine-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Strip length	9 … 9 mm / 0.31 … 0.35 Inch

Technical Data		
	non-programmable type	programmable type
Drive	Coupling "N" (1:1 with cam discs)	Coupling "N" (1:1 with cam discs)
Measuring range*	360°	1 … 360° programmable
Output signal	4 … 20 mA	4 … 20 mA
Turning direction	cw rising values	programmable
Resolution	12 Bit	14 Bit
Indep. linearity	± 0.3 % of measuring range	± 0.1 % of measuring range
Supply voltage	16 … 35 V DC	16 … 35 V DC
Current consumption without load (typ.)	19 mA	20 mA
Ohmic load at output	0 … 500 Ohm	0 … 500 Ohm
Max. capacitive load at output	100 nF	100 nF
Lifetime	50 mio. movements	50 mio. movements
Operating temperature	-40°C … +85 °C	-40°C … +85 °C

Pin Assignment			
Signal	Pin	Color (non-programmable type)	Color (programmable type)
Supply Voltage	1	brown	pink
Ground	2	green	black
Output signal	3	white	brown
Set 1	4	n/a	green
Set 2	5	n/a	yellow

* Referring to encoder shaft

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Analog Encoder (programmable)

Revision number: 3.1.1.12-01 **Revision date: 19.11.2019**

Features

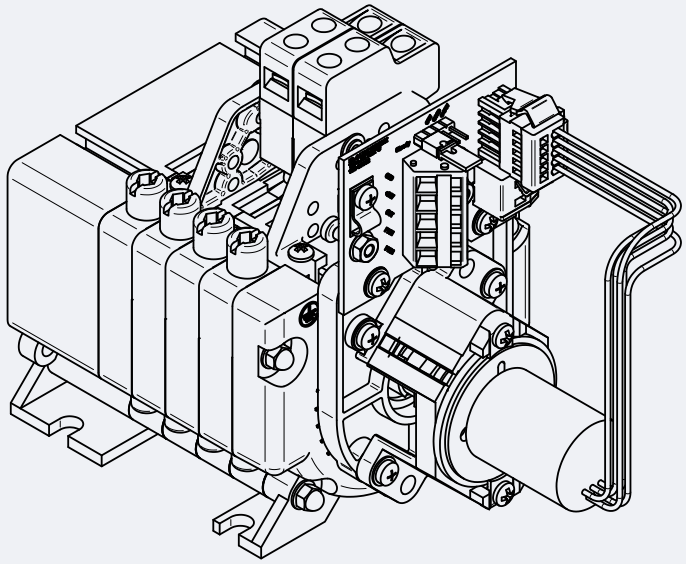
- Contactless measuring method
- Absolute value acquisition
- Long lifetime
- Turning synchronously with the cam discs

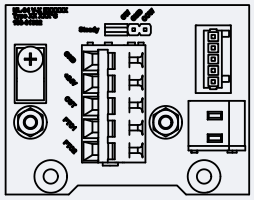
Application

- For simple measuring of absolute signals

Additional information

- Programmable type cw or ccw
- 0 point setting
- Adjustment via additional adjustment worm possible on request





Connector	
Multi-stranded conductor	0.08 … 2.5 mm² / 28 … 12 AWG
Fine-stranded conductor	0.08 … 2.5 mm² / 28 … 12 AWG
With end sleeve	0.25 … 1.5 mm²
Strip length	5 … 6 mm / 0.2 … 0.24 Inch

Pin Assignment	
GND	Ground
+24 V	Supply voltage
Out	Output signal
PTC1	For optional PTC-heating
PTC2	For optional PTC-heating

Technical Data		
	Current Output	Voltage Output
Drive	Coupling "N" (1:1 with cam discs)	Coupling "N" (1:1 with cam discs)
Measuring range*	360°	360°
Output signal	4 … 20 mA	0 … 10 V
Turning direction	programmable	programmable
Resolution	14 Bit	14 Bit
Indep. linearity	± 0.1 % of measuring range	± 0.1 % of measuring range
Supply voltage	18 … 35 V DC	18 … 35 V DC
Current consumption without load (typ.)	20 mA	20 mA
Ohmic load at output	0 … 500 Ohm	> 10 kOhm
Max. capacitive load at output	100 nF	100 nF
Lifetime	360 mio. movements	360 mio. movements
Operating temperature	-40°C … +85 °C	-40°C … +85 °C

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Incremental Encoder

Revision number: 3.1.1.13-01 **Revision date: 19.11.2019**

Features

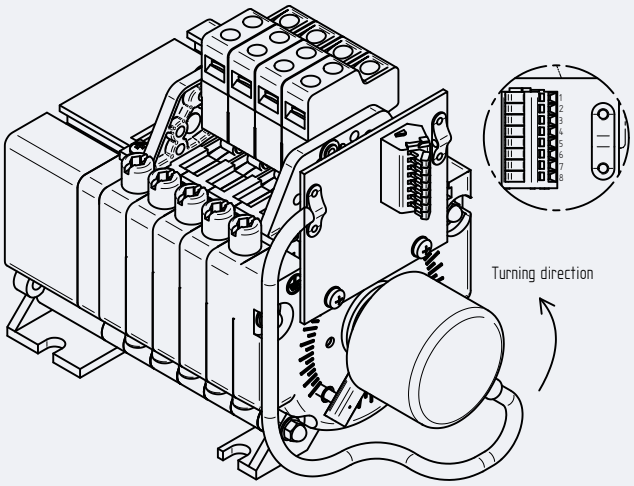
- Optical measuring
- Up to 3600 increments in small housing
- Already wired to squirrel cage tension
- 2 square signals, 90° phase shifted (+ inverted signals) for quadrature evaluation

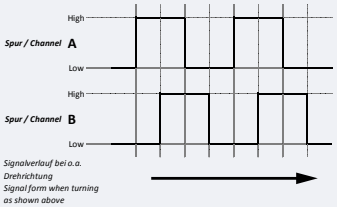
Application

- For giving the information about speed

Additional information

- Driven 1:1 from the second shaft end





Connector	
Solid conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Multi-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Fine-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Strip length	9 … 9 mm / 0.31 … 0.35 Inch

Technical Data	RS422	Push-Pull
Power supply UB	5 V ± 5% or 8…30 V	8 … 30 V DC
Pulses / 360°	5 … 3600	
Power consumption	Typ. 40 mA	< 40 mA
(without load)	Max. 90 mA	
Permissible load	± 20 mA	± 50 mA
Signal level “high”	> 2,5 V	> Vcc - 3 V
Signal level “low”	< 0,5 V	< 2,5 V
Max. frequency	300 kHz	200 kHz
Operating temperature	-40°C … +85 °C (5…1024 pulses)	
	-30°C … +85 °C (>1024 pulses)	

Assignment	Pin	Color
Ground	1	white
Supply-Voltage VCC	2	brown
A - Signal	3	green
B - Signal	4	yellow
0 - Signal	5	gray
A-Inv. - Signal	6	pink
B-Inv. - Signal	7	blue
0-Inv. - Signal	8	red

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: SSI Multiturn Encoder

Revision number: 3.1.1.14-01 **Revision date: 19.11.2019**

Features

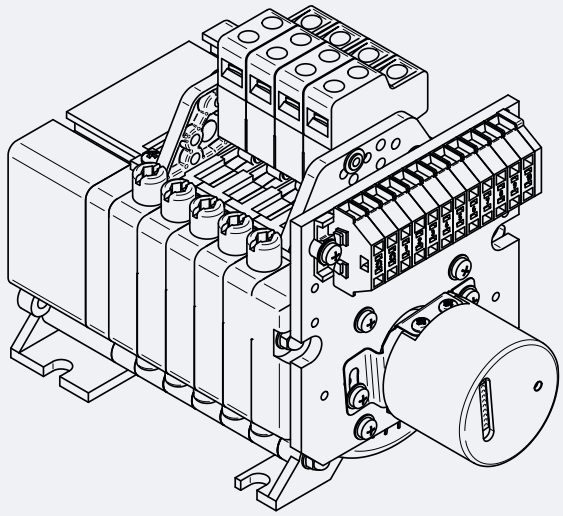
- Absolute value with high preciseness
- Without gear (Energy harvesting technology)
- Wired to squirrel cage tension

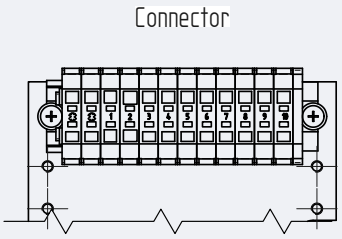
Application

- For very high accuracy demands

Additional information

- Without play driven 1:1 by the second shaft end
- Due to size it can be integrated in all types of housings





Connector	
Solid conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Fine-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Strip length	8 … 9 mm / 0.31 … 0.35 Inch

Technical Data	
Resolution singleturn	8 … 14 Bit
Resolution multiturn	1 … 39 Bit
Interface	SSI
Code	Gray / Binary
Clock frequency	100 kHz … 500 kHz
Data output	RS485 comp.
Power supply	10 … 32 V DC
Power consumption	Max. 0,5 W
Turn on time	max. 1,5 s
Operating temperature	-40°C … +85 °C

Configuration	
Turning direction	CW : DIR = GND
(View on shaft)	CCW : DIR = +UB
Set to Zero	Preset = +UB (2s)
Deactivate	Preset = GND

LED -Behaviour	
At Boot-Up	red (< 2,3s)
Error	red (> 2,3s)
Normal function	green

Pin Assignment		
Signal	Pin	Color
Ground	1	white
Supply Voltage	2	brown
SSI CLK +	3	green
SSI CLK -	4	yellow
SSI DATA +	5	gray
SSI DATA -	6	pink
Preset	7	blue
DIR	8	red
Screen	9	violet

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: CANopen Multiturn Encoder

Revision number: 3.1.1.15-01 **Revision date: 19.11.2019**

Features

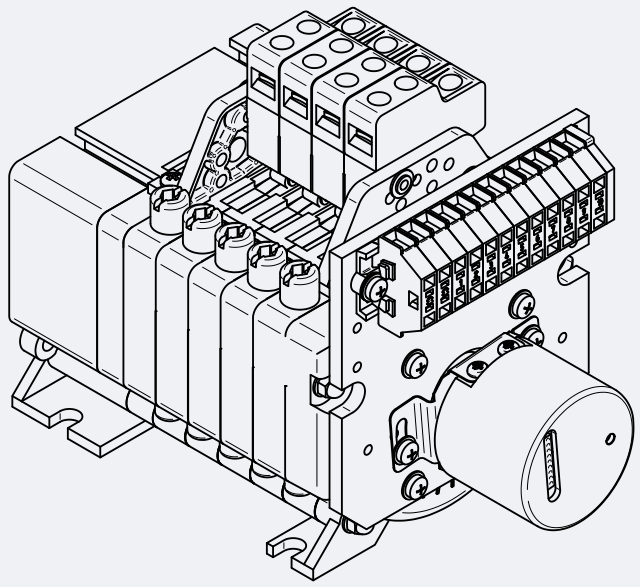
- Absolute value with high preciseness
- Without gear (Energy harvesting technology)
- Wired to squirrel cage tension

Application

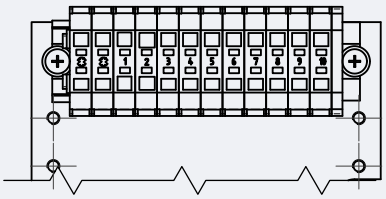
- For very high accuracy demands

Additional information

- Without play driven 1:1 by the second shaft end
- Due to size it can be integrated in all types of housings



Connector



Connector	
Solid conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Fine-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Strip length	8 … 9 mm / 0.31 … 0.35 Inch

Technical Data	
Resolution singleturn	8 … 14 Bit
Resolution multiturn	1 … 39 Bit
Code	Binary
Interface	CAN
Protocol	CANopen
Node ID	1 … 127 (default: 127)
Programmable CAN transmission modes	Synchronous / Asynchronous
Power supply	10 … 32 V DC
Power consumption	Max. 0,5 W
Turn on time	max. 1,5 s
Operating temperature	-40°C … +85 °C

Pin Assignment		
Signal	Pin	Color
Ground	1	white
Supply Voltage	2	brown
CAN High	3	green
CAN Low	4	yellow
CAN GND	5	gray

Standard settings as well as any customization in the software can be changed via LSS (CiA 305) and the SDO protocol (PDOs, Scaling, Heartbeat, Node-ID, Baud rate, etc.).

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Smart Cam®

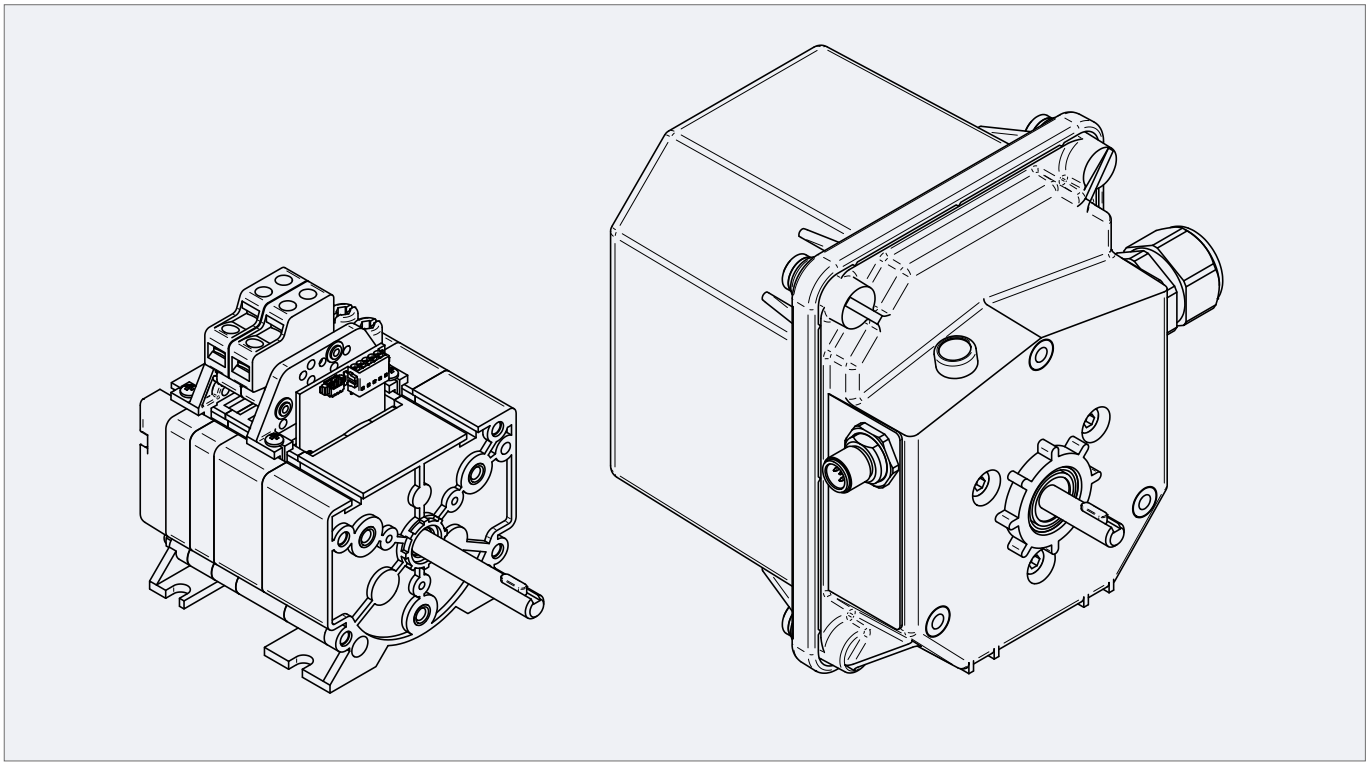
Revision number: 3.1.1.16-01 **Revision date: 19.11.2019**

Features

- Multiturn absolute encoder which can be fully integrated inside of the Series 51 Limit Switch
- Only little space needed (21 mm) additional to the limit switch

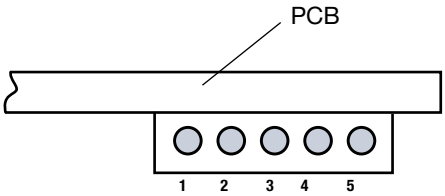
Additional information:

- Can be adapted to customer needs e.g. cable length measuring, speed or acceleration
- Resolution depending on gear
- Connected via M12 plug

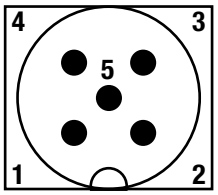


Technical Data	
Resolution singleturn	10 Bit
Resolution multiturn	70 Revolutions
Interface	CAN (ISO 11898)
Protocol	CANopen CiA DS 301 and DS406
Speed	Up to 1 Mbaud
Node ID	1 … 127
Configuration	LSS & LDO
Power supply	10 … 30 V DC
Operating temperature	-40°C … +85 °C

Pin Assignment (PCB Connector)	
Signal	Pin
CAN High	1
CAN Low	2
GND	3
CAN V+	4
CAN Shield	5



Pin Assignment (M12 Connector)	
Signal	Pin
CAN Shield	1
CAN V+	2
GND	3
CAN High	4
CAN Low	5



Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Option: Electromagnetic Tooth Clutch EZX

Revision number: 3.1.1.17-01 **Revision date: 19.11.2019**

Features

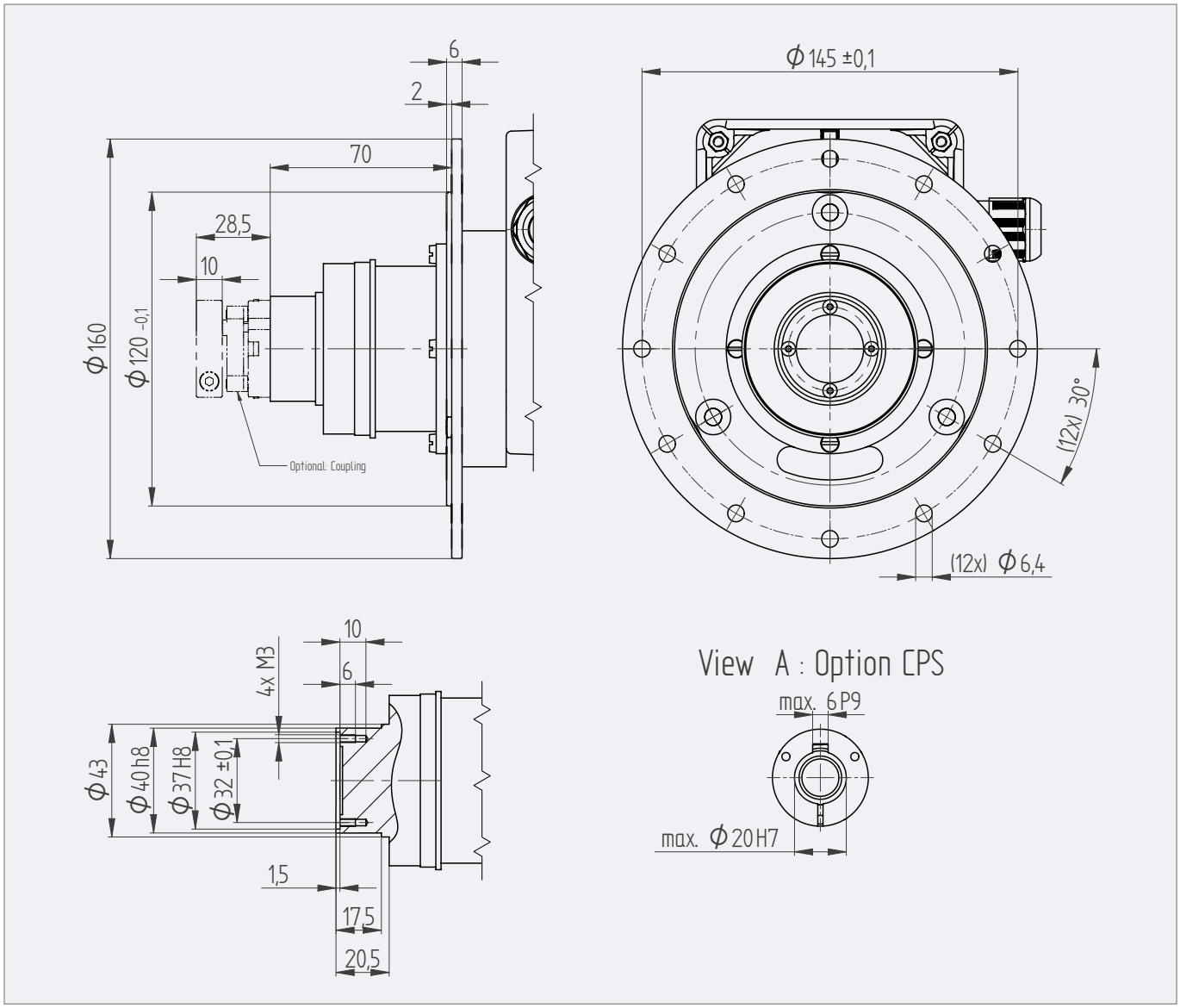
- Form fit connection inside
- High number of teeth for highest possible accuracy
- Safety related function, closed without current

Application

- For point hoist in theatres

Additional information

- Can be used together with all types of housing Series 51



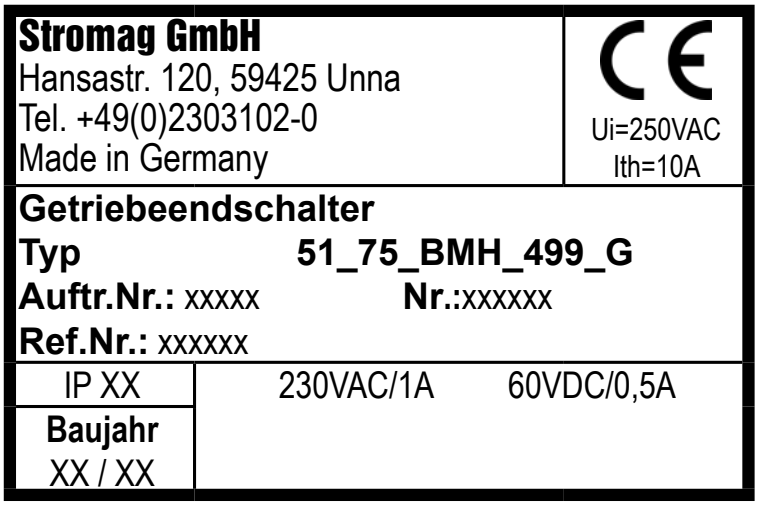
Technical Data EZX 0,1	
Maximum torque	1 Nm
Supply Voltage	24 V DC
Power consumption	25 W
Air gap off	0,85 … 0,95 mm
No. of teeth	204

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Key Of Types

Revision number: 3.1.1.18-01 **Revision date: 19.11.2019**



51	Switch type: GCLS Series 51		
75	Nominal Revolutions	Gear type N: 4.1, 6.5, 11	
		Gear type B: 17.5, 29, 48, 75, 125, 205, 323, 540, 880, 1384, 2288, 3735, 5900, 9800, 16000	
		Gear type DZ: 67, 110, 180, 280, 470, 770, 1200, 2000, 3300, 5200, 8700, 14200	
B	Gear type	N:	Without block adjustment
		B:	Block adjustment
		DZ:	Differential tooth gear
MH	Housing type	MH:	IP65, GTES mounted in an aluminum housing
		MC:	IP55, GTES mounted in a plastic housing with a short housing cover
		MK:	IP55, GTES mounted in a plastic housing with a long housing cover
		M:	IP00/IP20, without a protective housing
		MxZ:	IP66, GTES mounted in a glass fibre reinforced polycarbonate housing x: Number of intermediate pieces (0...9)
		CxZ:	IP65, GTES mounted in a glass fibre reinforced polycarbonate housing (compact) x: Number of intermediate pieces (0...9)
4	Number of contacts fitted		1 - 14
99	Type of switching contact	99:	Contact (changeover) with screw connections, contact material: Silver (standard)
		99G:	Contact (changeover) with screw connections, contact material: Gold
		99L:	Contact (changeover) with soldering pins (for PCB), contact material: Silver
		99P:	Contact (changeover) with flat plug connections, contact material: Silver
		99T:	Contact (push action) with screw connections, contact material: Silver
		99A:	Contact (push action) with screw connections, contact material: Gold
		99B:	Contact (changeover) with soldering pins, contact material: Gold
		99C:	Contact (changeover) with stranded wire output, contact material: Silver
G	Additional components	G	With encoder / sensor
		P	With potentiometer

Limit Switch Control Current

Planetary Gear Limit Switches

Series 51 – Explosion Proof Type

Revision number: 3.1.1.19-01 **Revision date: 19.11.2019**

Features

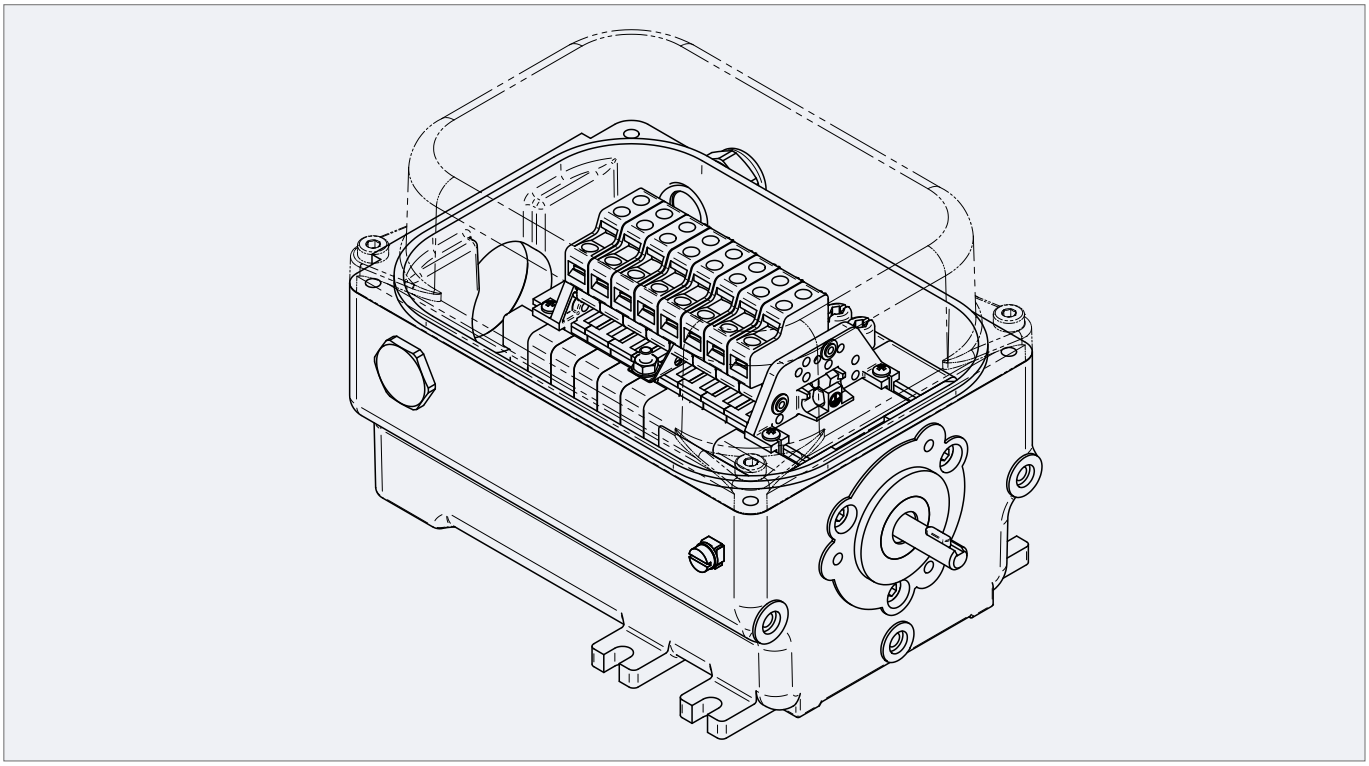
- IP65 Aluminum Housing
- Built in sensors and potentiometers possible (max. power loss 4 W -> safety barrier)

Application

- Usable for conductive and non-conductive dust in zone 21 and 22 Zone 21 (category 2D dust occasionally), zone 22 (category 3D, dust rarely)

Additional information

- Certification according to directive 2014/34/EU
- Certification according to IECEx



ATEX marking

II 2D Ex tb IIIC T100°C Db

IECEx marking

Ex tb IIIC T100°C Db

Explanation of markings

II	Group II, devices for use above ground
2D	Device category (for use in Zone 21 and 22)
tb	Type of protection tb, protection via housing (EN 60079-31)
IIIC	Dust group IIIC, conductive dust (includes group IIIB and IIIA)
T100°C	Maximum permitted surface temperature
Db	Equipment protection level (EPL) as per EN 60079-0

Technical details

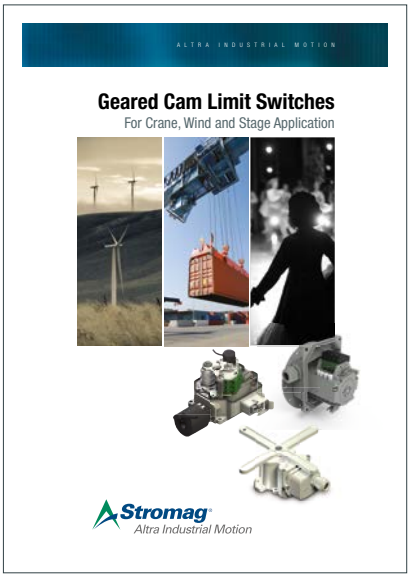
Temperature range:	-25°C to 60°C at a maximum input rotation speed of 1000 rpm
	-25°C to 40°C at a maximum input rotation speed of 1800 rpm
Number of contacts:	1 – 8 Contacts (without encoder)
	1 – 4 Contacts (with encoder)
Cable cross-section:	1 – 1,5 mm² (AWG 16 –18)
Electrical data:	Nominal voltage AC-15: 230V
	Nominal current AC-15: 1,5A
	Nominal voltage DC-13: 60V 24V
	Nominal current DC-13: 0,5A 2A
	Continuous thermal current max. 2A

Literature Portal

Please follow the link

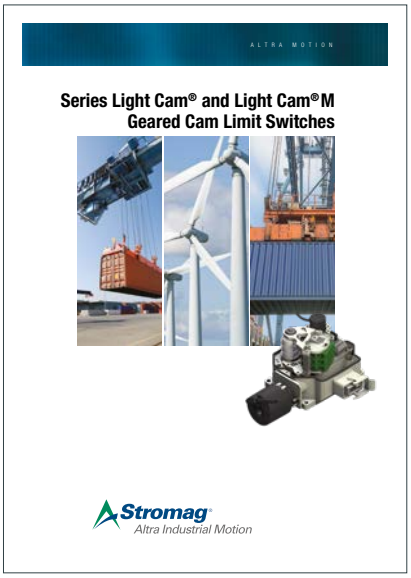
www.altraliterature.com

If you want to order a printed version of this overall catalog or a single catalog. Type into the field “Enter P# or Description“ the P-Number and choose under brands “Stromag“.



Overall Catalog: P-8543

P-8361



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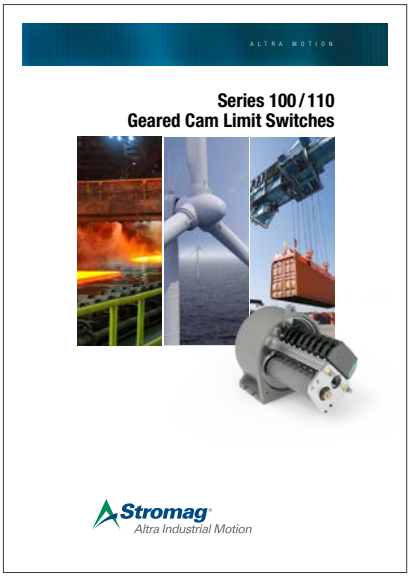

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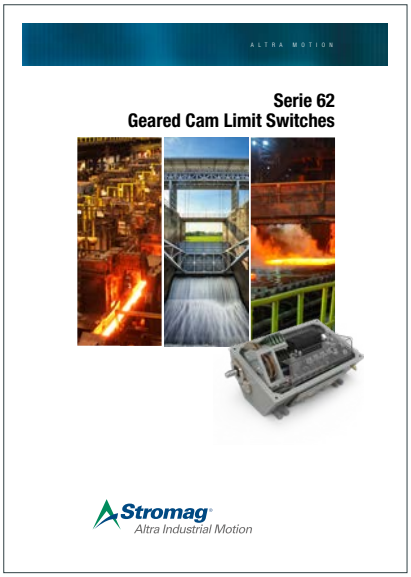

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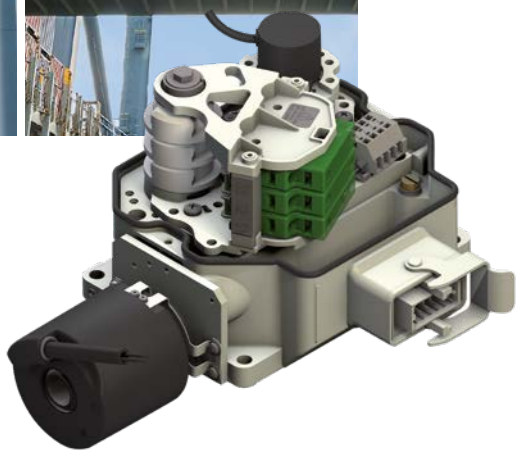
ALTRA MOTION

Series Light Cam® and Light Cam®M Geared Cam Limit Switches

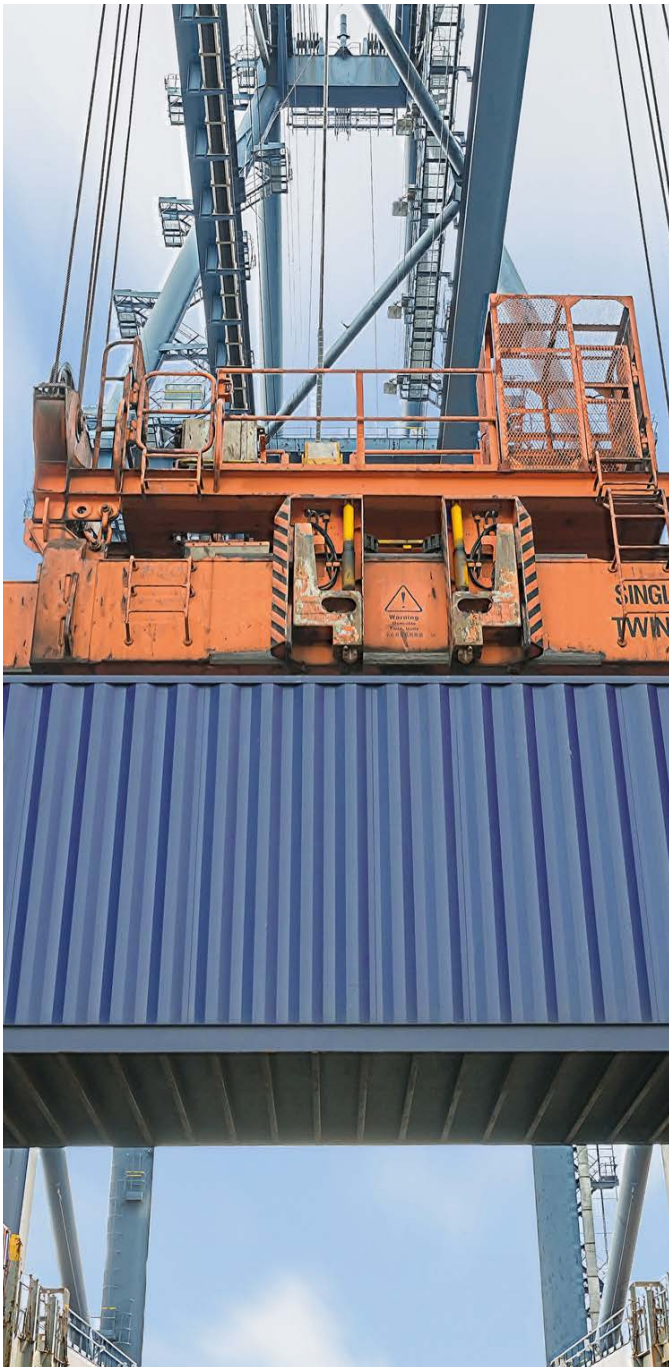


Stromag®
Altra Industrial Motion

CONTENT

Catalog Series Light Cam® and Light Cam® M: **II**

AT A GLANCE



STROMAG LIGHT CAM® AND LIGHT CAM® M

BENEFITS INCLUDE

- Form fit gear
- Self locking design for the cam discs
- High gear ratio of 74 for adjusting the cams
- Drive of incremental and absolute encoders possible

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

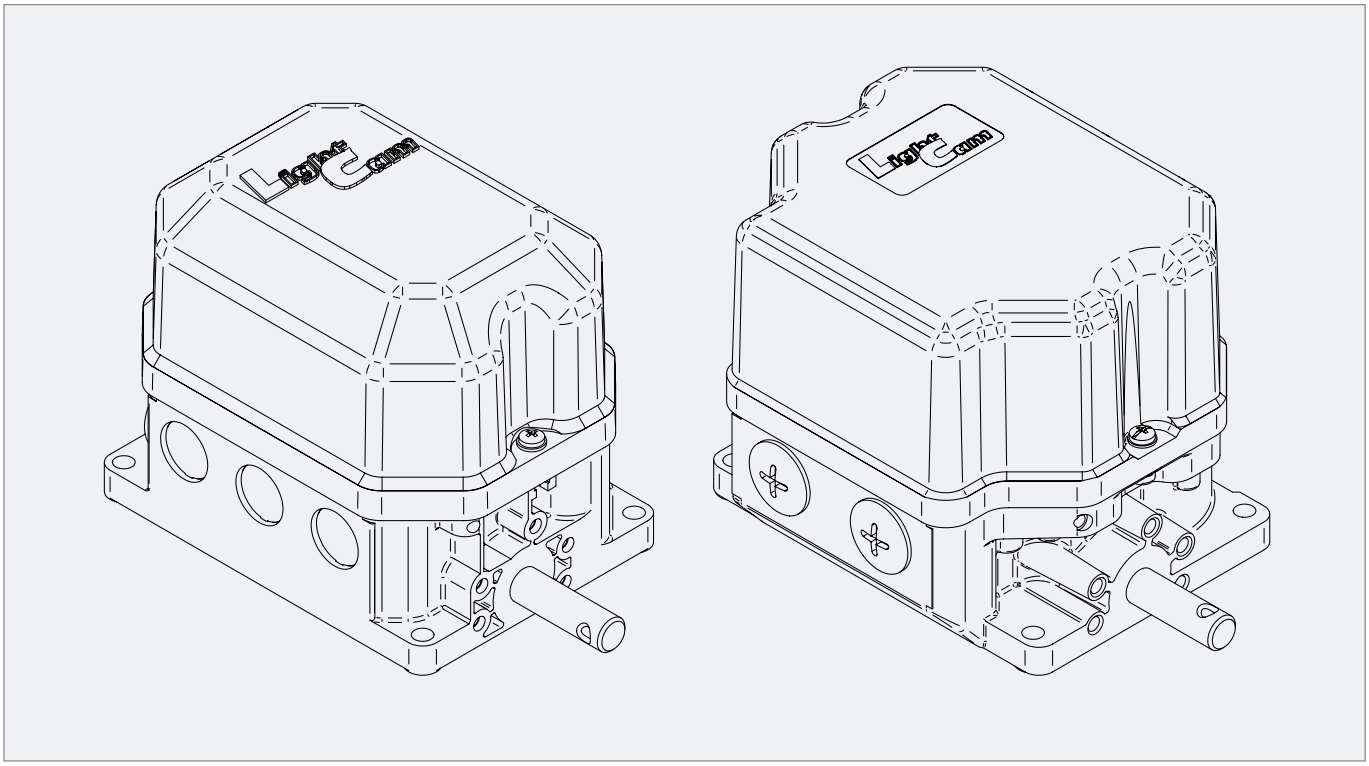
Series Light Cam® / Light Cam® M – Basic Limit Switch

Revision number: 3.1.2.1-01 **Revision date: 19.11.2019**

Features
- Combined worm / spur gear for high gear reductions requiring less mounting space
- 4 or 8 contacts available

Application
- Crane
- Wind
- Stage

Additional information
- IP65 synthetic housing or IP66 aluminum housing available



Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® / Light Cam® M – Gear Data

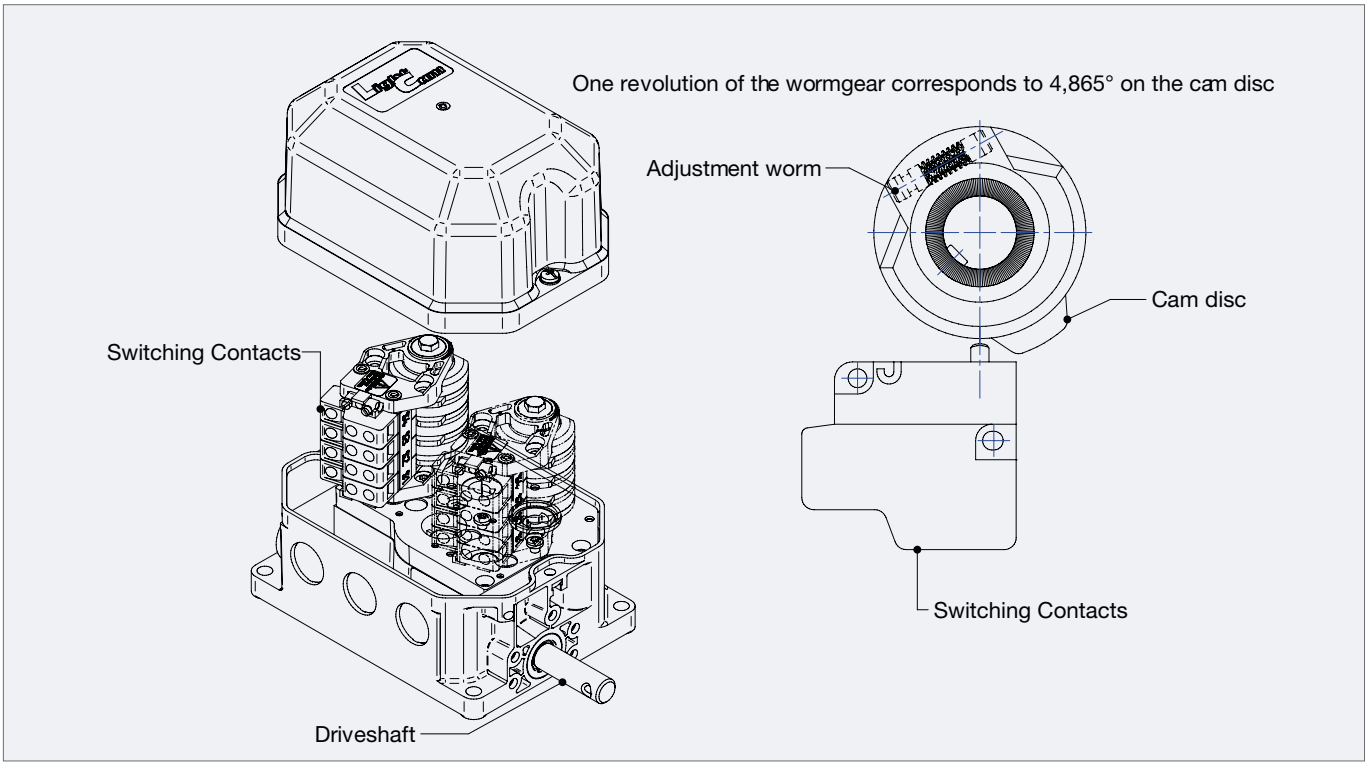
Revision number: 3.1.2.2-01 **Revision date: 19.11.2019**

Features

- Cam discs with precise adjustment and cam diameter of 42.5 mm
- Form fit gear design

Additional information

- Self-locking design for the cam discs
- High gear ratio of 74 for the cam adjustment



Gear Data Light Cam® / Light Cam® M											
Nominal revolutions at 40° - cam disc	Gear ratio	Mechanical hysteresis [revolutions at drive shaft]		Min.drive torque [Nm] for Switching an single comtact	Max.drive torque [Nm] for forced opening Switching an single comtact		Max. input speed [rpm]	Min. input speed [rpm] (only when used as a changeover)			
		Contact			Contact			Contact			
		99, 99G	80, 88, 90, 90G		99, 99G	80, 88, 90, 90G		99, 99G	90, 90G	88	80
0,85	1,000	0,003	0,017	0,2	0,493	1,663	200	0,049	0,212	0,042	0,424
1,85	2,118	0,006	0,037		0,338	0,891		0,103	0,449	0,090	0,899
3,9	4,484	0,013	0,077		0,265	0,526		0,219	0,952	0,190	1,903
6	6,781	0,020	0,117		0,243	0,416		0,331	1,439	0,288	2,878
9	10,254	0,031	0,177		0,229	0,343		0,501	2,176	0,435	4,352
15	16,994	0,051	0,294		0,217	0,286		0,830	3,606	0,721	7,212
25	29,672	0,089	0,513		0,210	0,249		1,449	6,297	1,259	12,593
29	33,529	0,101	0,579		0,209	0,244	600	1,638	7,115	1,423	14,230
53	60,000	0,180	1,037		0,205	0,224		2,931	12,732	2,546	25,465
76	85,500	0,257	1,477		0,203	0,217		4,176	18,144	3,629	36,287
95	107,368	0,322	1,855		0,203	0,214		5,244	22,784	4,557	45,569
135	153,000	0,459	2,644		0,202	0,210		7,473	32,468	6,494	64,935
180	208,772	0,626	3,607		0,201	0,207		10,198	44,303	8,861	88,606
260	297,500	0,893	5,140		0,201	0,205		14,532	63,131	12,626	126,263
305	343,817	1,031	5,940		0,201	0,204		16,794	72,960	14,592	145,920
360	406,870	1,221	7,030		0,201	0,204		19,874	86,340	17,268	172,681
435	489,939	1,470	8,465		0,201	0,203		23,931	103,968	20,794	207,937
515	579,789	1,739	10,017		0,201	0,203		28,320	123,035	24,607	246,070
620	698,163	2,094	12,063		0,200	0,202		34,102	148,155	29,631	296,310
880	994,880	2,985	17,189		0,200	0,201		48,595	211,120	42,224	422,240

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® / Light Cam® M – Switching Contacts 99

Revision number: 3.1.2.3-01 **Revision date: 19.11.2019**

Features

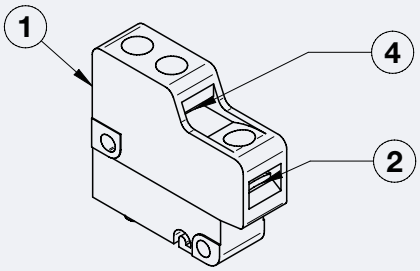
- Contacts with positive opening
- For up to 10 million switching operations
- Gold plated contacts on request
- Push or snap action contacts

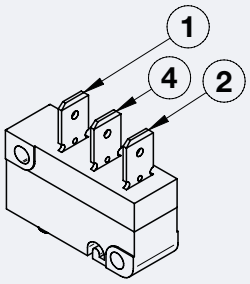
Application

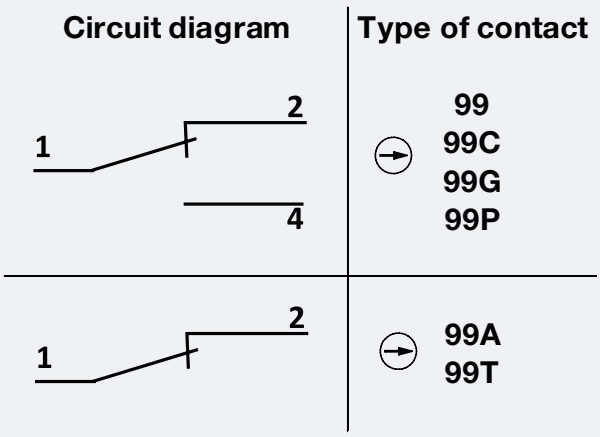
- Silver contacts for Relais
- Gold contacts for PLC

Additional information

- Screw or flat plug connections







Switching contact			Contact material		Switching system		Connection			Functionality		Electrical data		
Designation	Change-Over (NC /NO)	Normally closed (NC)	Silver	Gold (PLC-Application)	Snap-action	Push-action	screw terminals; 0,5 - 1,5 mm² / AWG 16 ... 22	Flatplugs 6,3mm	Standard wire output	Positive opening acc. to EN 60947-5-1 Annex K	Short circuit protection	Utilization category acc. to IEC 60947	Conventional thermal current Ith	Rated Insulation Voltage U_i
99	•		•		•		•			•	10A gG	AC–15: 1,5A, 230V DC-13: 0,5A, 60V	10A	250V
99P	•		•		•					•	10A gG			
99G	•			•	•		•			•	2A gR			
99T		•	•			•	•	•		•	10A gG			
99A		•		•		•	•	•		•	2A gG			
99C	•		•		•				•	•	10A gG			

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

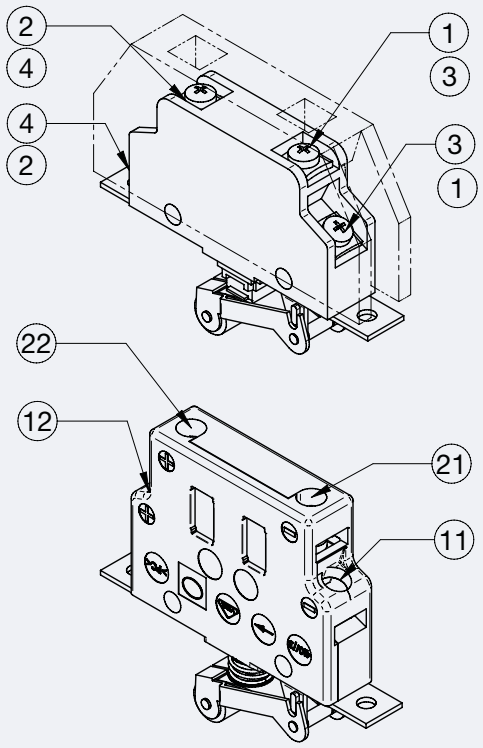
Series Light Cam® / Light Cam® M – Switching Contacts 80 – 90

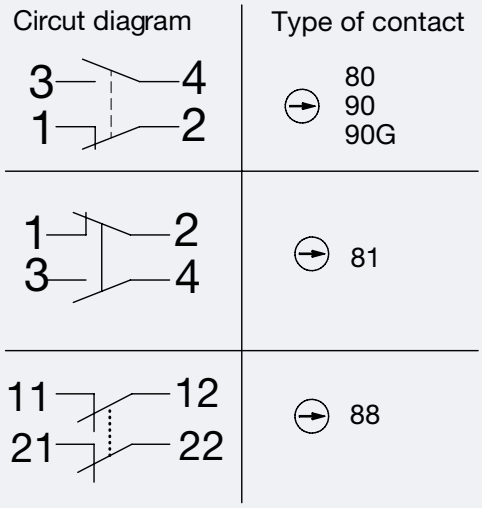
Revision number: 3.1.2.3-01 **Revision date: 19.11.2019**

Features
- Snap – and push action contacts available in silver and gold
- Galvanic isolated contacts possible
- All contacts with positive opening

Application
- Silver contacts for relais
- Gold contacts for PLC

Additional information
- Up to 3 contacts can be installed inside





Switching contact			Contact material		Switching system		Connection	Functionality		Electrical data		
Designation	Change-Over (NC / NO)	Normally closed (NC)	Silver	Gold (PLC-Application)	Snap-action	Push-action	screw terminals; 0,75 - 2,5 mm² / AWG 14 ... 20	Positive opening acc. to EN 60947–5–1 Annex K	Short circuit protection	Utilization category acc. to IEC 60947	Conventional thermal current Ith	Rated Insulation Voltage U_i
80	•		•		•		•	•	6A gG	AC–15: 3A, 230V DC-13: 1A, 110V	10A	400V
81	•		•			•	•	•	6A gG	AC–15: 3A, 230V DC-13: 1A, 110V		
90	•		•		•		•	•	6A gR	AC–15: 1A, 230V DC-13: 0,5A, 110V		
90G	•			•	•		•	•	2A gG	AC–12: 0,25A, 230V DC-12: 0,25A, 110V		
88		•		•	•		•	•	10A gG	AC–15: 1,5A, 230V DC-13: 1,5A, 24V		

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® – Light Cam® B3

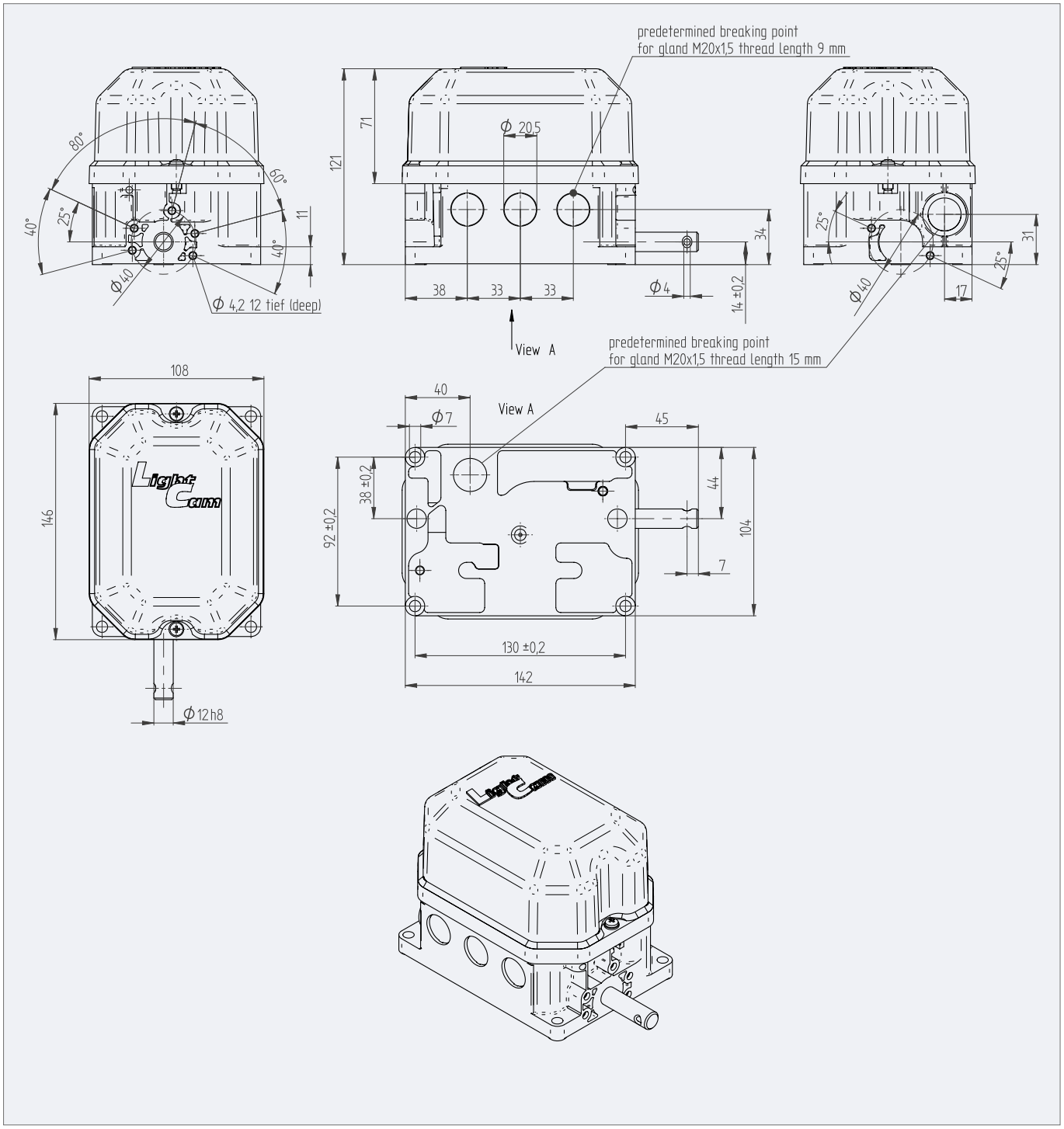
Revision number: 3.1.1.4-01 **Revision date: 19.11.2019**

Features

- Synthetic housing IP65 for outdoor application

Application

- Crane
- Wind
- Stage

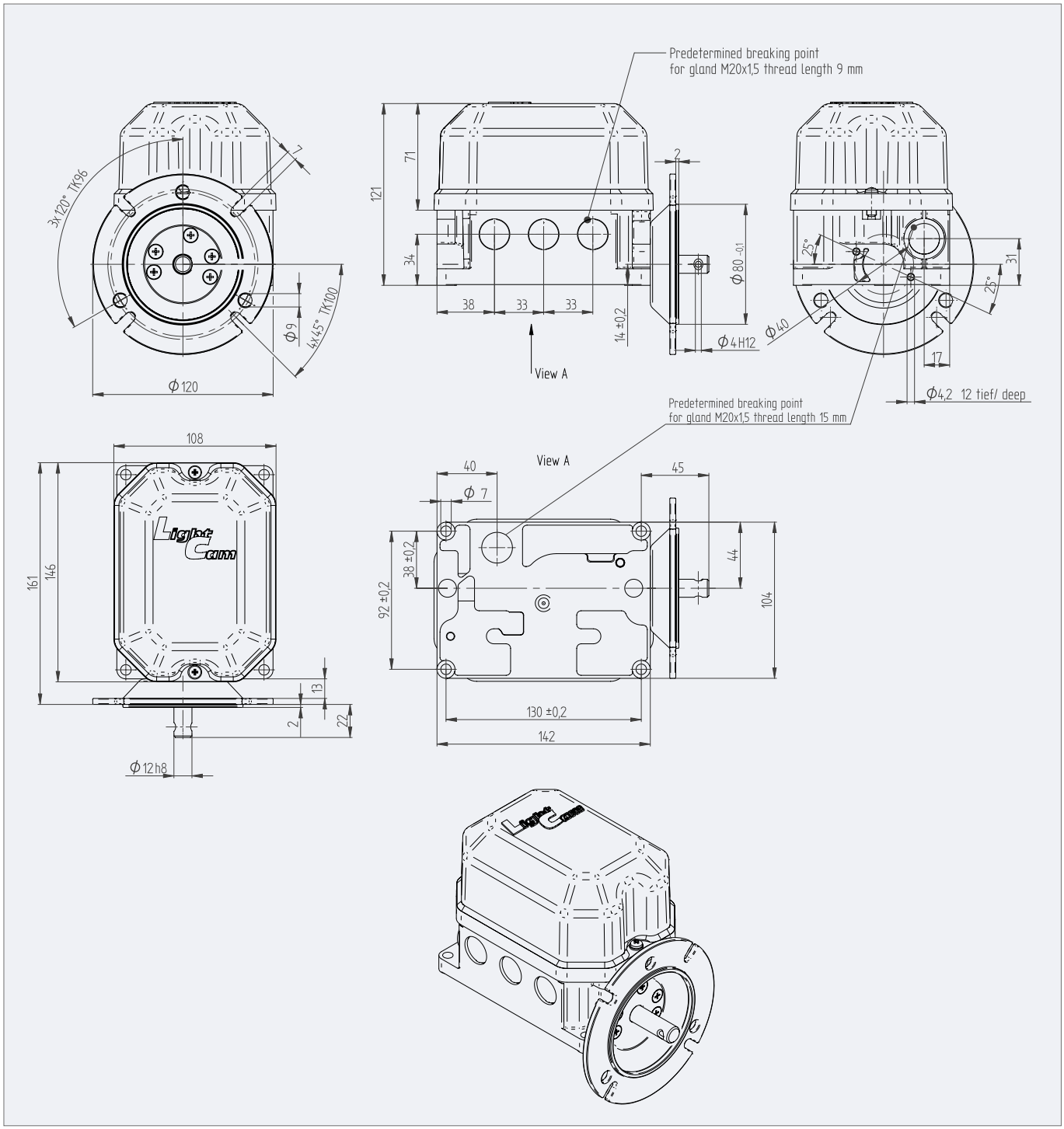


Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® – Light Cam® B5

Revision number: 3.1.2.5-01 **Revision date: 19.11.2019**



Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® – Light Cam® Metal B3

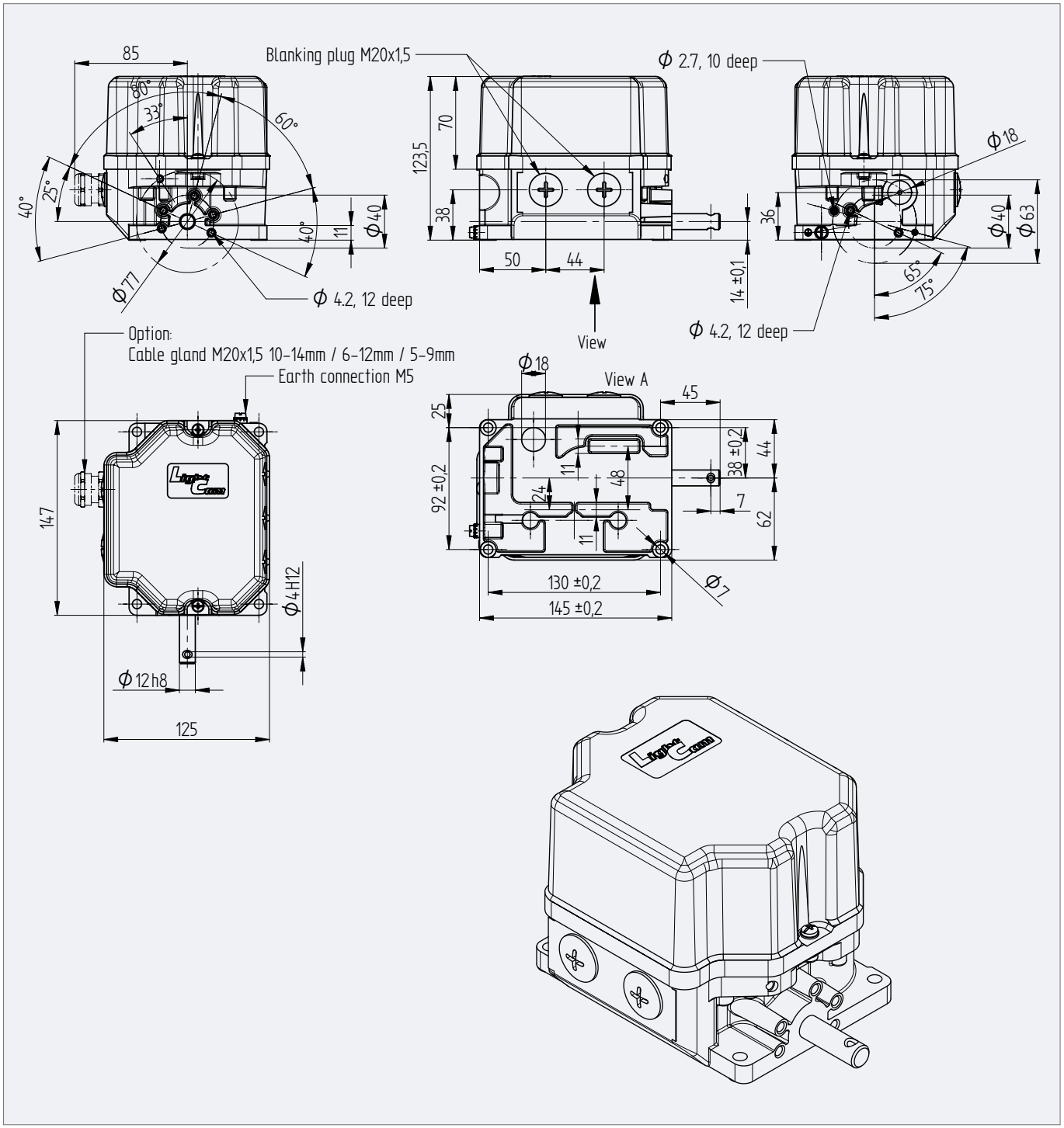
Revision number: 3.1.2.6-01 **Revision date: 19.11.2019**

Features

- Robust aluminum housing protection IP66

Application

- Crane
- Wind

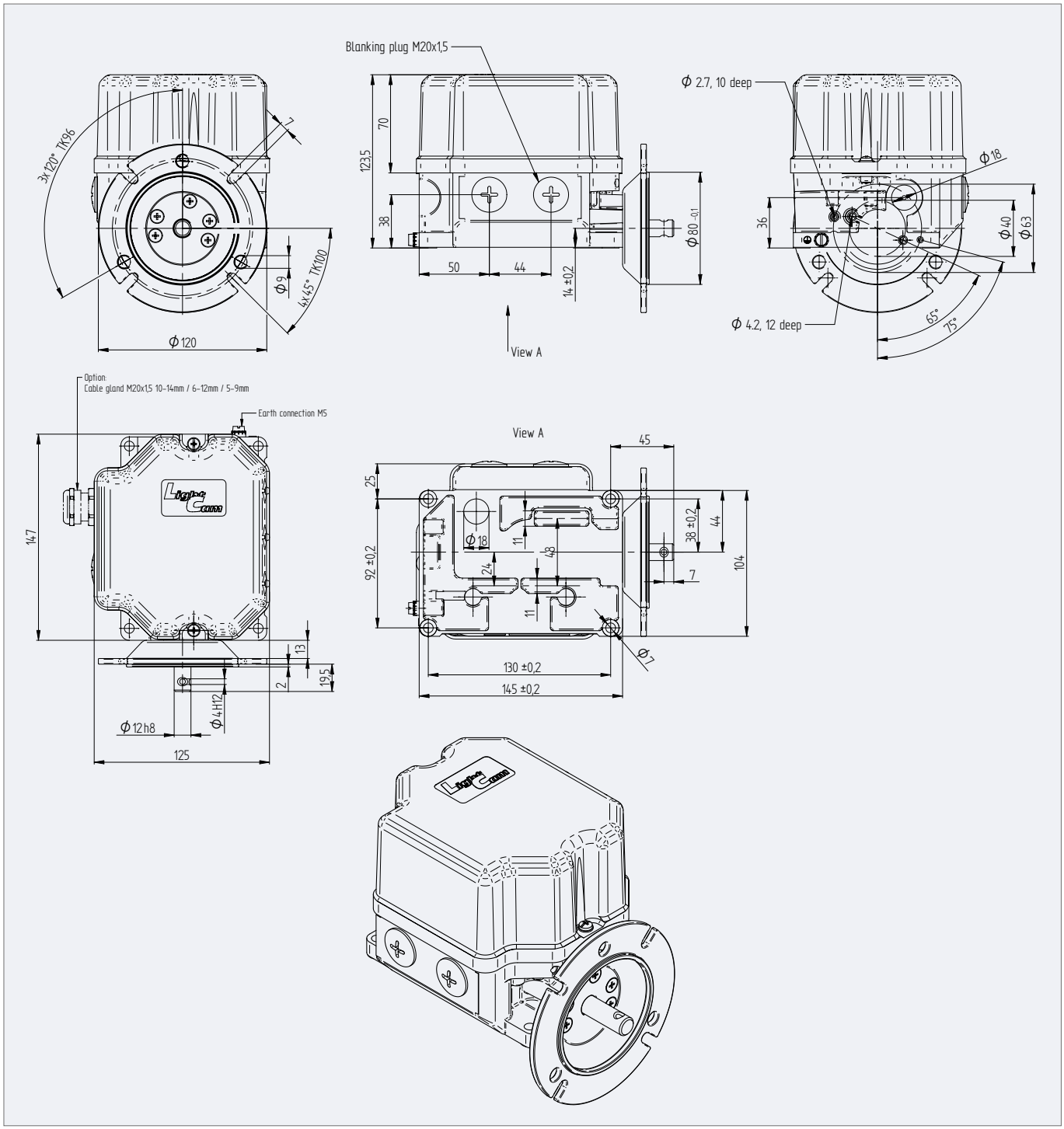


Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Series Light Cam® – Light Cam® Metal B5

Revision number: 3.1.2.7-01 **Revision date: 19.11.2019**



Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Customizable Cam Discs

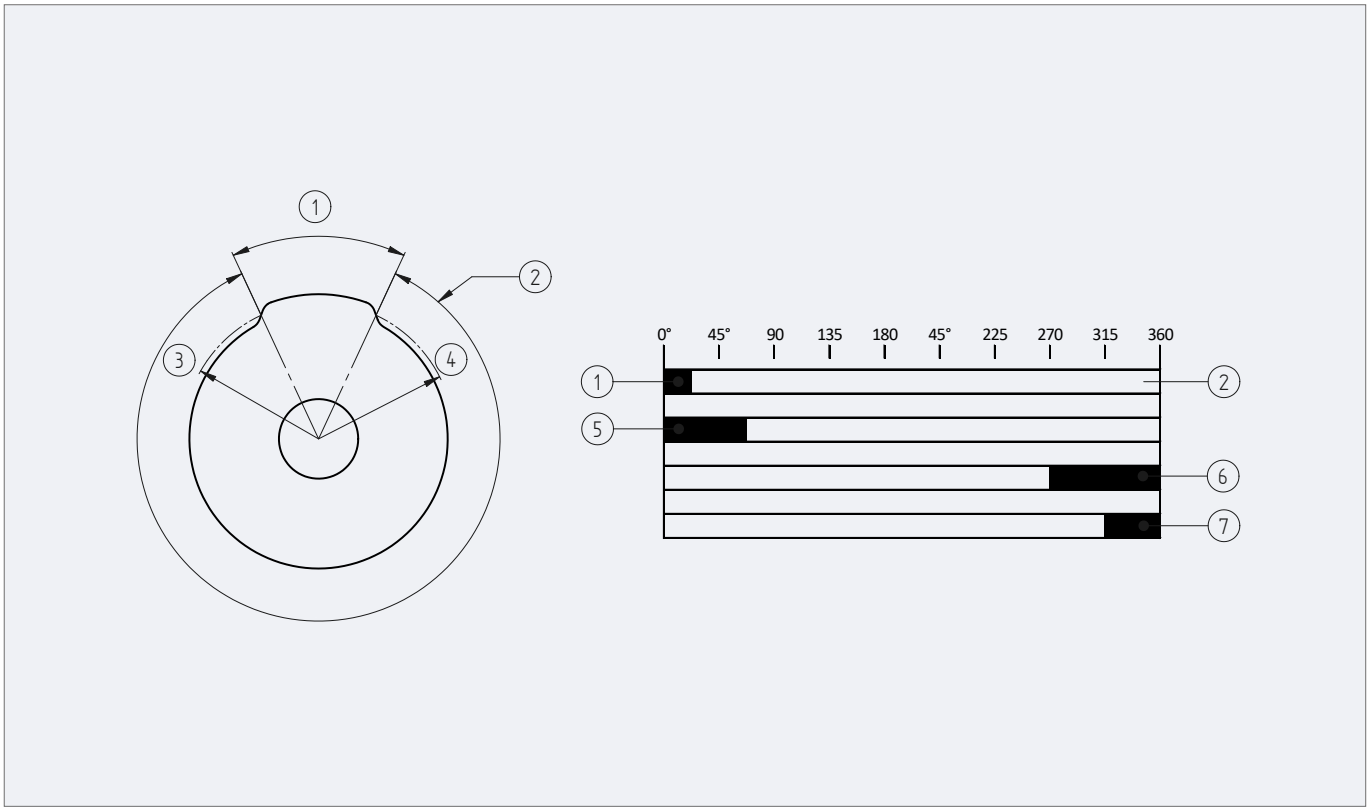
Revision number: 3.1.2.8-01 **Revision date: 19.11.2019**

Features

- 40 degree cam discs standard
- Other cam angles on request

Application

- For different switching programs cam discs with customized angles can be manufactured



A	Cam angle diagram	B	Application examples
1	Effective cam angle α (=castor angle)	1	Effective cam angle 15°
2	Effective cam angle β	5	Effective cam angle 60°
3	Switching point radius	6	Effective cam angle 90°
4	Reset point radius	7	Effective cam angle 45°

The cam discs are named after the effective cam angle. For cam discs of series Light Cam® / Light Cam®M, this corresponds to the switching point angle on the switching point radius of the cam disc. Standard cam angle for series Light Cam® / Light Cam®M is 40°. Any cam angles (15° – 345°) can be supplied as a special design upon request.
The usable revolutions enabled by a cam disc on a GCLS drive shaft, result in the following:

$$U = \frac{\beta * i}{360°} = \frac{(360° - \alpha) * i}{360°} = \frac{\alpha * i}{360°}$$

U	=	Usable revolutions
α	=	Effective cam angle
β	=	Usable cam angle (β = 360° – α)
i	=	gear ratio

Limit Switch Control Current

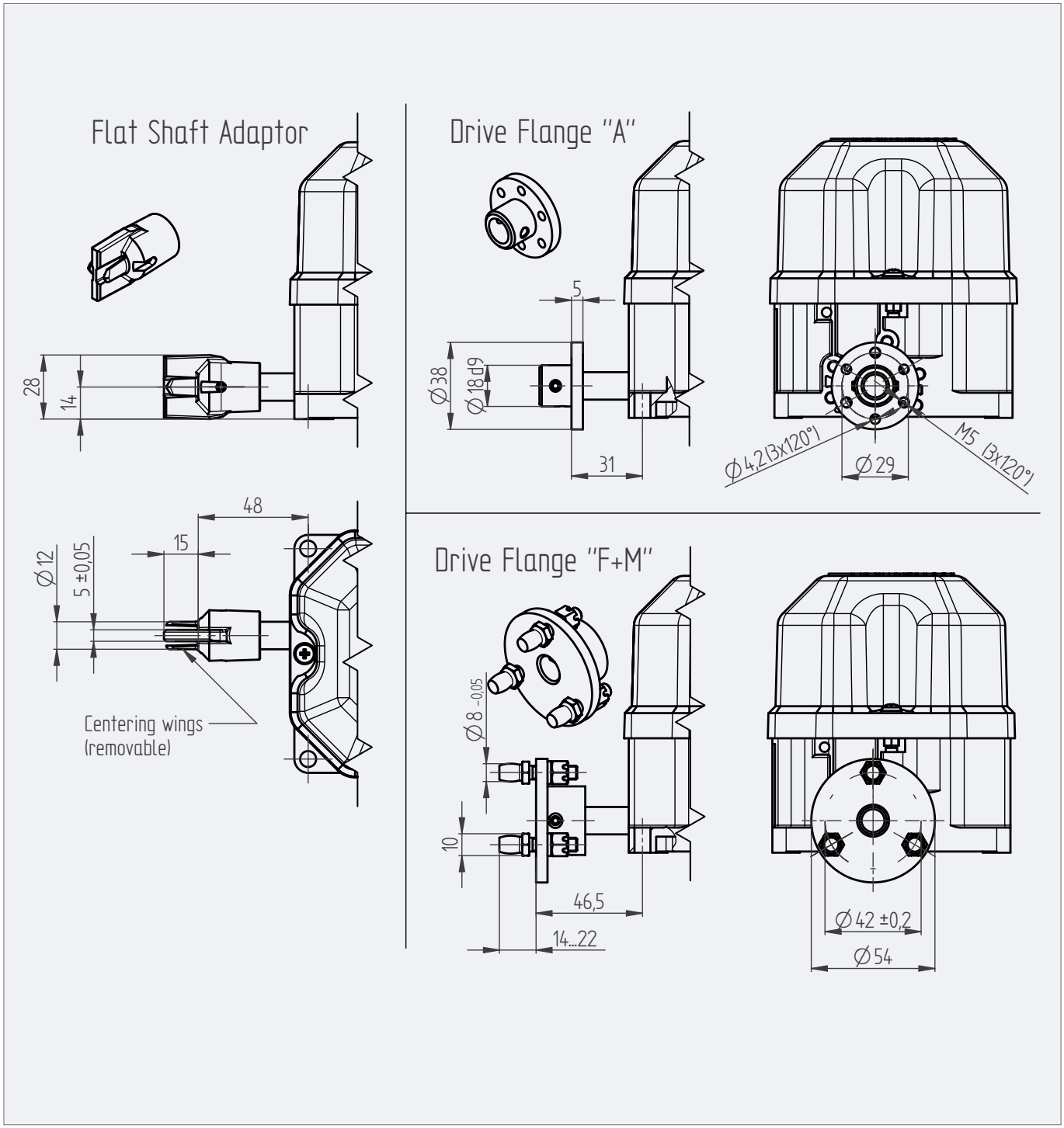
Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Optional Drive Flanges

Revision number: 3.1.2.9-01 **Revision date: 19.11.2019**

Features

- Easy adaptation for crane hoist with flange F+M and flat shaft adaptor
- Flange A for pinion wheels and belt drives



Limit Switch Control Current

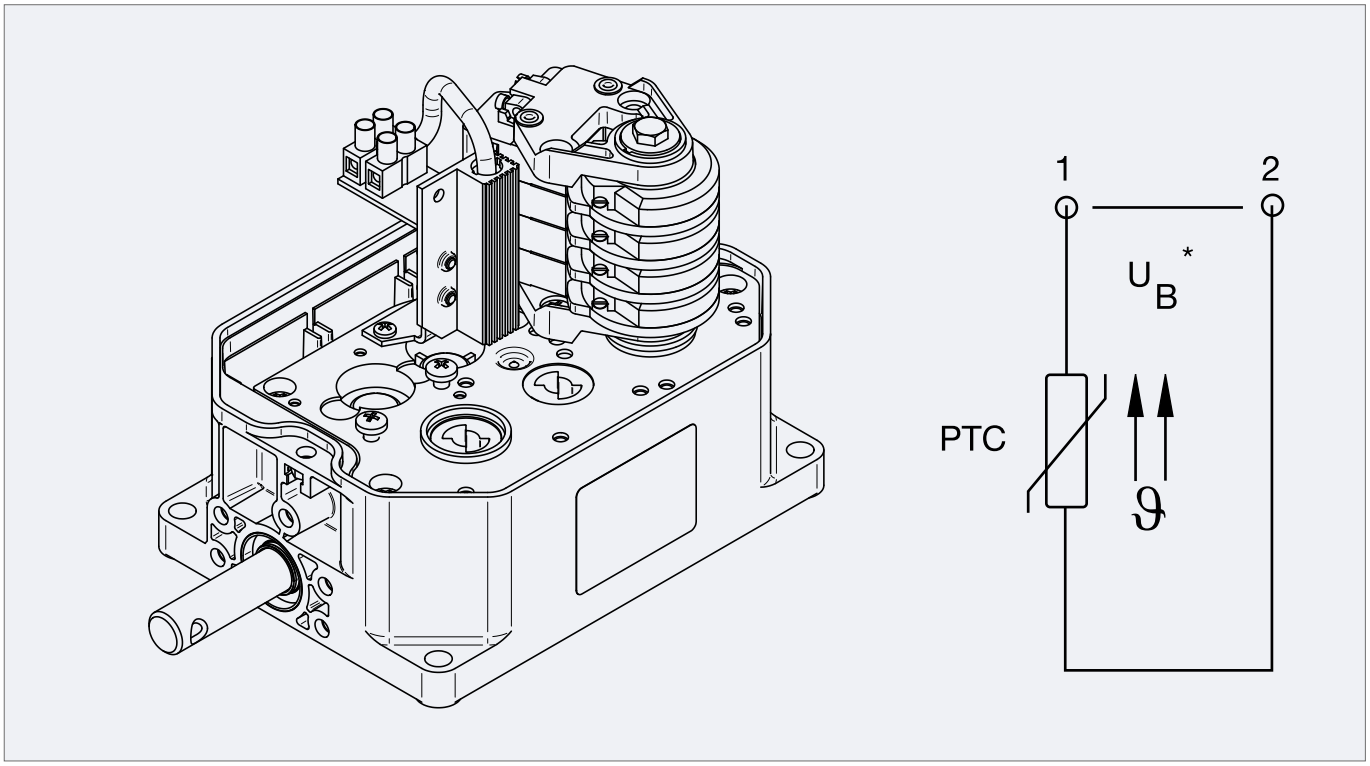
Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Option: Anti-Condensation-Heating

Revision number: 3.1.2.10-01 **Revision date: 19.11.2019**

Features
- PTC regulated heater
- 12 -36 or 110 – 250 V AC/DC

Application
- For application with high humidity or changing temperatures to avoid condensation water



Design: UB	12 – 36 V AC/DC	110 – 250 V AC/DC
Heat Output	ca. 2.5 Watts	ca. 4 Watts
PTC Cooling resistor (at 25 °C)	R25 = 20 Ω ± 35 %	R25 = 1500 Ω ± 35 %
PTC Reference temperature	50 °C	50 °C
Protection class (VDE 0100, 0160)	II	II
Connecting cable	2 x 0,25 mm², Silicon cable	2 x 0,25 mm², Silicon cable
Radiator	Anodised aluminum	Anodised aluminum
Weight	approx. 40 g	approx. 40 g

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Option: Potentiometer

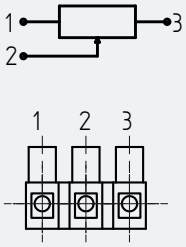
Revision number: 3.1.2.11-01 **Revision date: 19.11.2019**

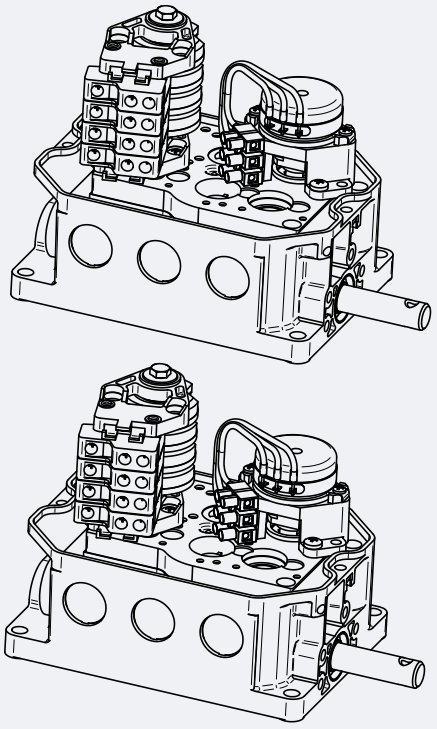
Features

- Cost effective solution for analog measurement

Application

- For simple measurements with lower requirements for preciseness





Connector	
Solid conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Fine-stranded conductor	0.5 … 2.5 mm² / 20 … 12 AWG
Strip length	ca. 4 mm / ca. 0.15 Inch

Pin Assignment	
Pin	Color
1	red
2	blue
3	black

Technical data								
Technology	wirewound					conductive synthetic		
Effective electrical angle of rotation*	355° ±5°					350° ±2°		
Rotational noise (ENR)	100 Ohm							
Max. / recommended wiper current	35 mA / 2 µA					max. 1 µA		
Power rating @ 70°C	0,5 W							
Insulation Voltage	1000 VAC, 1 min							
Insulation Resistance	1000 Mohm @ 1000 VDC					> 10 Mohm @ 500 V		
Lifetime	1 Mio. rotations (90% el. eff. angle half sine)*					100.000.000 movements*		
Operating temperature range	-20 … +80 °C					-30 … +80 °C		
Vibration (IEC 68-2-6, Test Fc)	15g 10..2000Hz x 12h					20g / 5..2000Hz / 0,75 mm		
Shock (IEC 68-2-27, Test Ea)	49g @ 11 ms x 18					50g / 11 ms		
Total resistance [kOhm]	1	2	5	10	20	1	2	5
Resistance tolerance	±3%	±3%	±3%	±3%	±3%	±20%	±20%	±20%
Independent linearity (best straight line)	±0,35%	±0,25%	±0,25%	±0,25%	±0,25%	±0,075%	±0,075%	±0,075%
Number of wire turns	570	740	1000	1270	1670	-	-	-
Theoretical resolution	0,18%	0,14%	0,10%	0,08%	0,60%	0,008°	0,008°	0,008°

* Referring to potentiometer shaft

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Option: Analog Encoder 4 – 20 mA

Revision number: 3.1.2.12-02 **Revision date: 12.10.2021**

Features

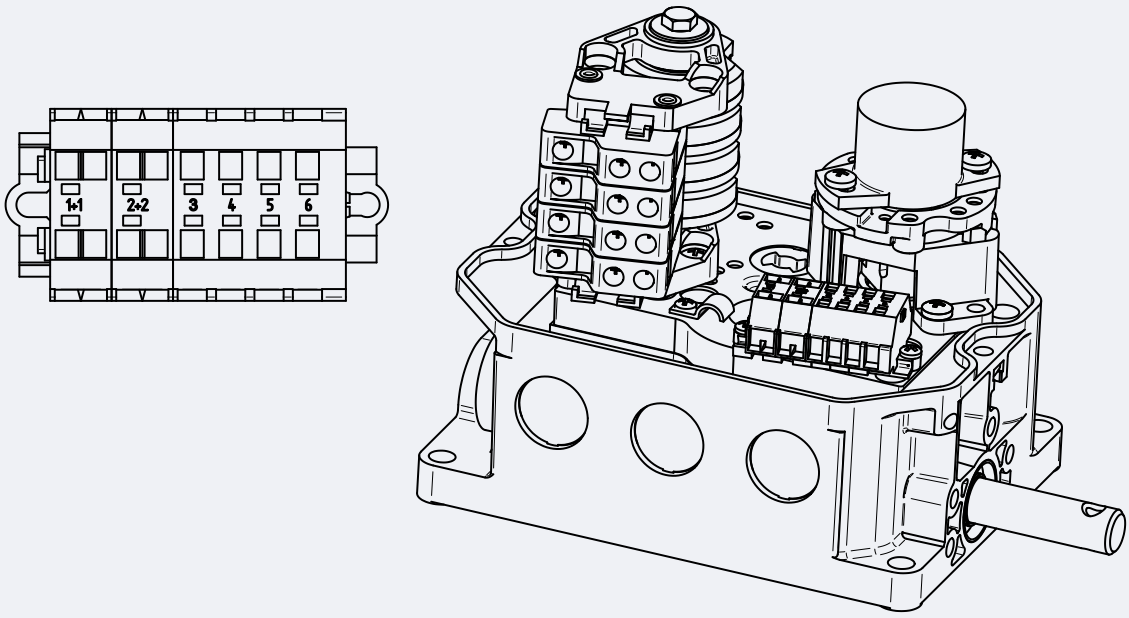
- Contactless measuring method
- Absolute value aquisition
- Long lifetime
- Turning synchronously with the cam discs

Application

- For simple measuring of absolute signals

Additional information

- Programmable type on request



Technical Data	
	non-programmable type
Drive	Coupling (1:1 with cam discs)
Measuring range (Referring to encoder shaft)	360°
Output Signal	4 … 20 mA
Turning direction (Referring to drive shaft limit switch)	cw rising values
Resolution	12 Bit
Indep. Linearity	± 0.3 % of measuring range
Supply Voltage	16 … 35 V DC
Current consumption without load (typ.)	19 mA
Ohmic load at output	0 … 500 Ohm
Max. capacitive load at output	100 nF
Lifetime	50 mio. movements
Operating Temperature	-40°C … +85 °C

Signal	Pin	Color
Supply Voltage	1+1	brown
Ground	2+2	green
-	3	-
Output signal	4	white
Screen	5	
-	6	-

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam® M – Option: Incremental Encoder

Revision number: 3.1.2.13-01 **Revision date: 19.11.2019**

Features

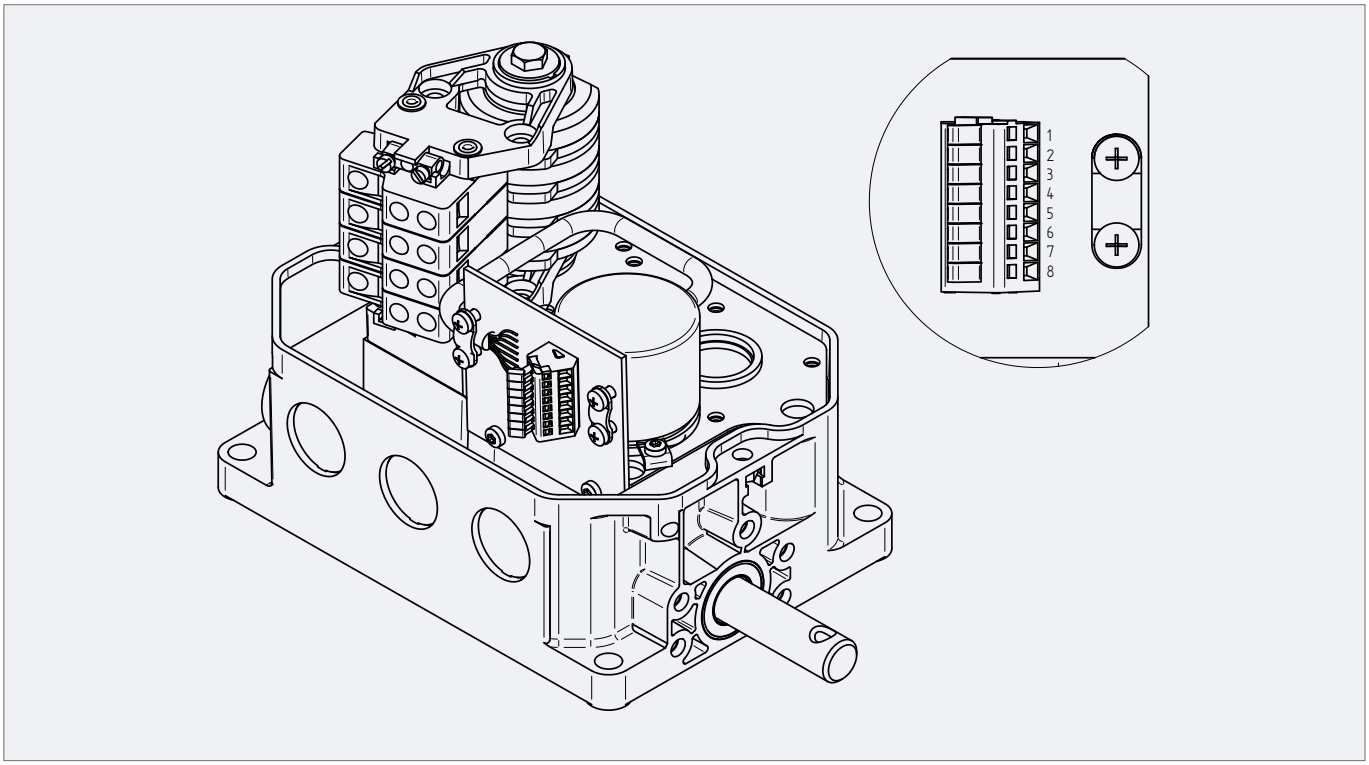
- Optical measuring
- Up to 3600 increments in small housing possible
- Already wired to squirrel cage tension

Application

- For giving information about speed and position

Additional information

- Driven 1:1 by bevel gear



Technical Data	RS422	Push-Pull
Power Supply UB	5 V ± 5% or 8…30 V	8 … 30 V DC
Pulses / 360°	5 … 3600	
Power consumption	Typ. 40 mA	< 40 mA
(without load)	Max. 90 mA	
Permissible load	± 20 mA	± 50 mA
Signal level "high"	> 2,5 V	> V_{cc} - 3 V
Signal level "low"	< 0,5 V	< 2,5 V
Max. Frequency	300 kHz	200 kHz
Operating Temperature	-40°C … +85 °C (5…1024 pulses)	
	-30°C … +85 °C (>1024 pulses)	

Assignment	Pin	Color
Ground	1	white
Supply-Voltage V_{CC}	2	brown
A - Signal	3	green
B - Signal	4	yellow
0 - Signal	5	gray
A-Inv. - Signal	6	pink
B-Inv. - Signal	7	blue
0-Inv. - Signal	8	red

Connector	
Solid conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Multi-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Fine-stranded conductor	0.08 … 1.5 mm² / 28 … 16 AWG
Strip length	9 … 9 mm / 0.31 … 0.35 Inch

Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

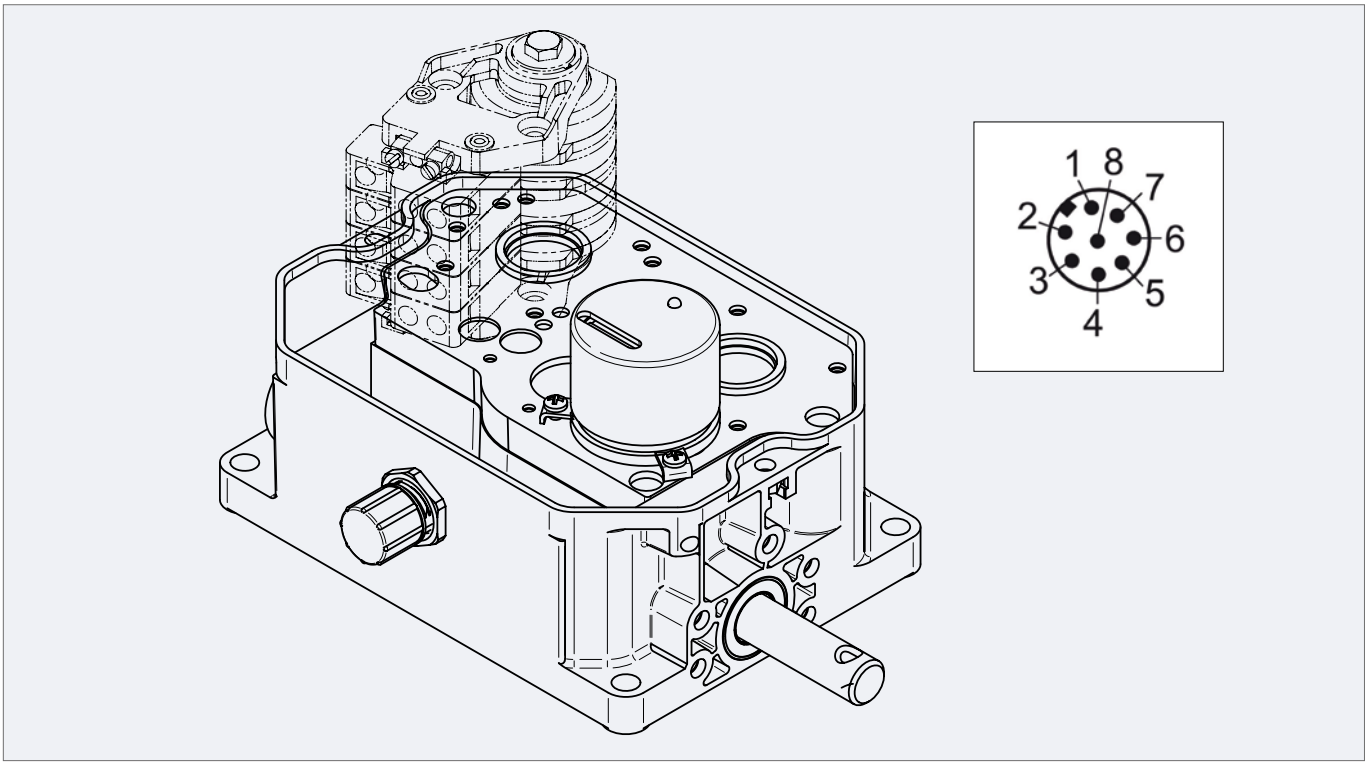
Light Cam® / Light Cam®M – Option: SSI Multiturn Encoder

Revision number: 3.1.2.14-01 **Revision date: 19.11.2019**

Features
- Absolute value with high preciseness
- Without gear (Energy harvesting technology)
- Connection via M12 plug at the outside of the housing

Application
- For very high accuracy demands

Additional information
- Driven 1:1 by the bevel gear



Technical Data	
Resolution Singleturn	8 … 14 Bit
Resolution Multiturn	1 … 39 Bit
Interface	SSI
Code	Gray / Binary
Clock frequency	100 kHz … 500 kHz
Data output	RS485 comp.
Power Supply	10 … 32 V DC
Power Consumption	Max. 0,5 W
Turn on time	max. 1,5 s
Operating Temperature	-40°C … +85 °C

Configuration	
Turning direction	CW : DIR = GND
(View on shaft)	CCW : DIR = +UB
Set to Zero	Preset = +UB (2s)
Deactivate	Preset = GND

LED -Behaviour	
At Boot-Up	red (< 2,3s)
Error	red (> 2,3s)
Normal function	green

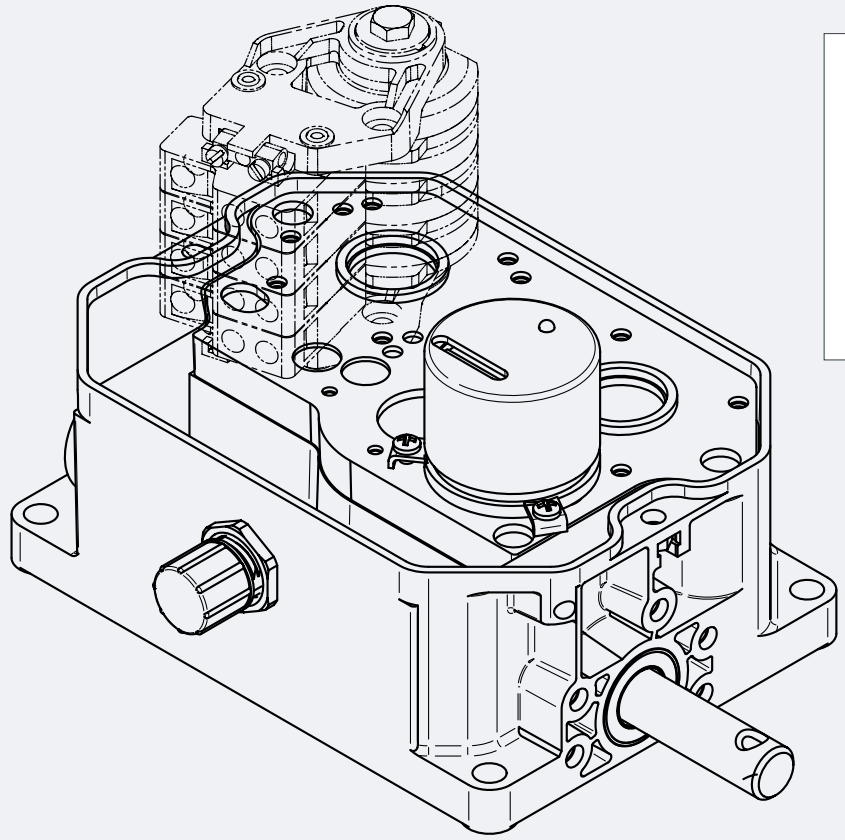
Pin Assignment		
Signal	Pin	Color
Ground	1	white
Supply Voltage	2	brown
SSI CLK +	3	green
SSI CLK -	4	yellow
SSI DATA +	5	gray
SSI DATA -	6	pink
Preset	7	blue
DIR	8	red
Screen	9	violet

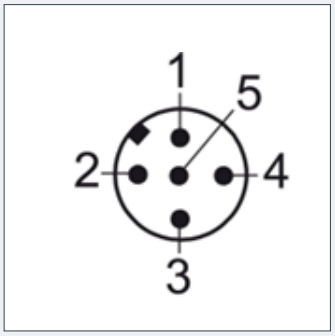
Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam® M – Option: CANopen Multiturn Encoder

Revision number: 3.1.2.15-01 **Revision date: 19.11.2019**





Technical Data	
Resolution singleturn	8 … 14 Bit
Resolution multiturn	1 … 39 Bit
Code	Binary
Interface	CAN
Protocol	CANopen
Node ID	1 … 127 (default: 127)
Programmable CAN transmission modes	Synchronous / Asynchronous
Power Supply	10 … 32 V DC
Power Consumption	Max. 0,5 W
Turn on time	max. 1,5 s
Operating Temperature	-40°C … +85 °C

Pin Assignment		
Signal	Pin	Color
Ground	1	white
Supply Voltage	2	brown
SSI CLK +	3	green
SSI CLK -	4	yellow
SSI DATA +	5	gray
SSI DATA -	6	pink
Preset	7	blue
DIR	8	red
Screen	9	violet

Standard settings as well as any customization in the software can be changed via LSS (CiA 305) and the SDO protocol (PDOs, Scaling, Heartbeat, Node-ID, Baud rate, etc)

Limit Switch Control Current

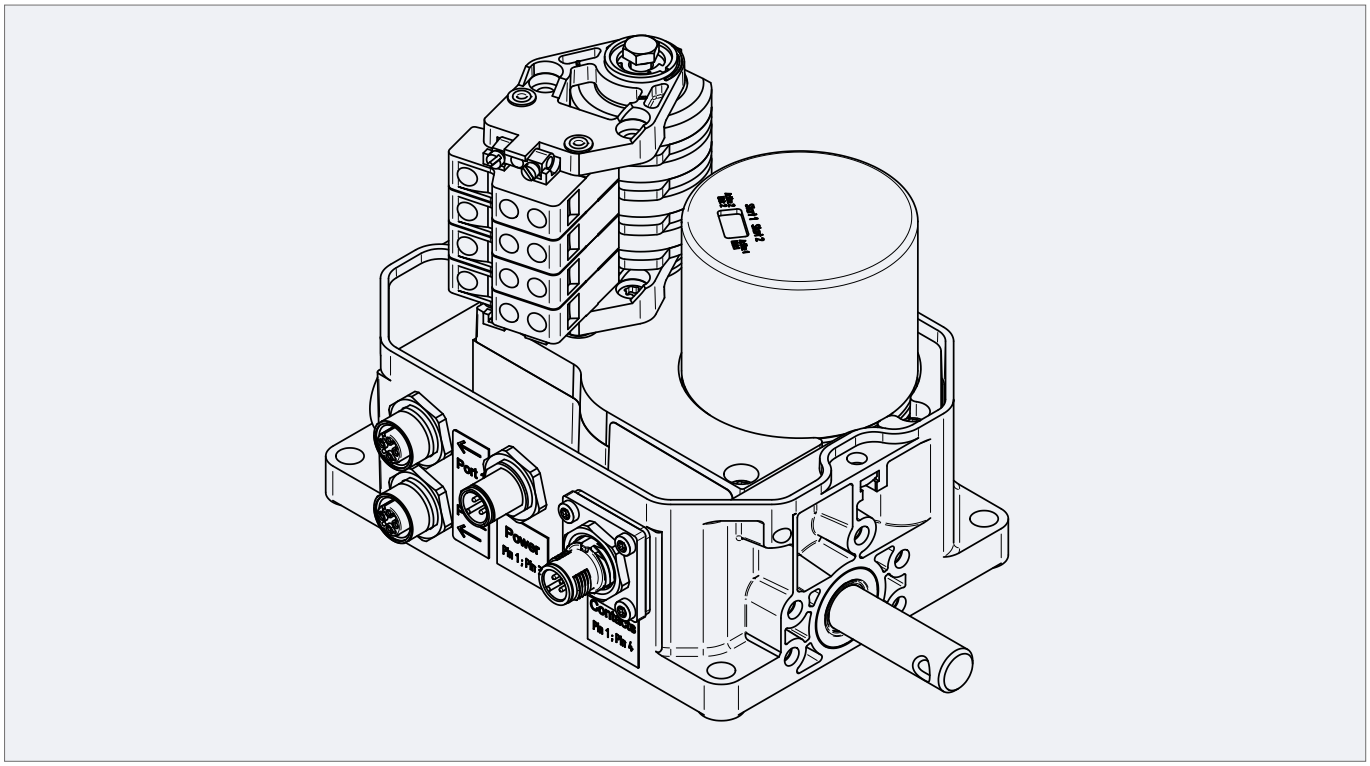
Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M – Option: Internal Profinet Encoder

Revision number: 3.1.2.16-01 **Revision date: 19.11.2019**

Additional information

- Solution with integrated Profinet encoder inside of the housing
- No additional space outside of the housing required



Technical Data	
Sensing principle	magnetic
Resolution Singleturn	up to 16 Bit
Resolution Multiturn	12 Bit
Interface	ProfiNet IO
Output code	binary
Code course	cw / ccw (programmable)
Power Supply	10 … 30 V DC
Power Consumption	approx. 4 W
Time delay before availability	< 250 ms
Operating Temperature	-40°C … +70 °C

Pin Assignment		
Signal	Ports 1 & 2	Color
	Female connector M12, 4 pole D-coded	Male connector M12, 4 pole A-coded
1	Tx+	+UB
2	Rx+	n.c.
3	Tx-	GND
4	Rx-	n.c.

Limit Switch Control Current

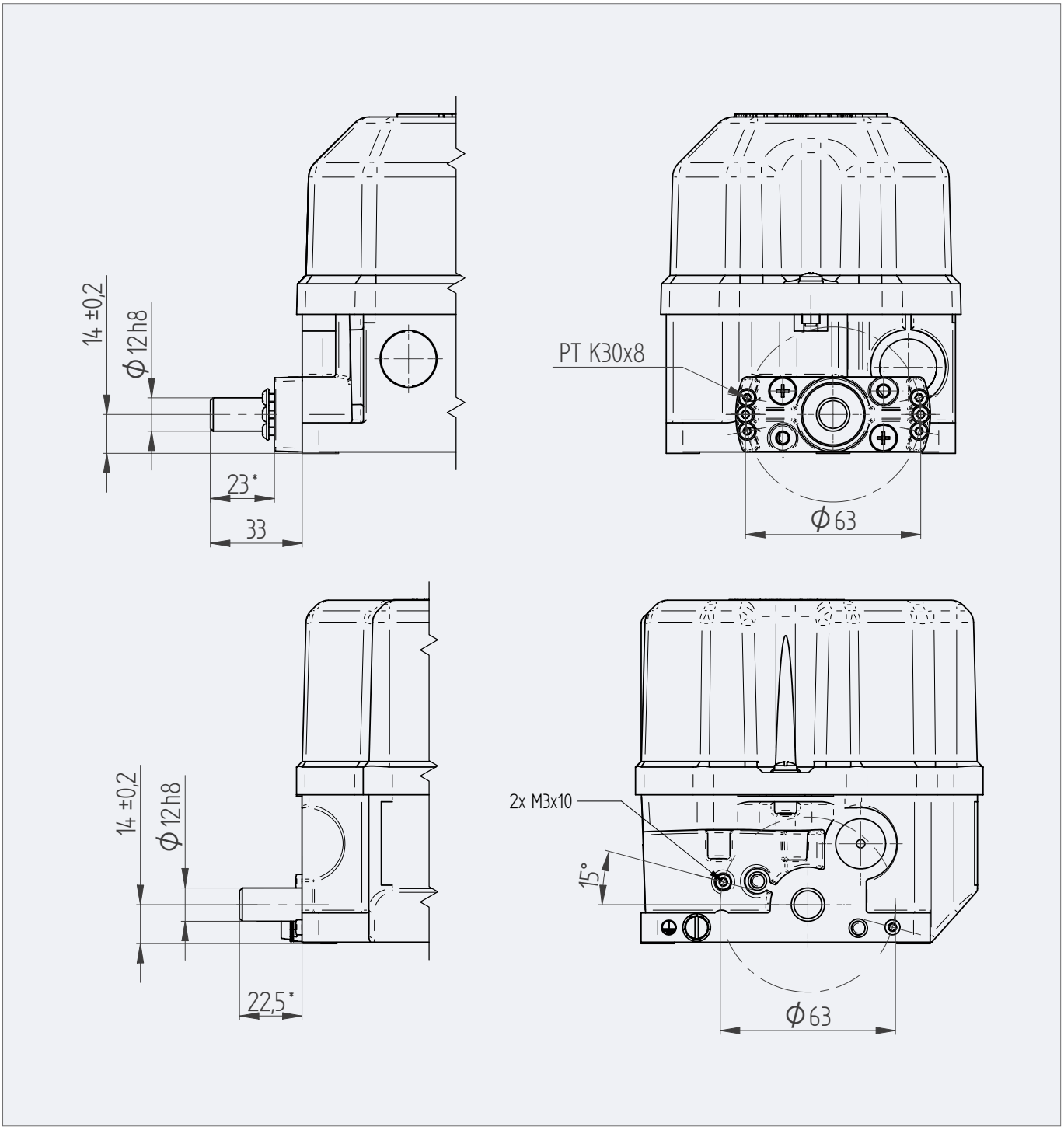
Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam® M: 2nd shaft end (encoder drive)

Revision number: 3.1.2.17-01 **Revision date: 19.11.2019**

Additional information

- For driving multiturn hollow shaft encoders from the second shaft end
- Driven 1:1 by the input shaft

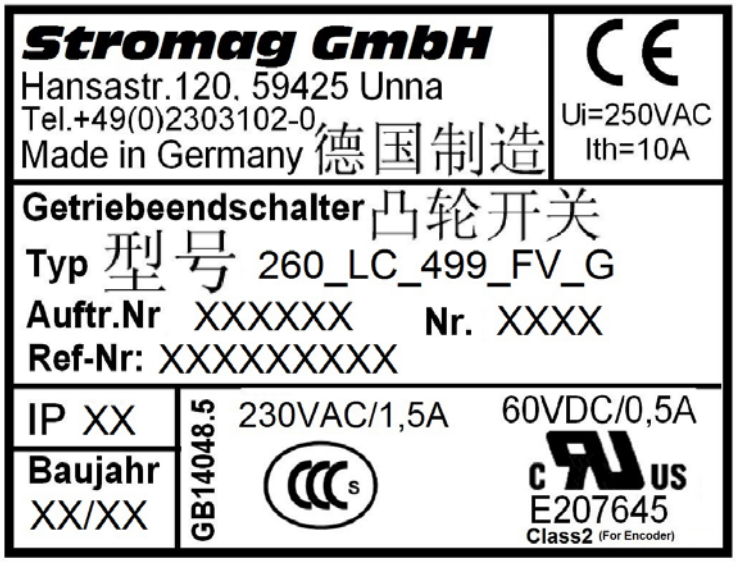


Limit Switch Control Current

Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam®M: Key of Types

Revision number: 3.1.2.18-02 **Revision date: 12.10.2021**



Light Cam® / Light Cam® Metal	Switch type: GCLS Series Light Cam® / Light Cam® Metal		
260	Nominal Revolutions	0.85, 1.85, 3.9, 6, 9, 15, 25, 29, 53, 76, 95, 135, 180, 260, 360, 435, 515, 620, 880	
LC	Housing type	Light Cam®	Synthetic housing
		Light Cam®M	Aluminum housing
4	Number of contacts fitted		1 - 8
99	Type of switching contact	99	Contact (changeover) with screw connections, contact material: Silver (standard)
		99G	Contact (changeover) with screw connections, contact material: Gold
		99L	Contact (changeover) with soldering pins (for PCB), contact material: Silver
		99P	Contact (changeover) with flat plug connections, contact material: Silver
		99T	Contact (push action) with screw connections, contact material: Silver
		99A	Contact (push action) with screw connections, contact material: Gold
		99B	Contact (changeover) with soldering pins, contact material: Gold
		99C	Contact (changeover) with stranded wire output, contact material: Silver
		90	Contact (NC+NO) with screw connections, contact material: Silver
		90G	Contact (NC+NO) with screw connections, contact material: Gold
		88	Contact (2x NC) with screw connections, contact material: Gold
FV	Type of cam discs	FV	Precise adjustable
G	Additional components	G	With encoder / sensor
		P	With potentiometer

Limit Switch Control Current

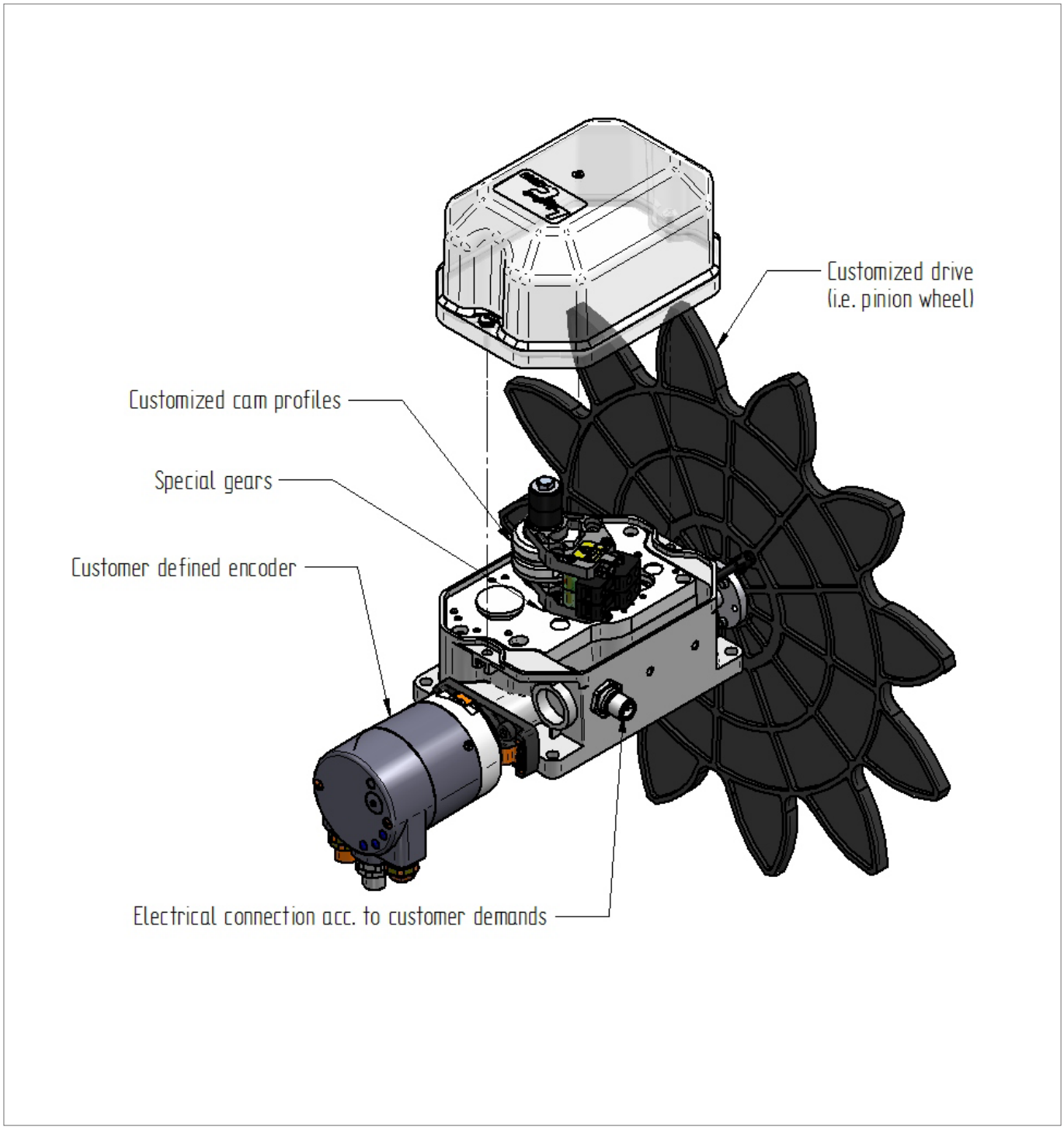
Worm / Bevel Geared Cam Limit Switches

Light Cam® / Light Cam® M: Highly customizable solutions

Revision number: 3.1.2.19-01 **Revision date: 19.11.2019**

Additional information

- Pinion wheels available on request
- Highly customized options for almost all parts available on request



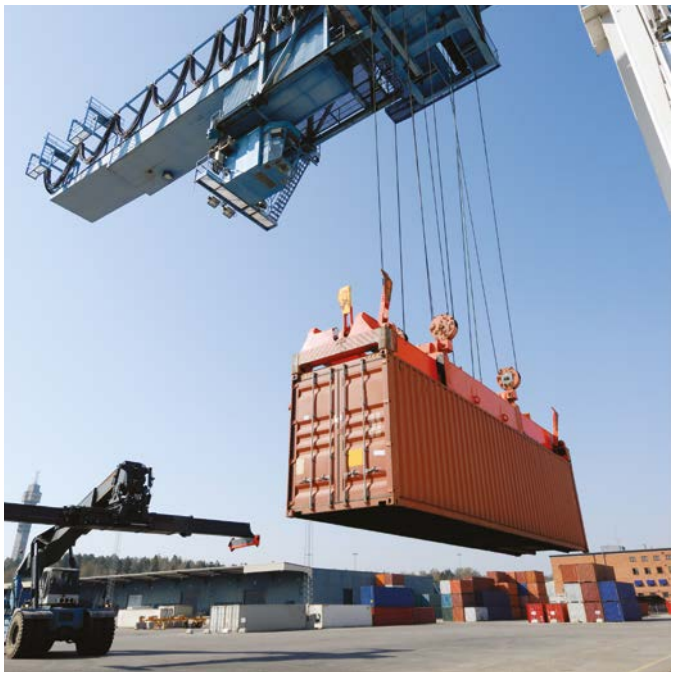
Series 100/110
Geared Cam Limit Switches

Stromag®
Altra Industrial Motion

CONTENT

Series 100 / 110: III

AT A GLANCE



STROMAG SERIES 100/110

BENEFITS INCLUDE

- Heavy duty housings for rough environments
- Execution for up to 120°C possible
- For nuclear application (on request) too

Series 100/110 – Basic Design

Revision number: 3.1.3.1-01 **Revision date: 19.11.2019**

Features

- Geared cam limit switch in metal or synthetic housing with IP65 and IP66 protective ratings
- High variants of gears available

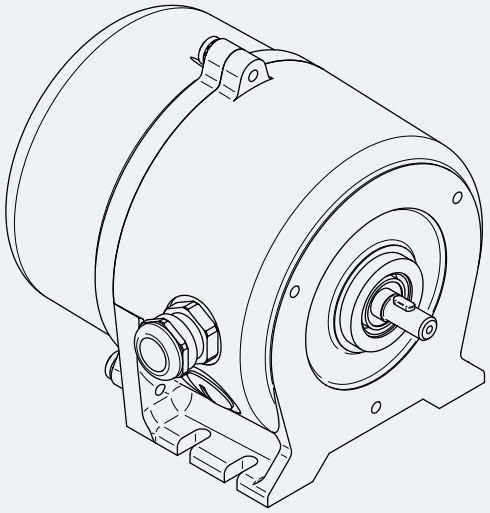
Application

- Cranes on- and offshore
- Steel works
- Generally for rough environments

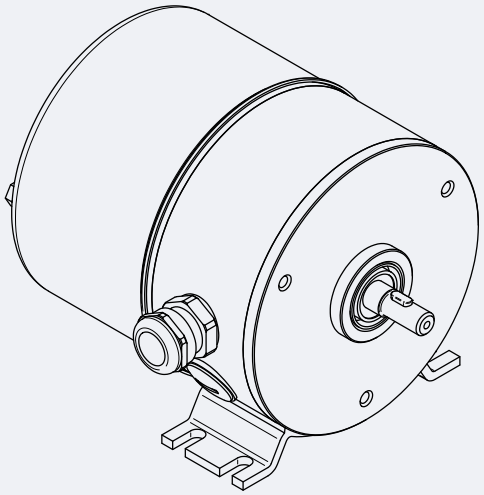
Additional information

- Available as geared, lever or counterweight execution
- -40°/-30°C up to +85°C depending on built in switching contacts

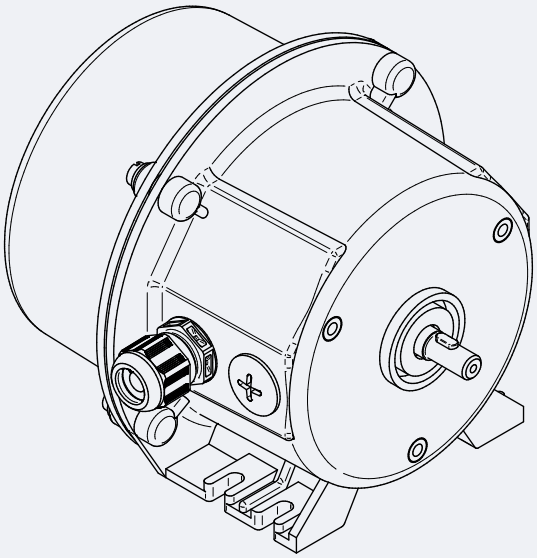
Cast iron housing IP66



Steel sheet housing IP65



Polycarbonate housing IP66



Limit Switch Control Current

Series 100/110 – Gear Data

Revision number: 3.1.3.2-01 **Revision date: 19.11.2019**

Features

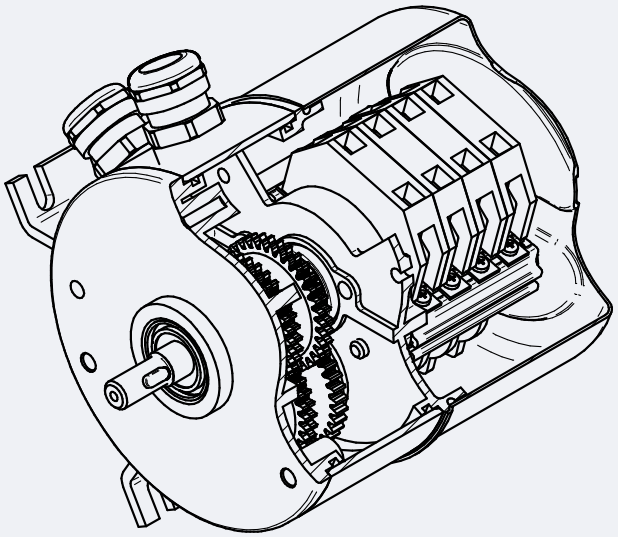
- Positive form locked connection gear in synthetic or metal execution
- High variants of gear ratios possible, 0,175 up to 17222 restricted by housing size

Application

- Cranes on- and offshore

Additional information

- Pre-tensioned gear wheels for less backlash possible



Available Gear Size Series 110 Synthetics Housing
Available Gear Size Series 100 Cast Iron Housing
Available Gear Size Series 100 Sheet Housing

Size	Gearbox - for contacts 51, 52, 53, 80, 81, 88, 90, 90G with cam discs 40° FV												
	Nominal revolutions	Usable revolutions with 40° cam disc	Gear ratio	Castor revolutions of the drive shaft after each side	Mechanical hysteresis [revolutions at drive shaft]		Max. input speed [rpm]	Min. input speed for alternating operation [rpm]				Min. drive torque for Switching an individual contact [Nm]	Max. drive torque for forced opening of an individual contact [Nm]	
					Contact			Contact					Contact	
					51, 52	80, 88, 90, 90G		51, 52	90, 90G	88	80		51, 52, 53	80, 81, 88, 90, 90G
1	0,153	0,152	0,175	0,022	0,001	0,002	50	0,001	0,037	0,007	0,074	1,5	5,368	9,881
	0,45	0,449	0,514	0,066	0,004	0,007	150	0,004	0,109	0,022	0,218	0,5	1,813	3,344
	0,76	0,872	1	0,128	0,008	0,014	150	0,007	0,212	0,042	0,424	0,2	0,875	1,663
	0,91	0,906	1,039	0,133	0,009	0,014	500	0,007	0,22	0,044	0,441	0,2	0,85	1,608
	1,69	1,696	1,944	0,248	0,016	0,027	600	0,014	0,413	0,083	0,825	0,2	0,547	0,952
	5	4,998	5,73	0,732	0,048	0,08	600	0,041	1,216	0,243	2,432	0,2	0,318	0,455
	6,4	6,41	7,352	0,939	0,061	0,102	600	0,052	1,56	0,312	3,12	0,2	0,292	0,399
	8,3	8,28	9,496	1,213	0,079	0,132	750	0,067	2,015	0,403	4,03	0,2	0,271	0,354
	16	16	18,35	2,345	0,152	0,255	750	0,13	3,894	0,779	7,788	0,2	0,237	0,28
	24	24,24	27,796	3,552	0,231	0,386	1000	0,197	5,898	1,18	11,797	0,2	0,224	0,253
	37	37,14	42,586	5,442	0,353	0,591	1000	0,301	9,037	1,807	18,074	0,2	0,216	0,234
2	51	51,25	58,759	7,508	0,487	0,816	1250	0,416	12,469	2,494	24,938	0,2	0,211	0,225
	92	91,66	105,092	13,428	0,872	1,46	1250	0,743	22,301	4,46	44,602	0,2	0,206	0,214
	166	166,57	190,974	24,402	1,584	2,652	1250	1,351	40,526	8,105	81,052	0,2	0,204	0,208
3	353	346,57	397,338	50,771	3,296	5,519	1250	2,811	84,318	16,864	168,635	0,2	0,202	0,204
	761	746,98	856,411	109,43	7,103	11,895	1250	6,058	181,736	36,347	363,472	0,2	0,201	0,202
4	1335	1310,32	1502,28	191,958	12,461	20,865	1500	10,626	318,794	63,759	637,588	0,2	0,2	0,201
	1612	1581,84	1813,576	231,735	15,043	25,189	1500	12,828	384,853	76,971	769,706	0,2	0,2	0,201
	3414	3349,78	3840,514	490,732	31,855	53,34	1500	27,166	814,982	162,996	-	0,2	0,2	0,2
5	5049	4954,15	5679,917	725,767	47,112	78,888	1500	40,177	1205,316	241,063	-	0,2	0,2	0,2
	7229	7093,66	8132,854	1039,198	67,458	112,956	1500	57,528	-	345,169	-	0,2	0,2	0,2
	15309	15021,86	17222,514	2200,654	142,851	239,202	1500	121,824	-	730,946	-	0,2	0,2	0,2

Series 100 – Steel Sheet Housing B3

Revision number: 3.1.3.3-01 **Revision date: 19.11.2019**

Features

- IP65 sheet steel housing foot mounted version B3
- Different kinds of housing sizes possible depending on gear and number of contacts

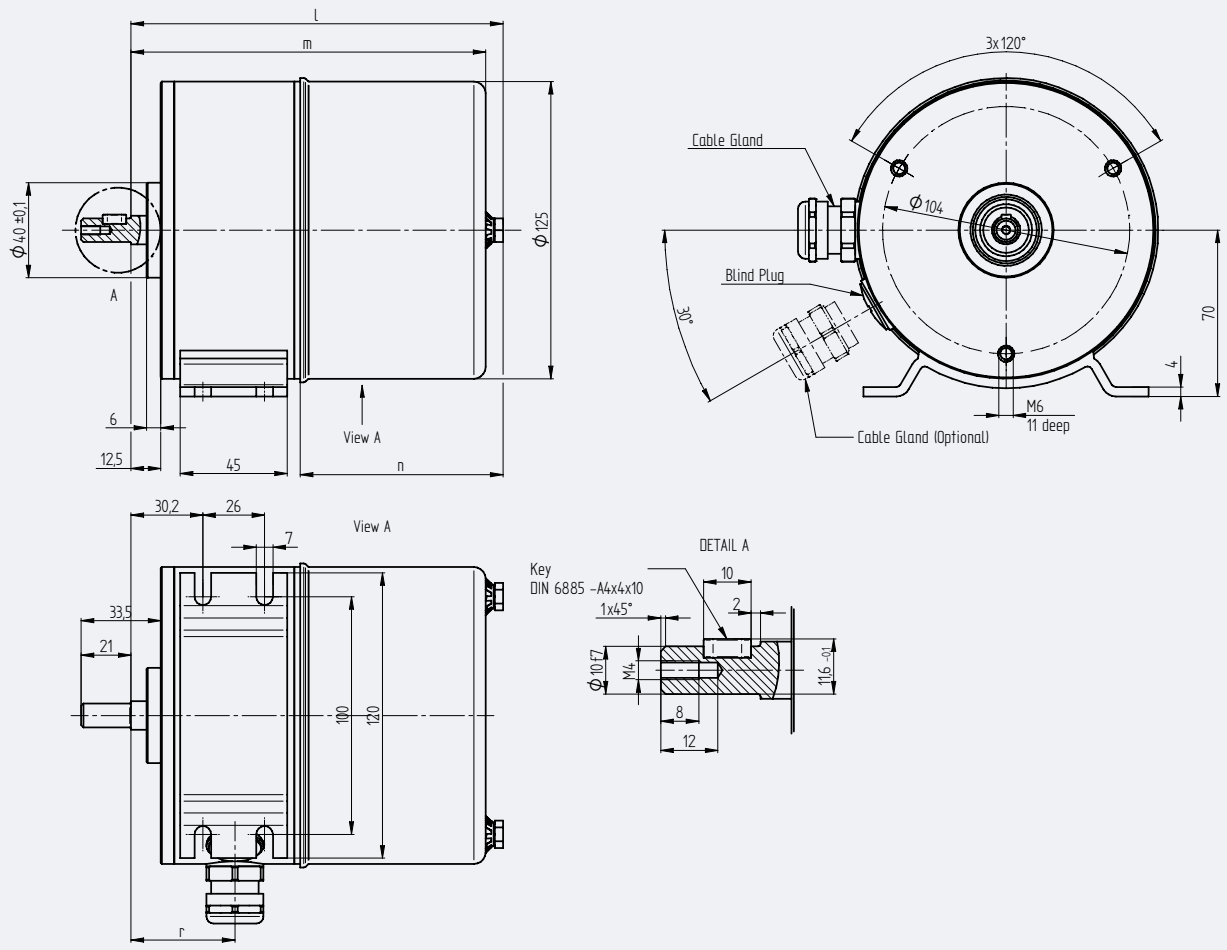
Application

- Crane on- and offshore

Additional information

- For rough environments
- Increased protection against corrosion through 2 component paint

Steel sheet housing B3



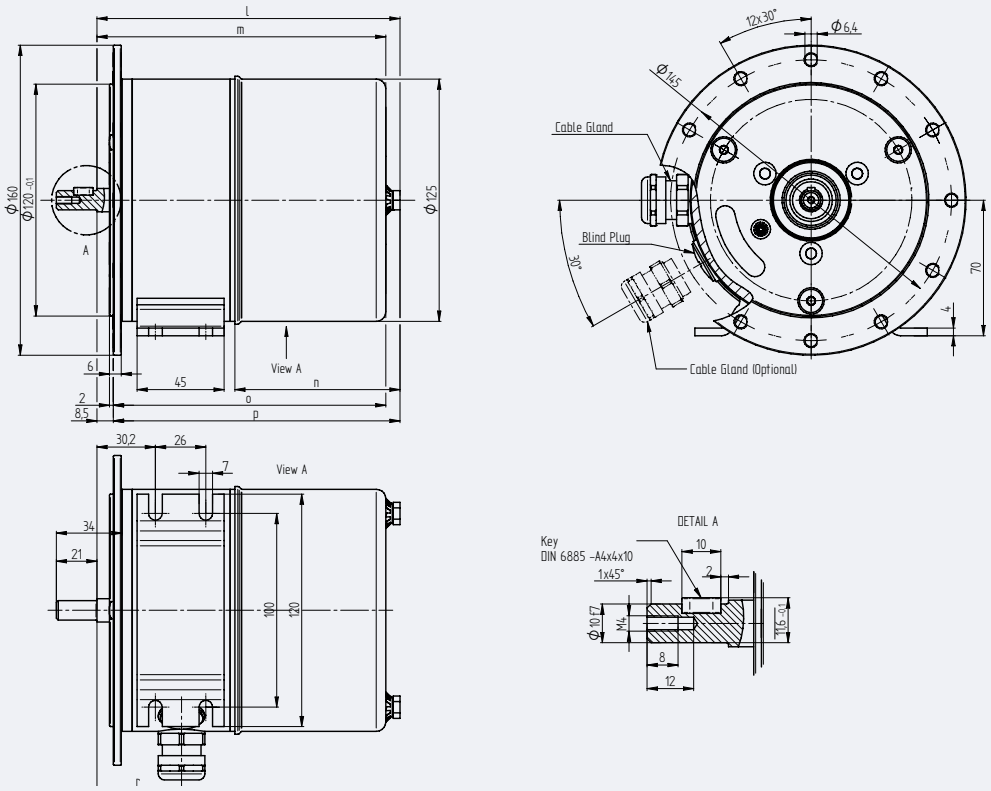
Size	1	1a	1b	1c	2	2a	2b	2c	3	3a	3b	3c	4	4a	4b	4c	5	5a	5b	5c
l	157	213	279	305	171	227	293	319	185	241	307	333	199	255	321	347	213	269	335	361
m	150	206	272	298	164	220	286	312	178	234	300	326	192	248	314	340	206	262	328	354
n	85	141	208	233	85	141	208	233	85	141	208	233	85	141	208	233	85	141	208	233
o	141,5	197,5	263,5	289,5	155,5	211,5	277,5	303,5	169,5	225,5	291,5	317,5	183,5	239,5	305,5	331,5	197,5	253,5	319,5	345,5
p	148,5	204,5	270,5	296,5	162,5	218,5	284,5	310,5	176,5	232,5	298,5	324,5	190,5	246,5	312,5	338,5	204,5	260,5	326,5	352,5
r	44	44	44	44	58	58	58	58	72	72	72	72	86	86	86	86	100	100	100	100
kg	2	2,7	4	4,7	2,2	2,9	4,2	4,9	2,4	3,1	4,4	5,1	2,6	3,3	4,6	5,3	2,8	3,5	4,8	5,5

Limit Switch Control Current

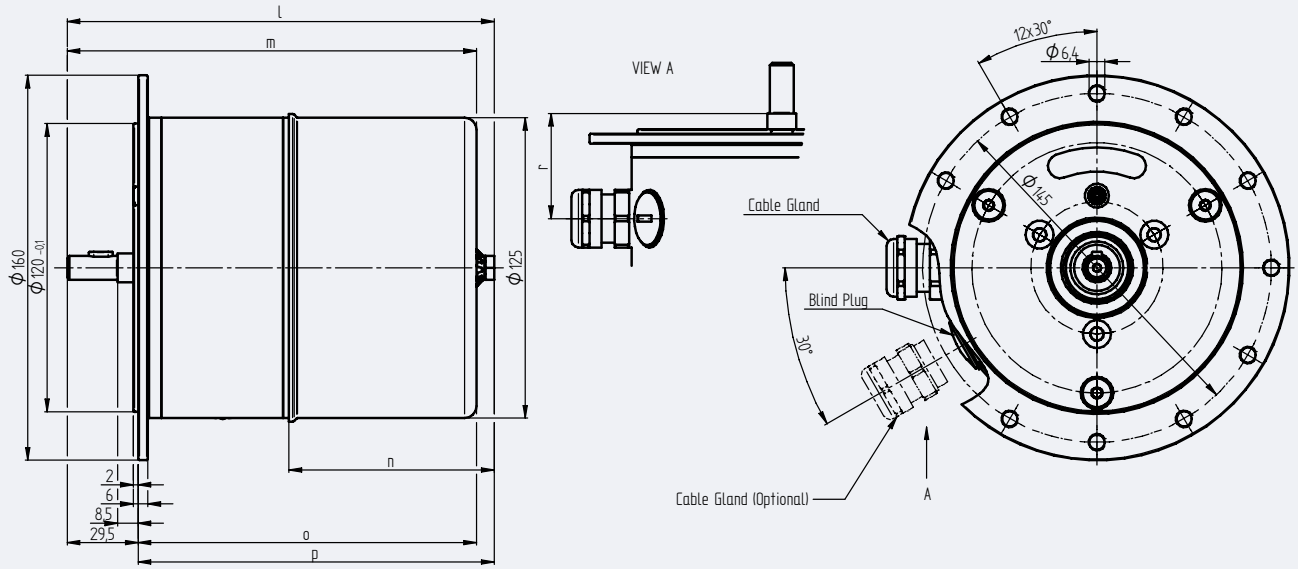
Series 100 – Steel Sheet Housing B3 / B5

Revision number: 3.1.3.3-01 **Revision date: 19.11.2019**

Steel housing B3/B5



Steel housing B5

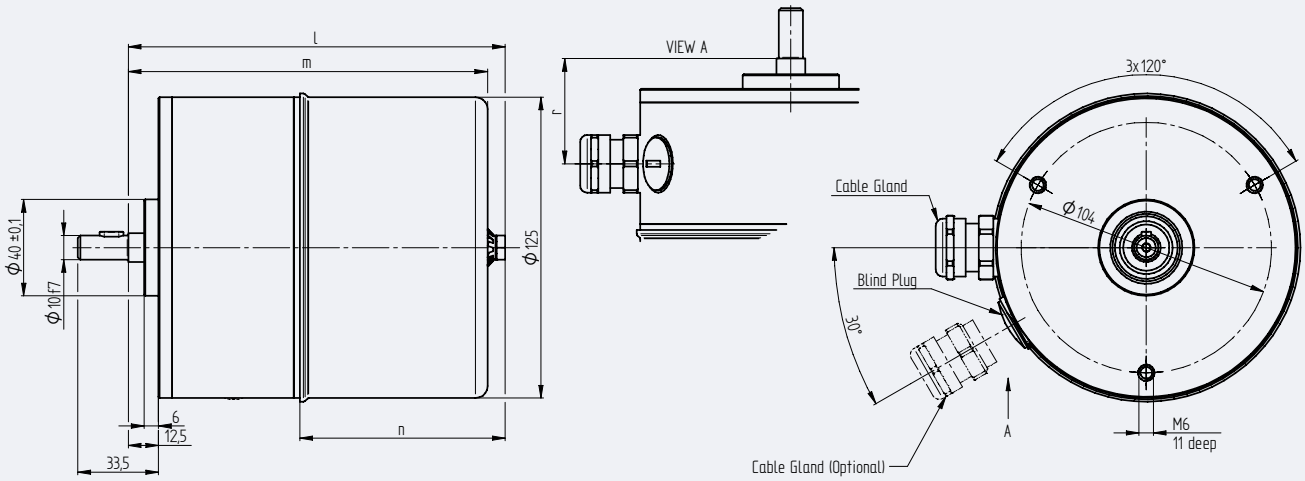


Limit Switch Control Current

Series 100 – Steel Sheet Housing B14

Revision number: 3.1.3.3-01 **Revision date: 19.11.2019**

Steel housing B14



Limit Switch Control Current

Series 100 – Cast Iron Housing B3

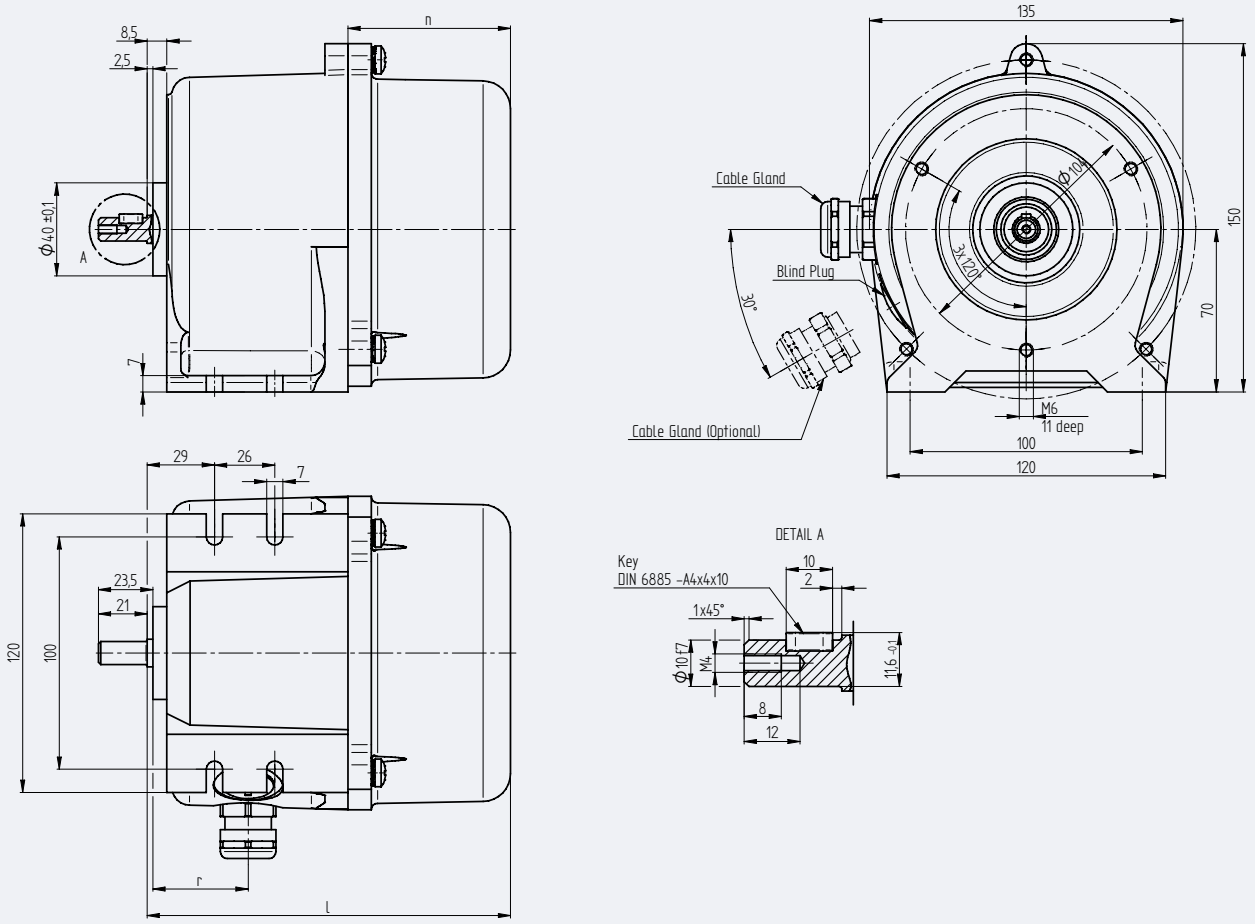
Revision number: 3.1.3.4-01 **Revision date: 19.11.2019**

Features
- IP66 cast iron housing foot mounted version B3
- Different kinds of housing sizes possible depending on gear and number of contacts

Application
- Crane on- and offshore
- Nuclear
- Steel works

Additional information
- For extreme rough environments
- Increased protection against corrosion through 2 component paint

Cast iron housing B3



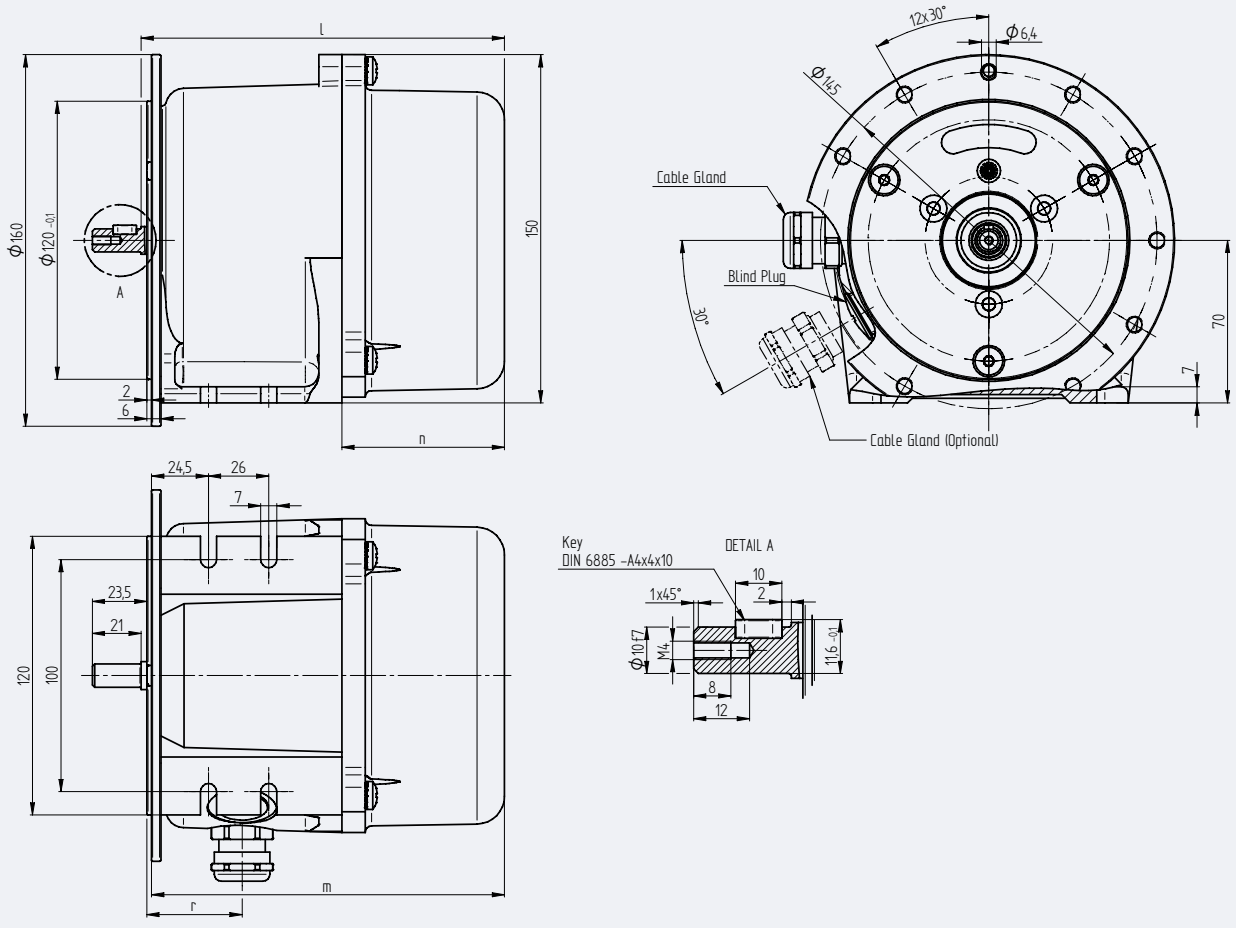
Size	1	1a	1b	1c	2	2a	2b	2c	3	3a	3b	3c
l	156,5	216,5	278	303	170,5	230,5	292	317	184,5	244,5	306	331
m	152	214,5	273,5	298,5	166	226	287,5	312,5	180	240	201,5	326,5
n	70	130	191,5	216,5	70	130	191,5	216,5	70	130	191,5	216,5
r	41	41	41	41	55	55	55	55	69	69	69	69
kg	5	5,3	5,6	5,8	5,45	5,75	6,05	6,,25	5,9	6,2	6,5	6,7

Limit Switch Control Current

Series 100 – Cast Iron Housing B3 / B5

Revision number: 3.1.3.4-01 **Revision date: 19.11.2019**

Cast iron housing B3/B5



Limit Switch Control Current

Series 110 – Polycarbonate Housing B3

Revision number: 3.1.3.5-01 **Revision date: 19.11.2019**

Features

- IP66 reinforced polycarbonate housing, foot mounted version B3
- Different kinds of sizes possible depending on number of contacts

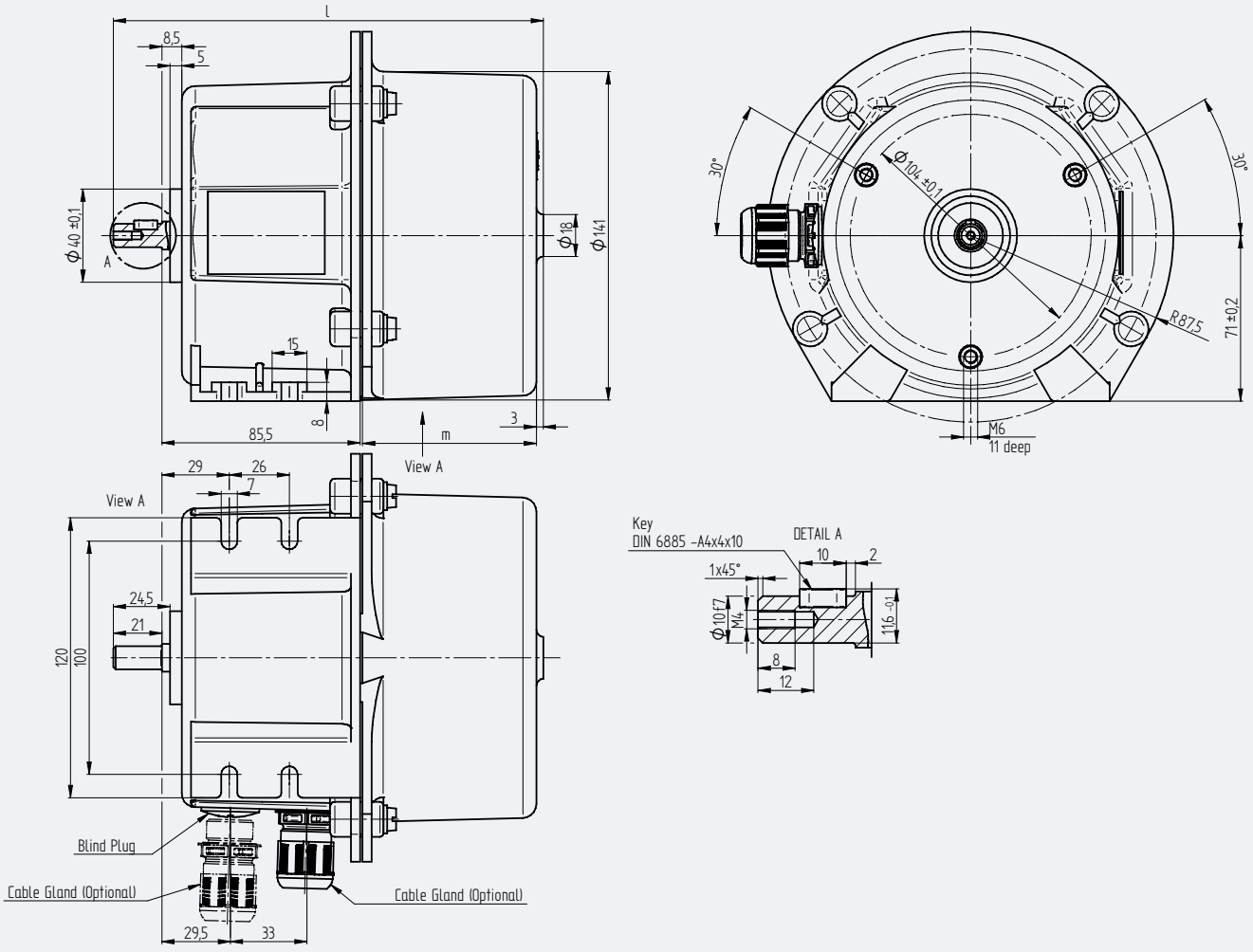
Application

- Crane on- and offshore
- Treatment plants

Additional information

- For rough environments
- High resistance against corrosion

Polycarbonate housing B3



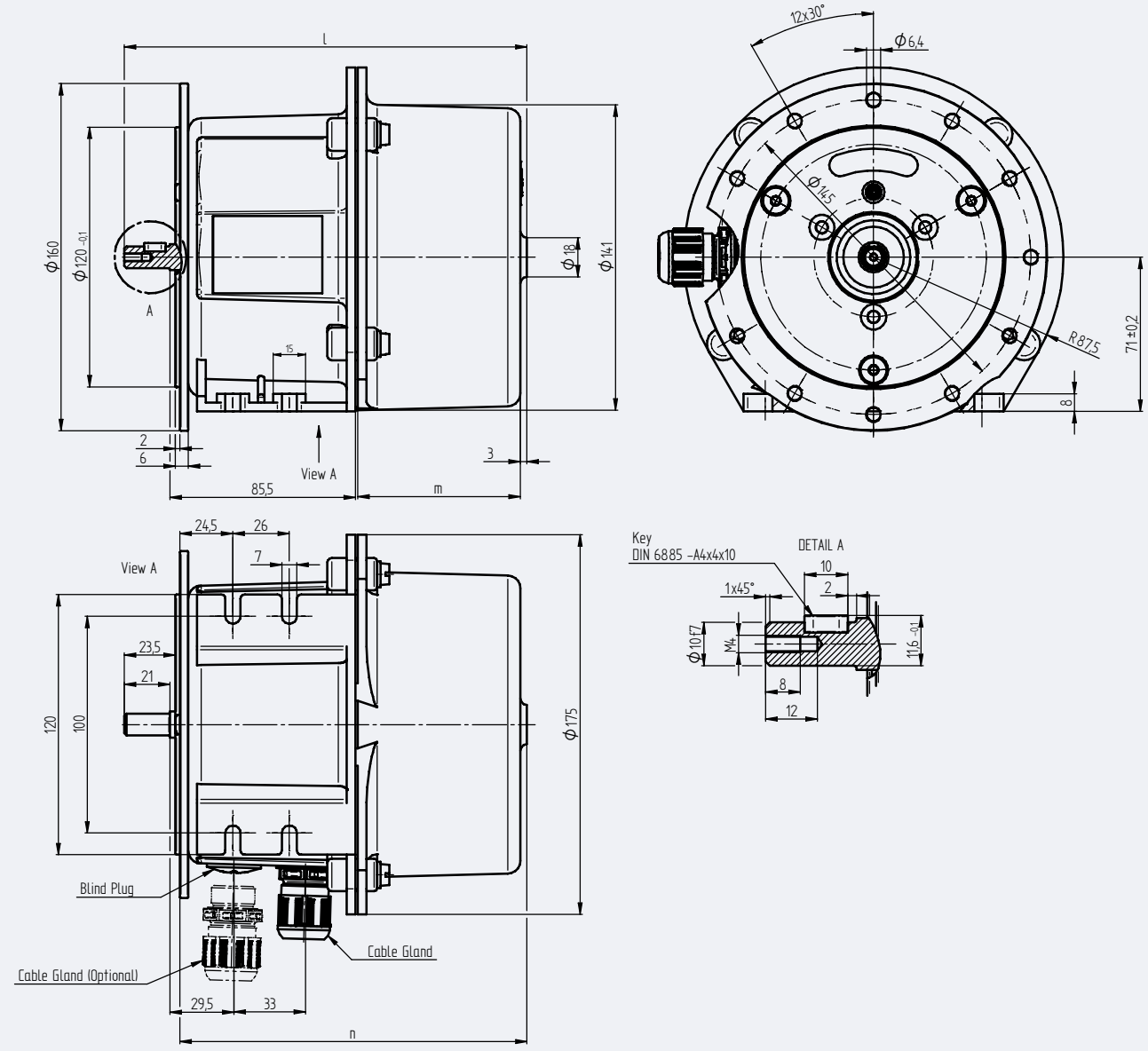
Size	a	b	c
l	185,5	250,5	310,5
m	75	140	200
n	160	225	285
kg	1,6	2	2,4

Limit Switch Control Current

Series 110 – Polycarbonate Housing B3 / B5

Revision number: 3.1.3.5-01 **Revision date: 19.11.2019**

Polycarbonate housing B3 / B5



Limit Switch Control Current

Series 100 – Lever Limit Switch

Revision number: 3.1.3.6-01 **Revision date: 19.11.2019**

Features

- Different type and number of contacts possible

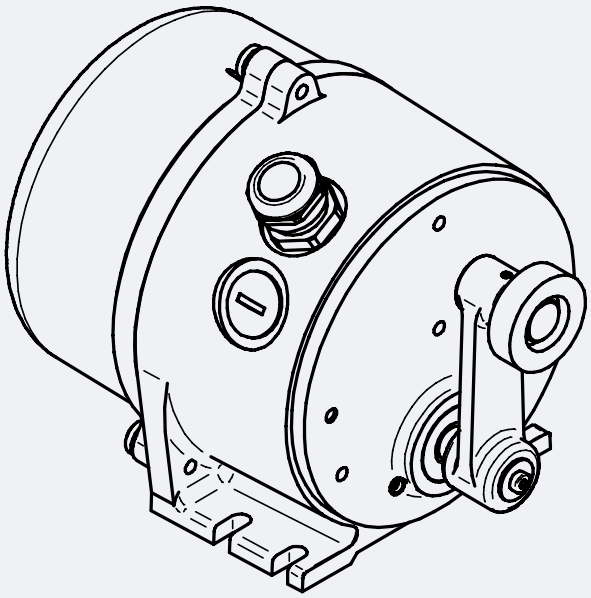
Application

- Cranes

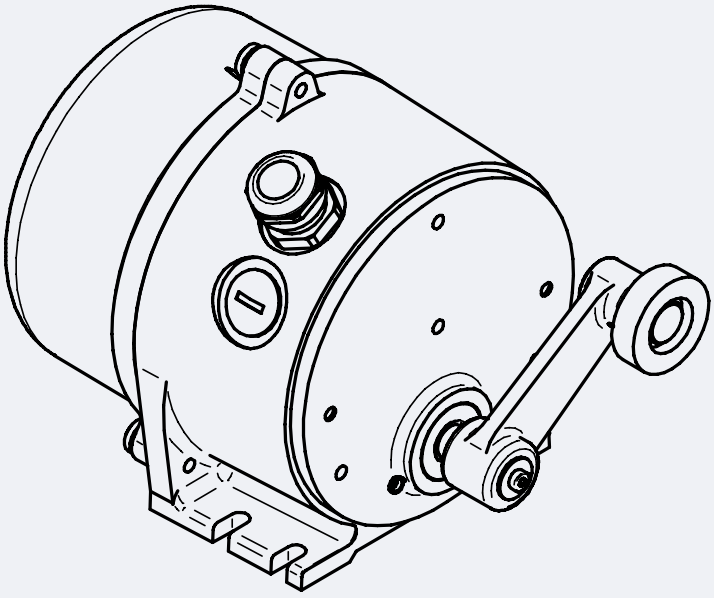
Additional information

- Actuation to both sides standard

Series 100 lever switch in neutral position



Series 100 lever switch in switched position



Limit Switch Control Current

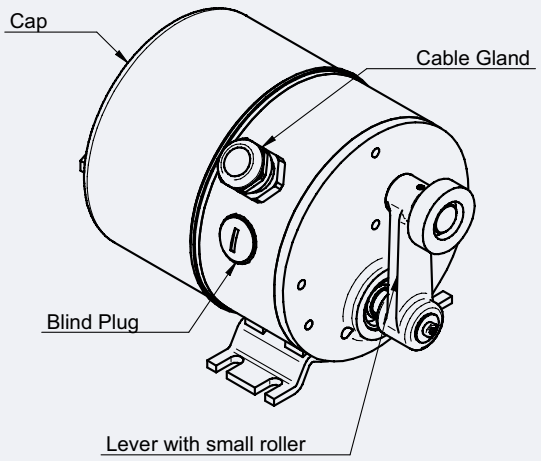
Series 100 – Available Levers

Revision number: 3.1.3.7-01 **Revision date: 19.11.2019**

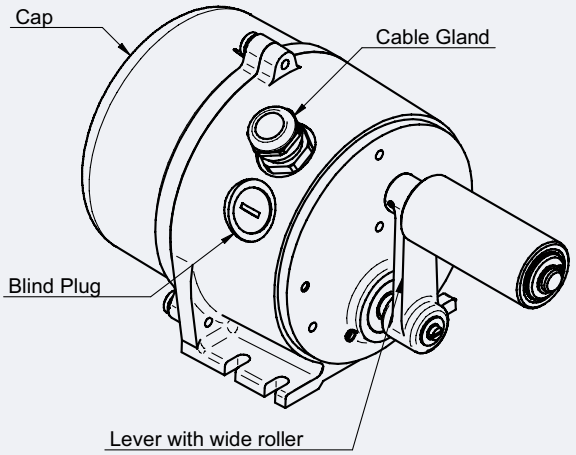
Features

- Execution with lever with roller or wide roller available

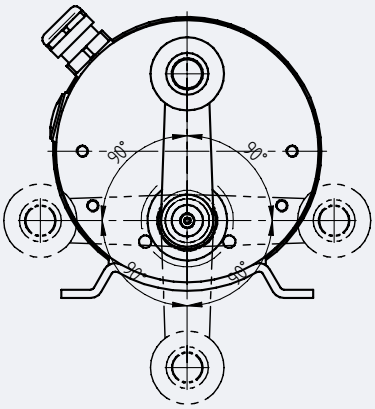
Steel sheet housing IP65



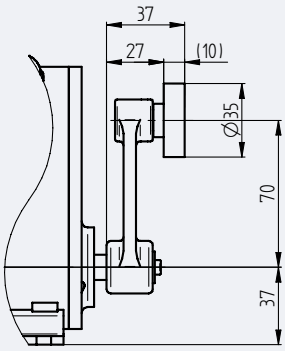
Cast iron housing IP66



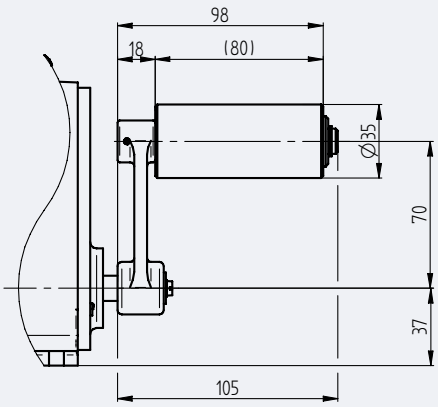
The Lever can be mounted every 90°



Dimensions small roller



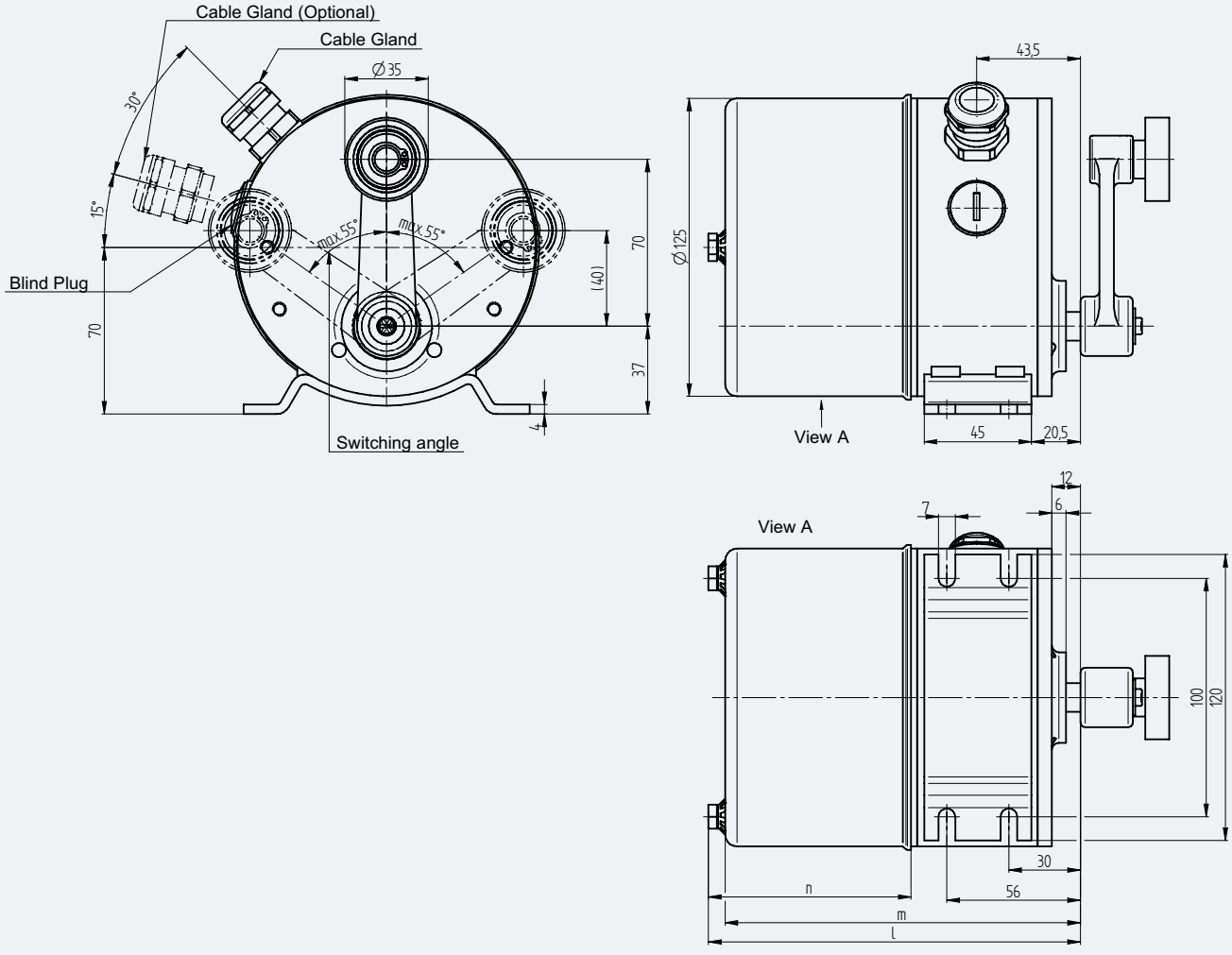
Dimensions wide roller



Limit Switch Control Current

Series 100 – Lever Limit Switch Steel Sheet Housing

Revision number: 3.1.3.8-01 **Revision date: 19.11.2019**

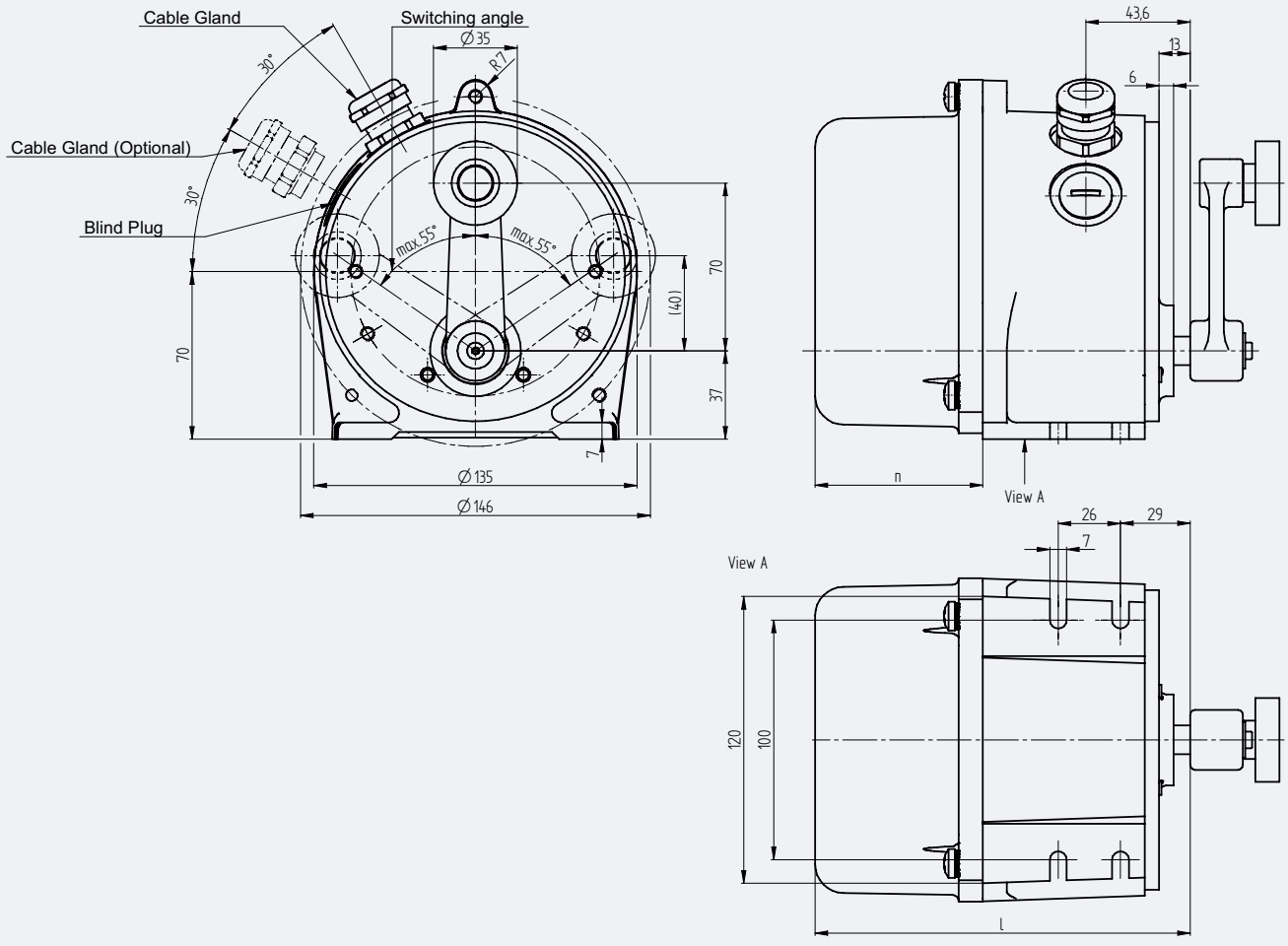


Size	1	1a	1b	1c
l	156	212	278	304
m	149	205	271	297
n	85	141	208	233
Max. number of contacts	4	8	12	14

Limit Switch Control Current

Series 100 – Lever Limit Switch Cast Iron Housing

Revision number: 3.1.3.9-01 **Revision date: 19.11.2019**



Size	1	1a	1b	1c
l	156,5	216,5	278	303
n	70	130	191,5	216,5
Max. number of contacts	4	8	12	14

Limit Switch Control Current

Series 100 – Counterweight Limit Switch

Revision number: 3.1.3.10-01 **Revision date: 19.11.2019**

Features

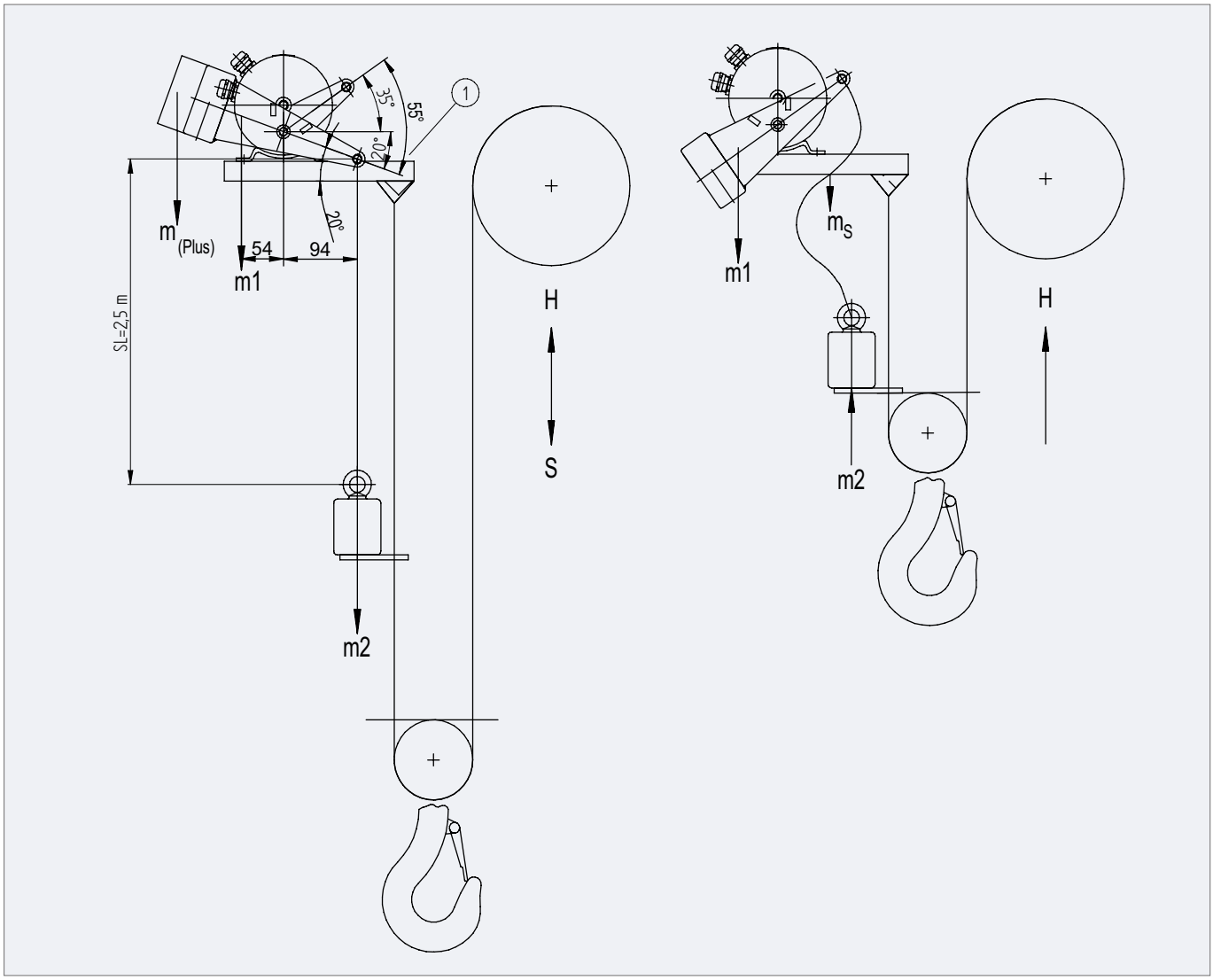
- Safety limit switch redundant additional to the geared cam limit switch for the emergency stop of the hook travel

Application

- Cranes onshore

Additional information

- Rope in different length available
- Rope reeving for different kind of rope diameter available

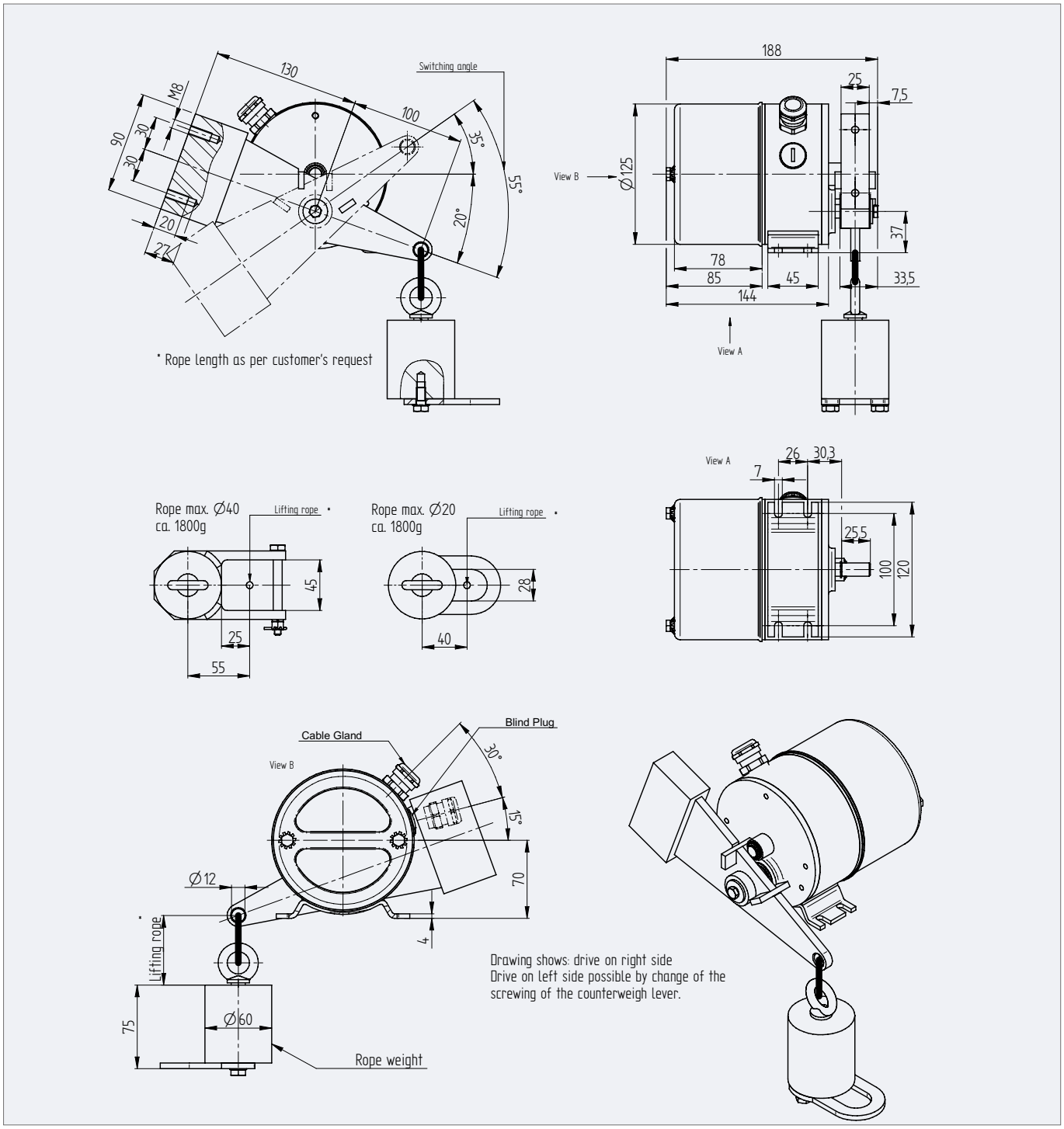


A	Normal operation Techn. condition: m1<m2
B	Emergency-stop shutdown Techn. condition: m1>ms
1	Switching angle
2	Hoist rope (d = 6 mm) rope length according to the castor run of the drive
H	Lift
m1	Counterweight lever
m2	Counterweight
m_s	Rope weight
$m_{(plus)}$	Additional weight
S	Lower

Limit Switch Control Current

Series 100 – Counterweight Limit Switch Steel Sheet Housing

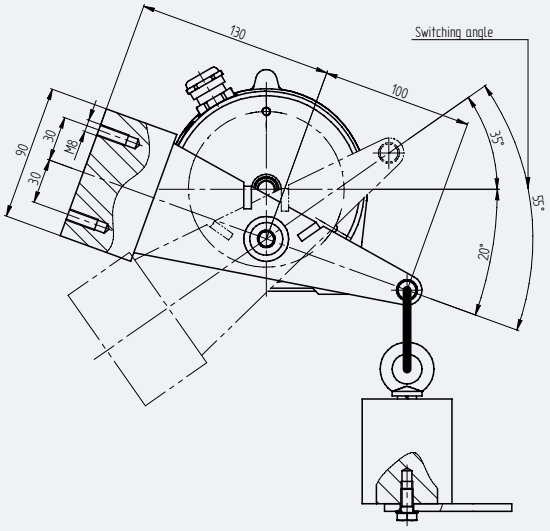
Revision number: 3.1.3.11-01 **Revision date: 19.11.2019**

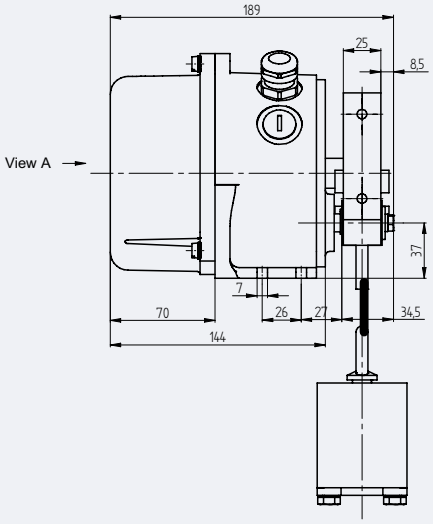


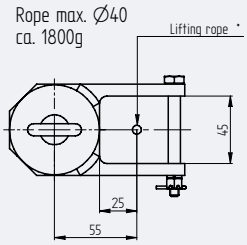
Limit Switch Control Current

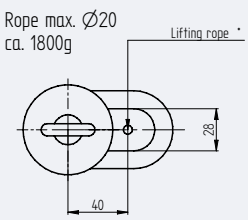
Series 100 – Counterweight Limit Switch Iron Cast Housing

Revision number: 3.1.3.12-01 **Revision date: 19.11.2019**

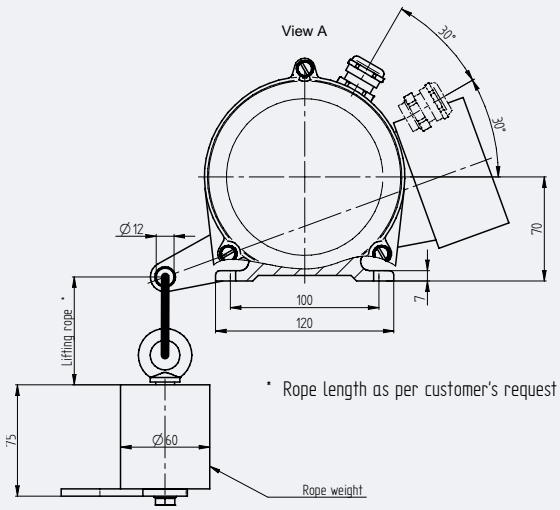




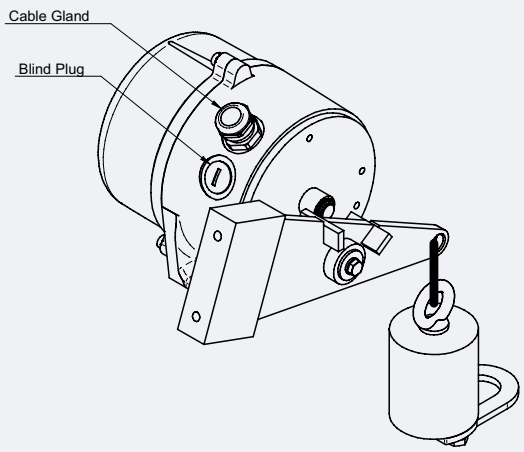




Drawing shows: drive on right side
Drive on left side possible by change of the screwing of the counterweigh lever.



* Rope length as per customer's request



Series 100 / 110 – Available Switches

Revision number: 3.1.3.13-02 **Revision date: 14.06.2021**

Features

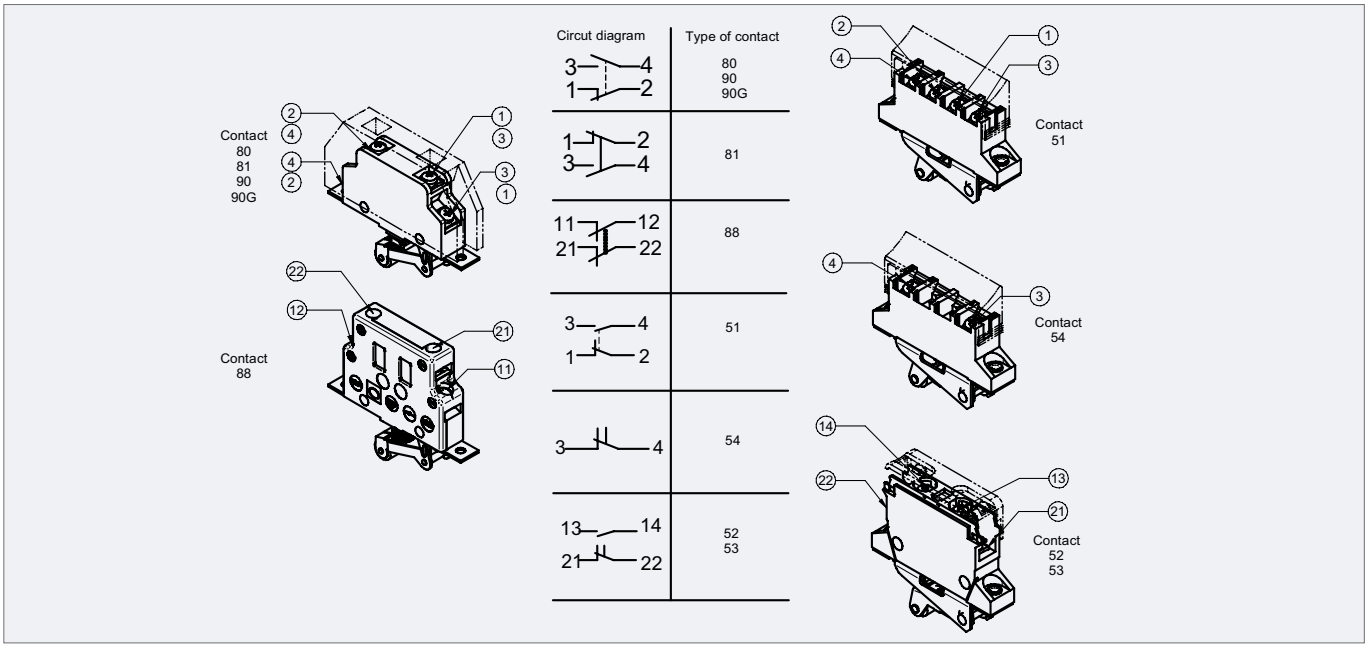
- Snap – and push action contacts available in silver and gold
- Galvanic isolated contacts possible
- Positive opening contacts available

Application

- For relais or PLC

Additional information

- Contact 52 and 53 usable for radioactive environment
- Contact 51 and 54 for temperature up to +120° Celsius



Switching contact			Contact material		Switching system		Connection	Electrical data					Additional data		
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC-Application)	Snap action switch	Push action switch	Screw terminals: 0,75 - 2,5 mm²/ AWG 14 ... 20	Utilization category acc. to IEC 60947	Conventional thermal current I_{th}	Rated Insulation Voltage U_i	Short circuit protection	Degree of Pollution	Mechanical Lifetime	Positive opening acc. to EN 60947-5-1 Annex K	Operating Temperature
51	•			•	•		•	AC–15: 230V, 2,5A DC-13: 24V, 4A	6A	250V	10A gL/gG	PD 2	30x106		-30°C ... +85°C *
52	•			•	•		•	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	6A gL/gG	PD 3	1x106	•	-30°C ... +85°C
53	•			•		•	•	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	6A gL/gG	PD 3	1x106	•	-30°C ... +85°C
54		•	•			•	•	AC–15: 230V, 2,5A DC-13: 24V, 1A	6A	250V	10A gL/gG	PD 2	30x106	•	-30°C ... +85°C *
80	•		•		•		•	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	6A gG	PD 3	10x106	•	-40°C ... +85°C
81	•		•			•	•	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	6A gG	PD 3	10x106	•	-40°C ... +85°C
90	•		•		•		•	AC–15: 230V, 1A DC-13: 110V, 0,5A	10A	400V	6A gR	PD 3	10x106	•	-40°C ... +85°C
90G	•			•	•		•	AC–12: 230V, 0,25A, DC-12: 110V, 0,25A	10A	400V	2A gG	PD 3	10x106	•	-40°C ... +85°C
88		•		•	•		•	AC–15: 230V, 1,5A DC-13: 24V, 1,5A	10A	400V	10A gG	PD 3	1,5x106	•	-40°C ... +85°C

* Up to +120°C in combination with high temperature type

Limit Switch Control Current

Series 100 / 110 – Cam Disc Types

Revision number: 3.1.3.14-01 **Revision date: 19.11.2019**

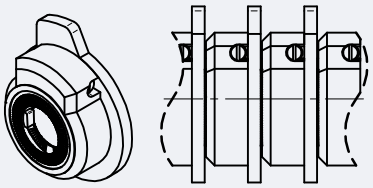
Features

- Easy adjustable cam discs via self-locking worm, gear ratio of 74
- Large cam disc diameter for high switching point accuracy

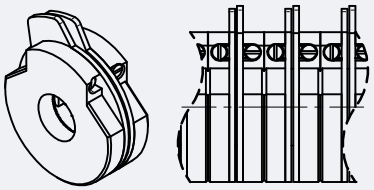
Additional information

- FV for normal application
- DFV for flexible adjustment of the cam angle
- DV for radioactive and high temperature application

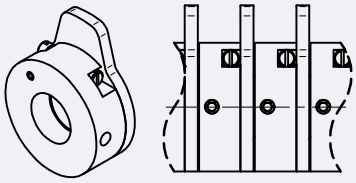
Cam disc FV



Cam disc DFV



Cam disc DV



Cam Disc Types	Standard Cam Angle	Special Cam Angel	Gradation Cam Angle	Disc Material
FV	40°	Other cam angles on request.	1°	Synthetic Material
DFV	40°		1°	Synthetic Material
DV	40°		1°	Brass

Limit Switch Control Current

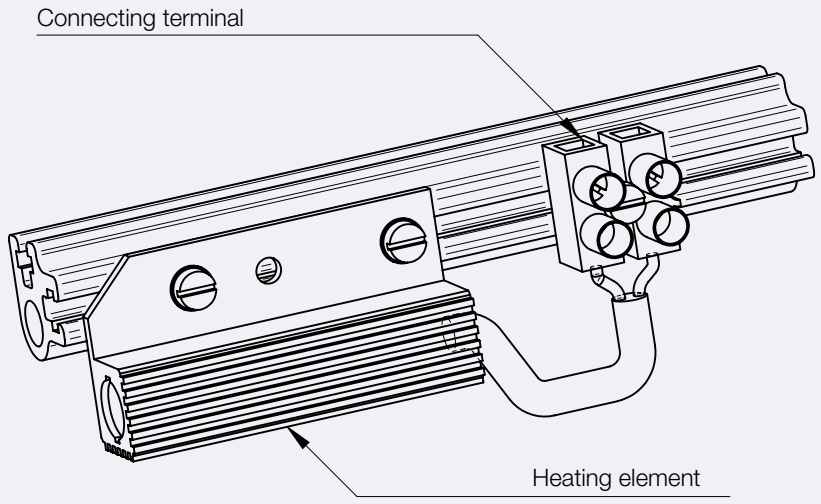
Series 100/110 – Option Anti-Condensation-Heating

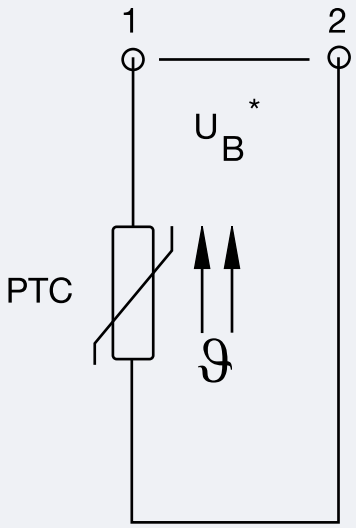
Revision number: 3.1.3.15-01 **Revision date: 19.11.2019**

Features
- Self-regulating PTC heating element

Application
- For anti-condensation to avoid water condensation within the geared cam limit switch

Additional information
- Additional safety for usage in low temperatures





Design	H1	H2
Supply Voltage UBB	12 – 36 V AC/DC	110 – 250 V AC/DC
Heat Output	ca. 2.5 Watts	ca. 4 Watts
PTC Cooling resistor (at 25 °C) R25	20 Ω ± 35 %	1500 Ω ± 35 %
PTC Reference temperature	50 °C	50 °C
Protection class (VDE 0100, 0160)	II	II
Connecting cable	2 x 0,25 mm², Silicon cable	2 x 0,25 mm², Silicon cable
Radiator	Anodised aluminum	Anodised aluminum
Weight	approx. 40 g	approx. 40 g

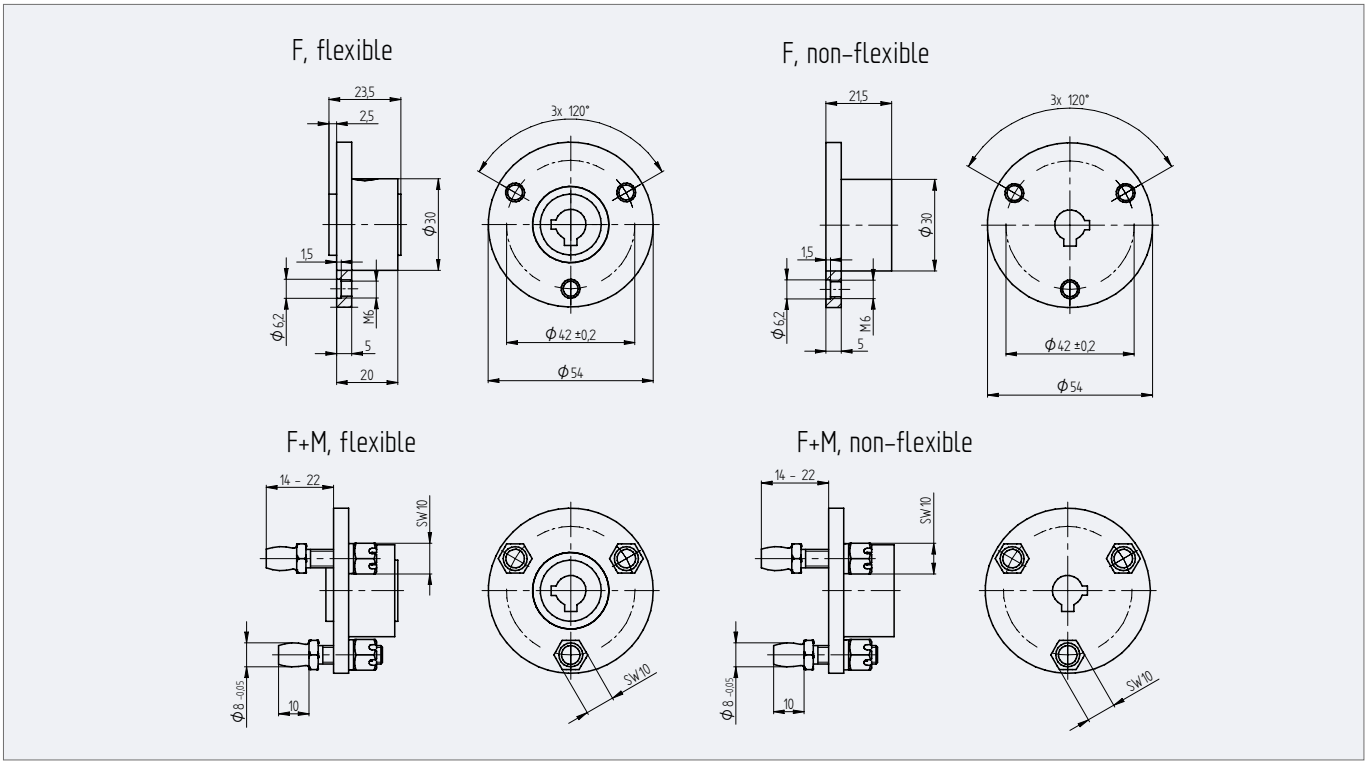
Limit Switch Control Current

Series 100 / 110 – Option Drive Flange F, F+M

Revision number: 3.1.3.16-01 **Revision date: 19.11.2019**

Features
- For easy connection to the machine

Application
- Cranes

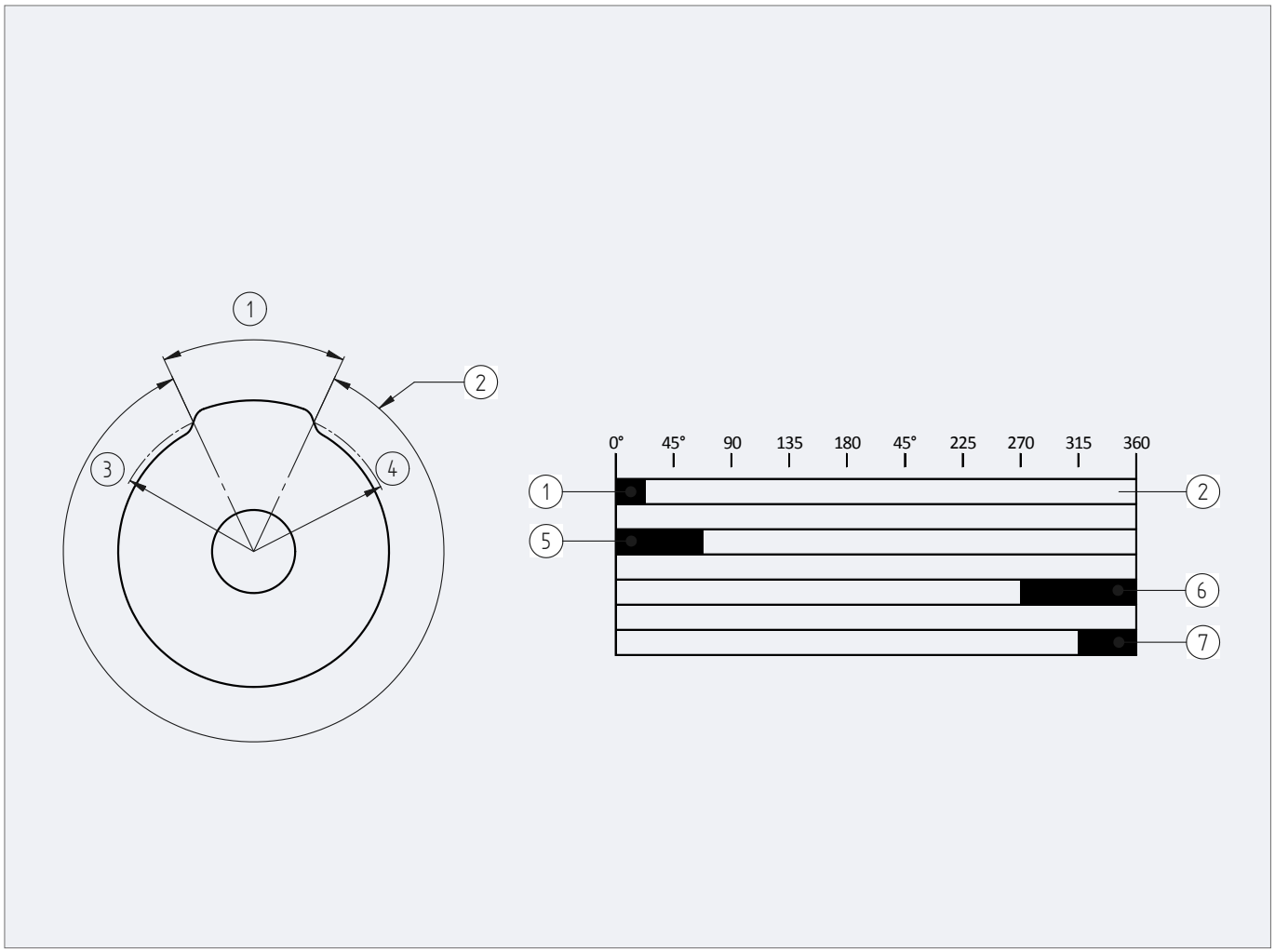


Flange	Type	Operating speed	Torsion angle (with a torque of 5 Nm)	Comment
F	flexible	nmax = 1000 rpm	5 ± 0.5°	not for Counterweight and Lever Switches
F	non-flexible	nmax = 1000 rpm	0°	not for Counterweight and Lever Switches
F+M	flexible	nmax = 1000 rpm	5 ± 0.5°	not for Counterweight and Lever Switches
F+M	non-flexible	nmax = 1000 rpm	0°	not for Counterweight and Lever Switches

Limit Switch Control Current

Series 100/110 – Customizable Cam Discs

Revision number: 3.1.3.17-01 **Revision date: 19.11.2019**



A	Cam angle diagram	B	Application examples
1	Effective cam angle α (=castor angle)	1	Effective cam angle 15°
2	Effective cam angle β	5	Effective cam angle 60°
3	Switching point radius	6	Effective cam angle 90°
4	Reset point radius	7	Effective cam angle 45°

The cam discs are named due to the effective cam angle. The effective cam angle corresponds to the switching point angle on the switching point radius of the cam disc. Standard cam angle for series 100/110 is 40°.

Any other cam angles (from 15° up to 345°) can be supplied as a special design upon request.
The usable revolutions enabled by a cam disc on the drive shaft, result in the following:

$$U = \frac{\beta * i}{360°} = \frac{(360° - \alpha) * i}{360°} = 1 - \frac{\alpha * i}{360°}$$

U = Usable revolutions
α = Effective cam angle
β = Usable cam angle (β = 360° – α)
i = gear ratio

Limit Switch Control Current

Series 100 – High Temperature & Radioactive Environment

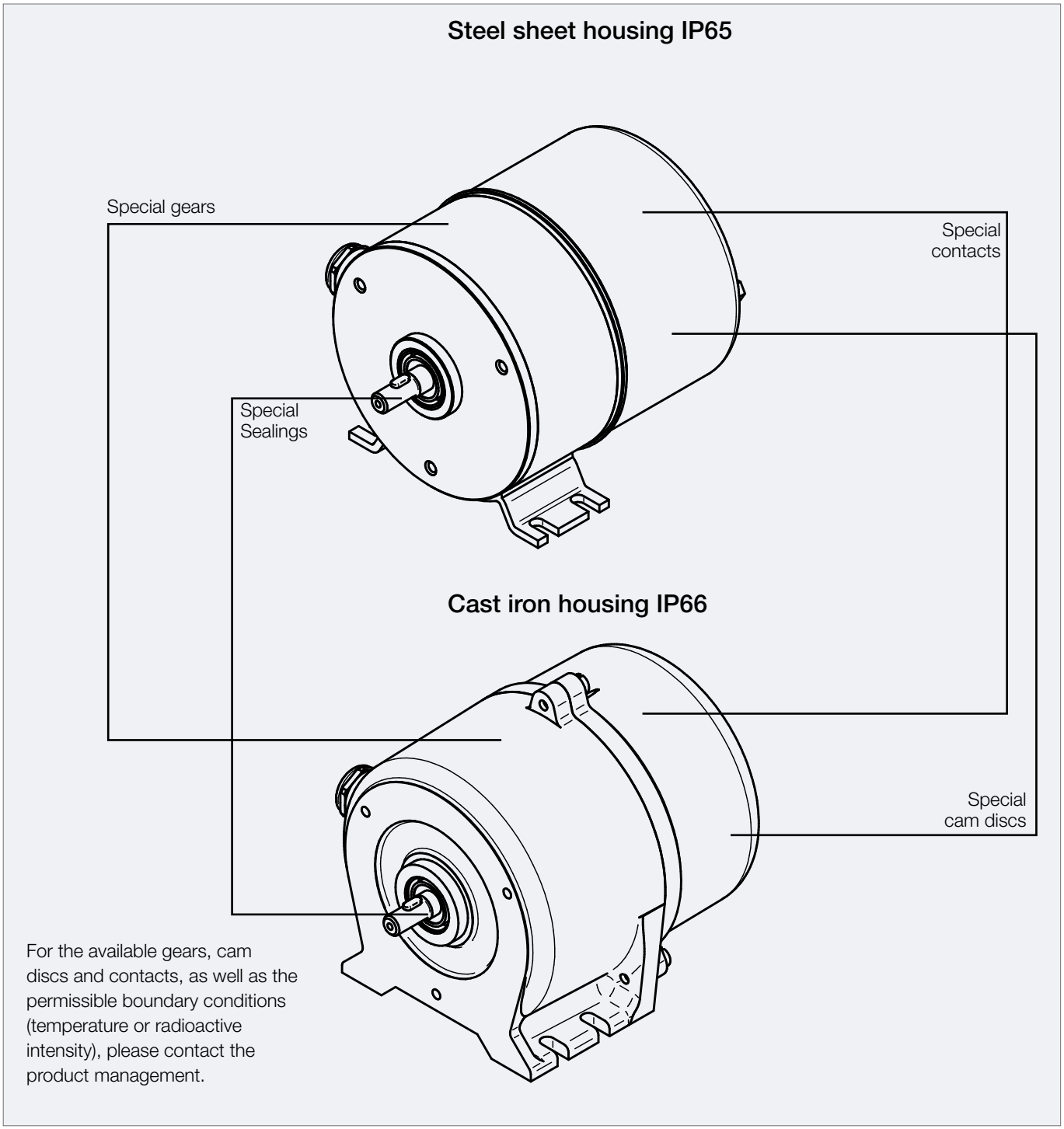
Revision number: 3.1.3.18-01 **Revision date: 19.11.2019**

Features

- Usable for temperatures up to + 120°C with contact 51 and 54
- Contact 52 and 53 for radioactive application

Additional information

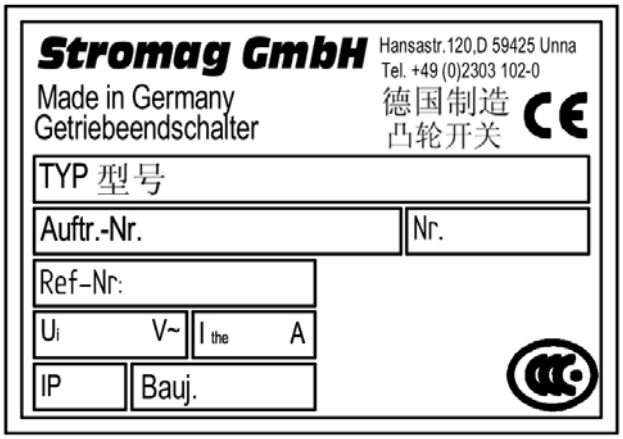
- Only cast iron housing for radioactive environment
- Radiation in gray has to be told to evaluate the usability



Limit Switch Control Current

Series 100/110 – Key of Types

Revision number: 3.1.3.19-01 **Revision date: 19.11.2019**



Switch type: GCLS Series 100/110			
100	Type of housing	100	Series 100 Limit Switch (metal housing)
		110	Series 110 Limit Switch (synthetic housing)
166	Usable revolutions	Suitable for GNE, HNE	0
		Suitable for 100/110	0.153, 0.45, 0.76, 0.91, 1; 1.69, 5, 6.4, 8.3, 16, 24, 37, 51, 92, 166,
			353, 420, 761, 1335, 1612, 3414, 5049, 7229, 15309
NE	Type of limit switch	NE	Geared Cam Limit Switch
		GNE	Counterweight switch
		HNE	Lever switch
4	Number of contacts fitted	110 (NE)	1 - 12
		100 (NE)	1 - 14
		100 (GNE, HNE)	1 - 4
51	Type of contacts fitted	80	Contact (changeover) with screw connections, contact material: Silver Ü
		81	Contact (push action) with screw connections, contact material: Silver Ü
		88	Contact (double action) with screw connections, contact material: Gold Ü
		90	Contact (changeover) with screw connections, contact material: Silver Ü
		90G	Contact (changeover) with screw connections, contact material: Gold Ü
		51	Snap-action with screw-terminals, contact material: gold
		52	Contact (changeover) with screw connections, contact material: Gold Ü
		53	Contact (push action) with screw connections, contact material: Gold Ü
FV	Type of cam discs fitted	FV	Precise adjustable points of actuation
		DV	Adjustable points of actuation, cam material: Brass
		DFV	Precise, double-adjustable points of actuation

Limit Switch Control Current

Series 100 – Special Type ATEX

Revision number: 3.1.3.20-01 **Revision date: 19.11.2019**

ATEX marking

II 2G Ex h IIC T4 Gb	<-- Marking for gas atmosphere
II 2D Ex h IIIB T125°C Db	<-- Marking for dust atmosphere
II 3D Ex h IIIB T125°C Dc	<-- Marking for dust atmosphere

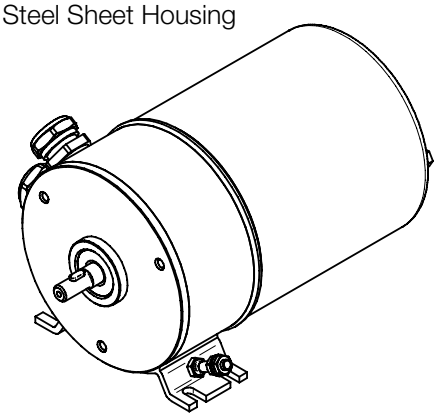
Explanation of markings

II	Group II, devices for use above ground
2G/2D/3D	2G: Device category (for use in Zone 1 and 2)
	2D: Device category (for use in Zone 21 and 22)
	3D: Device category (for use in Zone 22)
h	Type of protection h, protection constructional safety "c" (EN 80079-37)
IIC/IIIB	Gas group IIC (includes group IIB and IIA) Dust group IIIB, non-conductive dust (includes group IIIA)
T125°C	Maximum permitted surface temperature
Gb/Db/Dc	Equipment protection level (EPL) as per EN 80079-36

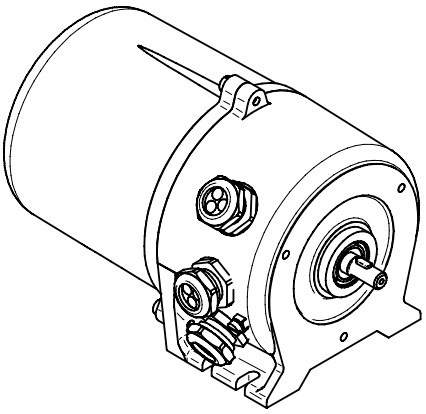
Technical details

Temperature range:	-20°C to 60°C
	-40°C to 60°C (Cold Climate Version)
Number of contacts:	1-8 Contacts
IP Protection class:	IP64: Steel Sheet Housing
	IP66: Cast Iron Housing
Rotation speed:	max. 1500 rpm (depending on chosen gear reduction)

Steel Sheet Housing



Cast Iron Housing



Available Switches for device categories 2G, 2D and 3D

Switching contact			Contact material		Switching system		Connection	Electrical data				Additional data		
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC-Application)	Snap action switch	Push action switch	Cable; with wires 0,75 mm²	Utilization category acc. to IEC 60947	Conventional thermal current I^{th}	Rated Insulation Voltage Ui	Short circuit protection	Mechanical Lifetime	Positive opening acc. to EN 60947–5–1 Annex K	Operating Temperature
EX	•		•		•		•	AC–15: 400V, 2A DC-13: 250V, 0,15A	5A	400V	*1	2x106		-40°C … +60°C *
EXZ		•	•			•	•	AC–15: 400V, 2A DC-13: 250V, 0,15A	5A	400V	*1	2x106	•	-40°C … +60°C

*1) The short-circuit protection for the EX and EXZ contacts must be designed according to the information in the EC Type Examination and the output of the user.

Switches for device category 3D: AI standard switches (see chapter 3.1.3.13)

Limit Switch Control Current

Series 100/110 – Encoder device

Revision number: 3.1.3.21-01 **Revision date: 19.11.2019**

Features

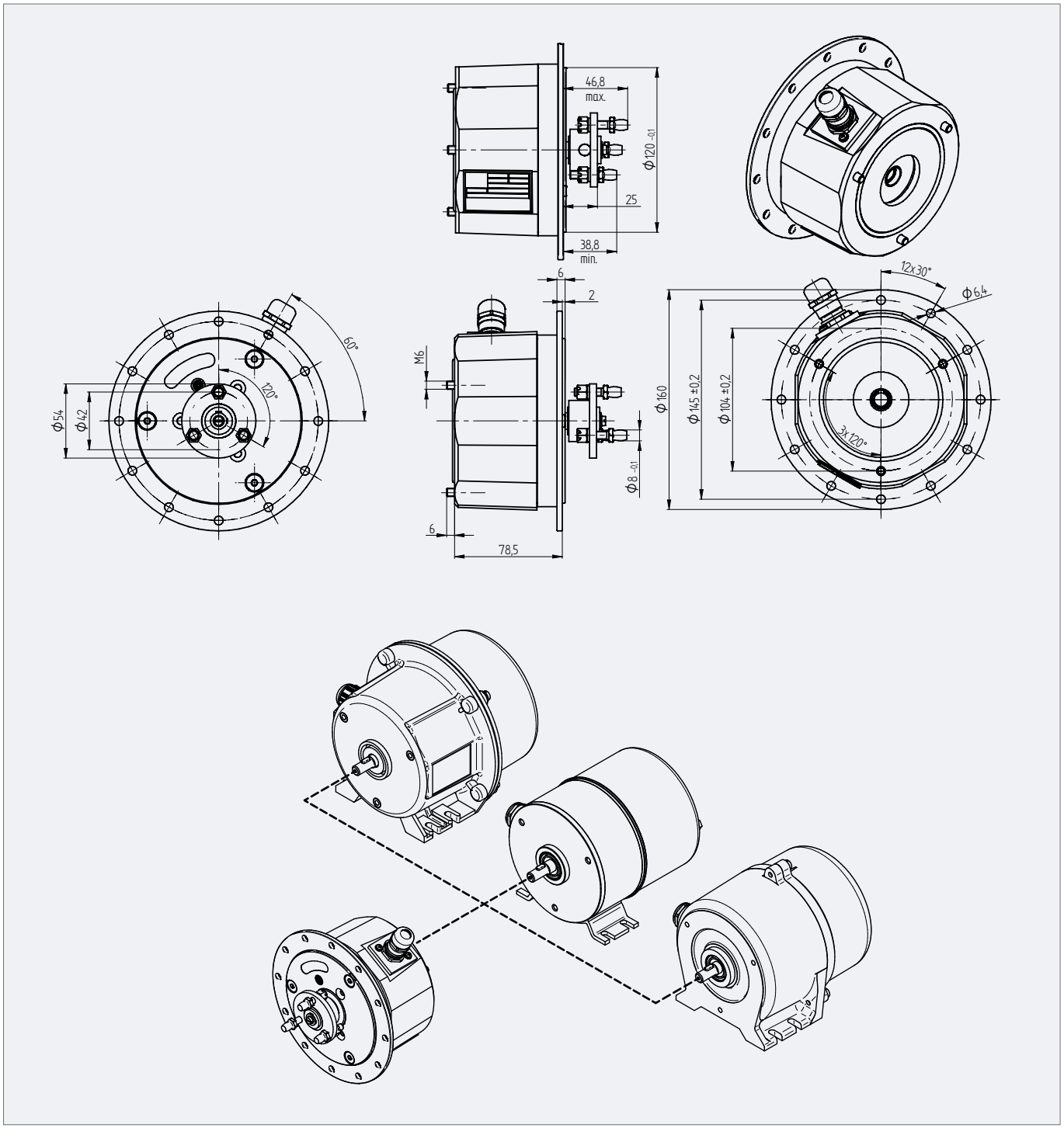
- Additional housing for installation of special hollow shaft multiturn encoders

Application

- Cranes

Additional information

- No standard application. Please contact our Product Management Department info@stromag.com



Limit Switch Control Current

Series 100 / 110 – Option: Analog Encoder

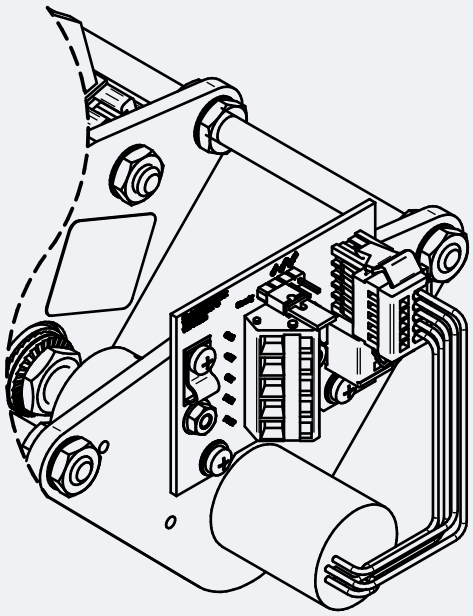
Revision number: 3.1.3.22-01 **Revision date: 19.11.2019**

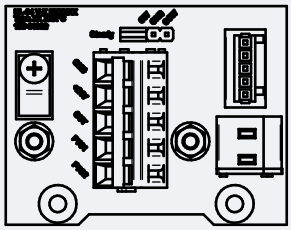
Features

- Singleturn absolute encoder up to 12 Bit
- Turns synchronously with the cam discs

Application

- For measurement of the absolute position





Connector	
Multi-stranded conductor	0.08 … 2.5 mm² / 28 … 12 AWG
Fine-stranded conductor	0.08 … 2.5 mm² / 28 … 12 AWG
With end sleeve	0.25 … 1.5 mm²
Strip length	5 … 6 mm / 0.2 … 0.24 Inch

Pin Assignment	
GND	Ground
+24 V	Supply voltage
Out	Output signal
PTC1	For optional PTC-heating
PTC2	For optional PTC-heating

Technical data	Current output	Voltage output
Drive	Coupling „N“ (1:1 with cam discs)	Coupling „N“ (1:1 with cam discs)
Measuring range*	360°	360°
Output Signal	4 … 20 mA	0 … 10 V
Turning direction	programmable	programmable
Resolution	14 Bit	14 Bit
Indep. Linearity	± 0.1 % of measuring range	± 0.1 % of measuring range
Supply Voltage	18 … 35 V DC	18 … 35 V DC
Current consumption without load (typ.)	20 mA	20 mA
Ohmic load at output	0 … 500 Ohm	> 10 kOhm
Max. capacitive load at output	100 nF	100 nF
Lifetime	360 mio. movements	360 mio. movements
Operating Temperature	-40°C … +85 °C	-40°C … +85 °C

* Referring to encoder shaft

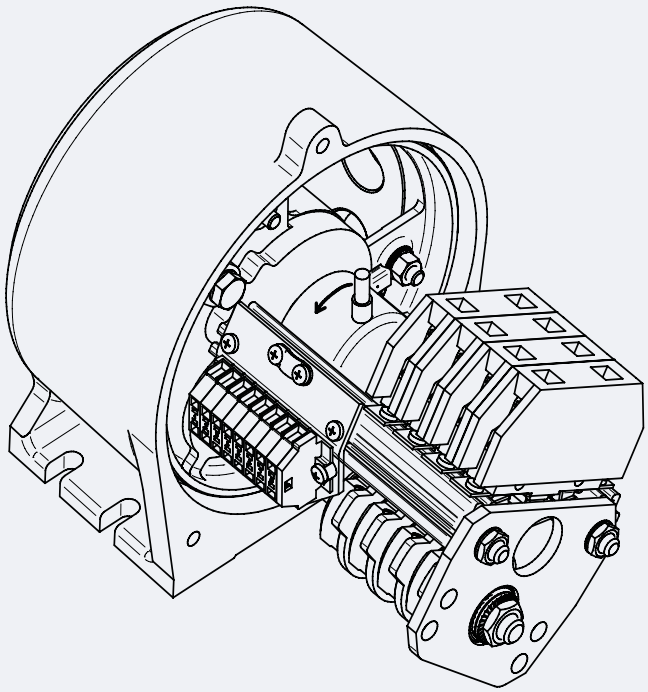
Limit Switch Control Current

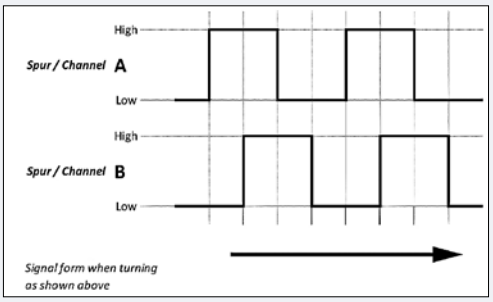
Series 100/110 – Option: Incremental Encoder

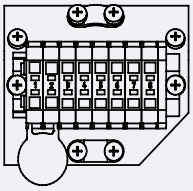
Revision number: 3.1.3.23-02 **Revision date: 14.06.2021**

Features
- Up to 3600 increments available
- Turns synchrously with the drive shaft

Application
- For measuring of position and speed

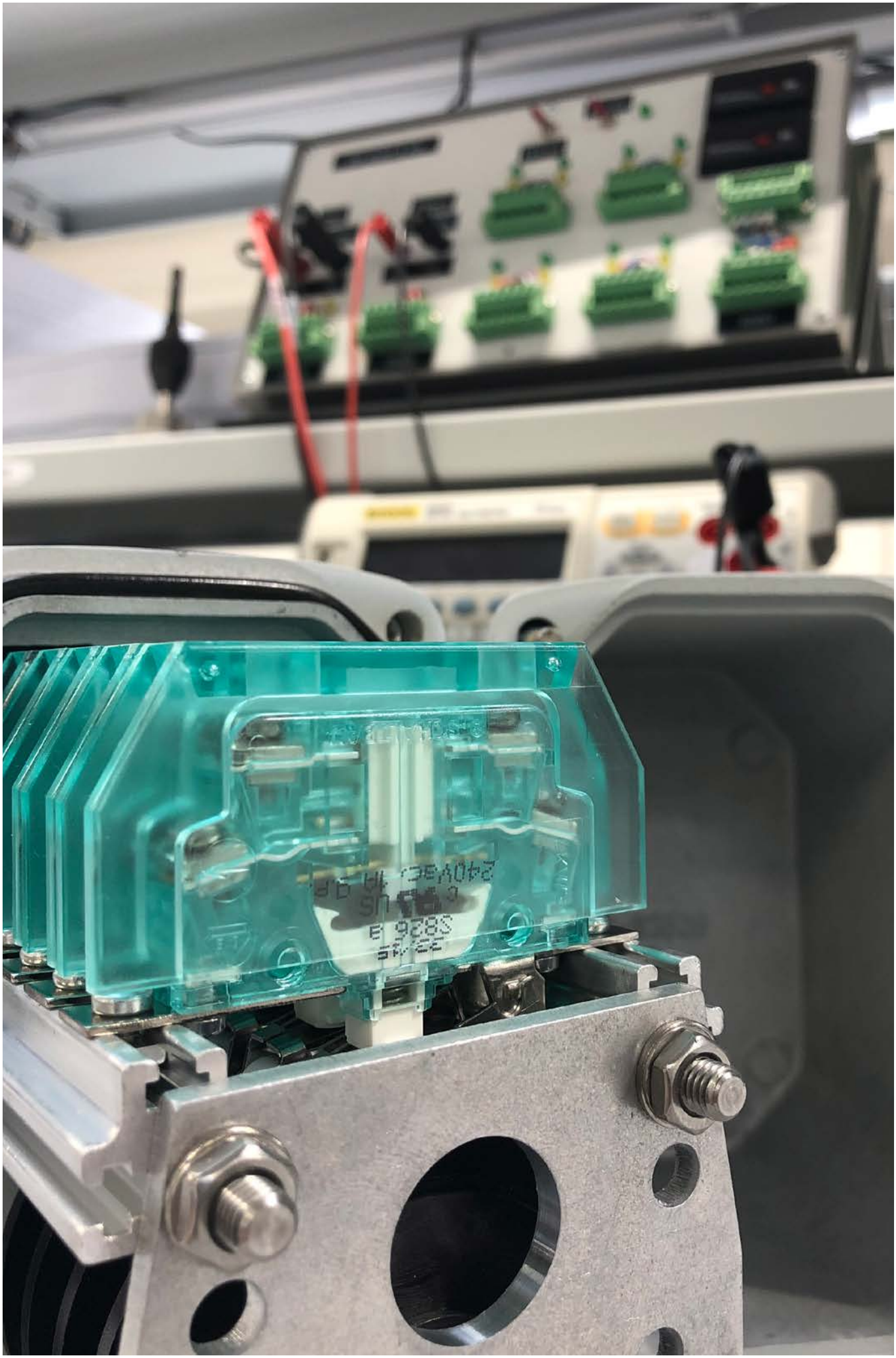






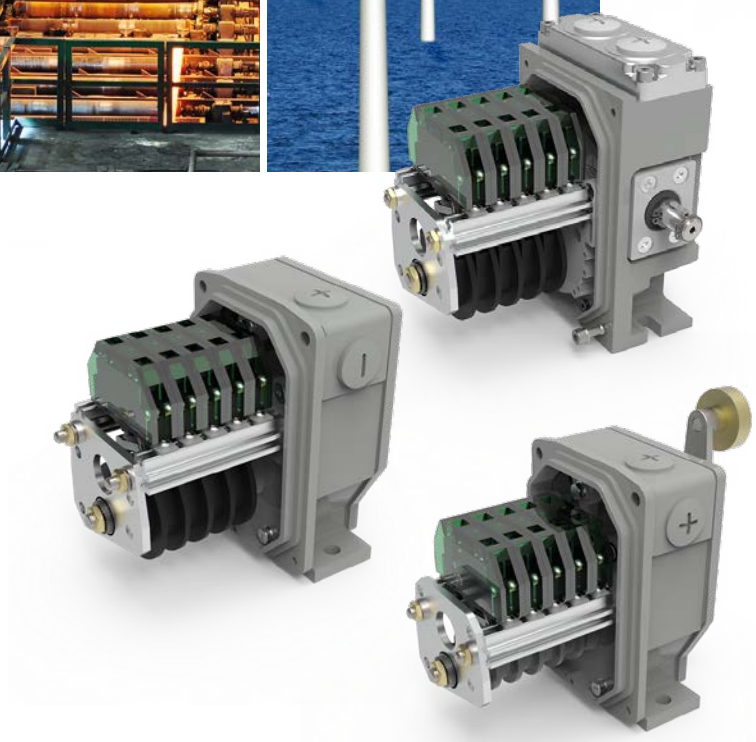
Technical Data	RS422	Push-Pull
Power Supply UB	5 V ± 5% or 8…30 V	8 … 30 V DC
Pulses / 360°	5 … 3600	
Power consumption (without load)	Typ. 40 mA Max. 90 mA	< 40 mA
Permissible load	± 20 mA	± 50 mA
Signal level „high“	> 2,5 V	> Vcc - 3 V
Signal level „low“	< 0,5 V	< 2,5 V
Max. frequency	300 kHz	200 kHz
Operating temperature	-40°C … +85 °C (5…1024 pulses)	
	-30°C … +85 °C (>1024 pulses)	

Assignment	Pin	Color
Ground	1	white
Supply-Voltage VCC	2	brown
A - Signal	3	green
B - Signal	4	yellow
0 - Signal	5	gray
A-Inv. - Signal	6	pink
B-Inv. - Signal	7	blue
0-Inv. - Signal	8	red

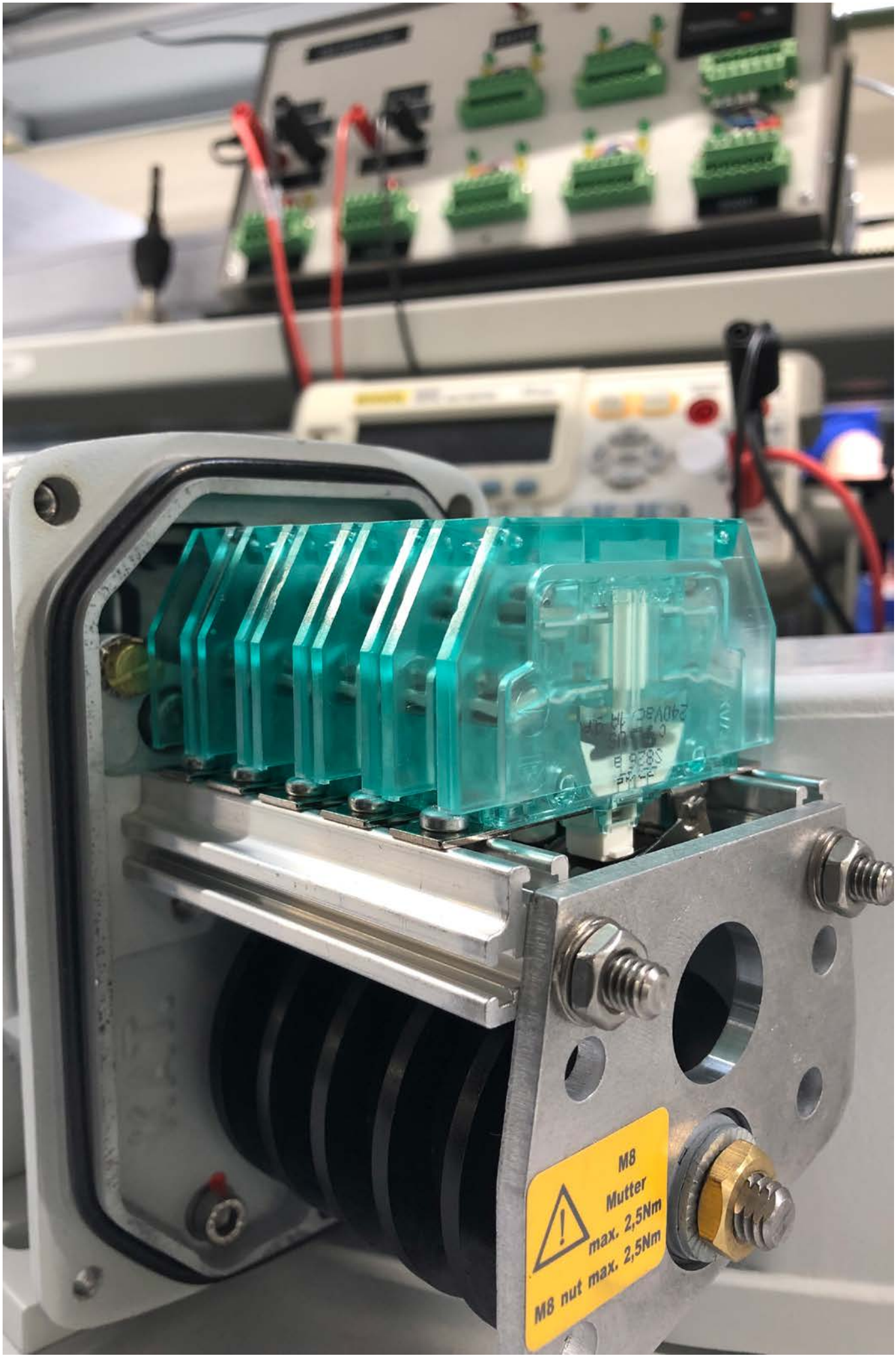


ALTRA MOTION

Series HGE / HEG / HHEV
Geared Cam Limit Switches



Stromag®
Altra Industrial Motion


M8
Mutter
max. 2,5Nm
M8 nut max. 2,5Nm

CONTENT

Catalog Series HGE / HEG / HHEV: **IV**

AT A GLANCE

STROMAG SERIES HGE / HEG / HHEV

BENEFITS INCLUDE

- HGE for tight installations (in axial directions)
- Drive of incremental and absolute encoders possible
- Up to 16 contacts
- HEG und HHEV up to 8 contacts

Series HGE – Worm Gear Limit Switch

Revision number: 3.1.4.1-01 **Revision date: 19.11.2019**

Features

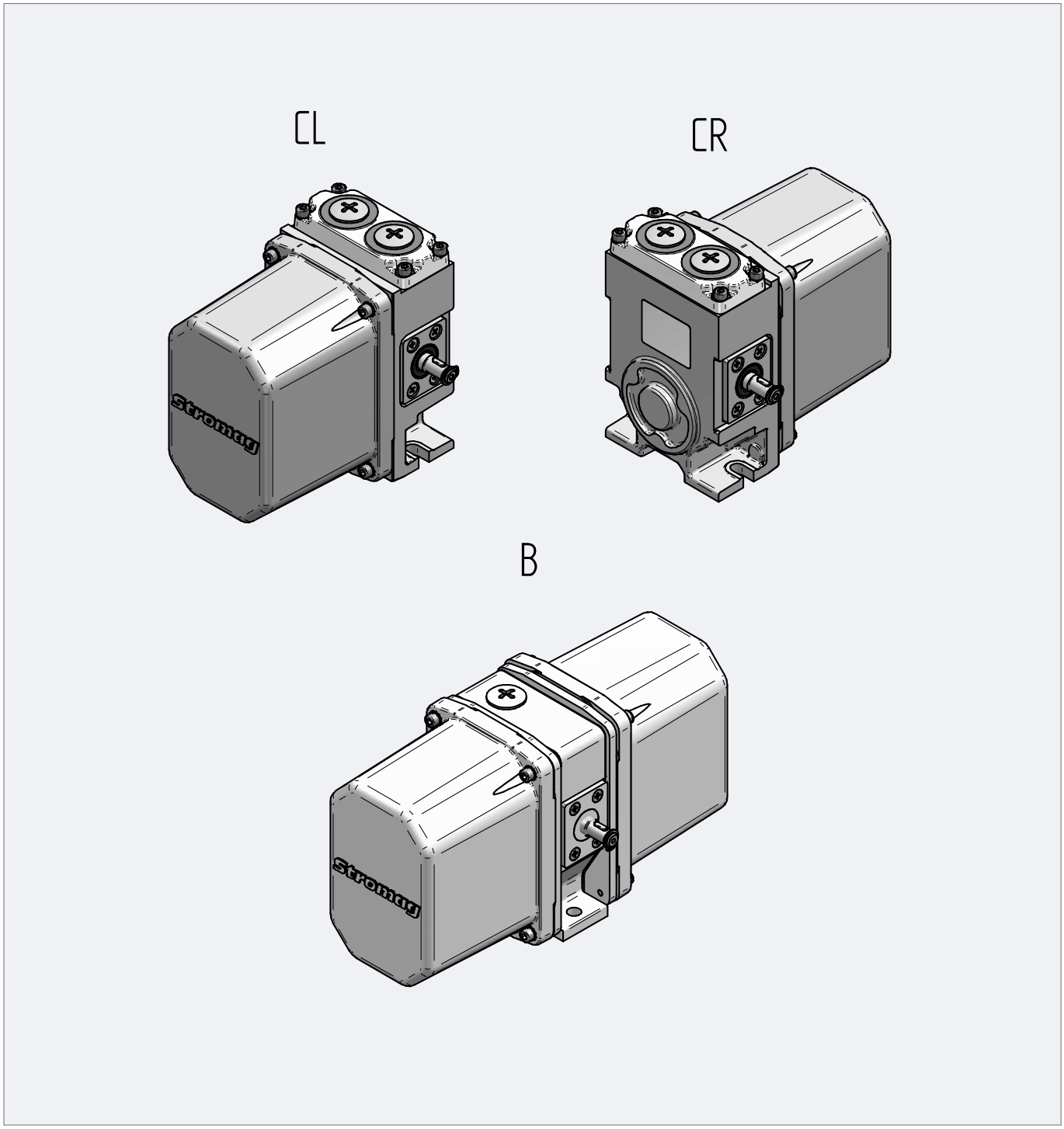
- Sea water resistant aluminum housing protection IP65
- Contact spaces on the left, on the right or on both sides possible

Application

- Crane
- Wind
- Steel works

Additional information

- For tight installations (especially in axial direction)
- Assembly of incremental or absolute multiturn possible



Series HGE / HEG / HHEV Limit Switches

Series HGE – Gear Data

Revision number: 3.1.4.2-01 **Revision date: 19.11.2019**

Features

- Designed as worm or worm spur gear
- All gear parts made of metal with life-time lubrication

Additional information

- 345, 460 and 715 are special gears on request

I) Gearbox - for contacts 80, 81, 88, 90, 90G with cam discs 40° FV70											
Nominal revolutions	Usable revolutions with 40° cam disc	Gear ratio i	Castor revolutions of the drive shaft after each side	Mechanical Hysteresis [revolution at drive shaft]		Max. input speed [min^{-1}]	Min. input speed for alternating operation [min^{-1}]			Min. drive torque for switching an individual contact [Nm]	Max. drive torque for forced opening of an individual contact [Nm]
				Contact			Contact				
				80, 90, 90G	88		80, 81	90, 90G	88		
9,5	10,67	12,000	1,333	0,073	0,097	250	3,638	1,819	0,364	0,20	0,371
18	18,29	20,571	2,286	0,125	0,166	250	6,236	3,118	0,624	0,20	0,300
22	22,40	25,200	2,800	0,154	0,203	250	7,639	3,820	0,764	0,20	0,281
29	29,64	33,344	3,705	0,203	0,269	250	10,108	5,054	1,011	0,20	0,261
35	44,44	50,000	5,556	0,305	0,403	500	15,158	7,579	1,516	0,10	0,141
70	76,19	85,714	9,524	0,523	0,691	500	25,984	12,992	2,598	0,10	0,124
85	93,33	105,000	11,667	0,640	0,846	500	31,831	15,915	3,183	0,10	0,120
100	107,25	120,652	13,406	0,736	0,972	500	36,576	18,288	3,658	0,10	0,117
115	123,50	138,933	15,437	0,847	1,120	750	42,118	21,059	4,212	0,10	0,115
155	155,56	175,000	19,444	1,067	1,410	750	53,052	26,526	5,305	0,10	0,112
180	194,18	218,449	24,272	1,332	1,760	750	66,223	33,112	6,622	0,10	0,109
230	230,30	259,091	28,788	1,580	2,088	1.000	78,544	39,272	7,854	0,05	0,058
260	264,08	297,091	33,010	1,811	2,394	1.000	90,064	45,032	9,006	0,05	0,057
305	313,21	352,364	39,152	2,148	2,839	1.000	106,820	53,410	10,682	0,05	0,056
345	352,36	396,409	44,045	2,417	3,194	1.000	120,172	60,086	12,017	0,05	0,055
460	476,00	535,500	59,500	3,265	4,315	1.000	162,338	81,169	16,234	0,05	0,054
715	740,44	833,000	92,556	5,079	6,712	1.000	252,526	126,263	25,253	0,05	0,052

Series HGE – Housing Types Cxx

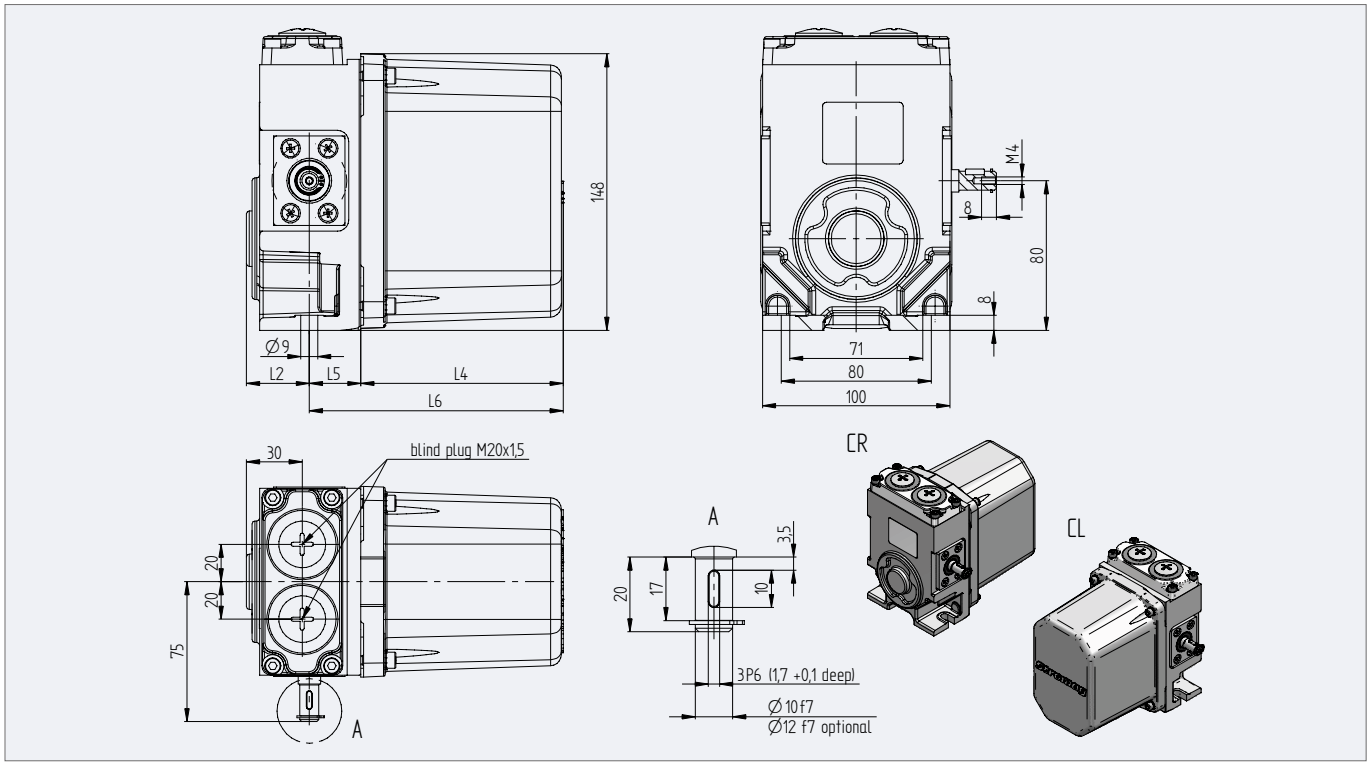
Revision number: 3.1.4.3-01 **Revision date: 19.11.2019**

Features

- Contact space on the left or on the right possible
- Max. of 8 contacts possible for each side

Additional information

- Dimensional drawing for 345,460 and 715 on request



Switch size	Gear size	No. switching contacts	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	weight [kg]
C1R/C1L	max. 305	max. 5	-	33,5	-	108	27	135	2,80
C2R/C2L	max. 305	max. 8	-	34	-	138	27	165	3,25

Series HGE / HEG / HHEV Limit Switches

Series HGE – Housing Types Bxx

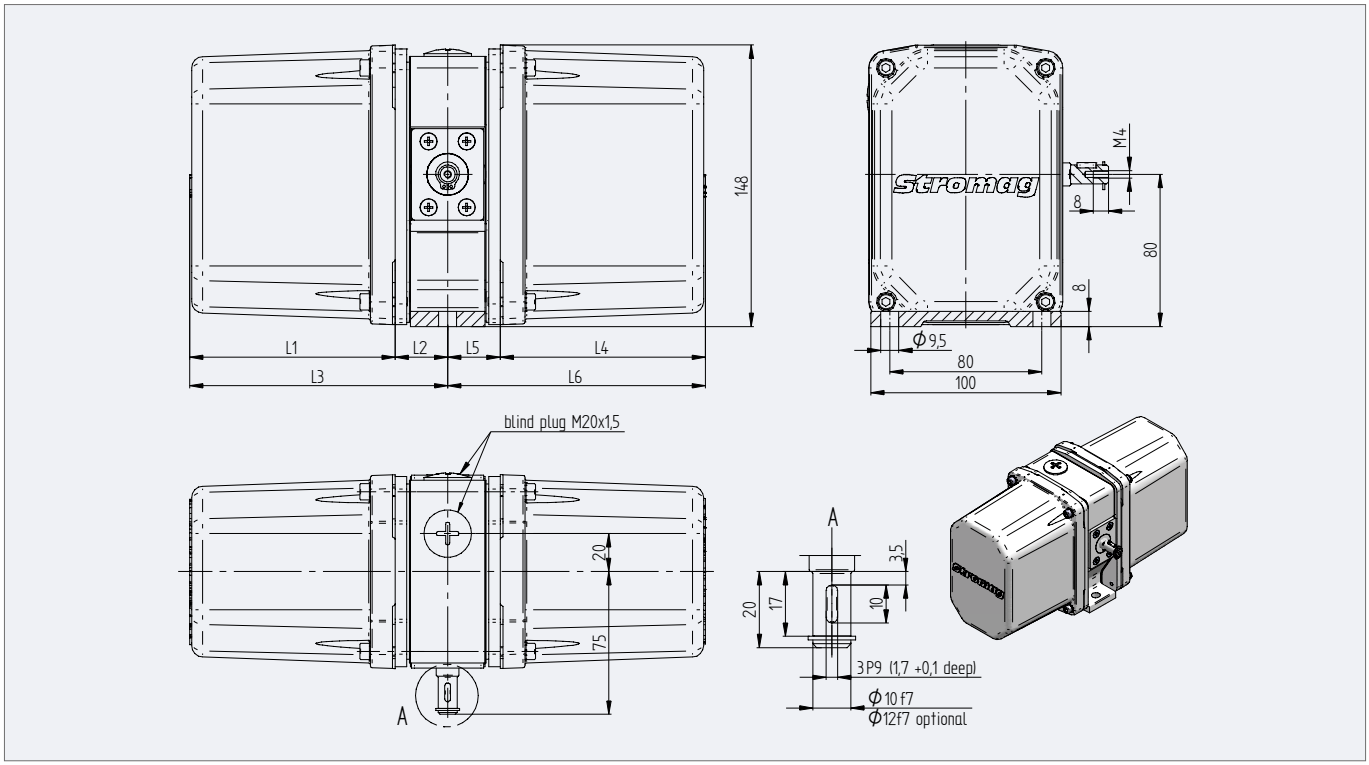
Revision number: 3.1.4.4-01 **Revision date: 19.11.2019**

Features

- Up to 16 contacts possible, max. 8 contacts on each side

Additional information

- Dimensional drawing for 345, 460 and 715 on request



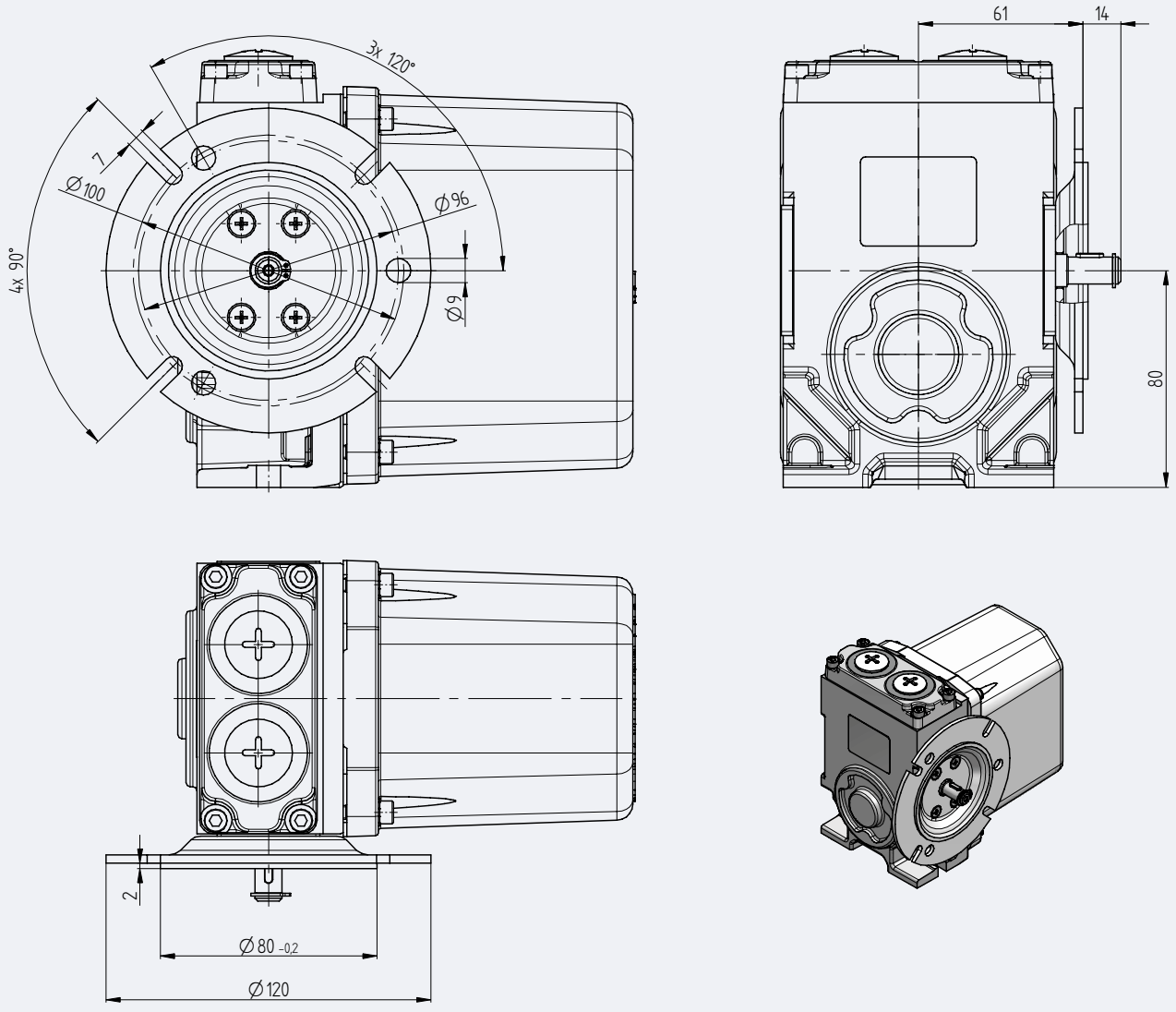
Switch size	Gear size	No. switching contacts	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	weight [kg]
B11	max. 305	max. 10	108	27	135	108	27	135	3,70
	>305		108	27	135	108	37	145	
B22	max. 305	max. 16	138	27	165	138	27	165	4,40
	>305		138	27	165	138	37	175	

Series HGE – Option: Mounting Flanges FL, FL160

Revision number: 3.1.4.5-01 **Revision date: 19.11.2019**

Additional weight: 0,10 kg

FL

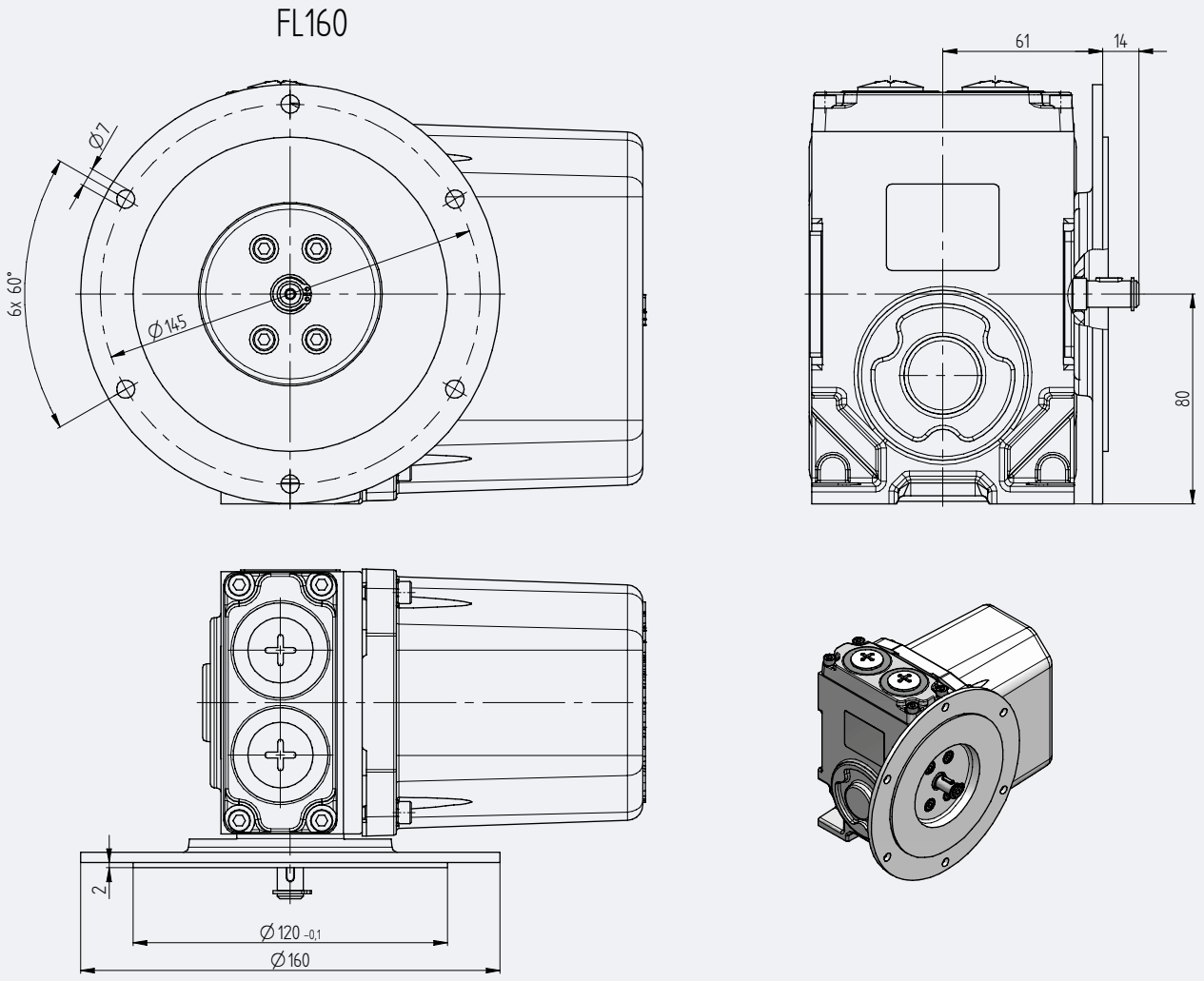


Series HGE / HEG / HHEV Limit Switches

Series HGE – Option: Mounting Flanges FL, FL160

Revision number: 3.1.4.5-01 **Revision date: 19.11.2019**

Additional weight: 0,27 kg



Series HGE – Option: Encoder Preparation

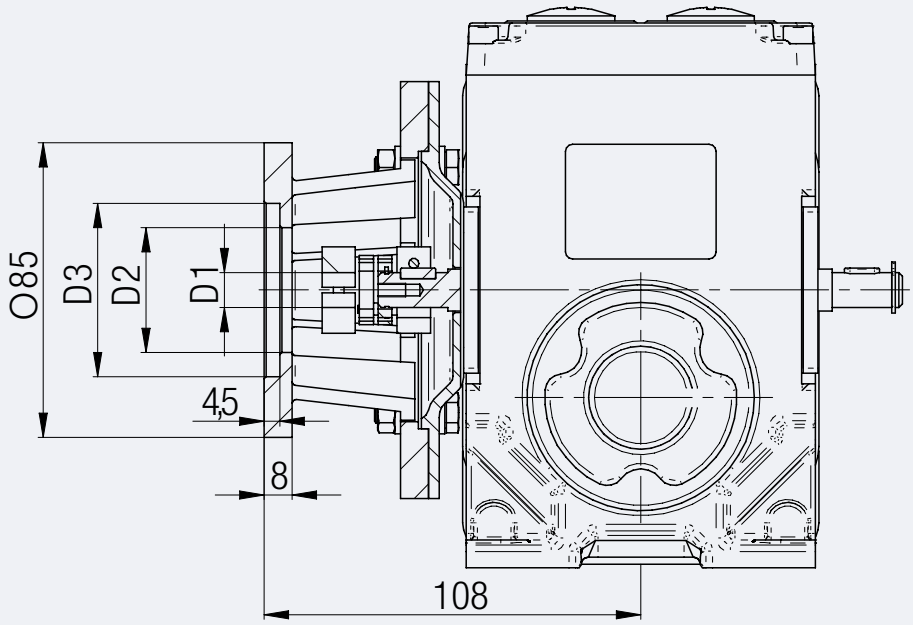
Revision number: 3.1.4.6-01 **Revision date: 19.11.2019**

Features

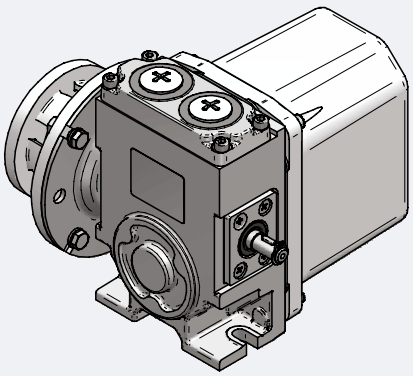
- Preparation for the installation of multi-turn encoders possible, driven by lead through drive shaft

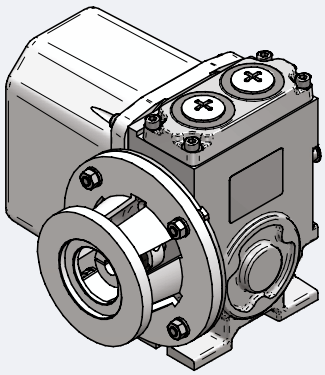
Additional information

- Adaptor for encoders with centering of 36 or 50 mm, other centerings on request
- Connection to the encoder with special encoder coupling



Example: CR





D1 [mm]	D2 [mm]	D3 [mm]
Ø6	Ø36H7 or other	Ø50H7 or other
Ø8		
Ø10		
Ø12		

Series HGE / HEG / HHEV Limit Switches

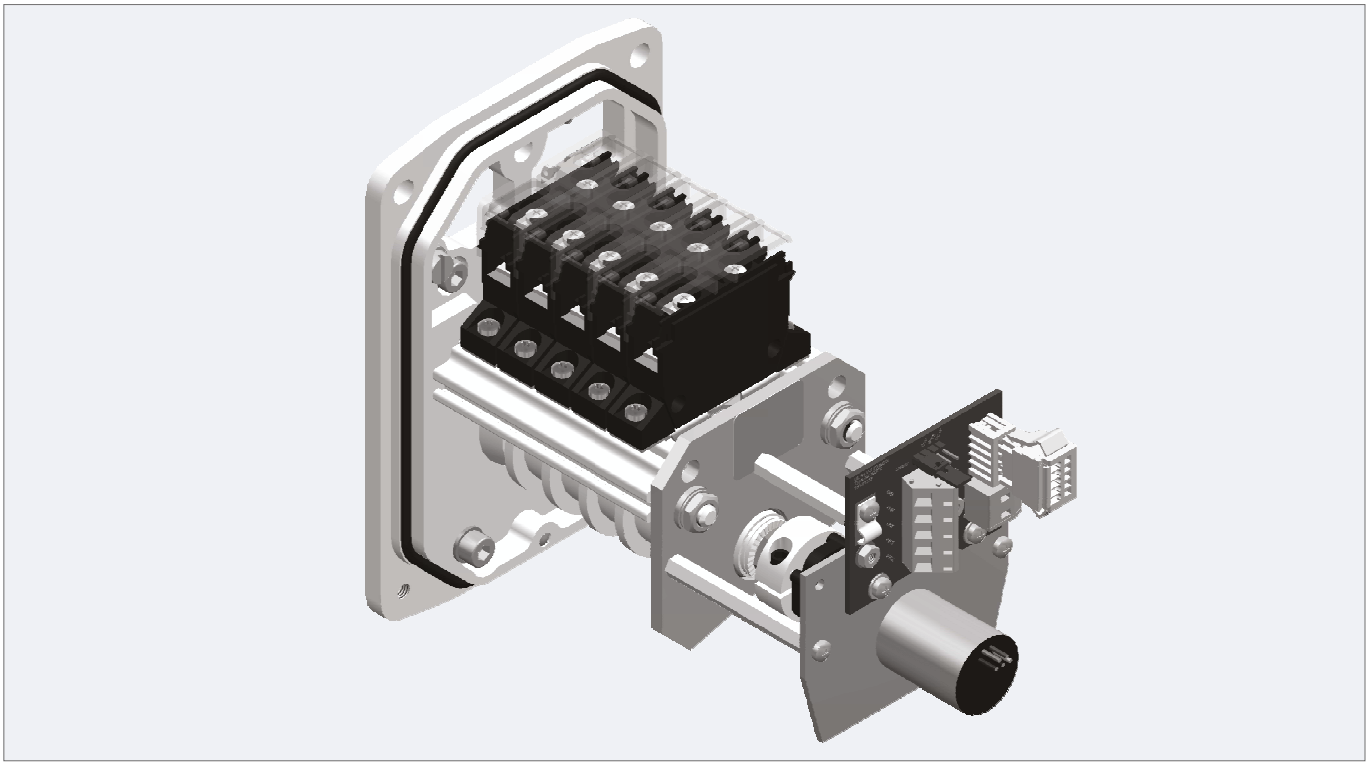
Series HGE – Option: Internal Encoder

Revision number: 3.1.4.6-01 **Revision date: 19.11.2019**

Features
- Contactless measuring method
- Absolute value acquisition
- Long lifetime
- Turning synchronously with the cam discs

Application
- For simple measuring of absolute signals (voltage or current)

Additional information
- Programmable type CW or CCW
- 0 point setting



Type	Current	Voltage
Supply Voltage UBB	18 to 35 VDC (RL = 500 W) 12 to 35 VDC (RL = 200 W)	18 to 35 VDC
Signal output	Iout: 4 to 20 mA (0°…360°)	Uout: 0.1 to 10 V (0°…360°)
Linearity	±0,1% to effective range	±0,1% to effective range
Hysteresis	max. 0,1°	max. 0,1°
Output charge	Load resistor 0…0,5 kW	Load resistor >= 10 kW
Rotary angle mech.	360° rotation possible	360° rotation possible
Temperature range	-40°C to +85°C	-40°C to +85°C
Weight	approx. 100 g	approx. 100 g

Series HEG – Spur Gear Limit Switch

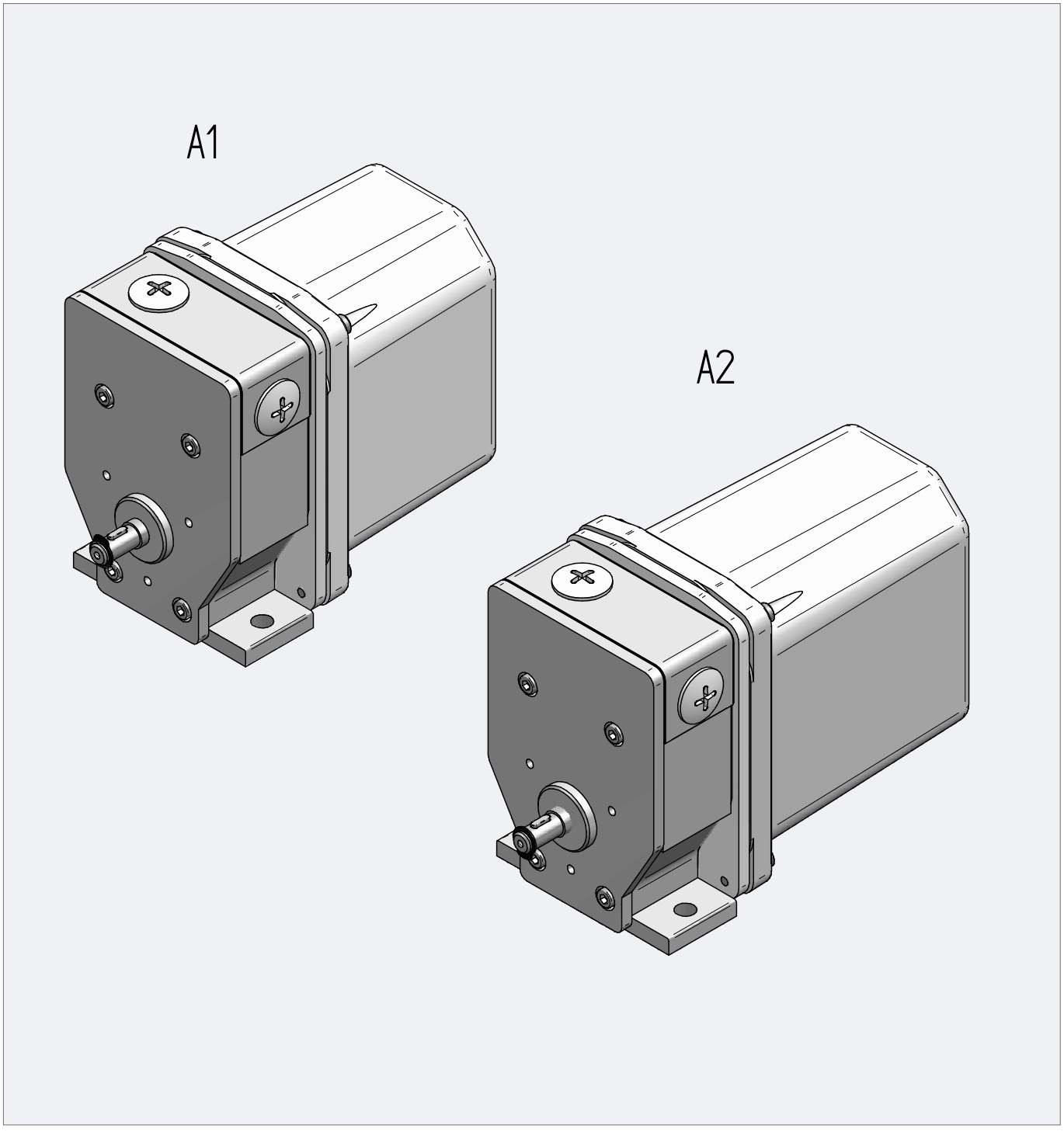
Revision number: 3.1.4.7-01 **Revision date: 19.11.2019**

Features

- Spur gear made of metal
- gear ratios <1 available
- Up to 8 contacts possible

Application

- Crane
- Steel works



Series HGE / HEG / HHEV Limit Switches

Series HEG – Gear Data

Revision number: 3.1.4.8-01 **Revision date: 19.11.2019**

I) Gearbox - for contacts 80, 81, 88, 90, 90G with cam discs 40° FV70

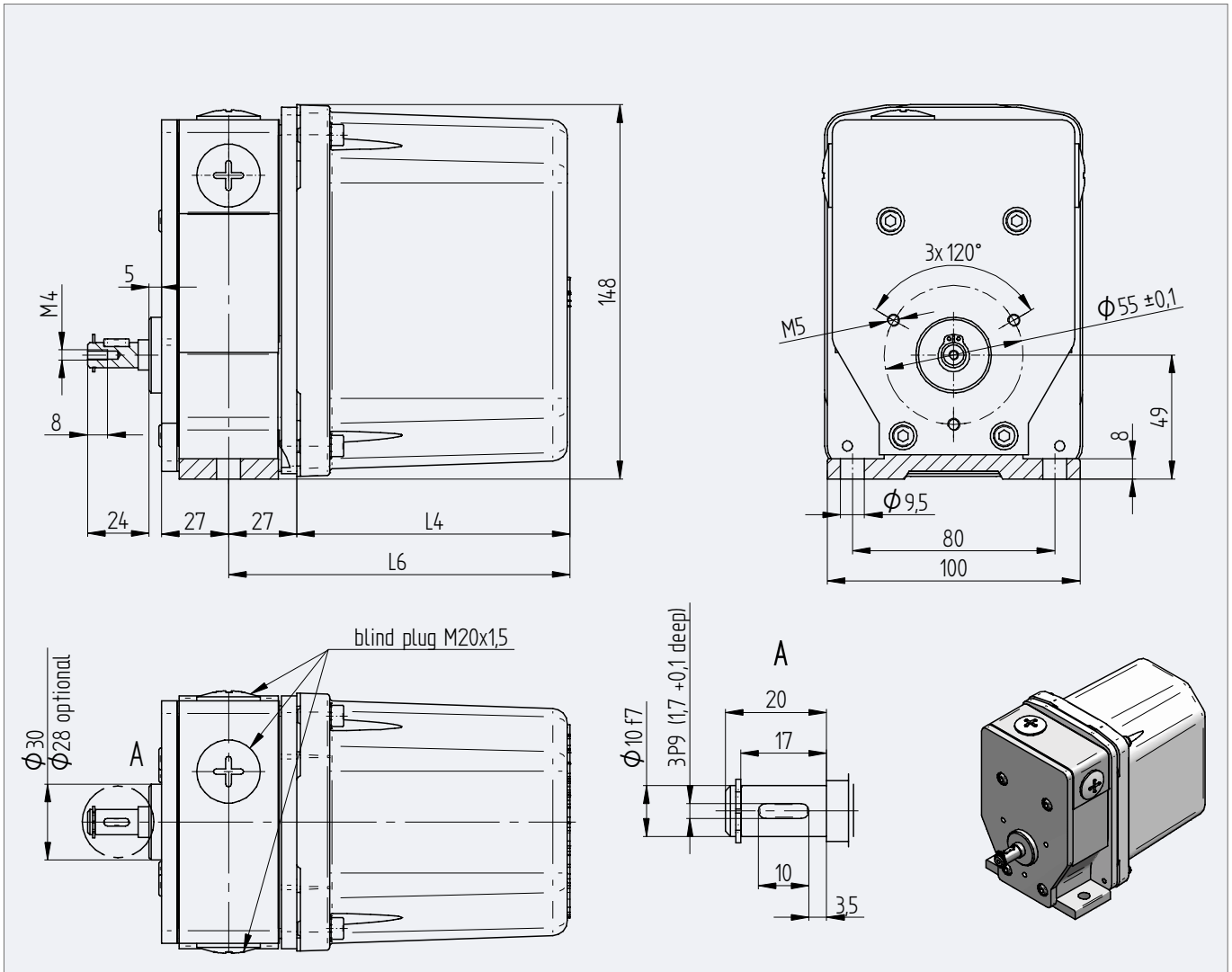
Nominal revolutions	Usable revolutions with 40° cam disc	Gear ratio i	Castor revolutions of the drive shaft after each side	Mechanical Hysteresis [revolution at drive shaft]		Max. input speed [rpm]	Min. input speed for alternating operation [rpm]			Min. drive torque for switching an individual contact [Nm]	Max. drive torque for forced opening of an individual contact [Nm]
				Contact			Contact				
				80, 90, 90G	88		80, 81	90, 90G	88		
0,15	0,18	0,200	0,022	0,001	0,002	50	0,061	0,030	0,006	0,625	10,238
0,2	0,22	0,250	0,028	0,002	0,002	50	0,076	0,038	0,008	0,500	8,190
0,28	0,30	0,333	0,037	0,002	0,003	50	0,101	0,051	0,010	0,375	6,143
0,38	0,40	0,444	0,049	0,003	0,004	50	0,135	0,067	0,013	0,281	4,607
0,5	0,53	0,600	0,067	0,004	0,005	150	0,182	0,091	0,018	0,208	3,413
1	0,89	1,000	0,111	0,006	0,008	150	0,303	0,152	0,030	0,125	2,048
1,1	1,19	1,333	0,148	0,008	0,011	150	0,404	0,202	0,040	0,094	1,536
1,5	1,60	1,800	0,200	0,011	0,015	150	0,546	0,273	0,055	0,069	1,138
2	2,67	3,000	0,333	0,018	0,024	250	0,909	0,455	0,091	0,042	0,683
2,5	3,56	4,000	0,444	0,024	0,032	250	1,213	0,606	0,121	0,031	0,512
3,5	4,44	5,000	0,556	0,030	0,040	250	1,516	0,758	0,152	0,025	0,410
6	8,00	9,000	1,000	0,055	0,073	250	2,728	1,364	0,273	0,014	0,228

II) Gearbox – for contacts 51 with cam discs 40° FV70, 52, 53 with cam discs 40° FV50 (All gear parts made of metal)

Nominal revolutions	Usable revolutions with 40° cam disc	Gear ratio i	Castor revolutions of the drive shaft after each side	Mechanical Hysteresis [revolution at drive shaft]	Max. input speed [rpm]	Min. input speed for alternating operation [rpm]		Min. drive torque for switching an individual contact [Nm]	Max. drive torque for forced opening of an individual contact [Nm]
				Contact		Contact	Contact		
				51, 52		51, 52	53		
0,15	0,17	0,200	0,028	0,002	50	0,001	0,085	0,446	3,375
0,2	0,22	0,250	0,034	0,002	50	0,002	0,106	0,357	2,700
0,28	0,29	0,333	0,046	0,003	50	0,002	0,141	0,268	2,025
0,38	0,38	0,444	0,061	0,004	50	0,003	0,189	0,201	1,519
0,5	0,52	0,600	0,083	0,005	150	0,004	0,255	0,149	1,125
1	0,87	1,000	0,138	0,008	150	0,007	0,424	0,089	0,675
1,1	1,15	1,333	0,183	0,011	150	0,009	0,566	0,067	0,506
1,5	1,55	1,800	0,248	0,014	150	0,013	0,764	0,050	0,375
2	2,59	3,000	0,413	0,024	250	0,021	1,273	0,030	0,225
2,5	3,45	4,000	0,550	0,032	250	0,028	1,698	0,022	0,169
3,5	4,31	5,000	0,688	0,040	250	0,035	2,122	0,018	0,135
6	7,76	9,000	1,238	0,072	250	0,064	3,820	0,010	0,075

Series HEG – Housing Types A1, A2

Revision number: 3.1.4.9-01 **Revision date: 19.11.2019**



Switch size	No. switching contacts	L4 [mm]	L6 [mm]	weight [kg]
A1	max. 5	108	135	2,80
A2	max. 8	138	165	3,25

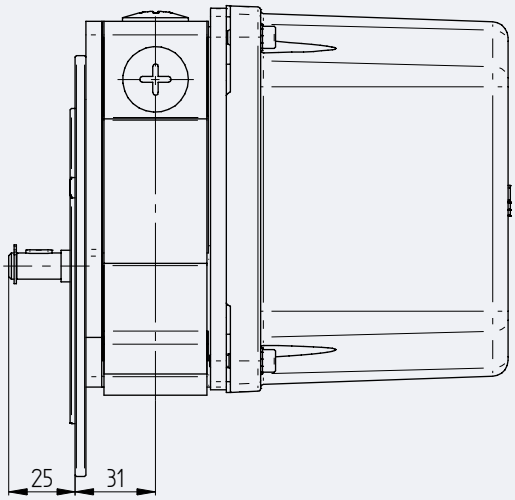
Series HGE / HEG / HHEV Limit Switches

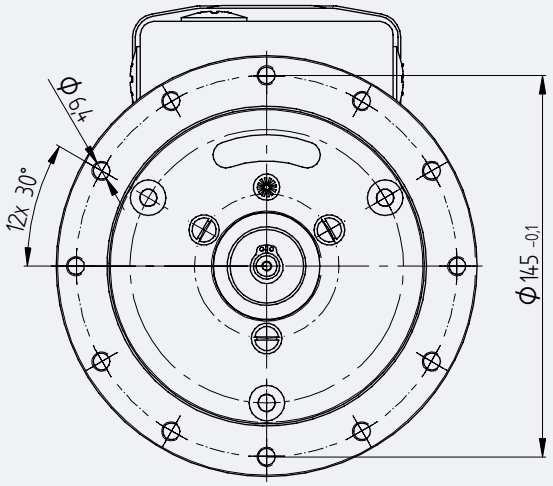
Series HEG – Option: Mounting Flanges FL

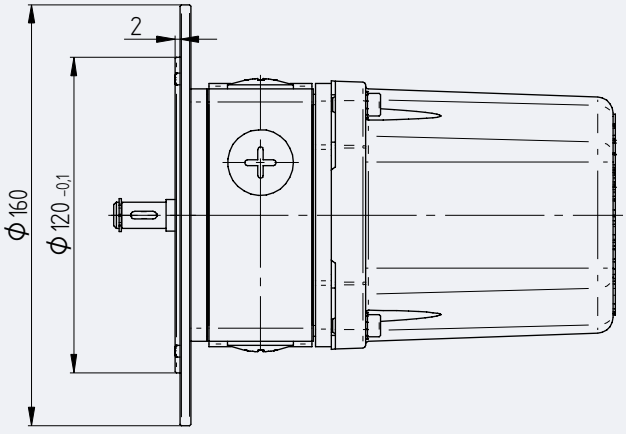
Revision number: 3.1.4.10-01 **Revision date: 19.11.2019**

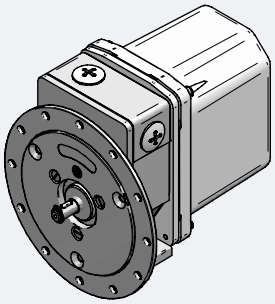
Additional weight: 0,25kg

FL







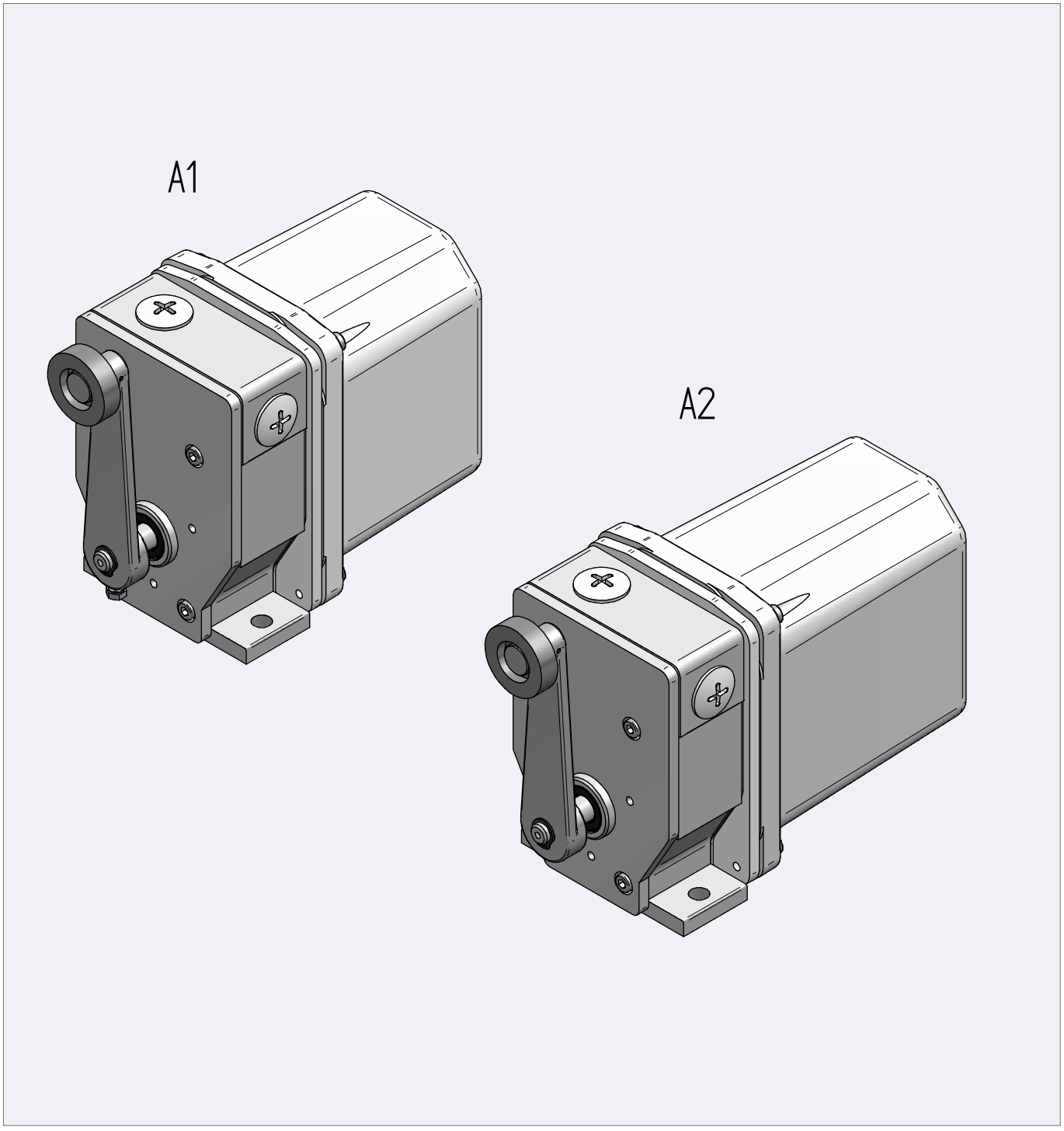


Series HHEV – Lever Limit Switch

Revision number: 3.1.4.11-01 **Revision date: 19.11.2019**

Features
- Aluminum housing IP65
- Up to 8 contacts possible

Additional information
- Actuation to both sides possible



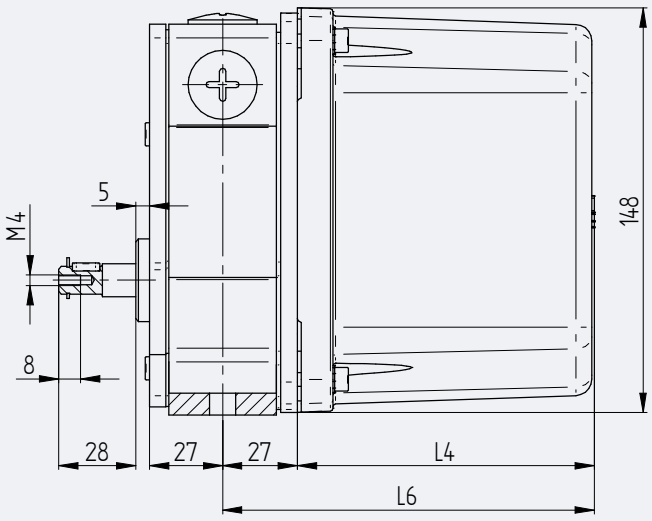
Series HGE / HEG / HHEV Limit Switches

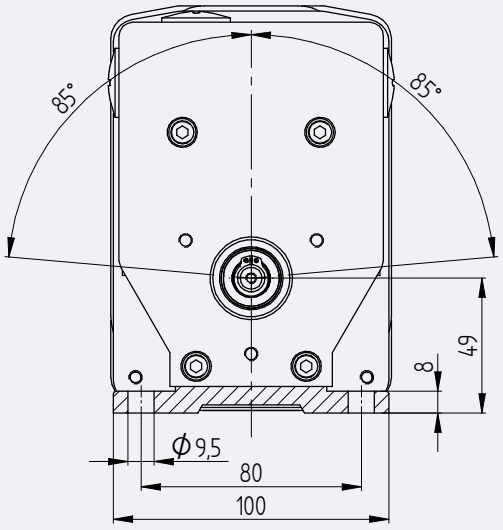
Series HHEV – Housing Types A1, A2

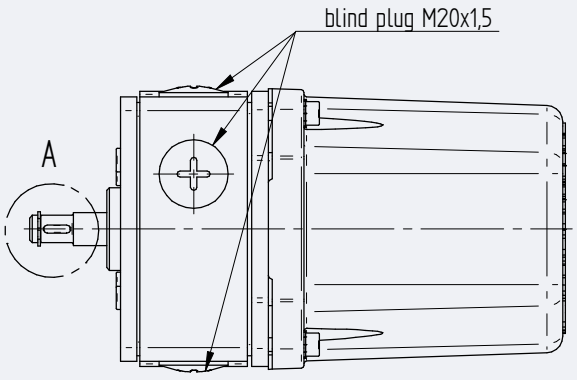
Revision number: 3.1.4.12-01 **Revision date: 19.11.2019**

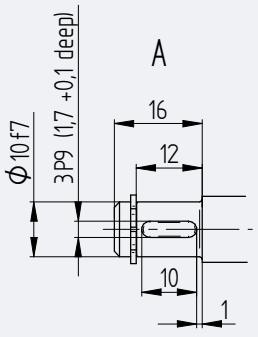
Features

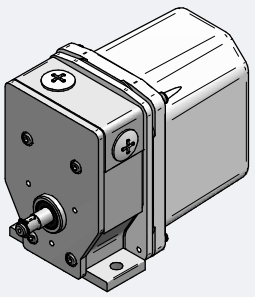
- Mechanical limits at +/- 85°
- Cam discs individually adjustable











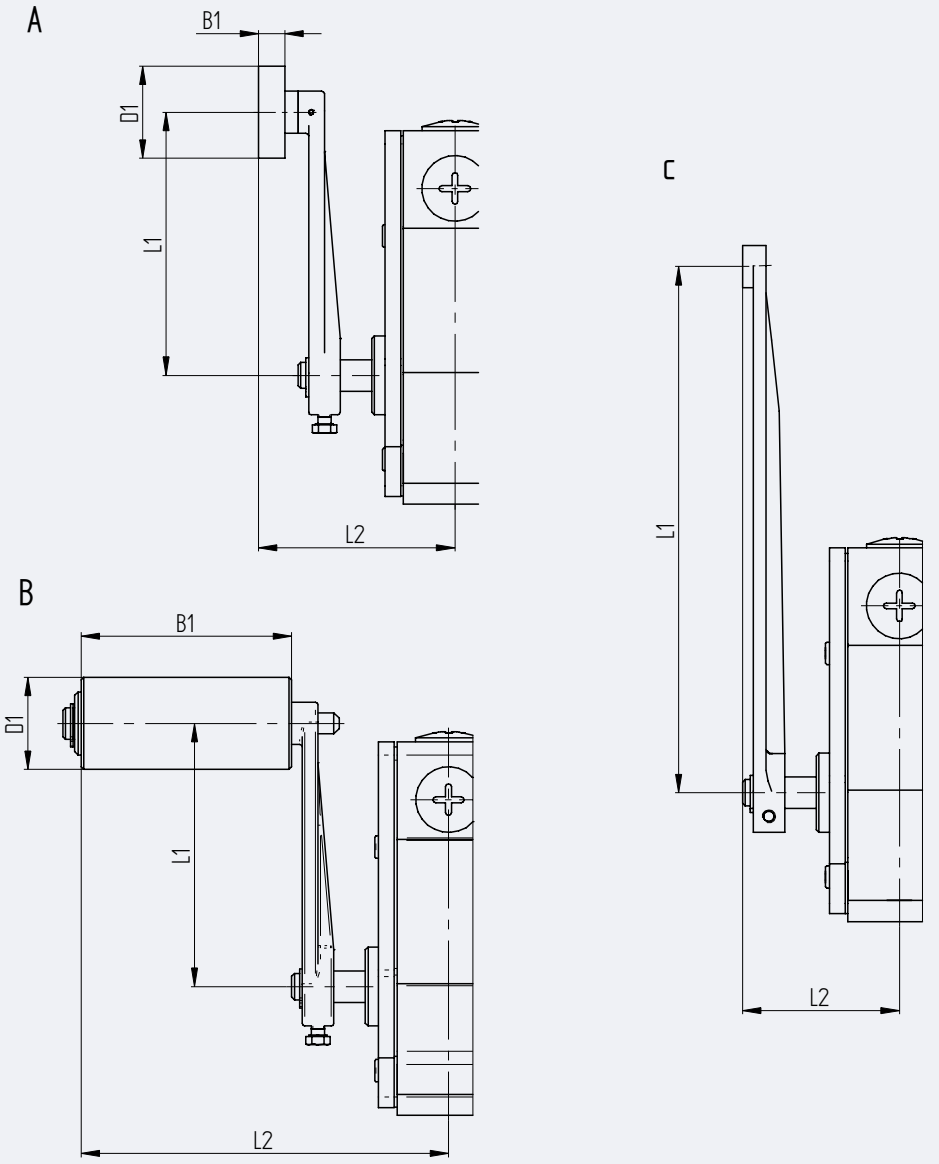
Switch size	No. switching contacts	L4 [mm]	L6 [mm]	weight [kg]
A1	max. 5	108	135	2,80
A2	max. 8	138	165	3,25

Series HHEV – Available Levers

Revision number: 3.1.4.13-01 **Revision date: 19.11.2019**

Additional information

- Type „C“ lever (L1=200mm) only for special applications, without spring return function



Shape	Material	bearing	D1 [mm]	B1 [mm]	L1 [mm]	L2 [mm]
A	brass	sleeve bearing	35	10	100	75
B	synthetic	ball bearing	35	80	100	140
C	x	x	x	x	200	60

Series HGE / HEG / HHEV Limit Switches

Series HGE, HEG, HHEV – Available Switches

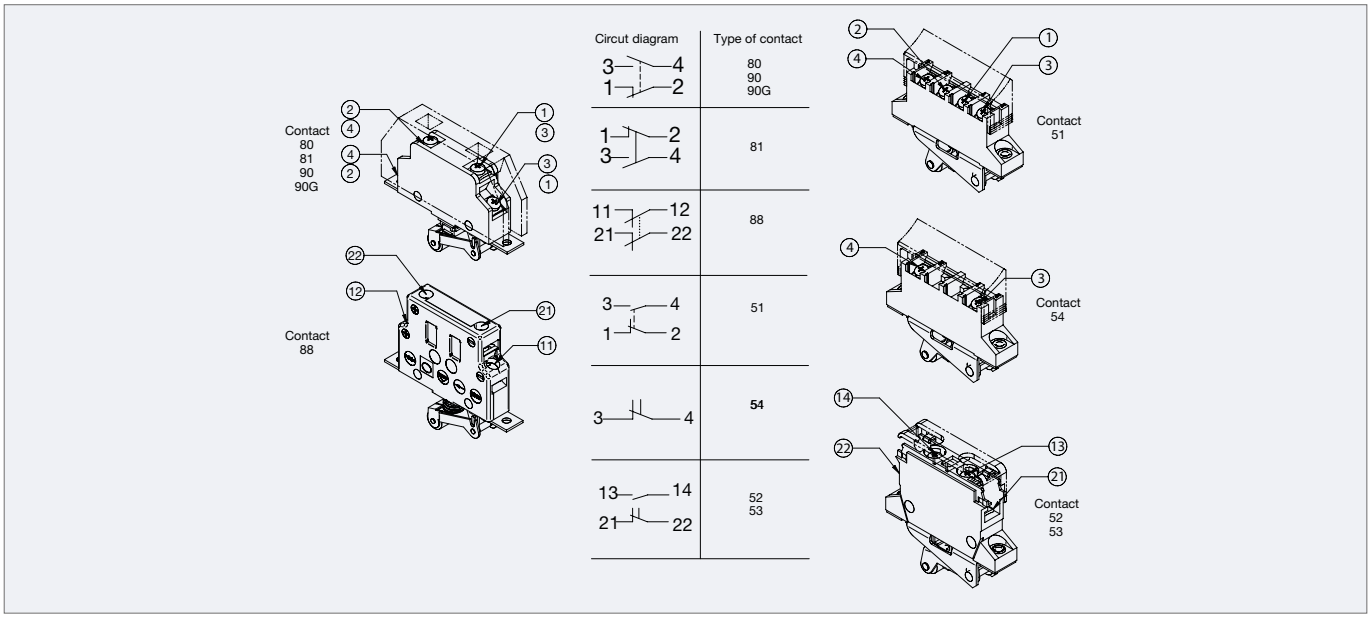
Revision number: 3.1.4.14-02 **Revision date: 14.06.2021**

Features

- Snap – and push action contacts available in silver and gold
- Galvanic isolated contacts available
- Positive opening contacts available

Application

- For relais or PLC



Switching contact			Contact material		Switching system		Connection	Electrical data					Additional data		
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC-Application)	Snap action switch	Push action switch	Screw terminals; 0,75 - 2,5 mm²/ AWG 14 ... 20	Utilization category acc. to IEC 60947	Conventional thermal current I_{th}	Rated Insulation Voltage U_i	Short circuit protection	Degree of Pollution	Mechanical Lifetime	Positive opening acc. to EN 60947–5–1 Annex K	Operating Temperature
51	•			•	•		•	AC–15: 230V, 2,5A DC-13: 24V, 4A	6A	250V	10A gL/gG	PD 2	30x106		-30°C ... +85°C *
52	•			•	•		•	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	6A gL/gG	PD 3	1x106	•	-30°C ... +85°C
53	•			•		•	•	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	6A gL/gG	PD 3	1x106	•	-30°C ... +85°C
54		•	•			•	•	AC–15: 230V, 2,5A DC-13: 24V, 1A	6A	250V	10A gL/gG	PD 2	30x106	•	-30°C ... +85°C *
80	•		•		•		•	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	6A gG	PD 3	10x106	•	-40°C ... +85°C
81	•		•			•	•	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	6A gG	PD 3	10x106	•	-40°C ... +85°C
90	•		•		•		•	AC–15: 230V, 1A DC-13: 110V, 0,5A	10A	400V	6A gR	PD 3	10x106	•	-40°C ... +85°C
90G	•			•	•		•	AC–12: 230V, 0,25A, DC-12: 110V, 0,25A	10A	400V	2A gG	PD 3	10x106	•	-40°C ... +85°C
88		•		•	•		•	AC–15: 230V, 1,5A DC-13: 24V, 1,5A	10A	400V	10A gG	PD 3	1,5x106	•	-40°C ... +85°C

Series HGE, HEG, HHEV – Cam Disc Types

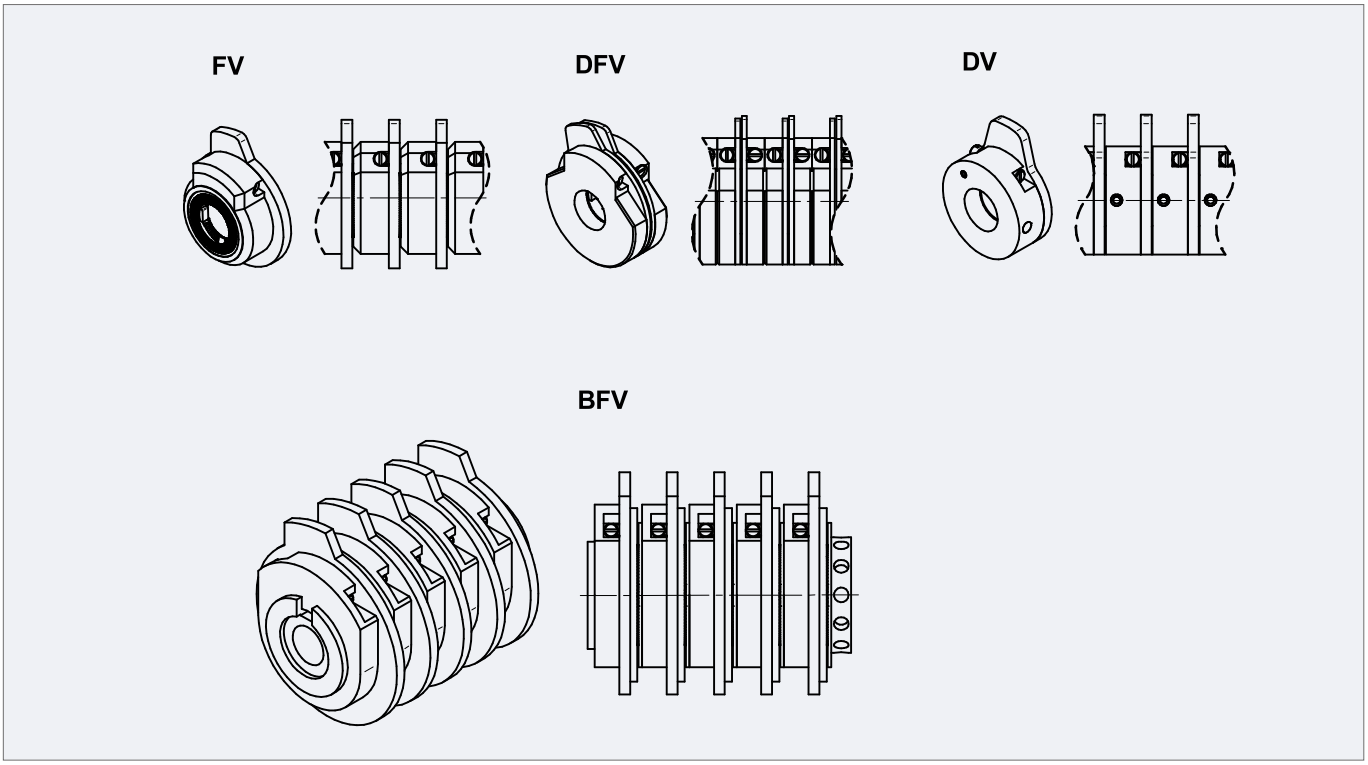
Revision number: 3.1.4.15-01 **Revision date: 19.11.2019**

Features

- Easy adjusable cam discs via self-locking worm, gear ratio of 74
- Large cam disc diameter for high switching point accuracy

Additional information

- FV for normal application
- DFV for flexible adjustment of the cam angle

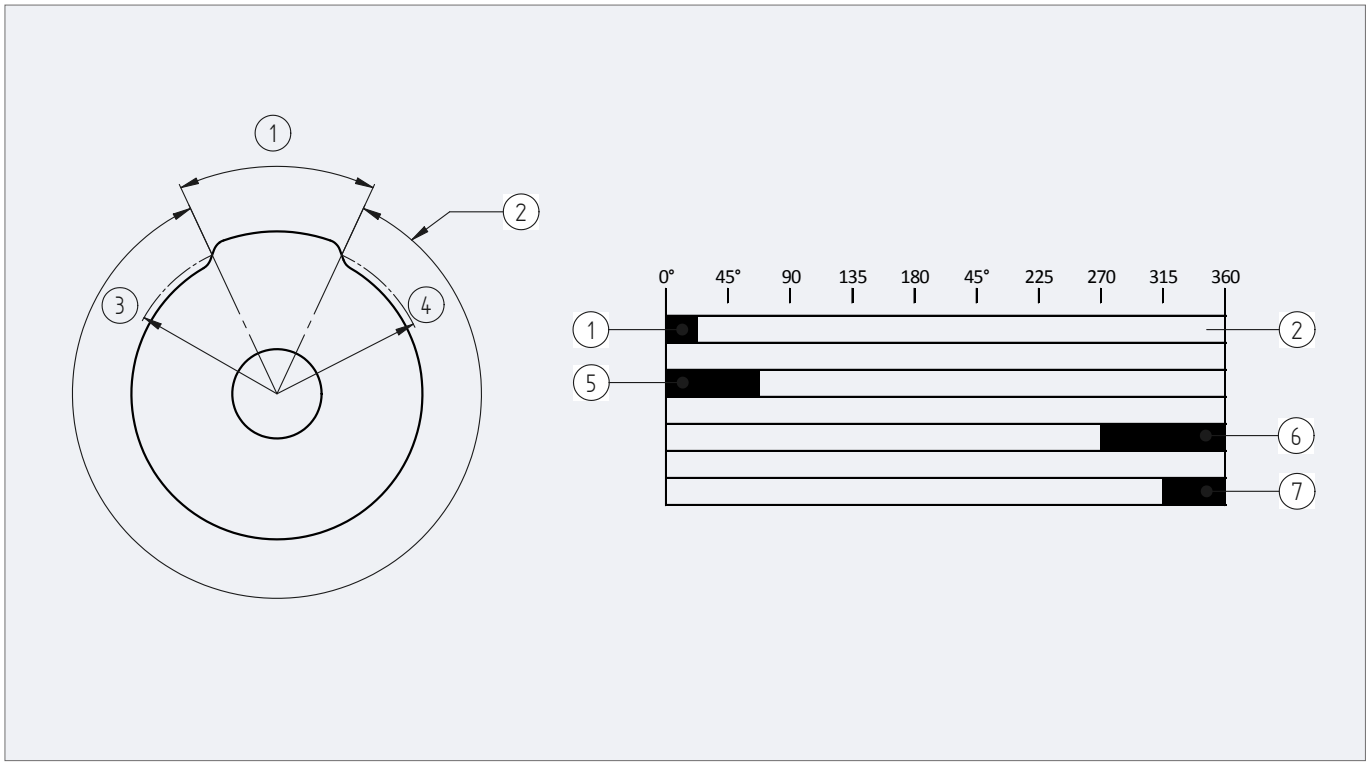


Cam Disc Types	Material	Diameter Cam Disk	Standard Cam Angle	Special Cam Angel	Gradation Cam Angle	precisely adjustable	block adjustment
FV50	synthetic	50mm	40°	other cam angles on request	1°	x	
DFV50	synthetic	50mm	40°		1°	x	
DV50	brass	50mm	40°		1°	x	
FV70	synthetic	70mm	40°		1°	x	
BFV70	synthetic	70mm	40°		1°	x	x

Series HGE / HEG / HHEV Limit Switches

Series HGE, HEG, HHEV – Customizable Cam Discs

Revision number: 3.1.4.16-01 **Revision date: 19.11.2019**



A	Cam angle diagram	B	Application examples
1	Effective cam angle α (=castor angle)	1	Effective cam angle 15°
2	Effective cam angle β	5	Effective cam angle 60°
3	Switching point radius	6	Effective cam angle 90°
4	Reset point radius	7	Effective cam angle 45°

The cam discs are named due to the effective cam angle. The effective cam angle corresponds to the switching point angle on the switching point radius of the cam disc. Standard cam angle for series HEG, HEG, HHEV is 40°.

Any other cam angles (from 15° up to 345°) can be supplied as a special design upon request.
The usable revolutions enabled by a cam disc on the drive shaft, result in the following:

$$U = \frac{\beta * i}{360°} = \frac{(360° - \alpha) * i}{360°} = 1 - \frac{\alpha * i}{360°}$$

U = Usable revolutions
α = Effective cam angle
β = Usable cam angle (β = 360° – α)
i = gear ratio

Series HGE, HEG, HHEV – Option: Anti-Condensation-Heating

Revision number: 3.1.4.17-01 **Revision date: 19.11.2019**

Features

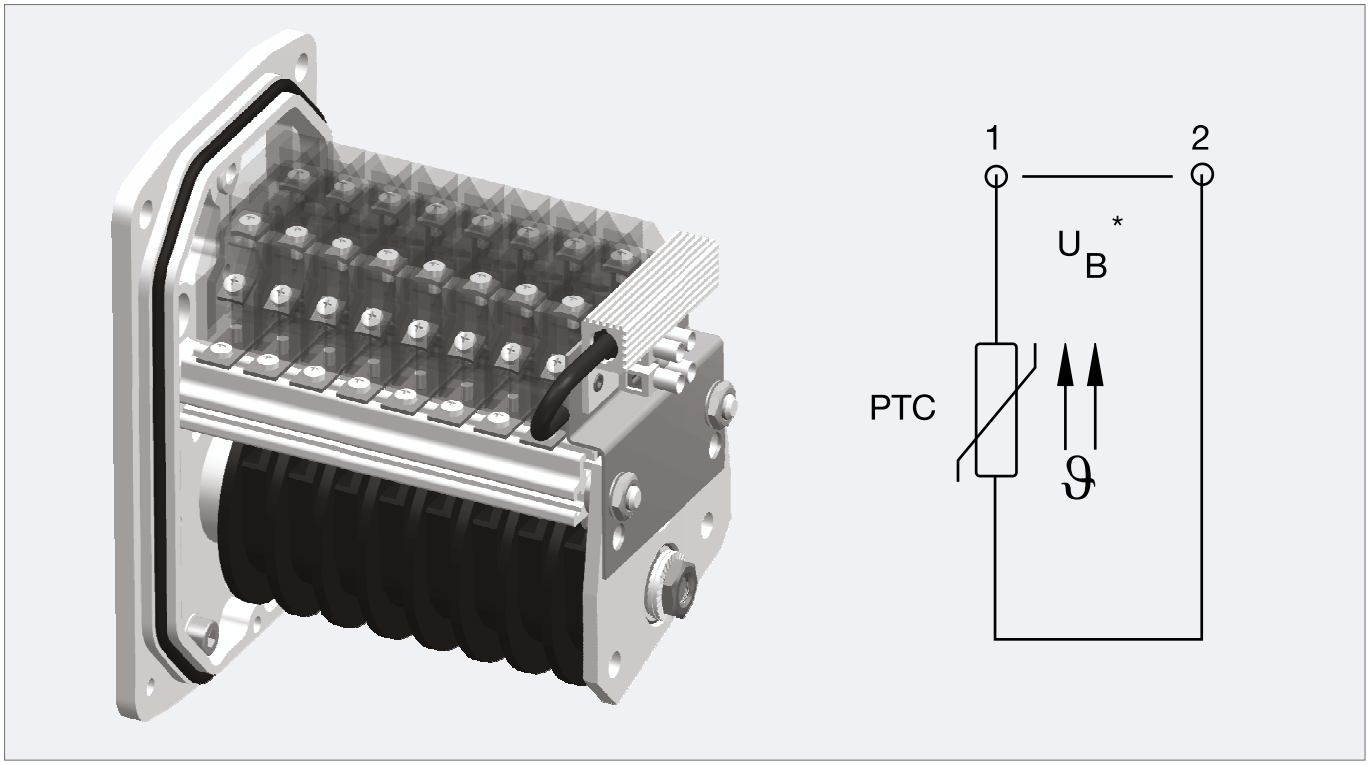
- Self-regulating PTC heating element

Application

- For anti-condensation to avoid water condensation within the geared cam limit switch

Additional information

- Additional safety for usage in low temperatures



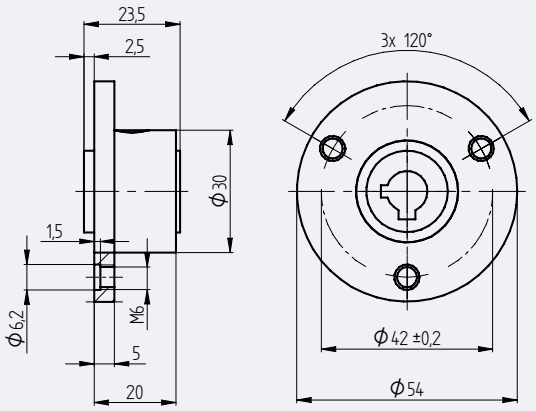
Design	H1	H2
Supply Voltage UBB	12 – 36 V AC/DC	110 – 250 V AC/DC
Heat Output	ca. 2.5 Watts	ca. 4 Watts
PTC Cooling resistor (at 25 °C) R25	20 Ω ± 35 %	1500 Ω ± 35 %
PTC Reference temperature	50 °C	50 °C
Protection class (VDE 0100, 0160)	II	II
Connecting cable	2 x 0,25 mm², Silicon cable	2 x 0,25 mm², Silicon cable
Radiator	Anodised aluminum	Anodised aluminum
Weight	approx. 40 g	approx. 40 g

Series HGE / HEG / HHEV Limit Switches

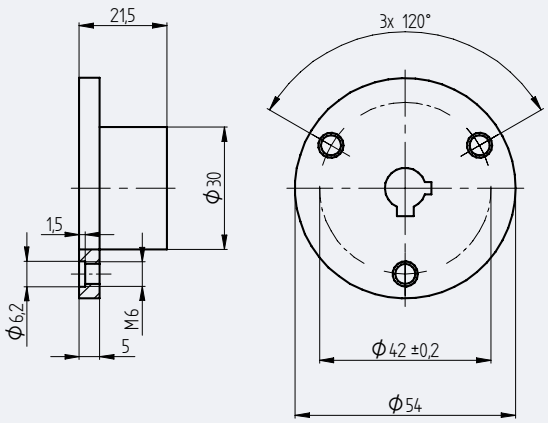
Series HGE, HEG – Option Drive Flange F, F+M

Revision number: 3.1.4.18-01 **Revision date: 19.11.2019**

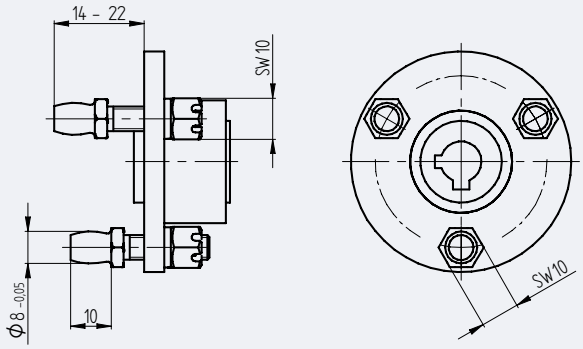
F, flexible



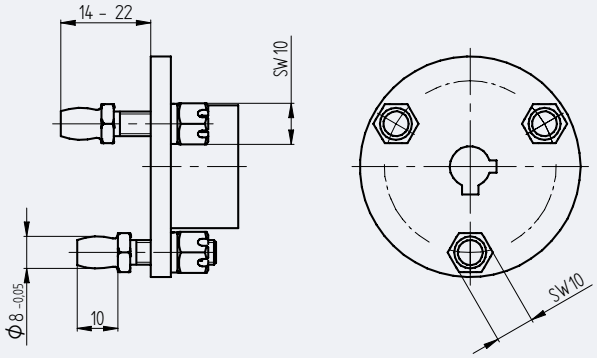
F, non-flexible



F+M, flexible



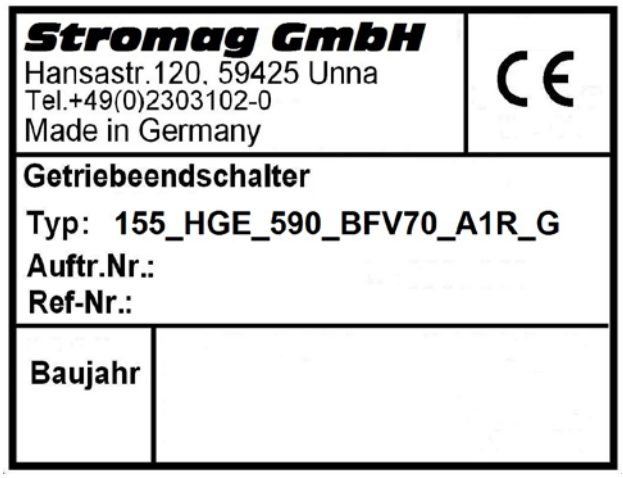
F+M, non-flexible



Flange	Type	Operating speed	Torsion angle (with a torque of 5 Nm)	Comment
F	flexible	n_{max} = 1000 rpm	5 ± 0.5°	not for HHEV
F	non-flexible	n_{max} = 1000 rpm	0°	not for HHEV
F+M	flexible	n_{max} = 1000 rpm	5 ± 0.5°	not for HHEV
F+M	non-flexible	n_{max} = 1000 rpm	0°	not for HHEV

Series HGE, HEG, HHEV – Key of Types

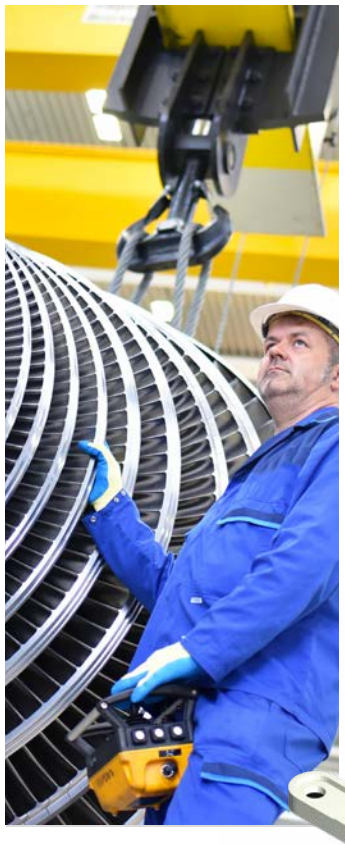
Revision number: 3.1.4.19-01 **Revision date: 19.11.2019**

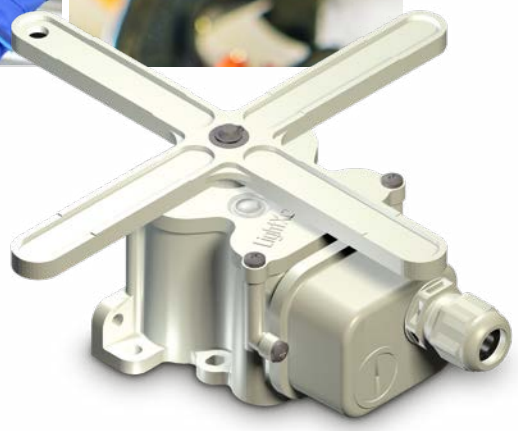


HGE, HEG or HHEV			
155	nominal revolutions	HGE	9.5, 18, 22, 29, 35, 70, 85, 100, 115, 155, 180, 230, 260, 305, 345, 460, 715
		HEG	0.15, 0.2, 0.28, 0.38, 0.39, 0.4, 0.5, 0.6, 0.65, 1, 1.05, 1.1, 1.4, 1.5, 1.9, 2, 2.5, 3.5, 6
		HHEV	0
HGE	Switch type	HGE	Worm Gear Limit Switch HGE
		HEG	Spur Gear Limit Switch HEG
		HHEV	Lever Limit Switch Series HHEV
5	Number of contacts fitted	HGE	1 to 8 contacts
		HEG	1 to 8 contacts
		HHEV	1 to 16 contacts
90	Type of switching contact	51	Contact (changeover) with screw connections, contact material: Gold
		52	Contact (changeover) with screw connections, contact material: Gold ⊖
		53	Contact (push action) with screw connections, contact material: Gold ⊖
		54	Contact (push action) with screw connections, contact material: Silver ⊖
		80	Contact (changeover) with screw connections, contact material: Silver ⊖
		81	Contact (push action) with screw connections, contact material: Silver ⊖
		90	Contact (changeover) with screw connections, contact material: Silver ⊖
		90G	Contact (changeover) with screw connections, contact material: Gold ⊖
		88	Contact (double action) with screw connections, contact material: Gold ⊖
BFV70	Type of built-in cam discs	FV50	Synthetic Material, precisely adjustable, diameter 50mm
		DFV50	Synthetic Material, double cams, precisely adjustable, diameter 50mm
		DV50	Brass, precisely adjustable, diameter 50mm
		FV70	Synthetic Material, precisely adjustable, diameter 70mm
		BFV70	Synthetic Material, block adjustment, precisely adjustable, diameter 70mm
A1R	Size contact space	A1	1 to 5 contacts
		A2	1 to 8 contacts
		A1R	1 to 5 contacts, right
		A2R	1 to 8 contacts, right
		A1L	1 to 5 contacts, left
		A2L	1 to 8 contacts, left
		B11	1 to 5 contacts, both sides
		B22	1 to 8 contacts, both sides
		B12	1 to 5 contacts, left / 1 to 8 contacts, right
		B21	1 to 8 contacts, left / 1 to 5 contacts, right
G	Additional components	G	with encoder / sensor
		P	with potentiometer

ALTRA MOTION

Stromag LightXcross LX®
Geared Cam Limit Switches





Stromag®
Altra Industrial Motion

CONTENT

AT A GLANCE

STROMAG LIGHTXCROSS® LX

BENEFITS INCLUDE

- Position shown in display and by lever marking
- Without mechanical end stop
- Positive opening contacts

Cross Lever Limit Switch

Series LightXcross LX® – Cross Lever Limit Switch

Revision number: 3.1.5.1-01 **Revision date: 19.11.2019**

Features

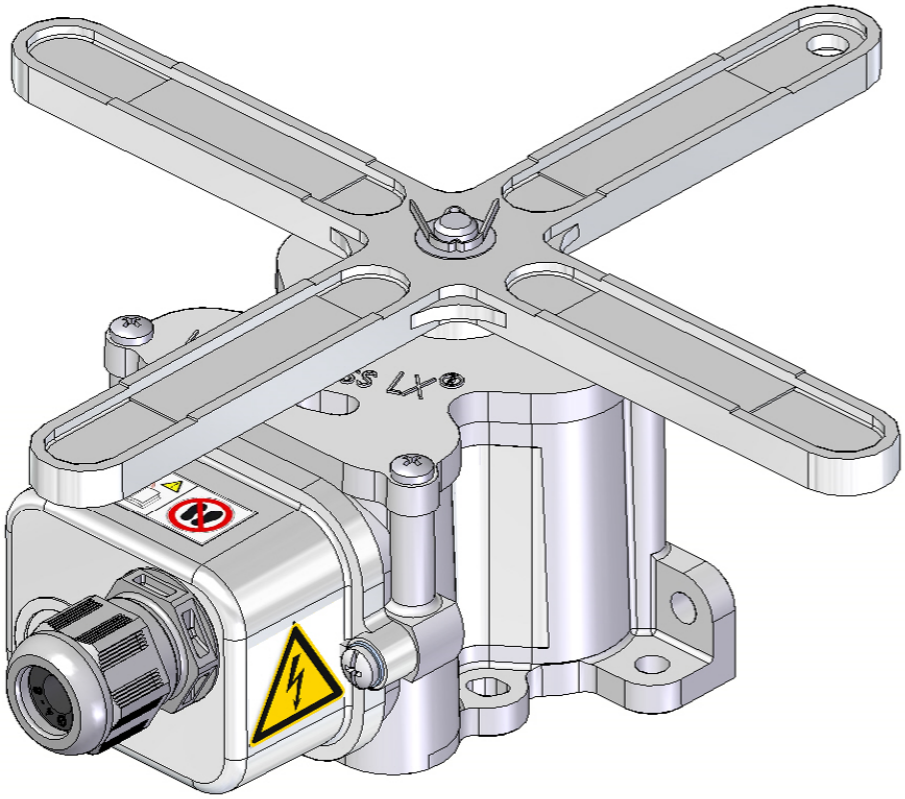
- Five positions, separate contact each for pre- and end stops in both directions
- Actuation via positive connections
- 4 Positive opening contacts

Application

- Cross and long travel for EOT cranes

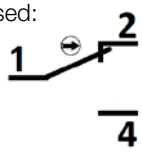
Additional information

- Position shown on display and by lever marking
- Without mechanical end stop
- Silver contacts, gold plated optional

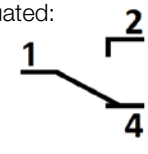


Contact	Intended purpose	Rotation direction
S1	Emergency stop	ccw
S2	Working stop	ccw
S3	Working stop	cw
S4	Emergency stop	cw

Contact released:
1-2 closed



Contact actuated:
1-2 opened

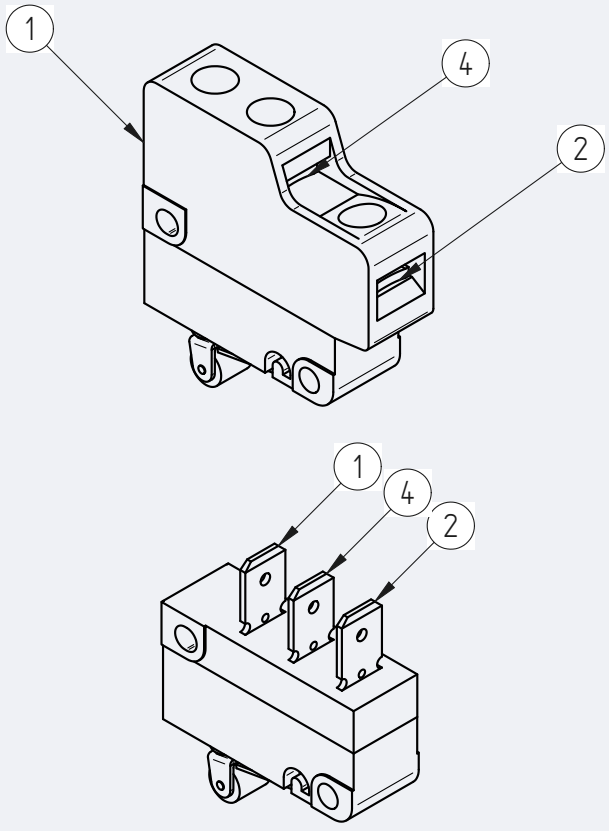


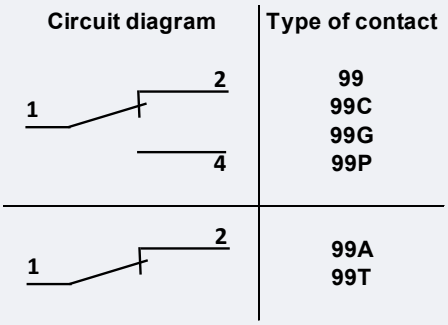
Switch setting / position (rotation direction)					
Contact	1. / +180° (ccw)	2. / +90° (ccw)	3. / 0° (Neutral)	4. / -90° (cw)	5. / -180° (cw)
S1	1-2 opened	1-2 closed			
S2	1-2 opened		1-2 closed		
S3	1-2 closed			1-2 opened	
S4	1-2 closed				1-2 opened

Cross Lever Limit Switch

Series LightXcross LX® – Available Switches

Revision number: 3.1.5.2-01 **Revision date: 19.11.2019**



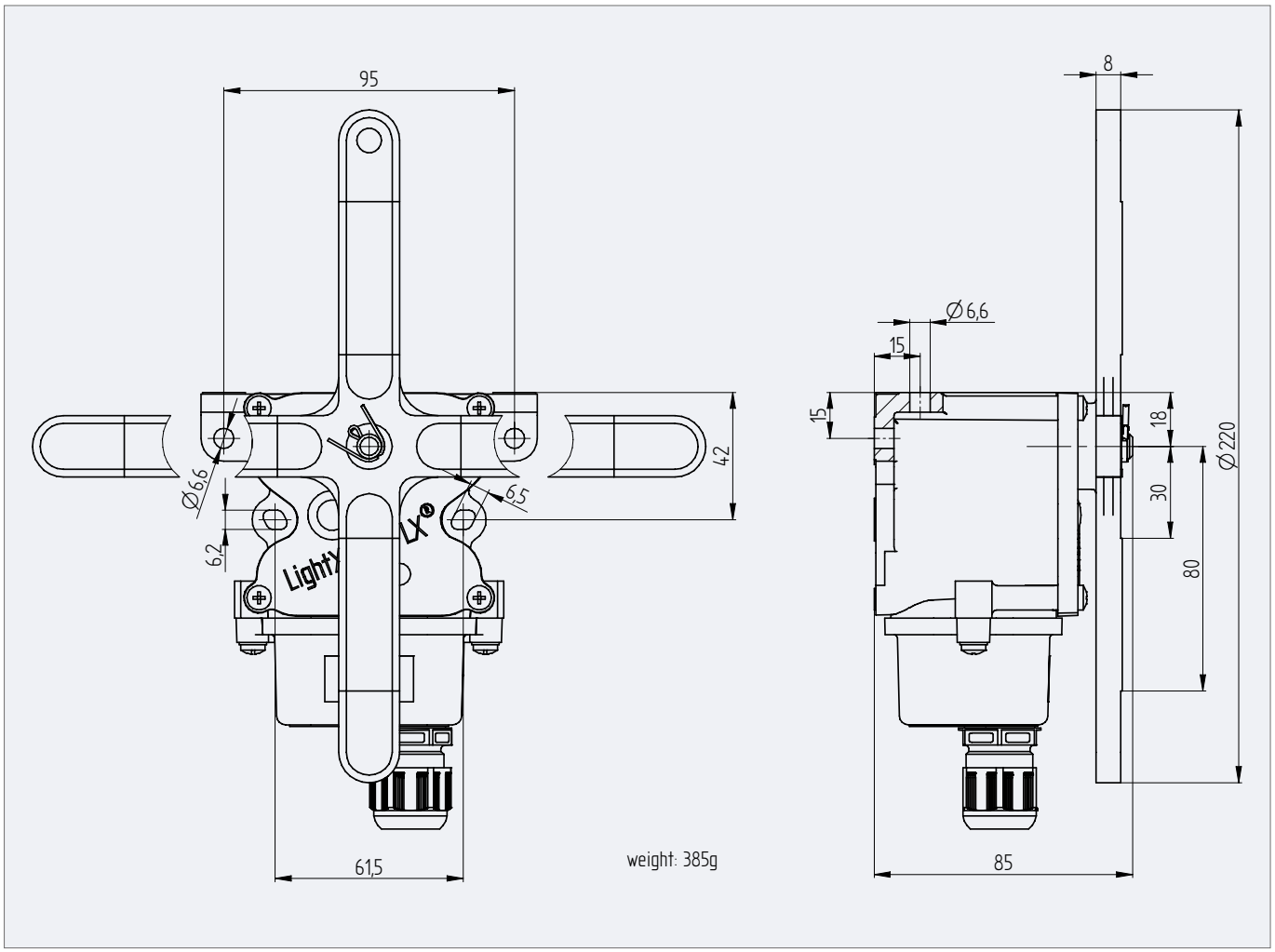


Switching contact			Contact material		Switching system		Connection		Functionality		Electrical data		
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC-Application)	Snap action switch	Push action switch	Screw terminals; 0,5 - 1,5 mm²/ AWG 22 ... 16	Flat plugs 6.3 mm	Positive opening acc. to EN 60947–5–1 Annex K	Short circuit protection	Utilization category acc. to IEC 60947	Conventional thermal current I_{th}	Rated Insulation Voltage U_i
99	•		•		•		•		•	10A gG	AC–15: 230V, 1,5A DC-13: 60V, 0,5A oder 24V, 2,0A	10A	250V
99G	•			•	•		•		•	2A gR	AC–15: 230V, 1,5A DC-13: 60V, 0,5A oder 24V, 2,0A	10A	250V
99P	•		•		•			•	•	10A gG	AC–15: 230V, 1,5A DC-13: 60V, 0,5A oder 24V, 2,0A	10A	250V
99T		•	•			•	•		•	10A gG	AC–15: 230V, 1,5A DC-13: 60V, 0,5A oder 24V, 2,0A	10A	250V
99A		•		•		•	•		•	2A gR	AC–15: 230V, 1,5A DC-13: 60V, 0,5A oder 24V, 2,0A	10A	250V

Cross Lever Limit Switch

Series LightXcross LX® – Dimensions

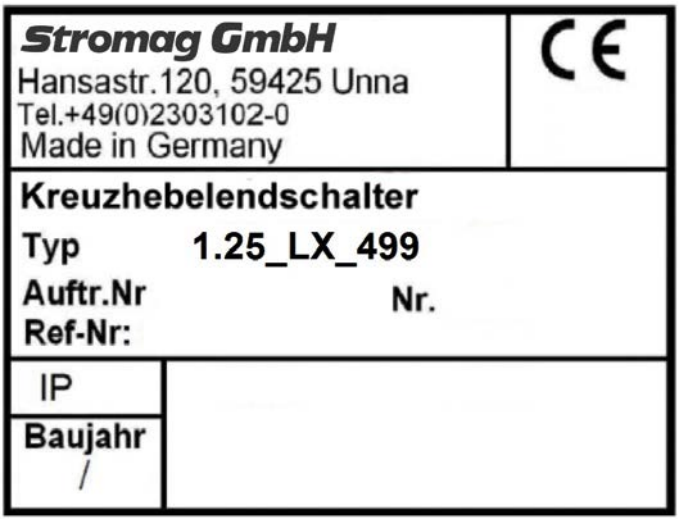
Revision number: 3.1.5.3-01 **Revision date: 19.11.2019**



Cross Lever Limit Switch

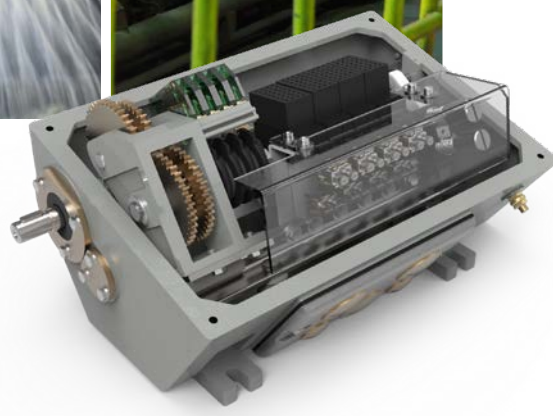
Series LightXcross LX® – Key of Types

Revision number: 3.1.5.4-01 **Revision date: 19.11.2019**

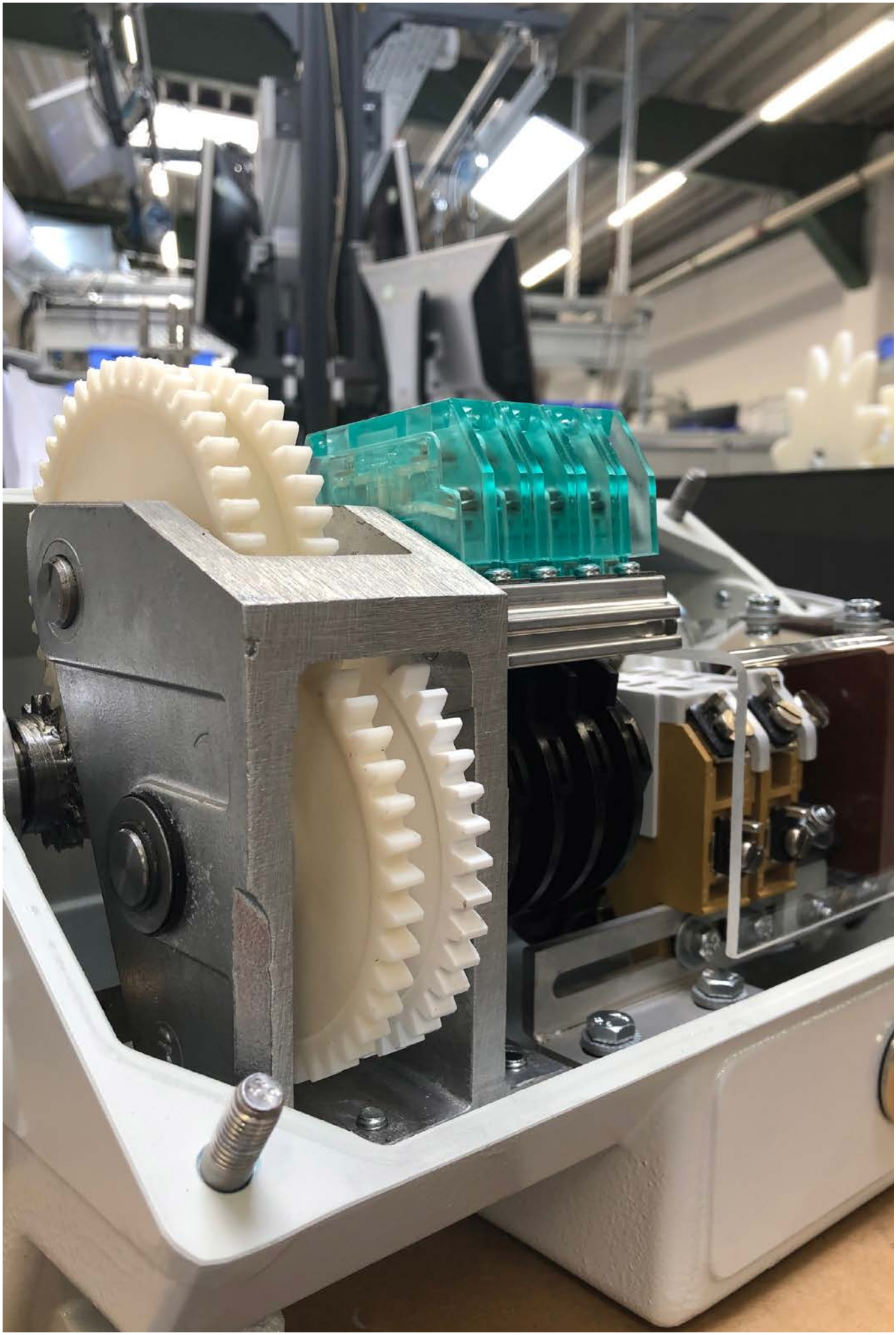


	Series LX		
1.25	nominal revolutions	1.25	5 positions at 90°, fully turn around
LX	Switch type	LX	Cross lever switch LightXcross LX®
4	Number of contacts fitted	4	
99	Type of switching contact	99	Contact (changeover) with screw connections, contact material: Silver
		99G	Contact (changeover) with screw connections, contact material: Gold
		99P	Contact (changeover) with flat plug connections, contact material: Silver
		99T	Contact (push action) with screw connections, contact material: Silver
		99A	Contact (push action) with screw connections, contact material: Gold

Serie 62
Geared Cam Limit Switches



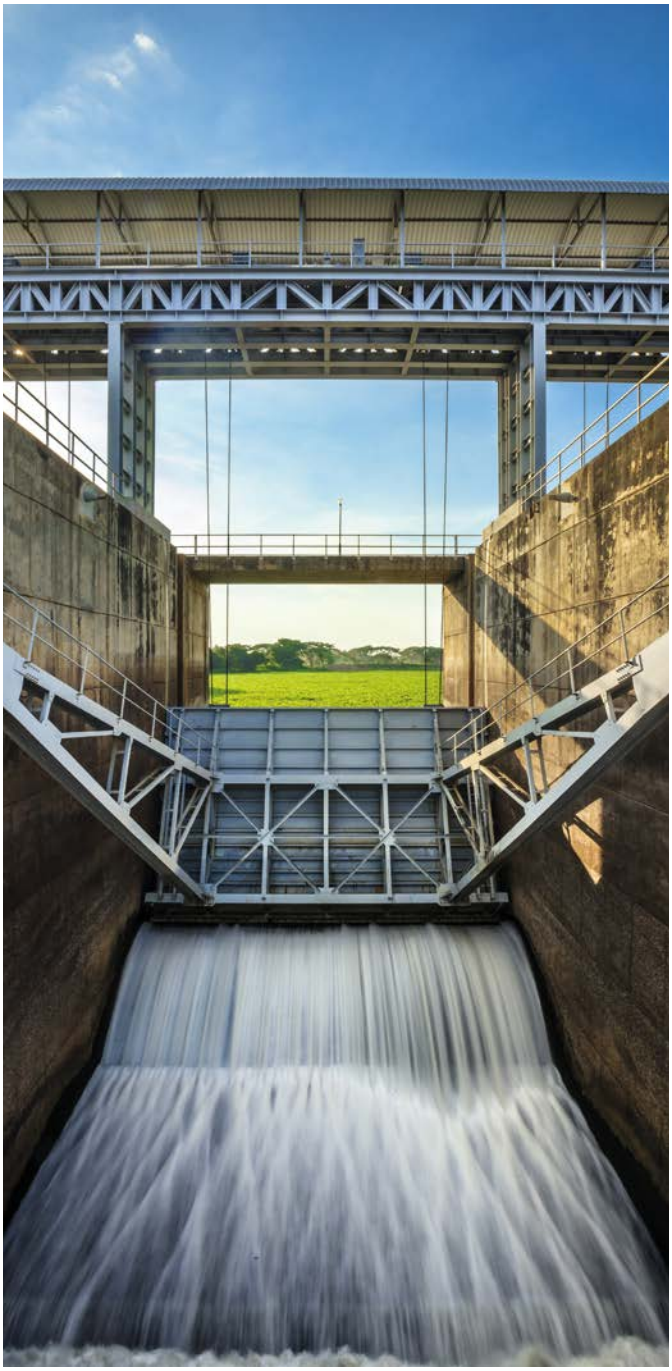
Stromag®
Altra Industrial Motion



CONTENT

Catalog Serie 62: **VI**

AT A GLANCE



STROMAG SERIES 62

BENEFITS INCLUDE

- Direct switch of three phase motors
- Contacts for up to 200 Amps

Limit Switches Main Current

Series 62 SNE – Basic Design Spindle Gear Switch

Revision number: 3.2.1.1-01 **Revision date: 19.11.2019**

Features

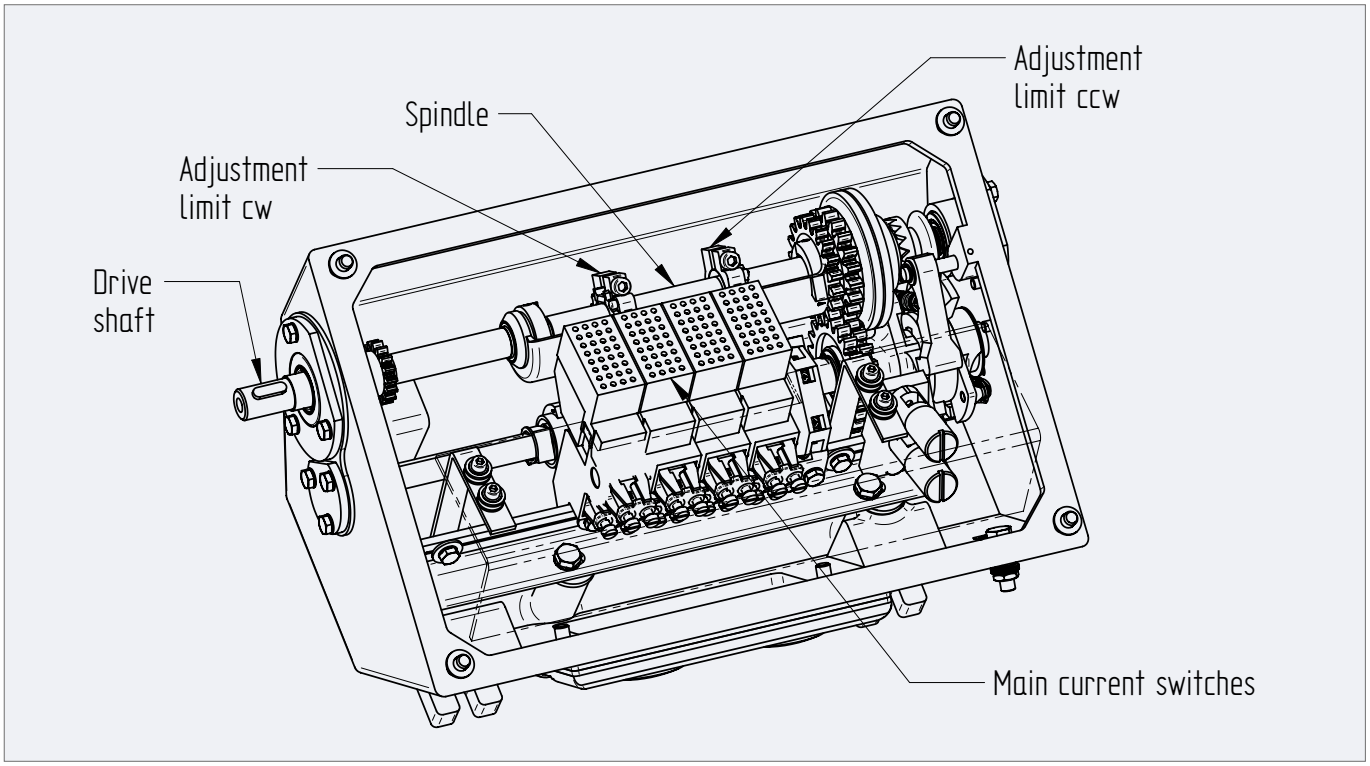
- Main current limit switch for direct switching of three phase-motors
- For 42 and 62 usable revolutions
- Main current contacts for 40 and 200 A permanent available

Application

- Steel plants and barrages

Additional information

- Also available in combination with installed auxiliary current contacts



Housing size without control switches			
Housing size	Max. rev range	Main current switches	
		Max. No.	Type
2	42	2 … 8	11 / 21
3	62	2 … 10	11 / 21
4	62	2 … 8	22
4	62	2 … 6	13 / 23

Housing size with fixed control switches				
Housing size	Max. rev range	Main current switches		Max. no. aux. switches
		Max. No.	Type	
2	42	2 … 4	11 / 21	4
2	42	5 … 6	11 / 21	2
3	62	2 … 6	11 / 21	4
3	62	6 … 8	11 / 21	2
4	62	7 … 8	11 / 21	4
4	62	2 … 6	22	4
4	62	2 … 4	13 / 23	4
4	62	5 … 6	13 / 23	2

Housing size with fixed control switches				
Housing size	Max. rev range	Main current switches		Max. no. aux. switches
		Max. No.	Type	
2	42	2 … 3	11 / 21	2
3	62	2 … 3	11 / 21	4
3	62	4	11 / 21	2
4	62	4 … 6	11 / 21	4
4	62	7 … 8	11 / 21	2
4	62	2 … 4	22	4
4	62	2 … 3	13 / 23	4
4	62	4	13 / 23	2

Limit Switches Main Current

Series 62 SNE – Housing Sizes 2 / 3

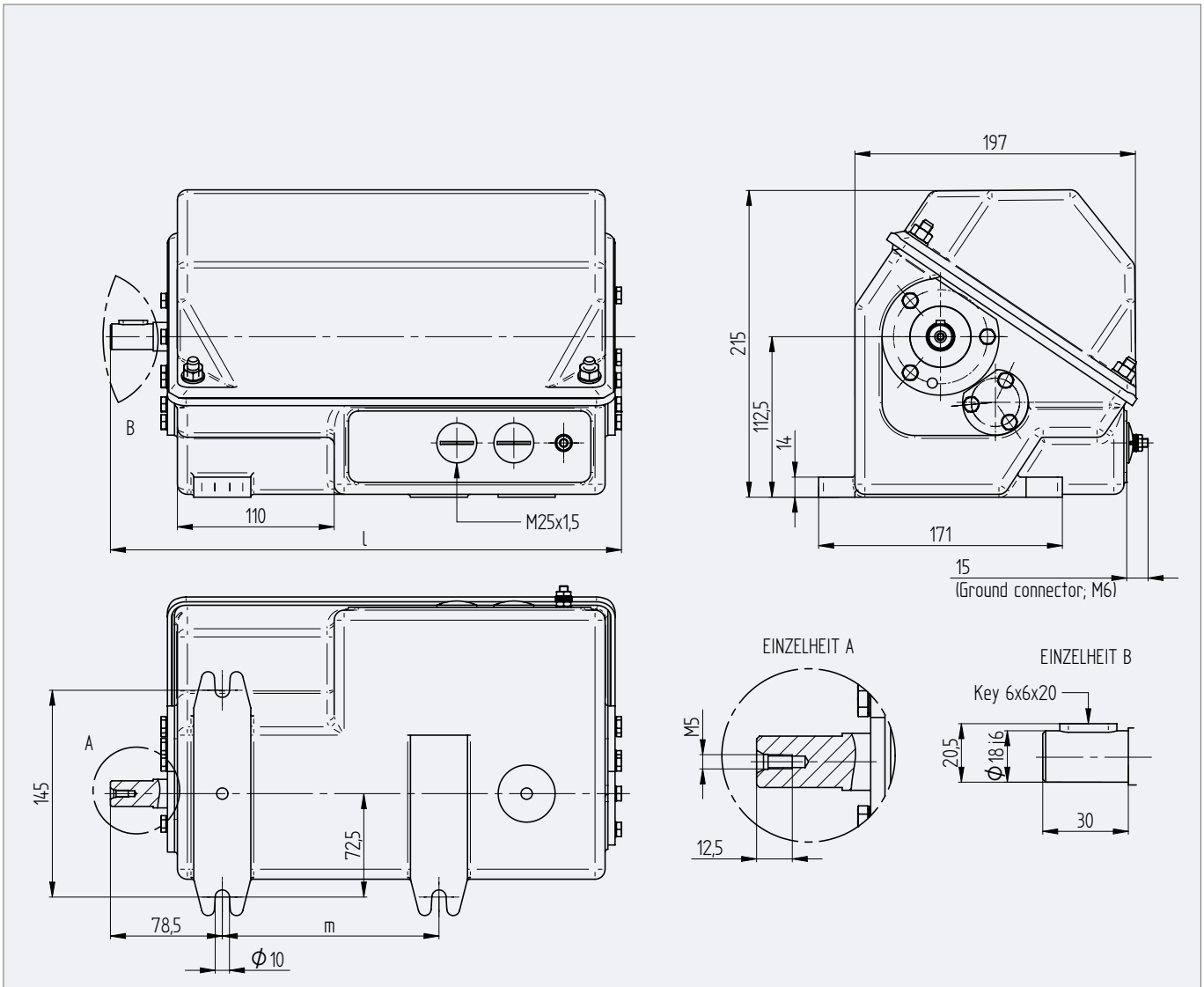
Revision number: 3.2.1.2-01 **Revision date: 19.11.2019**

Features

- Housings in the size 2 and 3 made of aluminum protection rate IP65

Additional information

- Made of sea water resistant aluminum



Housing size	Dimensions [mm]	
	l	m
2	358,5	152
3	398,5	213,5

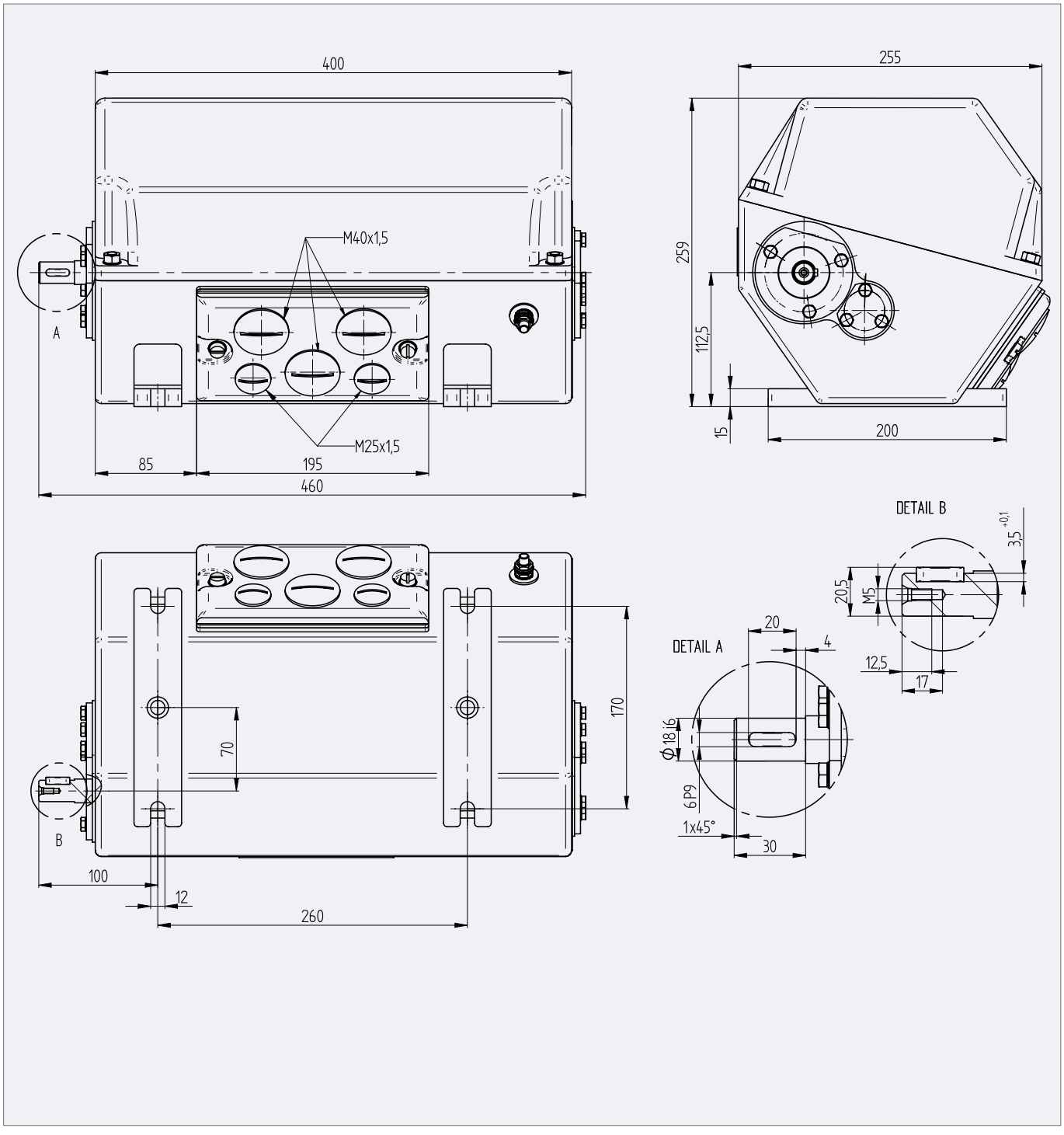
Limit Switches Main Current

Series 62 SNE – Housing Size 4

Revision number: 3.2.1.3-01 **Revision date: 19.11.2019**

Features

- Housing size 4 made of cast iron
  protection rate IP54



Limit Switches Main Current

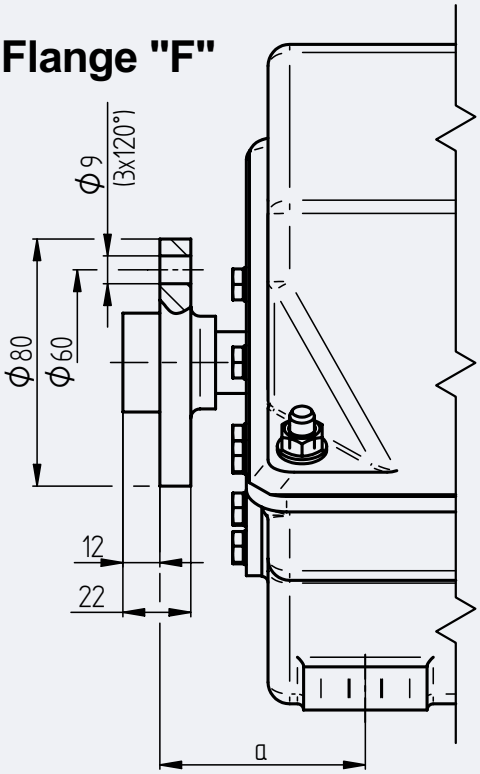
Series 62 SNE – Drive Flanges

Revision number: 3.2.1.4-01 **Revision date: 19.11.2019**

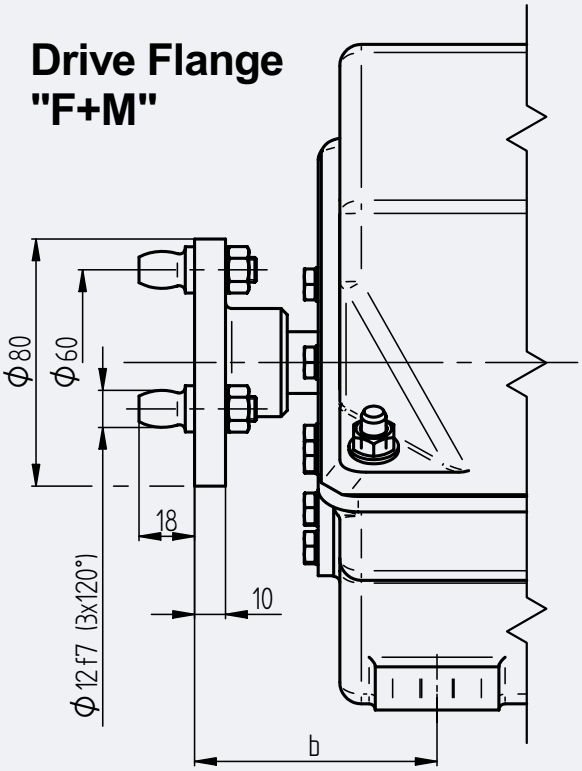
Features

- Drive flanges F and F+M on request

Drive Flange "F"



Drive Flange "F+M"



Housing size	Dimensions [mm]		
	a	b	c
2	66,5	78,5	118,5
3	66,5	78,5	118,5
4	88	100	140

Limit Switches Main Current

Series 62 HNE – Basic Design Lever Switch

Revision number: 3.2.1.5-01 **Revision date: 19.11.2019**

Features

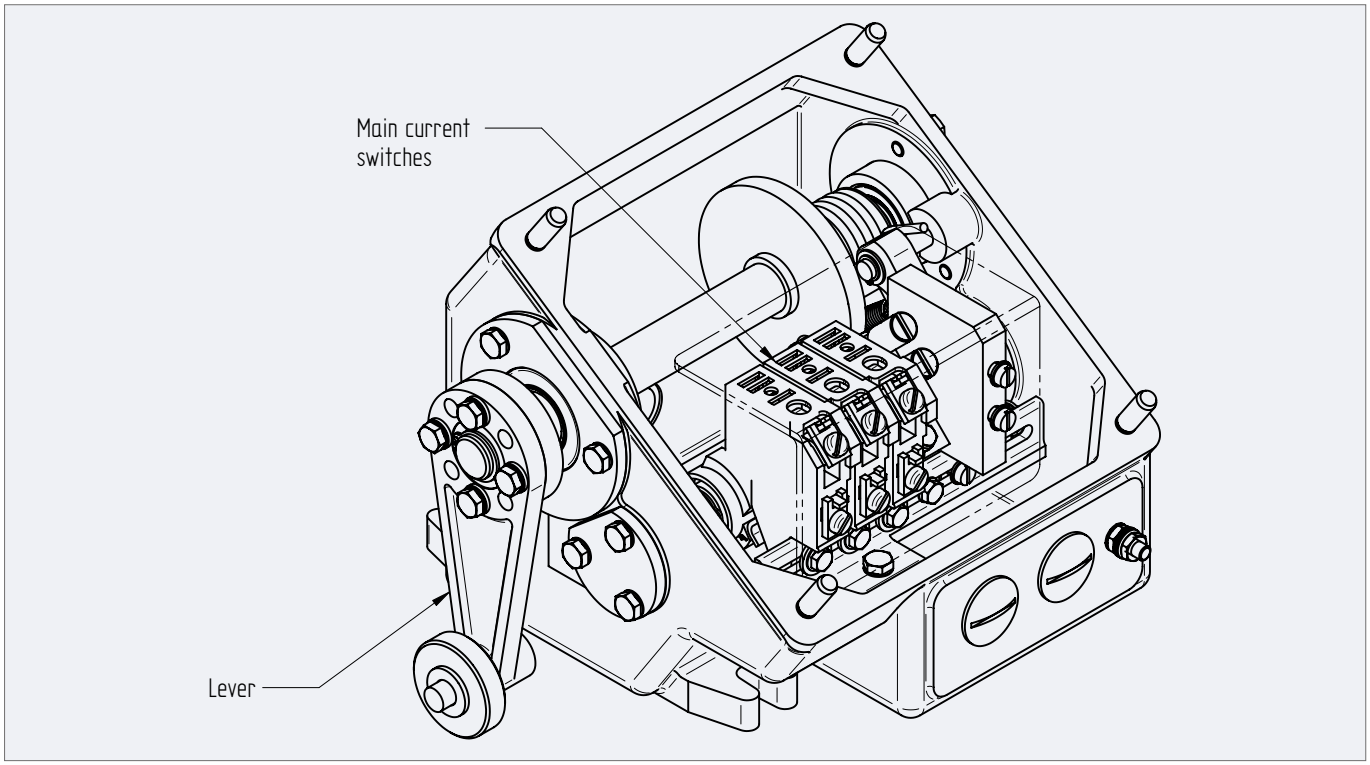
- Main current limit switch for direct switching of three phase-motors
- Main current contacts for 40 and 200 A permanent available

Application

- Steel plants and barrages

Additional information

- Also available in combination with installed auxiliary current contacts



Housing size without control switches		
Housing size	Main current switches	
	Max. No.	Type
1	2 ... 4	11 / 21
2	2 ... 6	11 / 21
4	2 ... 6	13 / 22 / 23

Housing size with fixed control switches			
Housing size	Main current switches		Max. no. aux. switches
	Max. No.	Type	
1	2	11 / 21	2
2	2 ... 6	11 / 21	2
4	2 ... 6	13 / 22 / 23	2

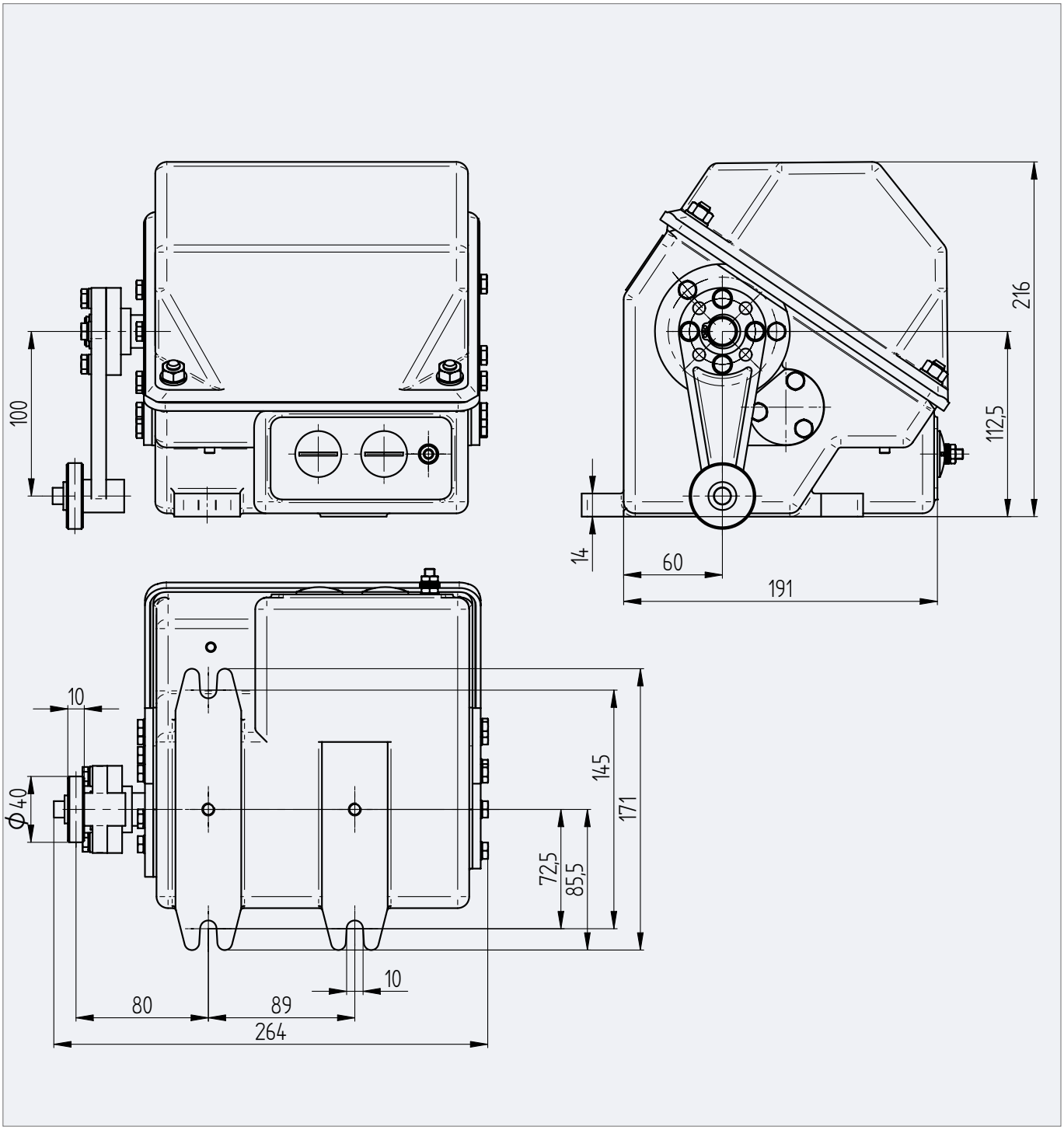
Limit Switches Main Current

Series 62 HNE – Housing Size 1

Revision number: 3.2.1.6-01 **Revision date: 19.11.2019**

Features

- Housings in the size 1 and 2 made of aluminum, protection rate IP65



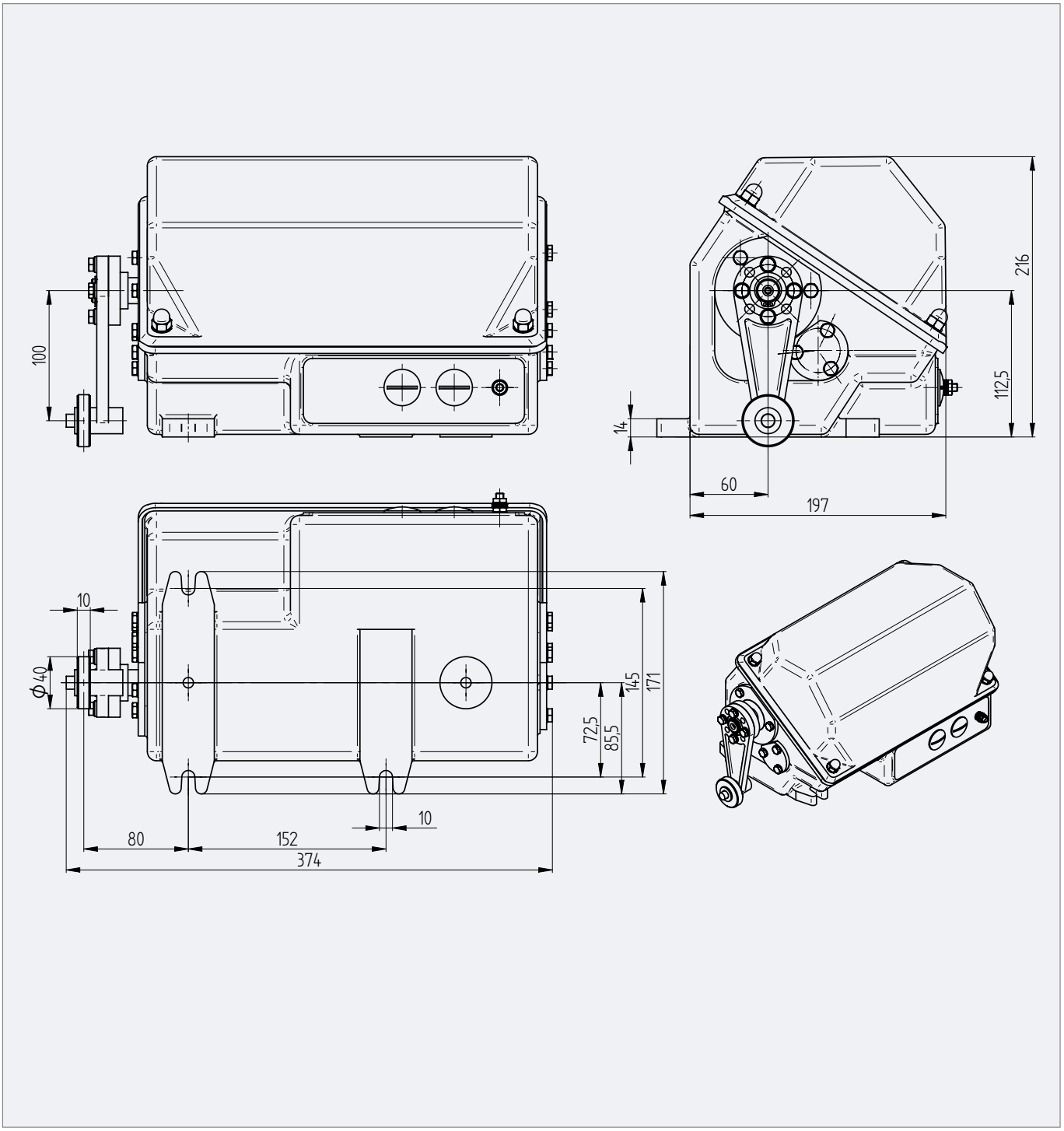
Limit Switches Main Current

Series 62 HNE – Housing Size 2

Revision number: 3.2.1.7-01 **Revision date: 19.11.2019**

Features

- Housings in the size 1 and 2 made of aluminum, protection rate IP65



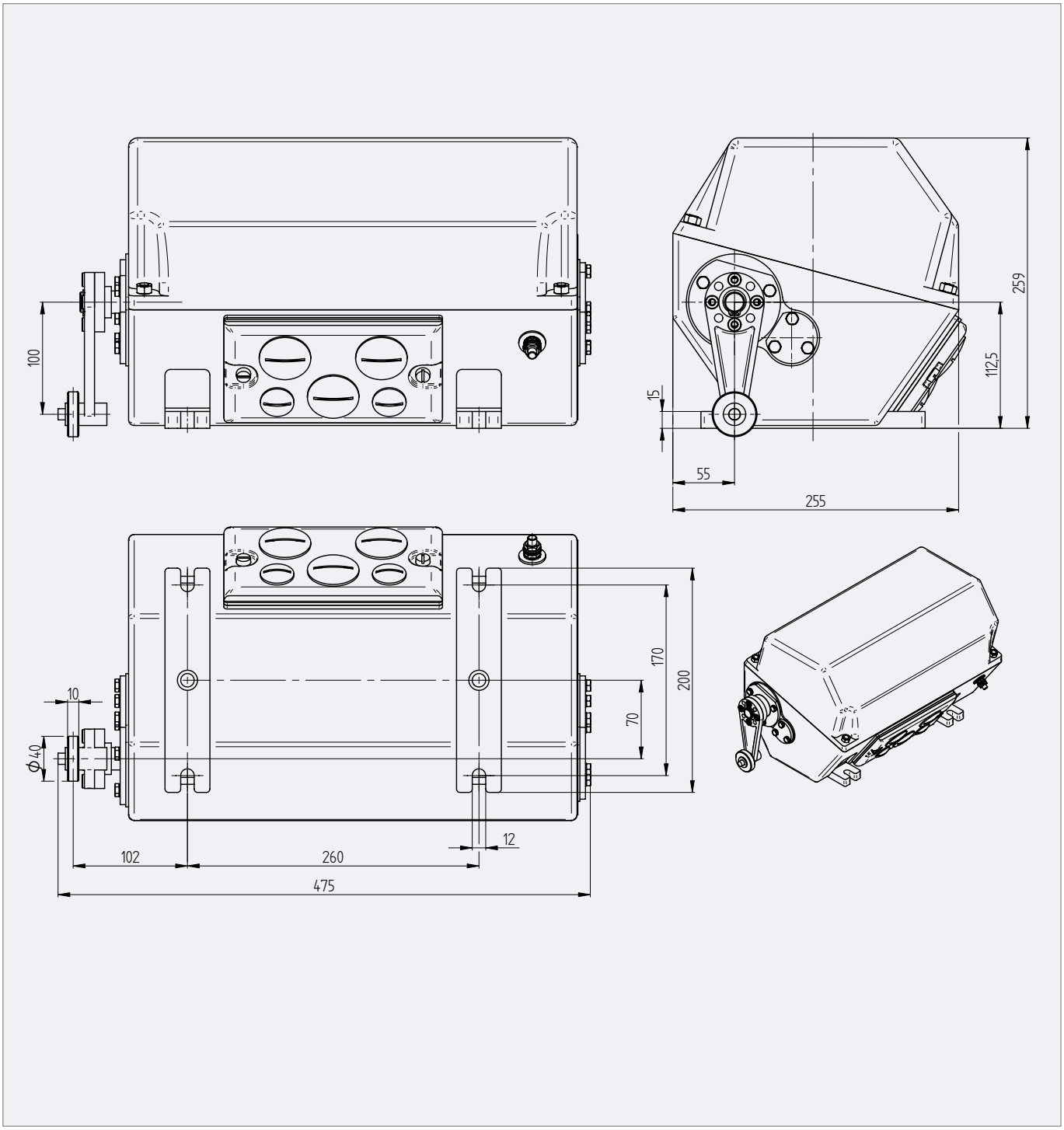
Limit Switches Main Current

Series 62 HNE – Housing Size 4

Revision number: 3.2.1.8-01 **Revision date: 19.11.2019**

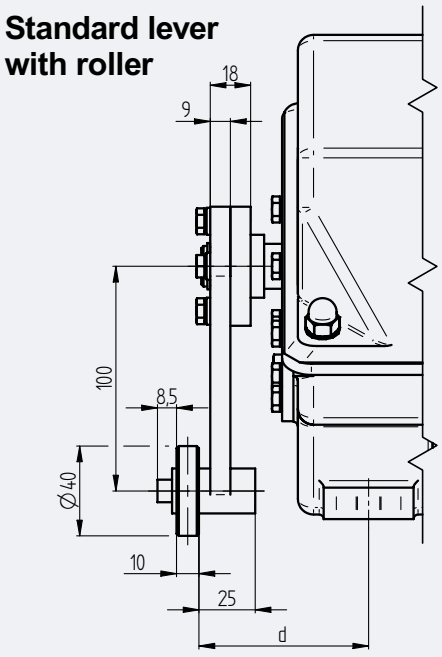
Features

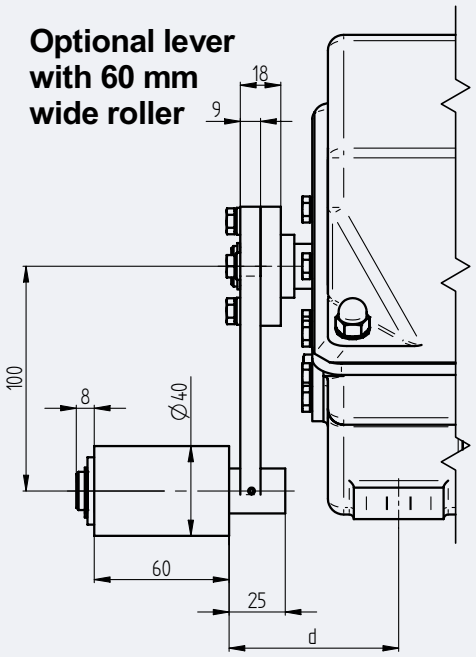
- Housings in the size 4 made of cast iron, protection rate IP54

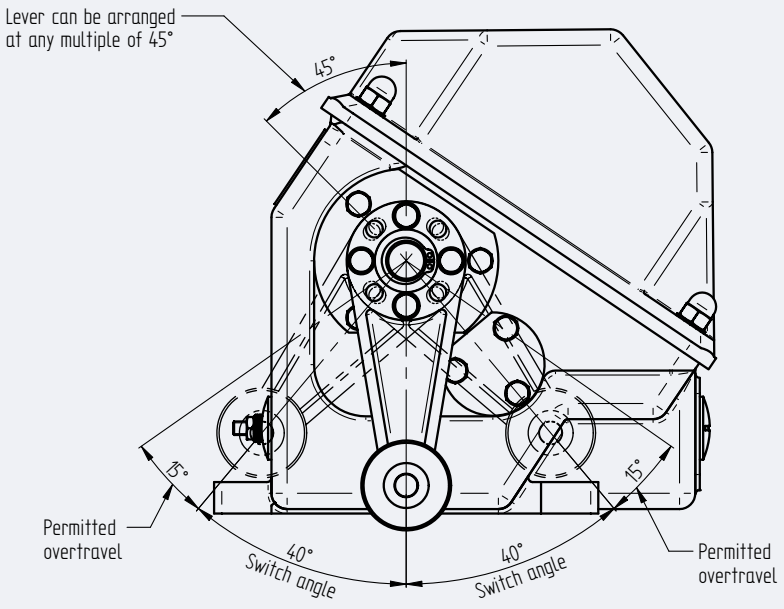


Series 62 HNE – Available Levers

Revision number: 3.2.1.9-01 **Revision date: 19.11.2019**







Housing size	Dimension [mm] d
1	75
2	75
4	97

Limit Switches Main Current

Series 62 GNE – Basic Design Counterweight Switch

Revision number: 3.2.1.10-01 **Revision date: 19.11.2019**

Features

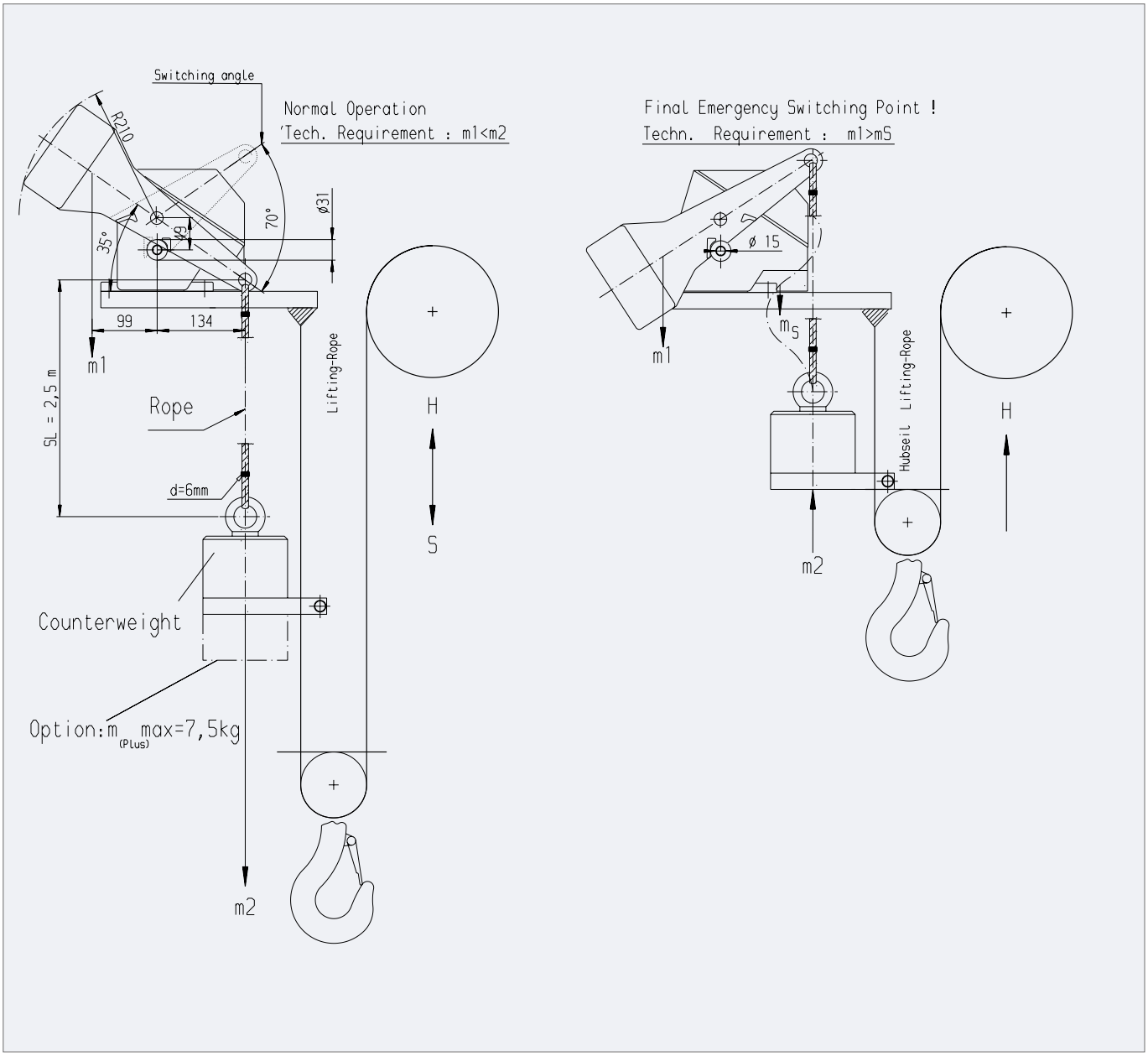
- Main current limit switch for direct switching of three phase-motors
- Main current contacts for 40 and 200 A permanent available

Application

- Steel plants

Additional information

- For the upper position of the hook, additionally to the geared cam limit switch at the drum, for diversity and redundancy



Housing size without control switches		
Housing size	Main current switches	
	Max. No.	Type
1	2 … 4	11 / 21
4	2 … 6	13 / 22 / 23

Housing size with fixed control switches			
Housing size	Main current switches		Max. no. aux. switches
	Max. No.	Type	
1	2	11 / 21	2
4	2 … 6	13 / 22 / 23	2

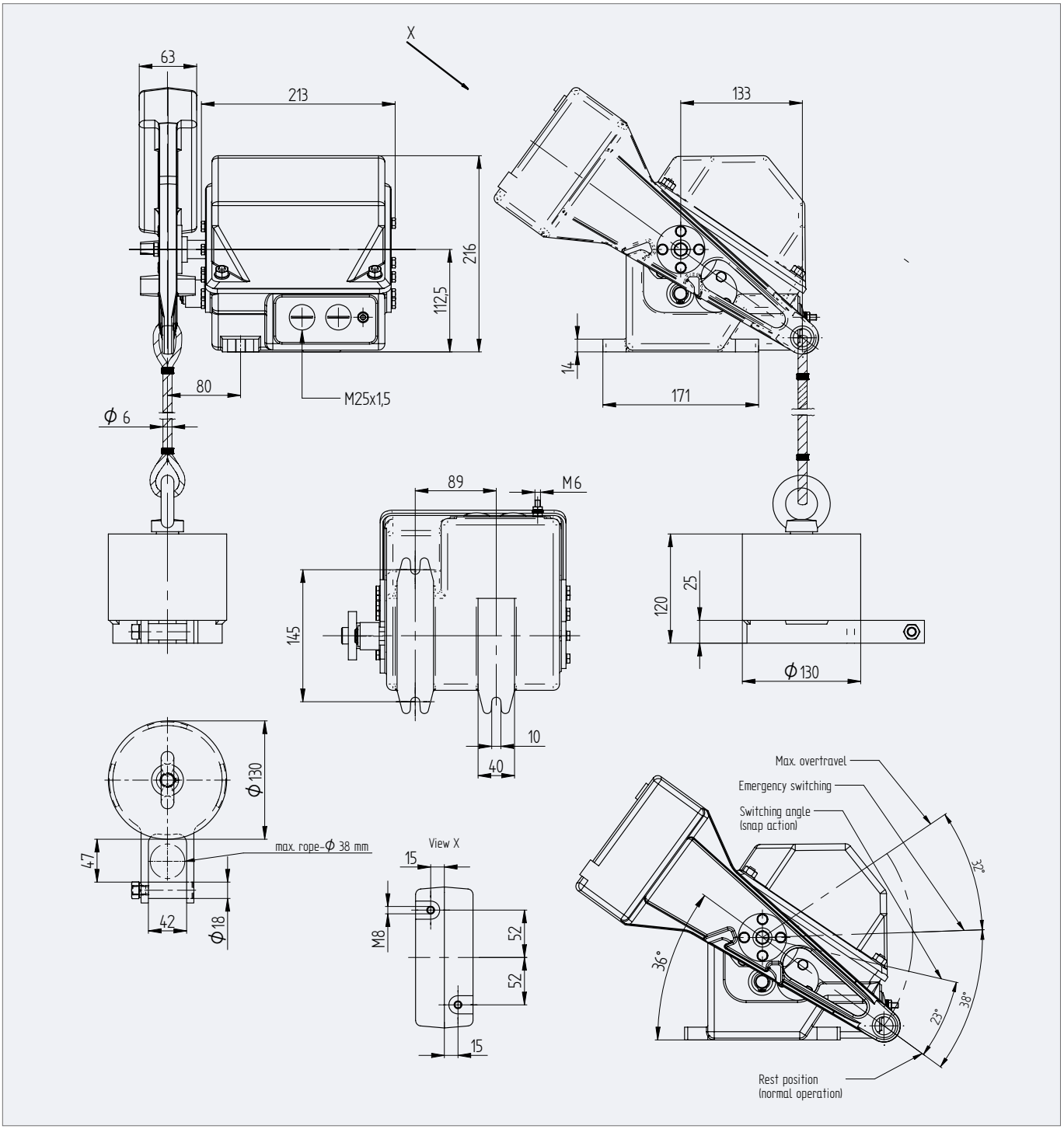
Limit Switches Main Current

Series 62 GNE – Housing size 1

Revision number: 3.2.1.11-01 **Revision date: 19.11.2019**

Features

- Housings in the size 1 and 2 made of aluminum, protection rate IP65



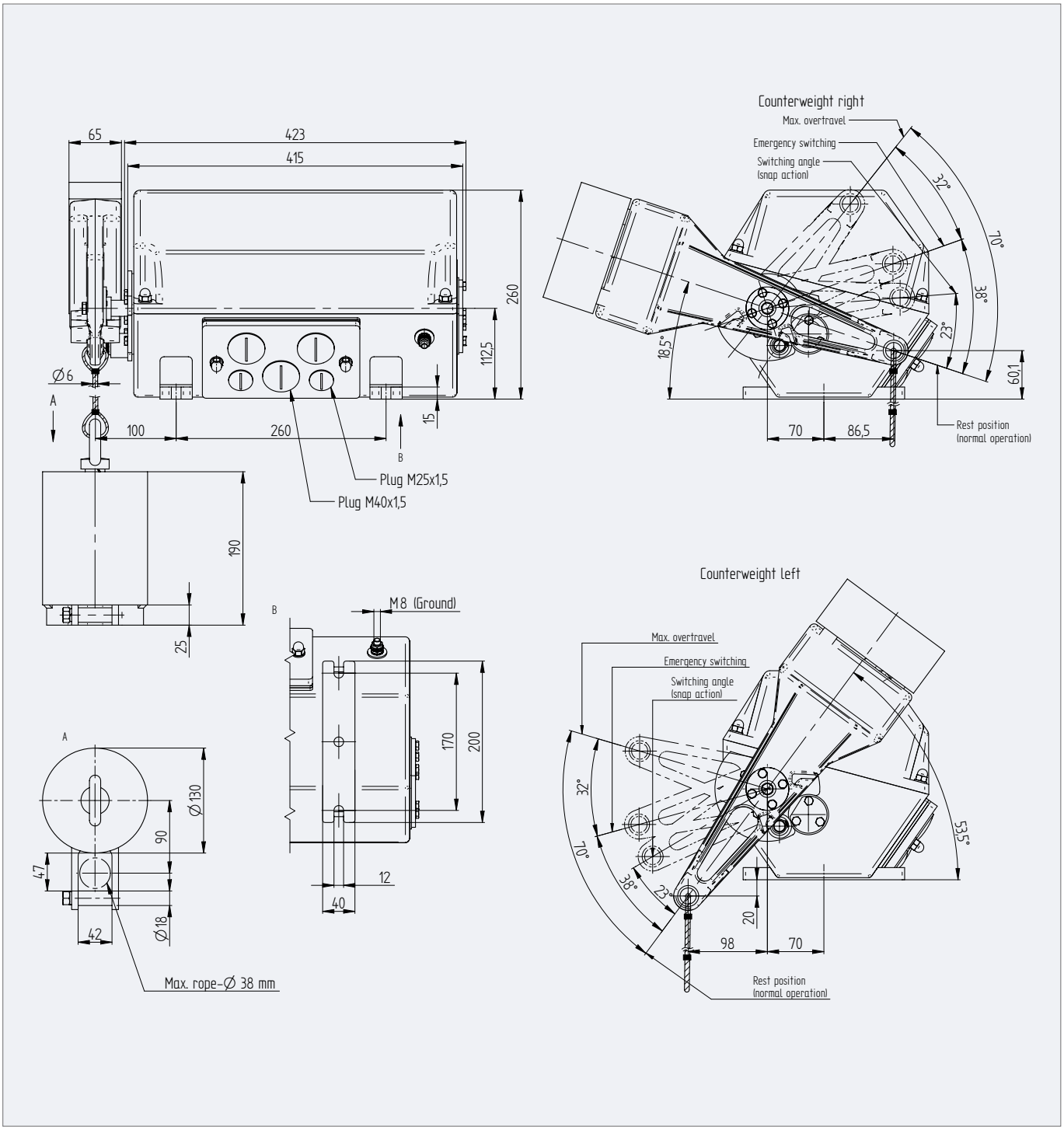
Limit Switches Main Current

Series 62 GNE – Housing size 4

Revision number: 3.2.1.12-01 **Revision date: 19.11.2019**

Features

- Housings size 4 made of cast iron protection rate IP54



Series 62 – Main Current Switches

Revision number: 3.2.1.13-01 **Revision date: 19.11.2019**

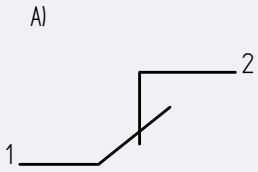
Features

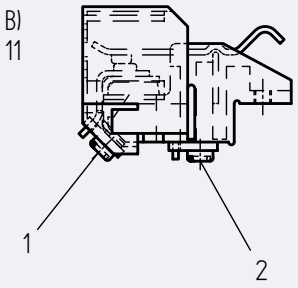
- Main current switches for alternating current (50 Hz / 60Hz)
- DC contacts may still be possible on request

Additional information

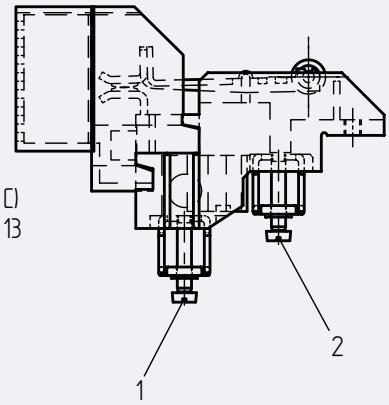
- The performance data of the switches is related to temperatures from -30°C up to + 45°C

A) Circuit diagram (NC)
B) Contact 11
C) Contact 13
D) Contacts 21, 22, 23

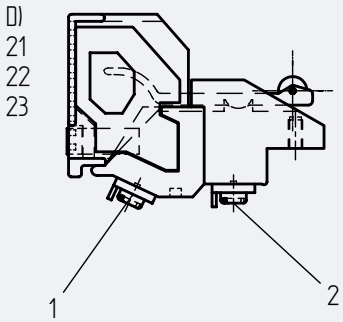




Switching Contact			Switching System		Electrical Data							Connection
Designation	Three phase current	Direct cureent	Snap action	Push action	Permanent current	Slip ring rotor 1), 2) Ia = 2x I_N; cosϕ = 0,7			Squirrel-cage rotor 1), 2) Ia = 2x I_N; cosϕ = 0,6			Screw terminals for cable cross section [mm²]
					A	230V	400V	500V	230V	400V	500V	
11[3]	•			•	40	15	28	28	12	20	20	1x10 or 2x6
13	•			•	200	60	100	130	60	100	100	1x70 or 2x50



Designation	Three phase current	Direct cureent	Snap action	Push action	Permanent current	DC motor			Blow-out coils available for the following currents [A]	Screw terminals for cable cross section [mm²]
DC contacts may still be possible on request					A	220V	440V	600V		
21		•		•	25	4	8	8	1, 2, 4, 8 und 25	1x10 or 2x6
22		•		•	90	16	20	20	30, 60 und 90	1x35 or 2x25
23		•		•	160	28	40	40	120 und 160	1x70 or 2x50



1) Breaking capacity in [kW] at 60% duty factor (ED) when switching off … [V]
2) If the same contacts for both directions of rotation of the motors are current transversed, the stated output is adm. Only up to 40% ED
3) When used as control current contact, load capacity up to 10A, 500 VAC

Limit Switches Main Current

Series 62 – Option: Fixed Control Switches

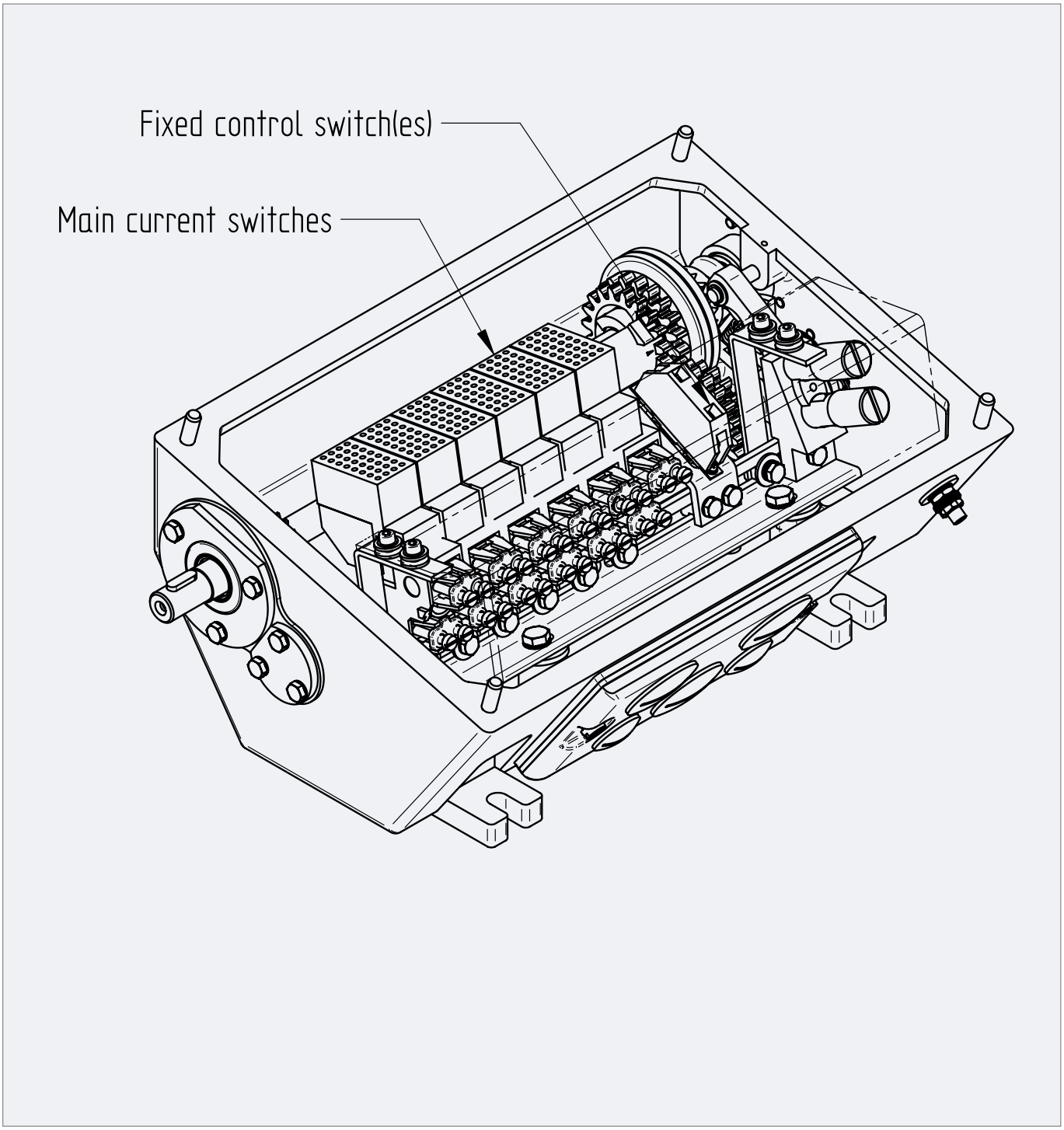
Revision number: 3.2.1.14-01 **Revision date: 19.11.2019**

Features

- Additionally to the main current switches
- Only for auxiliary current

Additional information

- Adjustment of the fixed control switches is not possible, switching is done 20° before the main current switches



Limit Switches Main Current

Series 62 – Option: Adjustable Control Switches (SNE only)

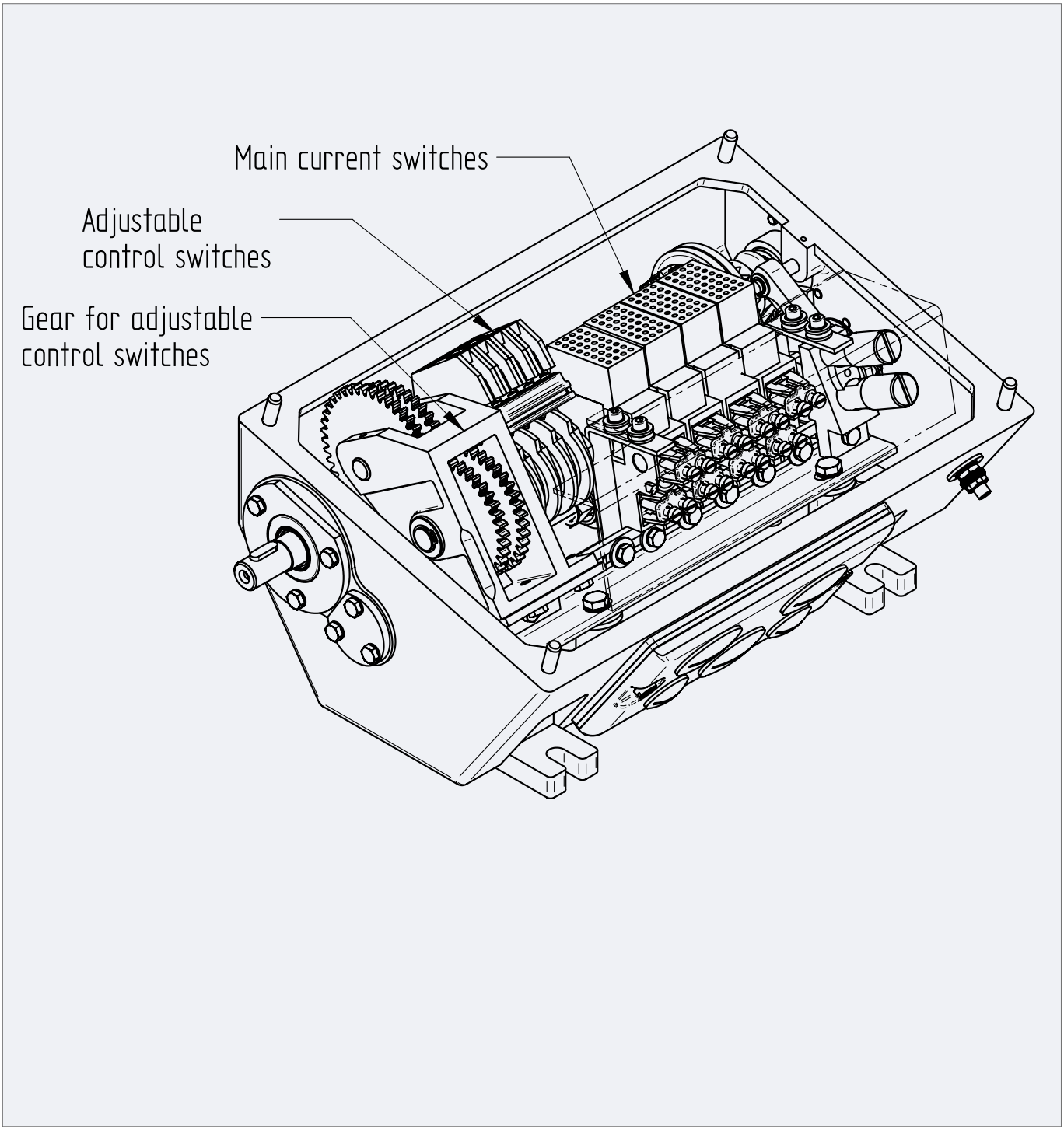
Revision number: 3.2.1.15-01 **Revision date: 19.11.2019**

Features

- Additionally to the main current switches
- Only for auxiliary current

Additional information

- Cam discs for this switches can be infinitely adjusted



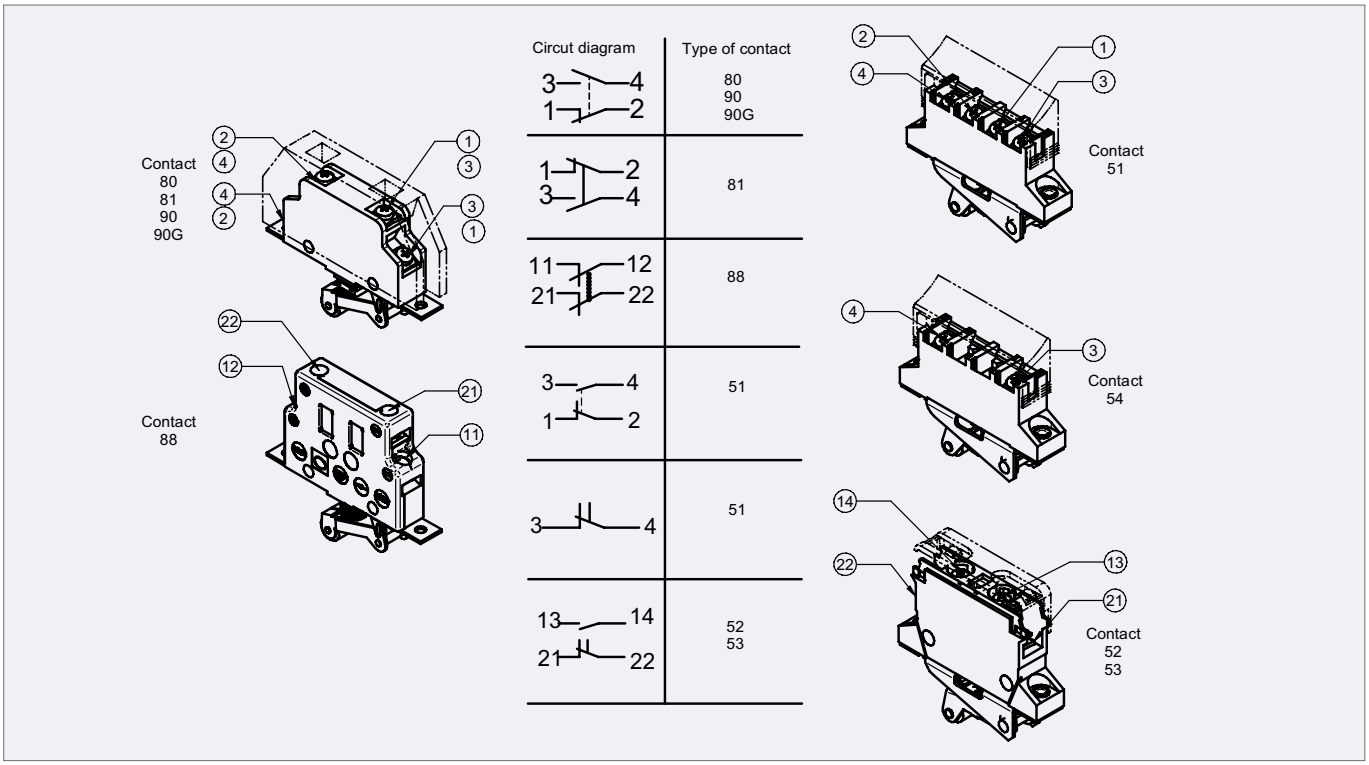
Limit Switches Main Current

Series 62 – Control Current Switches

Revision number: 3.2.1.16-01 **Revision date: 19.11.2019**

Features

- Different types of switches available for control current
- Gold plated types for PLC applications



Switching contact			Contact material		Switching system		Connection	Functionality		Electrical data			Utilization data
Designation	Circuit as a changeover	Circuit as an NC contact	Silver	Gold (PLC-Application)	Snap action switch	Push action switch	Screw terminals; 0,75 - 2,5 mm²/ AWG 14 ... 20	Positive opening acc. to EN 60947–5–1 Annex K	Short circuit protection	Utilization category acc. to IEC 60947	Conventional thermal current I_{th}	Rated Insulation Voltage U_i	Mechanical Lifetime
51	•			•	•		•		10A gL/gG	AC–15: 230V, 2,5A DC-13: 24V, 4A	6A	250V	30x106
52	•			•	•		•	•	6A gL/gG	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	1x106
53	•			•		•	•	•	6A gL/gG	AC–15: 230V, 2,5A DC-13: 24V, 6A	10A	250V	1x106
54		•	•			•	•	•	10A gL/gG	AC–15: 230V, 2,5A DC-13: 24V, 1A	6A	250V	30x106
80	•		•		•		•	•	6A gG	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	10x106
81	•		•			•	•	•	6A gG	AC–15: 230V, 3A DC-13: 110V, 1A	10A	400V	10x106
90	•		•		•		•	•	6A gR	AC–15: 230V, 1A DC-13: 110V, 0,5A	10A	400V	10x106
90G	•			•	•		•	•	2A gG	AC–12: 230V, 0,25A, DC-12: 110V, 0,25A	10A	400V	10x106
88		•		•	•		•	•	10A gG	AC–15: 230V, 1,5A DC-13: 24V, 1,5A	10A	400V	1,5x106

Series 62 – Contact Arrangement

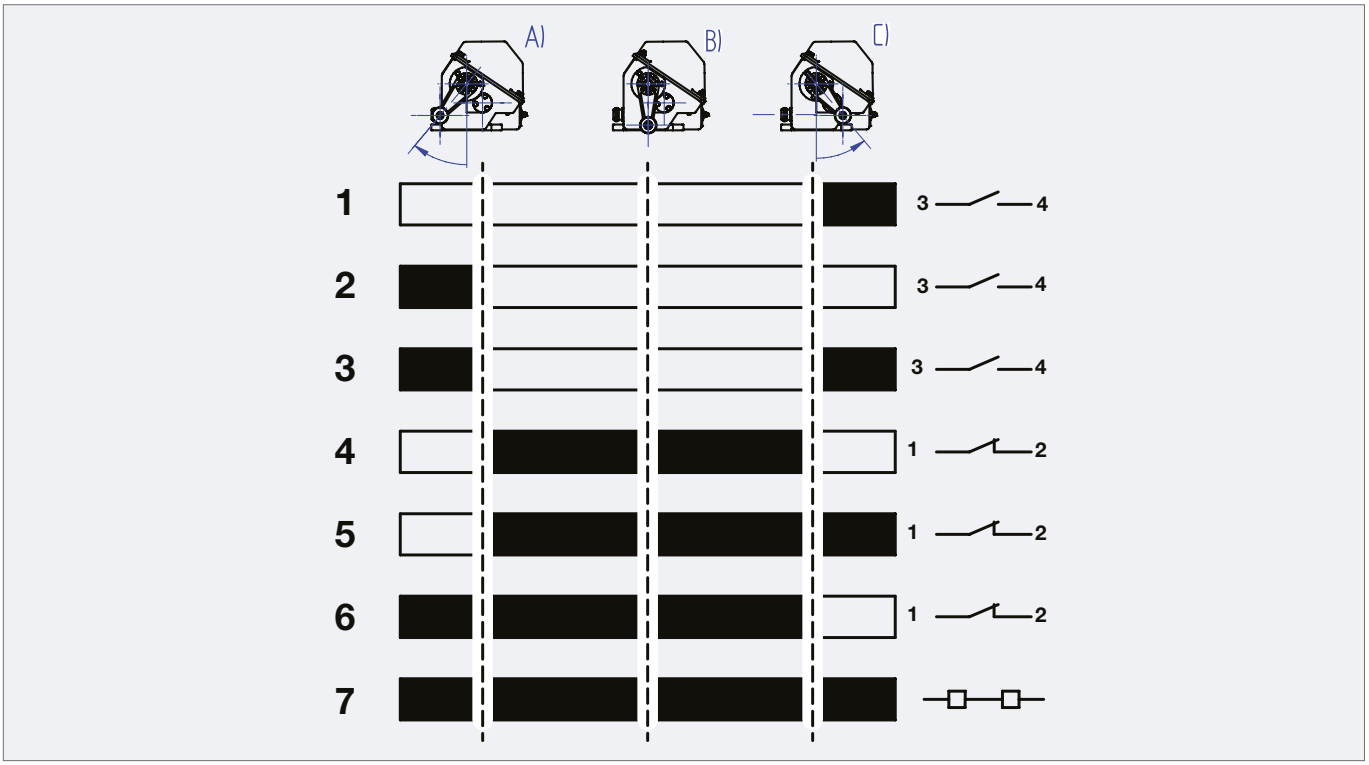
Revision number: 3.2.1.17-01 **Revision date: 19.11.2019**

Features

- Contact arrangement only for main current switches

Additional information

- Contact arrangement of the main current switches must be specified by the customer



Contact Arrangement		Contact state		
Arrangement	Description	Position A clockwise (cw)	Position B neutral	Position C counter-clockwise (ccw)
1	NO - closes in ccw direction	opened	opened	closed
2	NO - closes in cw direction	closed	opened	opened
3	NO - closes in cw & ccw direction	closed	opened	closed
4	NC - opens in cw & ccw direction	opened	closed	opened
5	NC - opens in cw direction	opened	closed	closed
6	NC - opens in ccw direction	closed	closed	opened
7	bridge - always remains closed	closed	closed	closed

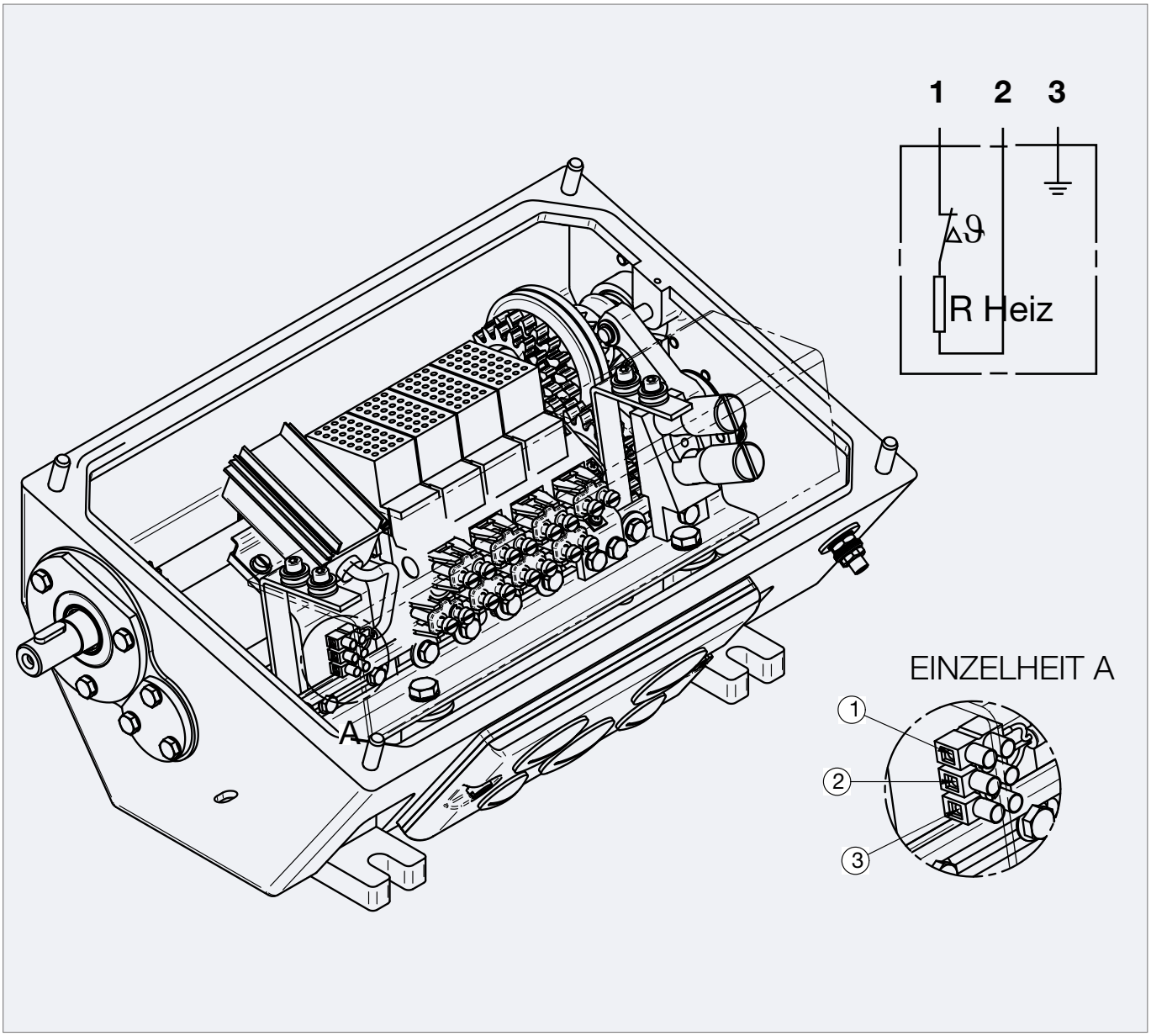
Limit Switches Main Current

Series 62 – Anti-Condensation-Heating

Revision number: 3.2.1.18-01 **Revision date: 19.11.2019**

Features

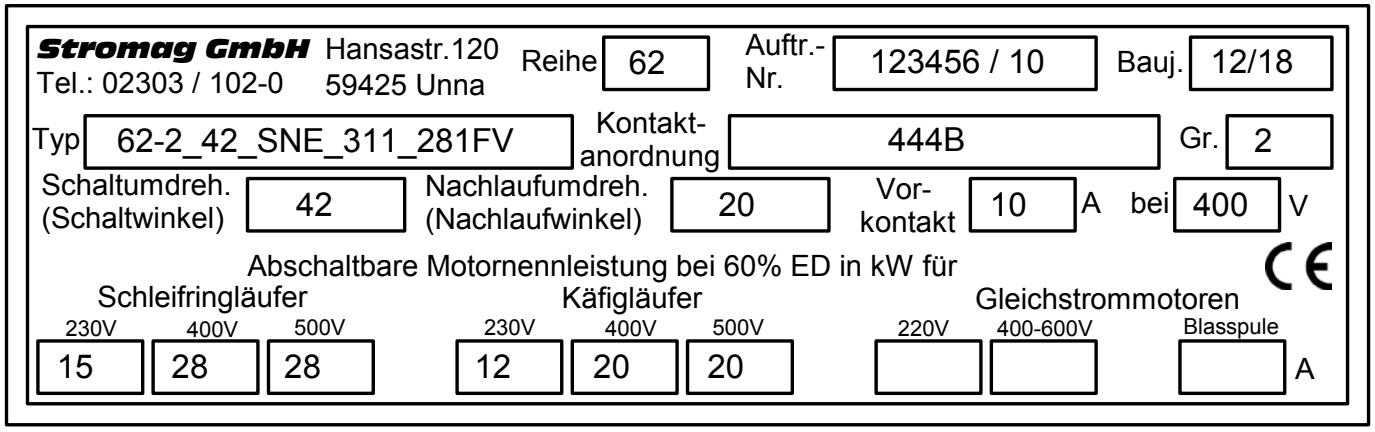
- To prevent the generation of condensation water due to quick temperature drops



Heating Technical Data				
Supply Voltage	Power	Power on	Power off	Connection
24 V AC	10 W	< 25 ° C	> 55 °C	3 x 0,75 mm²
110 - 265 V AC	10 W	< 25 ° C	> 55 °C	3 x 0,75 mm²

Series 62 – Key Of Types

Revision number: 3.2.1.19-01 **Revision date: 19.11.2019**



62	Switch type: Series 62		
62-1	Housing Size	62-1 62-2 62-3 62-4	Housing size 1, aluminum (HNE, GNE)
			Housing size 2, aluminum (HNE, SNE)
			Housing size 3, aluminum (SNE)
			Housing size 4, cast iron (HNE, GNE, SNE)
42	Usable Revolutions	0	For HNE, GNE
		42, 62	For SNE
SNE	Switch type	SNE	Spindle Switch
		HNE	Lever Switch
		GNE	Counterweight Switch
3	Number of main switches fitted		1 - 10
11	Type of main switches fitted	11	Main current switches, 40 A AC
		13	Main current switches, 200 A AC
		21	Main current switches, 25 A DC
		22	Main current switches, 90 A DC
		23	Main current switches, 160 A DC
2	Number of control switches fitted		1 - 4
81	Type of control switches fitted	11	Contact (push action) with screw connections, contact material: Silver
		80	Contact (changeover) with screw connections, contact material: Silver Ü
		81	Contact (push action) with screw connections, contact material: Silver Ü
		88	Contact (double action) with screw connections, contact material: Gold Ü
		90	Contact (changeover) with screw connections, contact material: Silver Ü
		90G	Contact (changeover) with screw connections, contact material: Gold Ü
		51	Snap-action with screw-terminals, contact material: gold
		52	Contact (changeover) with screw connections, contact material: Gold Ü
		53	Contact (push action) with screw connections, contact material: Gold Ü
		54	Contact (push action) with screw connections, contact material: Silver Ü
FV	Adjustablility of control switches		Fixed control switches
		FV	Adjustable control switches

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