



Switchgear and control equipment

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Switchgear and control equipment

Master controllers, differential limit switches

Summary

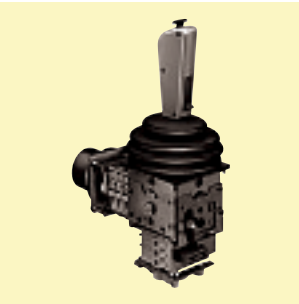
The drive motors of hoisting gear installations are controlled by cam controllers (master controllers) via contactors. Control devices with a largely bounce-free switching action are a prerequisite for proper functioning of contactor control. This requirement is met by the switchgear in the following.

The double master controllers are easy and reliable to operate. They have switching elements actuated by cam discs. The switching elements are available in two versions:

- With gold-plated switching contacts for reliably switching low voltages and currents as well as currents of up to 2 A and voltages of up to 250 V at AC-15
- With silver contacts for currents of up to 4 A at AC-15 250 V.

Easily sensed detent positions and a particularly emphasized zero detent allow reliable switching, even in forceful operation.

Double master controller 3SJ3



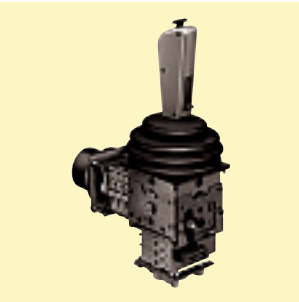
- Built-in switch for one or two directions of movement for crane controllers
- Switching elements with gold-plated contacts, suitable for electronics
- Choice of switching elements with silver contacts for currents of up to 4 A at AC-15 250 V
- Pushbutton and latch function in the switching lever
- Analog setpoint generators can be fitted
- Opto-electronic encoders (digital master controller) can be fitted

Grab differential limit switch 3SJ6

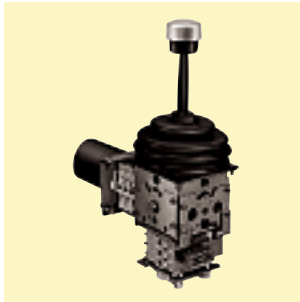


- Rugged cam-operated switch in a cast housing
- For grab cranes with single-lever grab control
- Actuation of the differential limit switch by the closing and holding winch

Double master controller 3SJ3



3SJ3 with grip



3SJ3 with ball



3SJ3 with pushbutton in the ball

Applications

Double master controllers 3SJ3 are intended for building-in in degree of protection IP 00. They are suitable for fitting in:

- Crane control gear, control stands and control pedestals
- Stationary and portable consoles
- Remote and floor-control units

The controllers are suitable for switching auxiliary circuits of up to 250 V at AC-15. The double contact principle and gold-plated switching contacts also ensure reliable switching at low voltages in electronic circuits.

Mounting

The duplex master controller is screwed on to the upper cover plate of the mounting space from the exterior with four screws. The plate on which the controller is secured should have a thickness of 2 to not more than 4 mm.

The mounting opening is sealed with a bellows.

This has a molded seal at the bottom fold which is clamped between the cover and the housing. The bellows is made of highly flexible neoprene and resists oil, acids, caustic solutions, sea water, ozone and UV radiation.

Double master controller 3SJ3

Drive block

The drive block has a switching lever and an internal articulated-shaft mechanism, with which two drive axles can be actuated independently, separately or jointly.

The drive axles are offset by 90°. Each drive axle can be actuated from each switching position of the other axle.

The switches for surface mounting on the side are driven via gear segments and spur gears; the switch fitted to the base is driven via bevel gears.

At the drive block, surface mounting switches can be fitted to one or both mounting surfaces of each drive axle. A surface mounting switch can also be fitted to the base on

which one of the two drive axles acts. However, not more than 24 switching elements may be arranged on one drive axle.

The number of mounting surfaces which can be occupied by switches is reduced if spring return devices are used or a surface mounting switch is to be fitted to the base.

The detent disc is part of the surface mounting switch and has an emphasized zero detent.

The drive block is available in two different versions:

- Normal version for a service life of 10 million switching operations
- Ruggedized version for a service life of 20 million switching operations.

Switching lever

A grip or ball is fitted to the switching lever as the actuating element.

Grey grip

- without momentary-action function
- with pushbutton
- with latch for zero position locking
- with latch as pushbutton.

Black ball

- without momentary-action function
- with pushbutton
- with dead man pushbutton (mechanical by keeping the upper half of the grip pressed down, or capacitive by resting the hand on it)
- with signal switch (by raising the lower half of the grip)

- with mechanical zero position locking (by raising the lower half of the grip).

The grey grip can be rotated 90° to each side after slackening a nut.

A pushrod positioned within the switching lever actuates a microswitch situated in the interior of the drive block. To allow the microswitch to be actuated from each switching position, the pushrod has a ball segment at the lower end.

The zero position locking is also actuated via the pushrod.

The switching rod travels largely wear-free in a gate with two guide rolls.

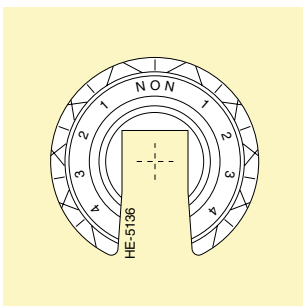
The lever excursion is restricted to 40° on each side. The stop plate can be replaced or exchanged for a special switching gate.

Double lever-operated mechanism

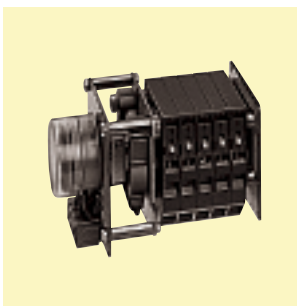
For special applications.



Surface mounting switch for 3SJ3



Cam disc for 3SJ3



Surface mounting switch of a 3SJ3 with wire-wound potentiometer with detent

Surface mounted switch

The surface mounted switch is assembled from switching elements, each with two contact elements, which are snap-fitted on a support.

The switching elements have special double contact elements of high reliability and are available in two versions:

- For currents ≤ 2 A as standard version (grey color). These switching elements have gold-plated contacts and can also reliably switch low currents in the mA region at low voltages. They are therefore also suitable for use in electronic circuits.

- For currents up to 4 A (yellow color). These switching elements with silver contacts should be used for switching currents of > 2 A (such as contactors of other manufacturers).

The control state indicators on the switching elements indicate the control state of the individual contacts.

Assemblies of 2, 4, 6, 8, 10 and 12 contacts can be created.

The conductor terminals use the SIGUT connection system and have the following technical advantages:

- Captive screws
- Funnel-shaped conductor and screwdriver guides
- Safe from touch by finger and back of hand to DIN VDE 0106 Part 100.

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Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Cam disc

A cam disc is assigned to each contact element. The cam discs are clamped onto the camshaft with cup springs. After removal of the double switching element, they can easily be replaced with a wire hook supplied with each switch.

The detent element is fitted to the side opposite to the drive side. The detent disc allows up to 4-0-4 switching positions and has recesses to emphasize the zero detent which can thus be clearly distinguished from the switching positions.

The detent spring can be replaced and is available in three strengths so that the detent can be adapted to the operational requirements.

The cam discs are marked on one side with "N" for non-overlapping contacting and on the other side with "U" for overlapping contacting.

With the programs cut at the factory, the "N" marking always points to the drive side.

The cam discs have markings allowing the switching program to be cut with a fine saw and file.

The cam discs must be seated on the switching shaft in such a way that the same marking is always seen in the viewing direction.

Spring return

Spring returns can be fitted to the opposite mounting surface of the switch for auto-return of the switching lever to the zero position.

The spring return is assembled on a baseplate and comprises two levers and one compression spring. When the switching lever is operated, the spring is tensioned by the roll lever. The spring return is available as a single part and can be retrofitted.

Fitting of potentiometers or digital encoders

On variable-speed drives, potentiometers or digital encoders are used to preset the setpoint. For this purpose, the following devices can be fitted on the detent side of the surface mounting switch without intermediate gearing, with maximum resolution of the angle of rotation:

- Opto-electronic encoder (OEE) 6GA4 603-□AA00 with linear characteristic
- Wire-wound potentiometer 6KA9 924-□ with linear or nonlinear characteristic.

Direct installation without intermediate gearing results in no backlash or hysteresis in actuation.

Friction brake

A mechanical friction brake can be installed to achieve greater friction force. The detents for the zero position, control range end or field weakening are then machined into the brake disc.

Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Technical data

Type	2 A contact Gold-plated contacts, for electronics		4 A contact Silver contacts	
	Normal Version	Ruggedized Version	Normal Version	Ruggedized Version
	3SJ3 0	3SJ3 1	3SJ3 5	3SJ3 6
Double master controller 3SJ3				
Rated insulation voltage V_i	AC V	250	250	250
	DC V	250	250	250
Test Voltage	kV	2.5	2.5	2.5
Rated Voltage V_{in}	AC V	250	250	250
Rated Operating Current I_{in}/AC-11, DC-11, AC-15, DC-13 at	- AC 250 V	A	2	4
	- DC 24 V	A	1	4
	- DC 48 V	A	0.5	4
Short-circuit Protection (without welding effect)	- DIAZED fuses, operating class gL	A	6	10
	- Circuit breakers with G characteristic	A	6	10
Mechanical Life		10×10^6	20×10^6	20×10^6
Maximum Switching Frequency	Cycles/h	1000		
Conductor Cross-sections	- stranded with ferrules	mm ²	2 x 0.5 to 1.5	
	- solid	mm ²	2 x 1 to 2.5	
Pushbutton in the switching lever				
Rated Voltage V_{in}	V	250		
Rated Current I_{in} /AC-15 at 250 V	A	2		
Life of the microswitch (1 changeover contact)	Cycles	10×10^6		
Permissible ambient temperature	- Operation	°C	- 20 to + 60	- 40 to + 60
	- Storage	°C	- 50 to + 80	- 50 to + 80
Climatic resistance	Damp heat constant		Damp heat constant	Damp heat constant
	DIN IEC 68 Part 2-3		DIN IEC 68 Part 2-3	DIN IEC 68 Part 2-3
	Damp heat cyclic		Damp heat cyclic	Damp heat cyclic
	DIN IEC 68 Part 2-30		DIN IEC 68 Part 2-30	DIN IEC 68 Part 2-30
Creepage distances and clearances to IEC 947-1; 2.5.46.51		Overvoltage category III, pollution severity 3		
Regulations		IEC 947-5-1 EN 60 947 DIN VDE 0660-200		
Approvals		CSA-LR 18831-5M		
Degree of protection to IEC 529 DIN 40 050		IP 00		

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Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Technical data

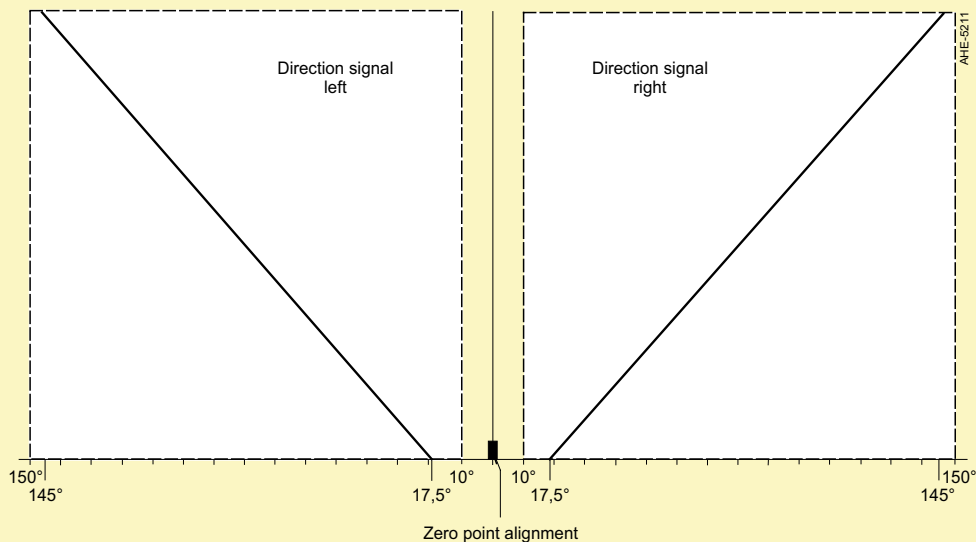
Opto-electronic encoder 6GA4 603 (for digital setpoints) ¹⁾

The opto-electronic encoder (OEE) forms a digital master controller when it is assembled together with two switching elements (four contacts) of a master controller 3SJ3. Of these four contacts, one contact serves for monitoring the zero position, and two contacts serve for presetting the direction.

The OEE must be supplied with 24 V DC either from a separate power supply unit. A 15-core connecting cable with DA 15 male connector at one end is required for connecting the OEE to a terminal strip or ET 100/ET 200.

See page 4/7 for connector assignments.

	6-bit encoder (standard version)		8-bit encoder
	Order No.	6GA4 603-1AA00	6GA4 603-2AA00
Type		OEC 2-4-1	OEC 2-2-1
Encoding		Binary	Binary
Characteristic		Linear	Linear
Power supply	DC V	20 to 30	20 to 30
Current consumption	mA	150	150
Output (push-pull output stage)		24 V DC, 15 mA	24 V DC, 15 mA
Temperature range	°C	-20 to +60	-20 to +60
Service life	Hours of operation	50 000	50 000
Connection		Female sub D connector DA15 with strain relief	Female sub D connector DA15 with strain relief
Degree of protection		IP 54	IP 54
Weight	g	Approx. 350	Approx. 350
Connecting cable		Order No. 3SX4 175 with DA 15 male connector, 1.5 m long, approx. 200 g	



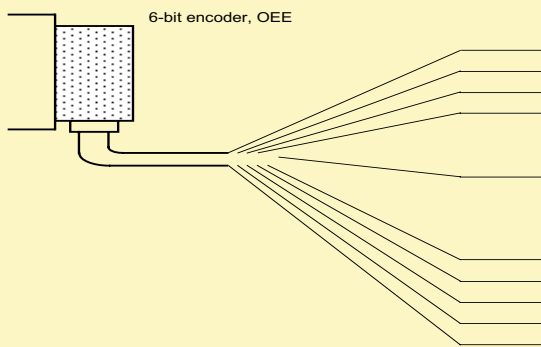
Output characteristic of the opto-electronic encoder for digital master controllers

¹⁾ Encoder of type OEC 4 with PROFIBUS or CAN bus connection on request.

Double master controller 3SJ3

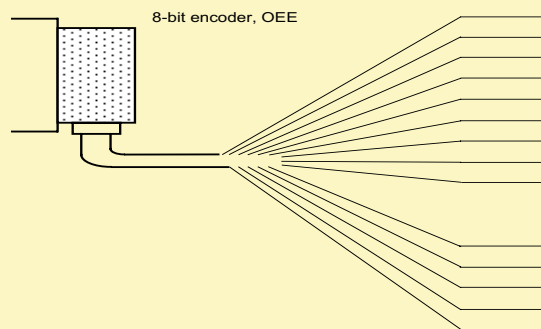
Technical data

Opto-electronic encoder 6GA4 603 (for digital setpoints)



Pin assignments of the sub D connector	Core color of cable	Function
1	white	not connected
2	brown	D4 active-high 24 V DC
3	green	D3 active-high 24 V DC
4	yellow	D2 active-high 24 V DC
5	grey	D1 active-high 24 V DC
6	pink	not connected
7	blue	not connected
8	black	0 V ground
9	red	10 to 30 V DC supply
10	—	not connected
11	—	not connected
12	violet	direction left active-high
13	grey-pink	direction right active-high
14	red-blue	D6 active-high 24 V DC
15	white-green	D5 active-high 24 V DC
—	brown-green	shield

AHE-5212b



Pin assignments of the sub D connector	Core color of cable	Function
1	white	not connected
2	brown	D6 active-high 24 V DC
3	green	D5 active-high 24 V DC
4	yellow	D4 active-high 24 V DC
5	grey	D3 active-high 24 V DC
6	pink	D2 active-high 24 V DC
7	blue	D1 active-high 24 V DC
8	black	0 V ground
9	red	10 to 30 V DC supply
10	—	not connected
11	—	not connected
12	violet	direction left active-high
13	grey-pink	direction right active-high
14	red-blue	D8 active-high 24 V DC
15	white-green	D7 active-high 24 V DC
—	brown-green	shield

AHE-5213a

Pin assignments for the opto-electronic encoder

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Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Technical data

Opto-electronic encoder 6GA4 603 (for analog setpoints)

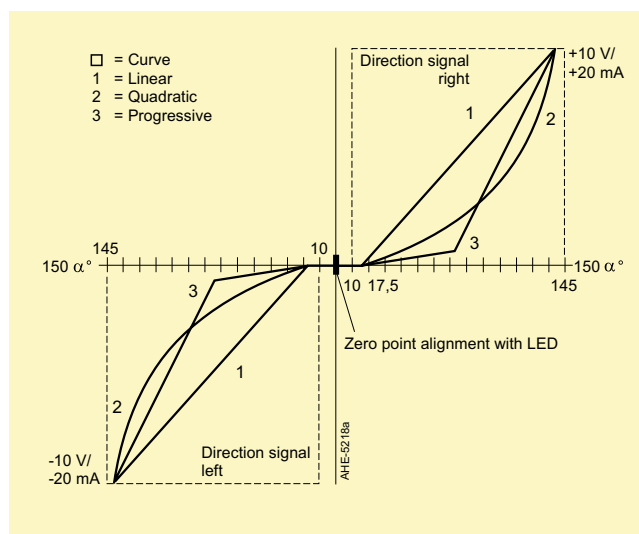
The following opto-electronic encoders (OEE) are available as replacements for the magneto-resistive potentiometer 6KA9 110-3B:

- Encoder 6DA4 603-3AA0 (type OEC 2-3-2-2) with ± 10 V output
- Encoder 6DA4 603-4AA0 (type OEC 2-3-2-6) with ± 20 mA output

Caution: the encoders can only be fitted onto master controllers 3SJ3.

A 15-core cable with DA 15 plug at one end is required to connect the OEE to a terminal strip or ET 100/ET 200.

	Order No. 6GA4 603-3AA00	6GA4 603-4AA00
Type	OEC 2-3-2-2	OEC 2-3-2-6
Encoding	6-bit grey code	6-bit grey code
Characteristic	Square (2)	Square (2)
Power supply	DC V 18 to 36	18 to 36
Current consumption	mA 150	150
Output	± 10 V	± 20 mA
Required load		max. 500 Ω , 2 %
Temperature range	$^{\circ}\text{C}$ -20 to +60	-20 to +60
Service life	Hours of operation 50 000	50 000
Connection	Female sub D connector DA15 with strain relief	Female sub D connector DA15 with strain relief
Degree of protection	IP 54	IP 54
Weight	g Approx. 350	Approx. 350
Connecting cable	Order No. 3SX4 232 with DA 15 male connector, 1.5 m long, approx. 200 g	



Output characteristic of the opto-electronic encoder for analog setpoints

Plug pins	Core color
+ 24 V power supply	Red
0 V ground	Black
± 10 V/ ± 20 mA	Green

Double master controller 3SJ3

Technical data

Wire-wound potentiometer 6KA9 924

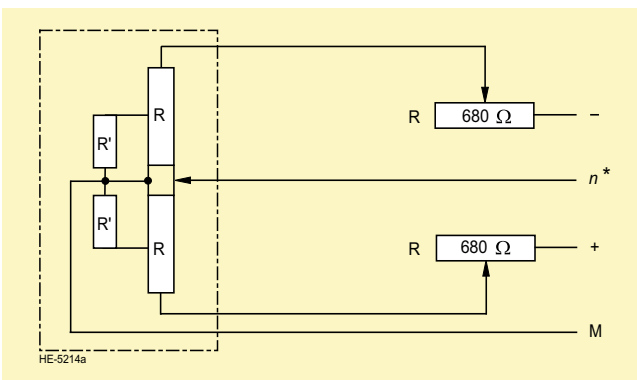
The wire-wound potentiometers have a "zero region" at their midpoint (master controller midpoint). The version with

the bent characteristic curve allows precise operation of the drive at low speeds.

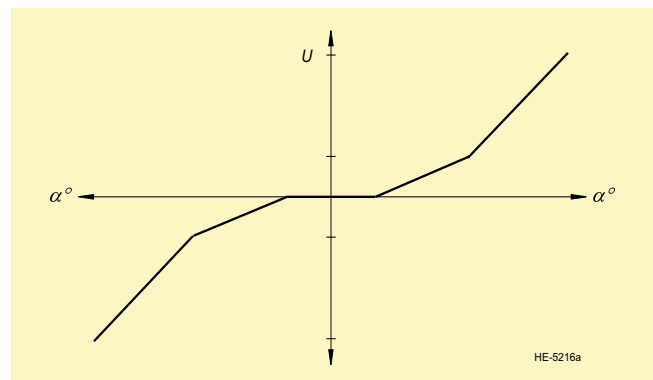
The wire-wound potentiometers must be powered by the control unit via two adjustable alignment resistors, or supplied with a regulated DC voltage from the exterior.

Other resistance values are available on request.

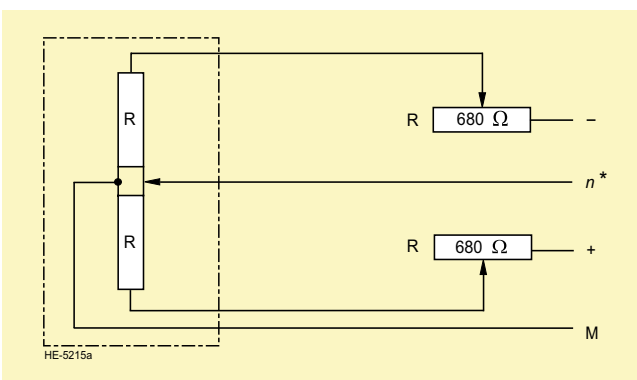
	Order No. 6KA9 924-1	6KA9 924-2
Type	T 178	T 130
Rating (20° C)	W 2.5	2.5
Linearity error	% 0.3	0.3
Resistance tolerance	% 1	1
Total resistance	kΩ 2 x 1.4	2 x 2
Weight	g 70	68
Characteristic	Linear, bent	Linear
Mechanical life	Cycles 10 ⁷	10 ⁷



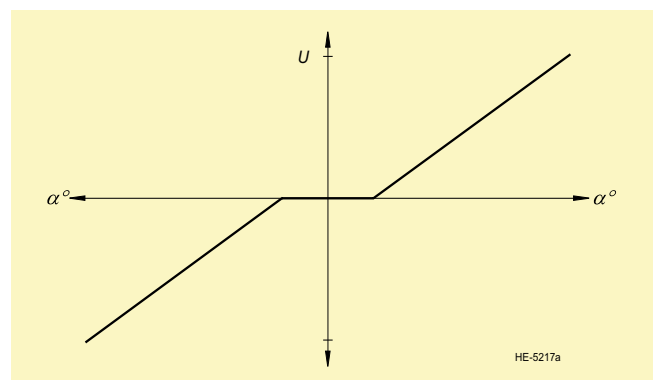
Circuit diagram of the nonlinear wire-wound potentiometer



Characteristic of the nonlinear wire-wound potentiometer



Circuit diagram of the linear wire-wound potentiometer



Characteristic of the linear wire-wound potentiometer

- n* Speed setpoint
- U Voltage
- α Angle of rotation



Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Selecting and ordering data

	No. of switching contacts for the surface mounting switches		Normal version	Weight approx. kg	Ruggedized version	Weight approx. kg
	①	②	Order No.		Order No.	
Versions with gold-plated contacts for currents ≤ 2 A, suitable for electronics	–	2	3SJ3 001– A □ □ □	1.13	3SJ3 101– A □ □ □	1.43
	–	4	3SJ3 002– A □ □ □	1.17	3SJ3 102– A □ □ □	1.47
	–	6	3SJ3 003– A □ □ □	1.21	3SJ3 103– A □ □ □	1.51
	–	8	3SJ3 004– A □ □ □	1.25	3SJ3 104– A □ □ □	1.55
	–	10	3SJ3 005– A □ □ □	1.29	3SJ3 105– A □ □ □	1.59
	–	12	3SJ3 006– A □ □ □	1.33	3SJ3 106– A □ □ □	1.63
	2	–	3SJ3 010– □ A □ □	1.13	3SJ3 110– □ A □ □	1.43
	2	2	3SJ3 011– □ □ □ □	1.39	3SJ3 111– □ □ □ □	1.69
	2	4	3SJ3 012– □ □ □ □	1.43	3SJ3 112– □ □ □ □	1.73
	2	6	3SJ3 013– □ □ □ □	1.47	3SJ3 113– □ □ □ □	1.77
	2	8	3SJ3 014– □ □ □ □	1.51	3SJ3 114– □ □ □ □	1.81
	2	10	3SJ3 015– □ □ □ □	1.55	3SJ3 115– □ □ □ □	1.85
2	12	3SJ3 016– □ □ □ □	1.59	3SJ3 116– □ □ □ □	1.89	
4	–	3SJ3 020– □ A □ □	1.17	3SJ3 120– □ A □ □	1.47	
4	2	3SJ3 021– □ □ □ □	1.43	3SJ3 121– □ □ □ □	1.73	
4	4	3SJ3 022– □ □ □ □	1.47	3SJ3 122– □ □ □ □	1.77	
4	6	3SJ3 023– □ □ □ □	1.51	3SJ3 123– □ □ □ □	1.81	
4	8	3SJ3 024– □ □ □ □	1.55	3SJ3 124– □ □ □ □	1.85	
4	10	3SJ3 025– □ □ □ □	1.59	3SJ3 125– □ □ □ □	1.89	
4	12	3SJ3 026– □ □ □ □	1.63	3SJ3 126– □ □ □ □	1.93	
6	–	3SJ3 030– □ A □ □	1.21	3SJ3 130– □ A □ □	1.21	
6	2	3SJ3 031– □ □ □ □	1.47	3SJ3 131– □ □ □ □	1.77	
6	4	3SJ3 032– □ □ □ □	1.51	3SJ3 132– □ □ □ □	1.81	
6	6	3SJ3 033– □ □ □ □	1.55	3SJ3 133– □ □ □ □	1.85	
6	8	3SJ3 034– □ □ □ □	1.59	3SJ3 134– □ □ □ □	1.89	
6	10	3SJ3 035– □ □ □ □	1.63	3SJ3 135– □ □ □ □	1.93	
6	12	3SJ3 036– □ □ □ □	1.67	3SJ3 136– □ □ □ □	1.97	
8	–	3SJ3 040– □ A □ □	1.25	3SJ3 140– □ A □ □	1.55	
8	2	3SJ3 041– □ □ □ □	1.51	3SJ3 141– □ □ □ □	1.81	
8	4	3SJ3 042– □ □ □ □	1.55	3SJ3 142– □ □ □ □	1.85	
8	6	3SJ3 043– □ □ □ □	1.59	3SJ3 143– □ □ □ □	1.89	
8	8	3SJ3 044– □ □ □ □	1.63	3SJ3 144– □ □ □ □	1.93	
8	10	3SJ3 045– □ □ □ □	1.67	3SJ3 145– □ □ □ □	1.97	
8	12	3SJ3 046– □ □ □ □	1.71	3SJ3 146– □ □ □ □	2.01	
10	–	3SJ3 050– □ A □ □	1.29	3SJ3 150– □ A □ □	1.59	
10	2	3SJ3 051– □ □ □ □	1.55	3SJ3 151– □ □ □ □	1.85	
10	4	3SJ3 052– □ □ □ □	1.59	3SJ3 152– □ □ □ □	1.89	
10	6	3SJ3 053– □ □ □ □	1.63	3SJ3 153– □ □ □ □	1.93	
10	8	3SJ3 054– □ □ □ □	1.67	3SJ3 154– □ □ □ □	2.01	
10	10	3SJ3 055– □ □ □ □	1.71	3SJ3 155– □ □ □ □	2.05	
10	12	3SJ3 056– □ □ □ □	1.75	3SJ3 156– □ □ □ □	2.09	
12	–	3SJ3 060– □ A □ □	1.33	3SJ3 160– □ A □ □	1.63	
12	2	3SJ3 061– □ □ □ □	1.59	3SJ3 161– □ □ □ □	1.89	
12	4	3SJ3 062– □ □ □ □	1.63	3SJ3 162– □ □ □ □	1.93	
12	6	3SJ3 063– □ □ □ □	1.67	3SJ3 163– □ □ □ □	1.97	
12	8	3SJ3 064– □ □ □ □	1.71	3SJ3 164– □ □ □ □	2.01	
12	10	3SJ3 065– □ □ □ □	1.75	3SJ3 165– □ □ □ □	2.05	
12	12	3SJ3 066– □ □ □ □	1.79	3SJ3 166– □ □ □ □	2.09	

Switching lever (see page 4/12 for other Order No. suffixes)	Grip	0
	Grip with momentary-action pushbutton	3
	Grip with latch for mechanical zero position locking	2
	Grip with latch as pushbutton	8
	With ball	5
	With ball with momentary-action pushbutton	4
	With ball with dead man pushbutton	1
	With ball with capacitive dead man pushbutton ¹⁾	9
	With ball with signal button	6
	With ball for mechanical zero position locking	7
	Double lever drive ²⁾	9

Selecting and ordering notes

- Select the circuit (contact arrangement) according to the equipment diagrams.
- Determine the number of required contacts from the contact arrangement.
- Normal or ruggedized version, with or without spring return.
- Switching lever version, add to the Order No.:
3SJ□ □ □ □ – ■ □ □ □ □
- Switch arrangement, add to the Order No.:
3SJ□ □ □ □ – □ ■ □ □ □ □

Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Selecting and ordering data

No. of switching contacts for the surface mounting switches		Normal version Order No.	Weight approx. kg	Ruggedized version Order No.	Weight approx. kg	
①	②					
Versions with reinforced silver contacts for currents of up to 4 A	–	2	3SJ3 501– A □ □ □	1.13	3SJ3 601– A □ □ □	1.43
	–	4	3SJ3 502– A □ □ □	1.17	3SJ3 602– A □ □ □	1.47
	–	6	3SJ3 503– A □ □ □	1.21	3SJ3 603– A □ □ □	1.51
	–	8	3SJ3 504– A □ □ □	1.25	3SJ3 604– A □ □ □	1.55
	–	10	3SJ3 505– A □ □ □	1.29	3SJ3 605– A □ □ □	1.59
	–	12	3SJ3 506– A □ □ □	1.33	3SJ3 606– A □ □ □	1.63
	2	–	3SJ3 510– □ A □ □	1.13	3SJ3 610– □ A □ □	1.43
	2	2	3SJ3 511– □ □ □ □	1.39	3SJ3 611– □ □ □ □	1.69
	2	4	3SJ3 512– □ □ □ □	1.43	3SJ3 612– □ □ □ □	1.73
	2	6	3SJ3 513– □ □ □ □	1.47	3SJ3 613– □ □ □ □	1.77
	2	8	3SJ3 514– □ □ □ □	1.51	3SJ3 614– □ □ □ □	1.81
	2	10	3SJ3 515– □ □ □ □	1.55	3SJ3 615– □ □ □ □	1.85
2	12	3SJ3 516– □ □ □ □	1.59	3SJ3 616– □ □ □ □	1.89	
4	–	3SJ3 520– □ A □ □	1.17	3SJ3 620– □ A □ □	1.47	
4	2	3SJ3 521– □ □ □ □	1.43	3SJ3 621– □ □ □ □	1.73	
4	4	3SJ3 522– □ □ □ □	1.47	3SJ3 622– □ □ □ □	1.77	
4	6	3SJ3 523– □ □ □ □	1.51	3SJ3 623– □ □ □ □	1.81	
4	8	3SJ3 524– □ □ □ □	1.55	3SJ3 624– □ □ □ □	1.85	
4	10	3SJ3 525– □ □ □ □	1.59	3SJ3 625– □ □ □ □	1.89	
4	12	3SJ3 526– □ □ □ □	1.63	3SJ3 626– □ □ □ □	1.93	
6	–	3SJ3 530– □ A □ □	1.21	3SJ3 630– □ A □ □	1.21	
6	2	3SJ3 531– □ □ □ □	1.47	3SJ3 631– □ □ □ □	1.77	
6	4	3SJ3 532– □ □ □ □	1.51	3SJ3 632– □ □ □ □	1.81	
6	6	3SJ3 533– □ □ □ □	1.55	3SJ3 633– □ □ □ □	1.85	
6	8	3SJ3 534– □ □ □ □	1.59	3SJ3 634– □ □ □ □	1.89	
6	10	3SJ3 535– □ □ □ □	1.63	3SJ3 635– □ □ □ □	1.93	
6	12	3SJ3 536– □ □ □ □	1.67	3SJ3 636– □ □ □ □	1.97	
8	–	3SJ3 540– □ A □ □	1.25	3SJ3 640– □ A □ □	1.55	
8	2	3SJ3 541– □ □ □ □	1.51	3SJ3 641– □ □ □ □	1.81	
8	4	3SJ3 542– □ □ □ □	1.55	3SJ3 642– □ □ □ □	1.85	
8	6	3SJ3 543– □ □ □ □	1.59	3SJ3 643– □ □ □ □	1.89	
8	8	3SJ3 544– □ □ □ □	1.63	3SJ3 644– □ □ □ □	1.93	
8	10	3SJ3 545– □ □ □ □	1.67	3SJ3 645– □ □ □ □	1.97	
8	12	3SJ3 546– □ □ □ □	1.71	3SJ3 646– □ □ □ □	2.01	
10	–	3SJ3 550– □ A □ □	1.29	3SJ3 650– □ A □ □	1.59	
10	2	3SJ3 551– □ □ □ □	1.55	3SJ3 651– □ □ □ □	1.85	
10	4	3SJ3 552– □ □ □ □	1.59	3SJ3 652– □ □ □ □	1.89	
10	6	3SJ3 553– □ □ □ □	1.63	3SJ3 653– □ □ □ □	1.93	
10	8	3SJ3 554– □ □ □ □	1.67	3SJ3 654– □ □ □ □	2.01	
10	10	3SJ3 555– □ □ □ □	1.71	3SJ3 655– □ □ □ □	2.05	
10	12	3SJ3 556– □ □ □ □	1.75	3SJ3 656– □ □ □ □	2.09	
12	–	3SJ3 560– □ A □ □	1.33	3SJ3 660– □ A □ □	1.63	
12	2	3SJ3 561– □ □ □ □	1.59	3SJ3 661– □ □ □ □	1.89	
12	4	3SJ3 562– □ □ □ □	1.63	3SJ3 662– □ □ □ □	1.93	
12	6	3SJ3 563– □ □ □ □	1.67	3SJ3 663– □ □ □ □	1.97	
12	8	3SJ3 564– □ □ □ □	1.71	3SJ3 664– □ □ □ □	2.01	
12	10	3SJ3 565– □ □ □ □	1.75	3SJ3 665– □ □ □ □	2.05	
12	12	3SJ3 566– □ □ □ □	1.79	3SJ3 666– □ □ □ □	2.09	

Switching lever (See page 4/12 for other Order No. suffixes)	Grip	0
	Grip with momentary-action pushbutton	3
	Grip with latch for mechanical zero position locking	2
	Grip with latch as pushbutton	8
	With ball	5
	With ball with momentary-action pushbutton	4
	With ball with dead man pushbutton	1
	With ball with capacitive dead man pushbutton ¹⁾	9
	With ball with signal button	6
	With ball for mechanical zero position locking	7
	Double lever drive ²⁾	9

6. Mounting surfaces for the surface-mounting switches, add to the Order No.:
3SJ□ □ □ □ – □ □ □ □ ■ ■

7. For additional fitted parts, add -Z to the Order No.:
3SJ□ □ □ □ – □ □ □ □ □ □ – Z
with additional codes.

¹⁾ Order No. with -Z and additional code **H1A**

²⁾ Order No. with -Z and additional code **H2B**

Switchgear and control equipment

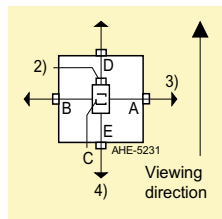
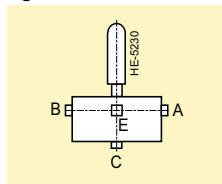
Master controllers, differential limit switches

Double master controller 3SJ3

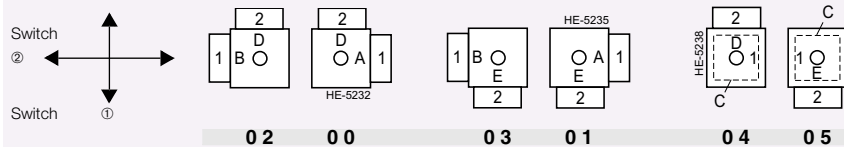
Selecting and ordering data

Standard circuits	No. of contacts	Arrangement No. ¹⁾	Order No. suffix for surface mounting switch	
			①	②
			3SJ3 □□□□ - □ □ □ □ □ □	
Contact arrangement for surface mounting switches ① and ②	„a“	6	NEP 126 0105	DD
	„ak“	12	NEP 126 0106	EE
	„uk(0)“	12	NEP 126 0108	FF
	„ehk(0)“	12	NEP 126 0103	BB
	„ek(0)“	12	NEP 126 1027	QQ
	„gk(0)“	12	NEP 126 2262	HH
	„ehk(0)“	12	NEP 126 2273	GG
	„ek(0)“	12	NEP 126 2274	JJ
	„gk(0)“	12	NEP 126 2262	HH
	Contactor controller; „ak“, „uk(0)“, „ehk(0)“, „ek(0)“, „gk(0)“	6	NEP 126 0148	MM
	Contactor controller; „ak“, „uk(0)“, „ehk(0)“, „ek(0)“, „gk(0)“	6	NEP 126 0148	MM
	Single-lever grab control (holding winch) with H-gate	6	NEP 126 2080	NN
		6	NEP 126 2081	PP
	„csak“, „csk“, and variable-speed DC drives <u>with</u> field weakening	6	NEP 126 2866	SS
	Variable-speed DC drives <u>without</u> field weakening	6	NEP 126 2867	TT
	„m“	4	NEP 126 0118	KK
	Variable-speed drives with field weakening stage (engaged) and OEE	4	MSP 220	XX
	Variable-speed drives without field weakening stage, with OEE	4	MSP 210	YY
	Without contact arrangement or without surface mounting switch	up to 12	–	AA
	Without contact arrangement or without surface mounting switch	up to 12	–	ZZ
With contact arrangement, as required:	up to 12	–		
Additional codes: "JOY" for surface mounting switch ①, "KOY" for surface mounting switch ②, please also enclose contact arrangement sketch (see form on page 4/18) and indicate the corresponding surface mounting switch ① or ② in the order text.				

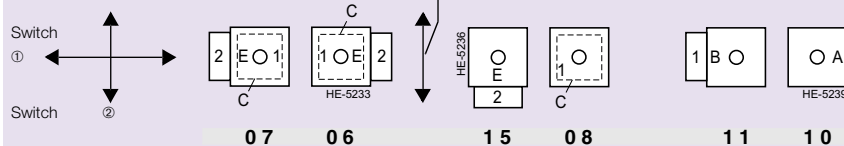
Assignment of mounting surfaces to direction of movement of the switching lever



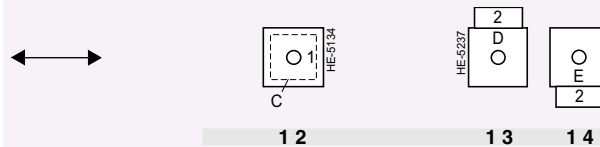
Direction of movement for



Direction of movement for



Direction of movement



- 1) Equipment diagrams of the surface mounting switches with the corresponding arrangement numbers, see pages 4/14-4/17.
- 2) Latch
- 3) Lateral movement: mounting surfaces D, E
- 4) Longitudinal movement: mounting surfaces A, B, C

Double master controller 3SJ3

Selecting and ordering data

Add-on parts

Opto-electronic encoder 6GA4 603-1AA00 (6-bit, digital)
 on surface mounting switch ①: Order No. suffix **-Z** and code **A03**¹⁾
 on surface mounting switch ②: Order No. suffix **-Z** and code **A04**¹⁾

Opto-electronic encoder 6GA4 603-2AA00 (8-bit, digital)
 on surface mounting switch ①: Order No. suffix **-Z** and code **A05**¹⁾
 on surface mounting switch ②: Order No. suffix **-Z** and code **A06**¹⁾

Opto-electronic encoder 6GA4 603-3AA00 (analog, ± 10 V)
 on surface mounting switch ①: Order No. suffix **-Z** and code **A07**²⁾
 on surface mounting switch ②: Order No. suffix **-Z** and code **A08**²⁾

Opto-electronic encoder 6GA4 603-4AA00 (analog, ± 20 mA)
 on surface mounting switch ①: Order No. suffix **-Z** and code **A09**²⁾
 on surface mounting switch ②: Order No. suffix **-Z** and code **A10**²⁾

Nonlinear wire-wound potentiometer 6KA9 924-1
 on surface mounting switch ①: Order No. suffix **-Z** and code **B01**
 on surface mounting switch ②: Order No. suffix **-Z** and code **B02**

Linear wire-wound potentiometer 6KA9 924-2
 on surface mounting switch ①: Order No. suffix **-Z** and code **B03**
 on surface mounting switch ②: Order No. suffix **-Z** and code **B04**

H-gate for single-lever grab controller
 Order No. suffix **-Z** and code **C01**

Gate as required
 Order No. suffix **-Z** and code **Y01** and pls. enclose contact arrangement sketch

Detent wheel according to special specification
 for surface mounting switch ①: Order No. suffix **-Z** and code **Y01**
 for surface mounting switch ②: Order No. suffix **-Z** and code **Y02**

Spring return
 for surface mounting switch ①: Order No. suffix **-Z** and code **D01**
 for surface mounting switch ②: Order No. suffix **-Z** and code **D02**

Friction brake
 on surface mounting switch ①: Order No. suffix **-Z** and code **E01**
 on surface mounting switch ②: Order No. suffix **-Z** and code **E02**

3SJ3 . . . -□□□□□-**Z**
 ■■■ + □□□ + □□□

Specify the codes additively



1) A connecting cable 3SX4175 is additionally required. It must be ordered separately (see section "Spare parts" on page 4/19).
 2) A connecting cable 3SX4232 is additionally required. It must be ordered separately (see section "Spare parts" on page 4/19).

Ordering example

Double master controller 3SJ3, normal version
 Surface mounting switch ① for hoisting winch, standard circuit >>csk<<
 Arrangement No. NEP 126 2866 (from equipment diagram, page 4/14 ff.): 6 contacts
 Surface mounting switch ② for running gear, standard circuit >>ak<<
 Arrangement No. NEP 126 0106 (from equipment diagram, page 4/14 ff.): 12 contacts

Switching lever with ball as dead man pushbutton

Arrangement No. NEP 126 2866 for surface mounting switch ①

Arrangement No. NEP 126 0106 for surface mounting switch ②

Arrangement of surface mounting switches ① on mounting surface B; ② on mounting surface D

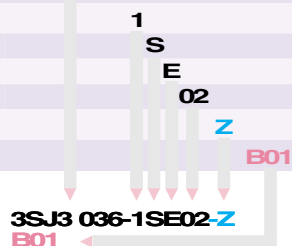
Identification of special version

Wire-wound potentiometer fitted to surface mounting switch ① (order code)

Please specify on the order:

Order No.

3SJ3 036



Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

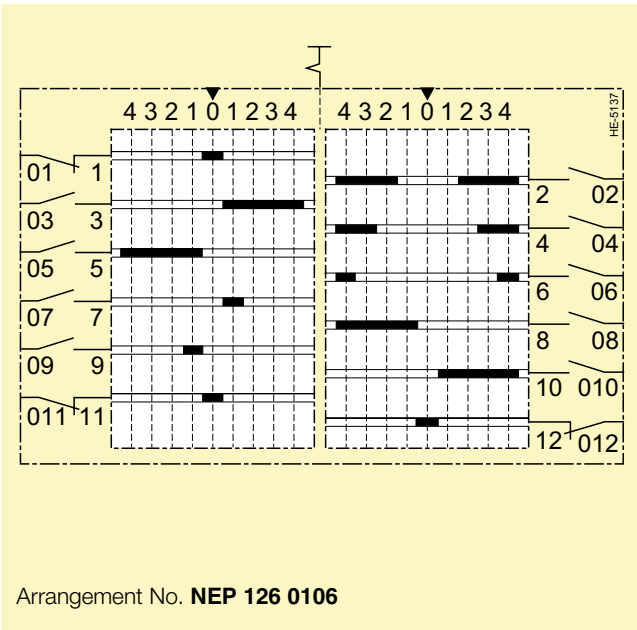
Equipment circuit diagrams

The graphic symbols shown on the equipment circuit diagrams only indicate the type, circuit and method of operation of the equipment according to DIN 40 713, but not its design.

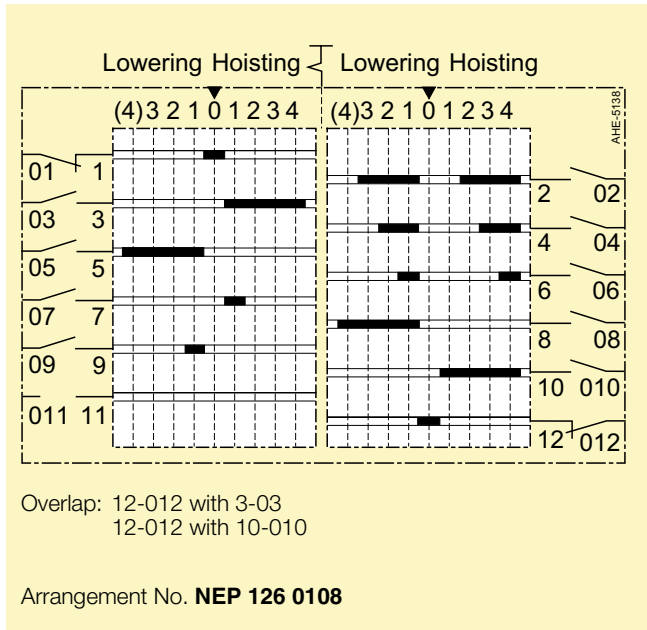
A closed switching contact is identified by this symbol:
 =====■===== .

The switching contacts assigned to the cams next to the contact arrangement, indicate the control state at the zero position.

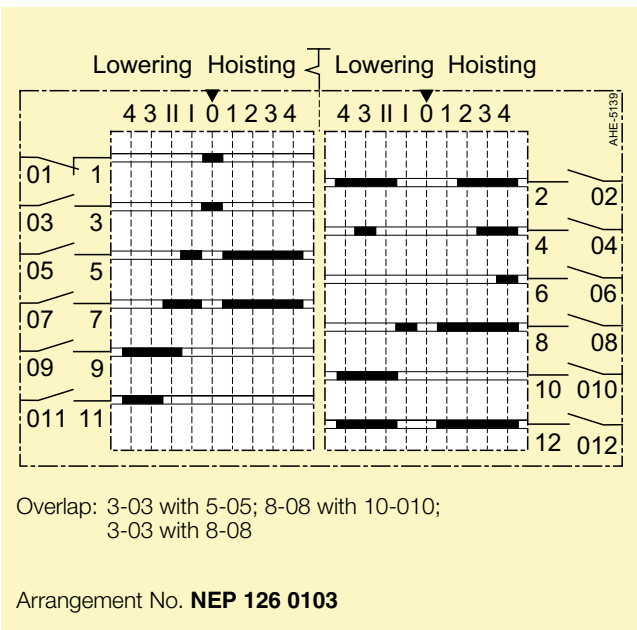
If the shaft (cam shaft) is rotated to the right, the switching program shown to the left of the zero position becomes effective.



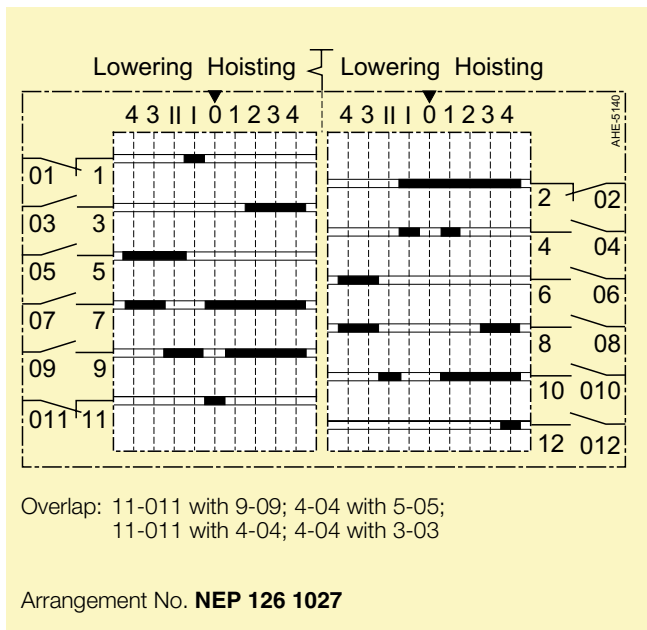
Circuit "ak"



Circuit "uk(0)" with time-delay relay, position (4)
 Lowering is blocked



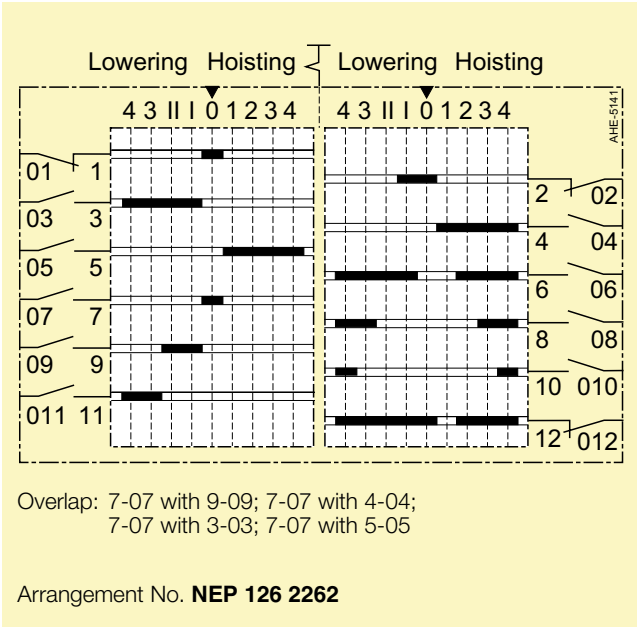
Circuit "ehk(0)" with time-delay relay



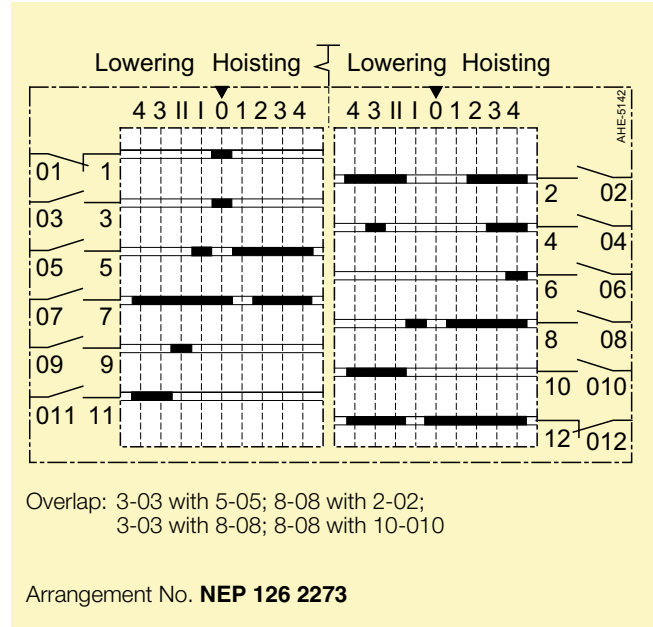
Circuit "ek(0)" with time-delay relay

Double master controller 3SJ3

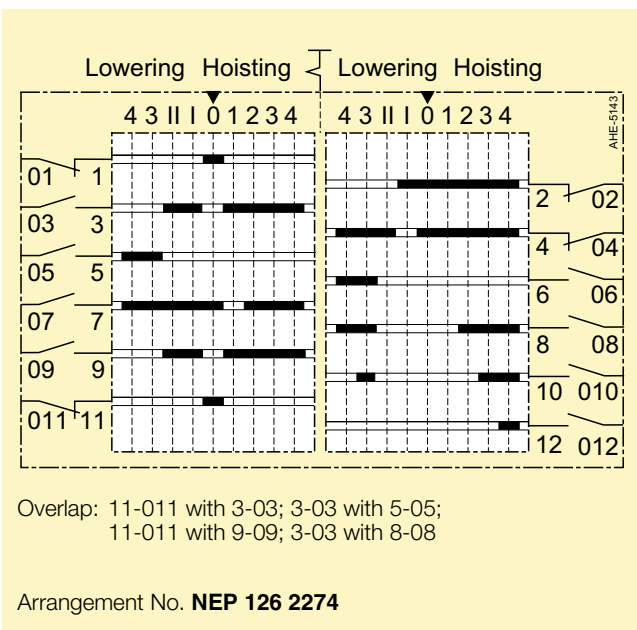
Equipment circuit diagrams



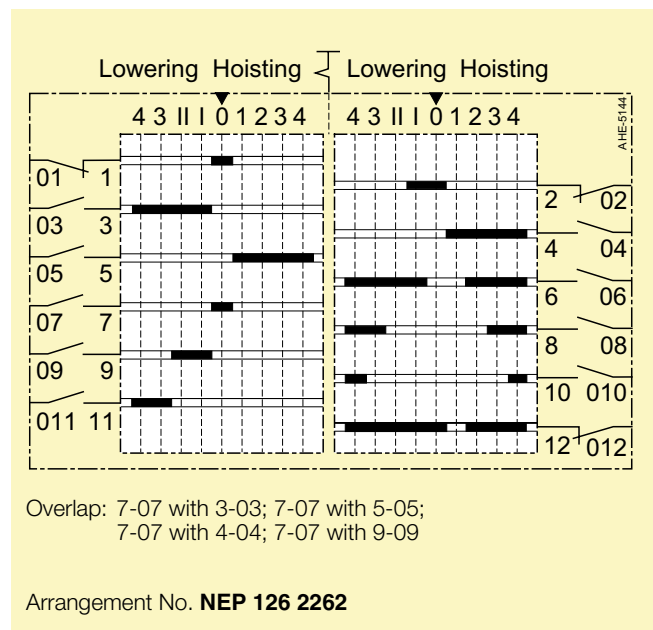
Circuit "gk(0)" with time-delay relay



Circuit "ehk(0)" with SIMOMAT control monitor



Circuit "ek(0)" with SIMOMAT control monitor



Circuit "gk(0)" with SIMOMAT control monitor

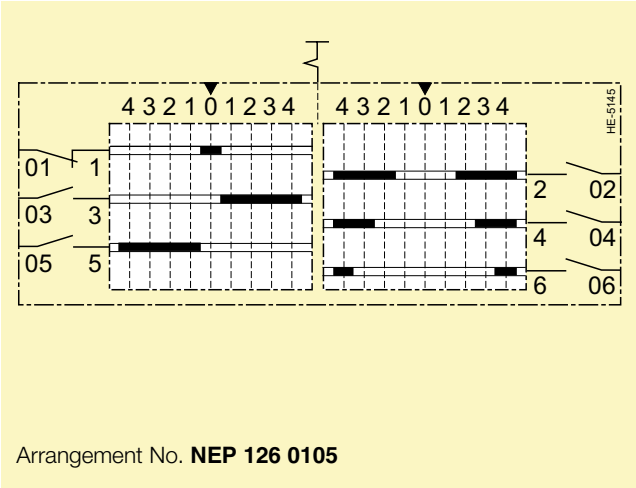
1
2
3
4

Switchgear and control equipment

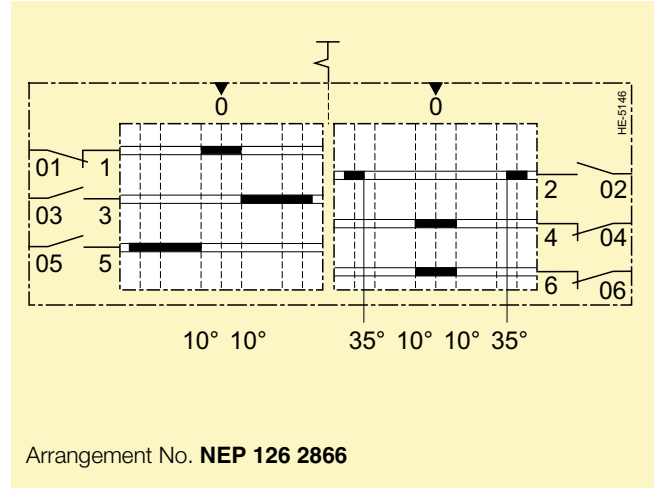
Master controllers, differential limit switches

Double master controller 3SJ3

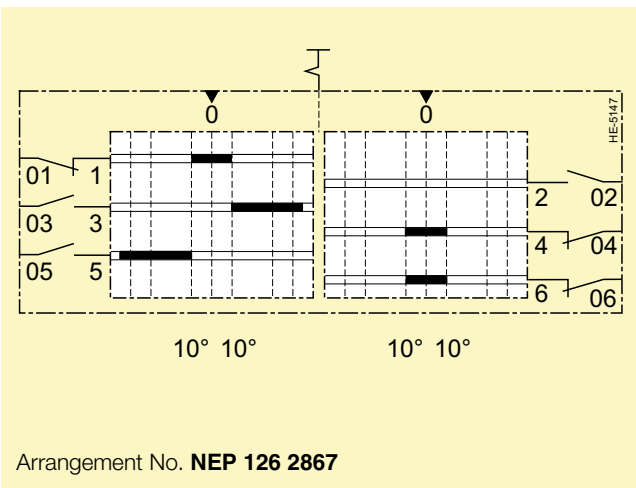
Equipment circuit diagrams



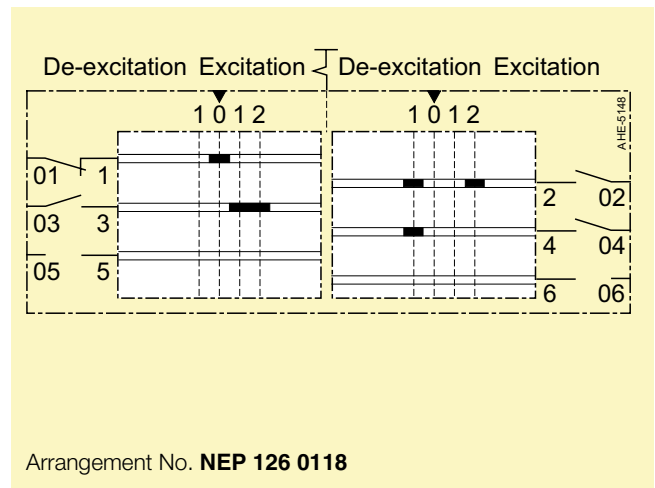
Circuit "a"



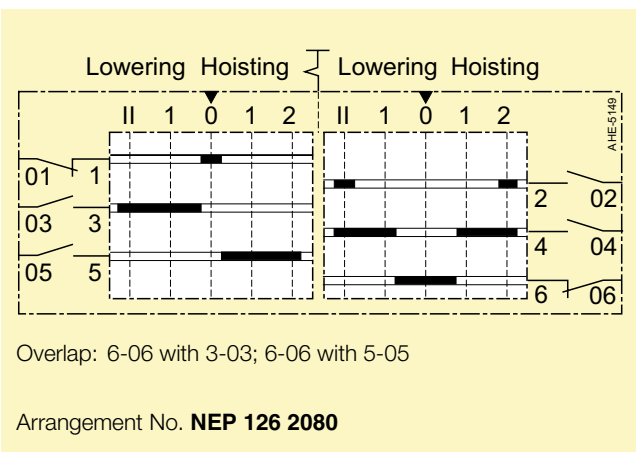
Circuits "csak", "csk" and for variable-speed DC drives with field weakening



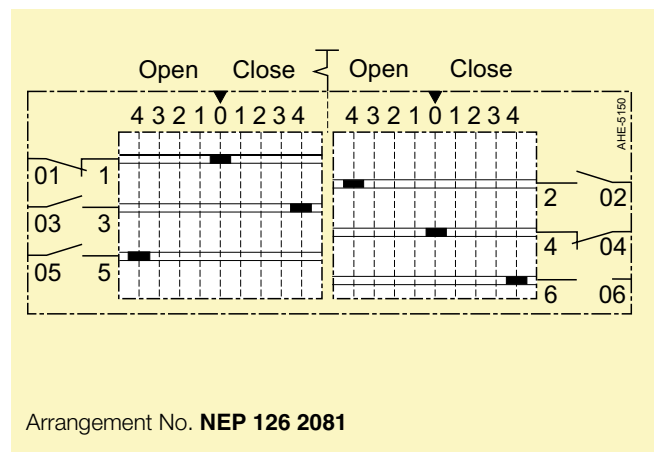
Circuits for variable-speed DC drives without field weakening



Circuit "m"



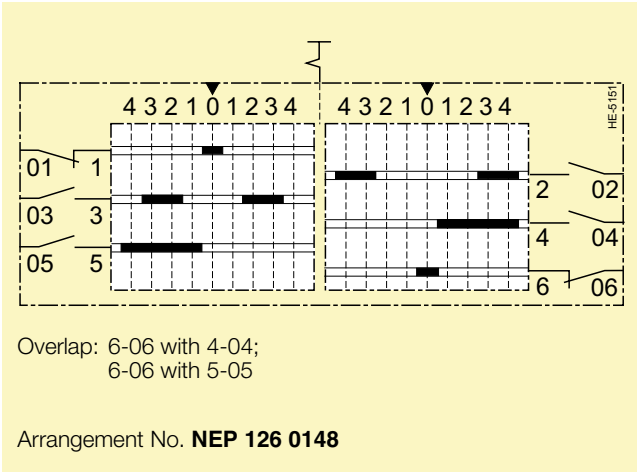
Single-lever grab control with contactor controller (holding winch)



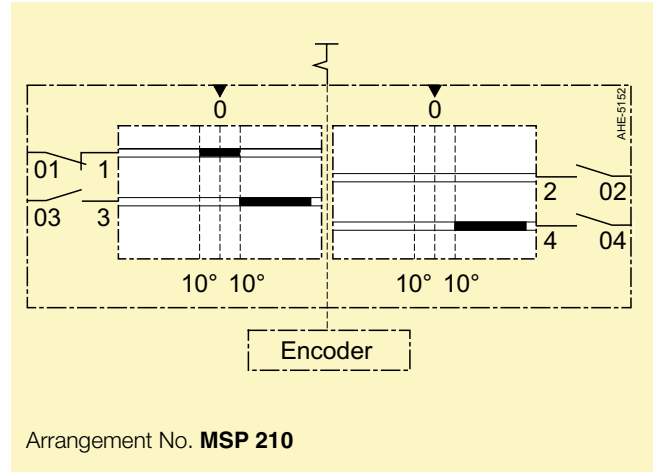
Single-lever grab control with contactor controller (closing winch)

Double master controller 3SJ3

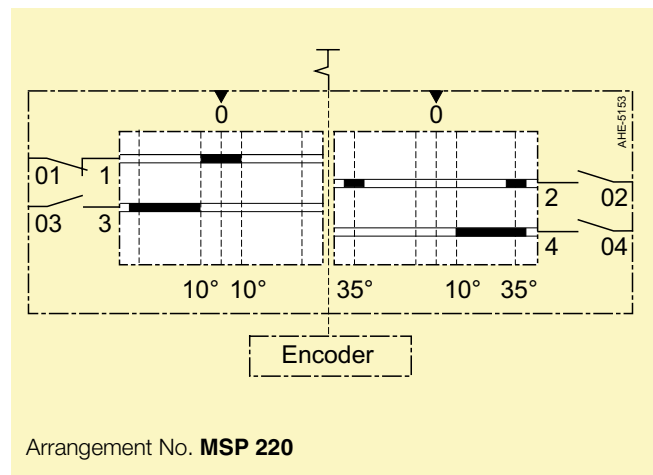
Equipment circuit diagrams



Circuits with contactor controller



Digital master controller for variable-speed drives without field weakening stage



Digital master controller for variable-speed drives with engaged field-weakening stage

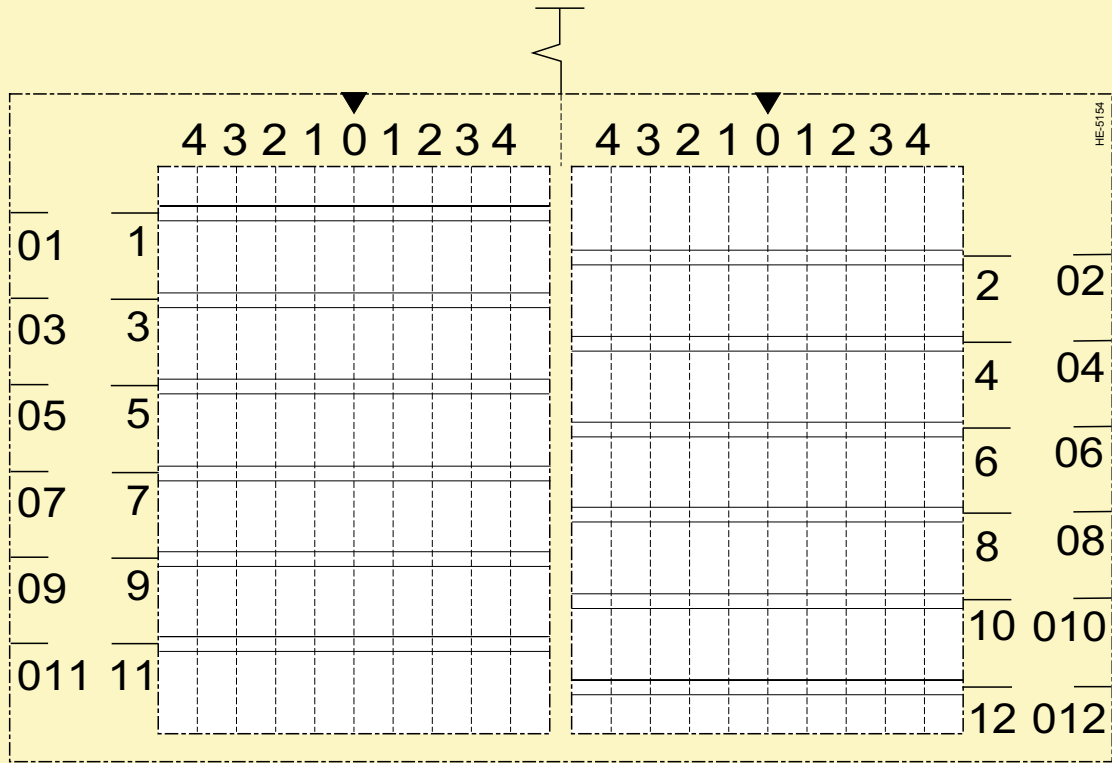


Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Equipment circuit diagrams





Form for equipment circuit diagram

Please copy this page for switch designs which differ from our standard contact arrangements (pages 4/14

and 4/17); enter the desired arrangement and enclose the sheet with the order.

Double master controller 3SJ3

Spare parts

Description		Order No.	Weight approx. kg	
Spare parts for 3SJ3	Drive block	normal version ruggedized version	3SX4 157 – □ AA □ □ ³⁾ 3SX4 158 – □ AA □ □ ³⁾	0.75 1.05
	 <p>Detent disc 3SX4 142</p>  <p>Microswitch 3SX4 136</p>	Surface mounting switch	with 2 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement	3SX4 151 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾
with 4 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement		3SX4 152 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾	0.38	
with 6 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement		3SX4 153 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾	0.42	
with 8 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement		3SX4 154 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾	0.46	
with 10 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement		3SX4 155 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾	0.5	
with 12 contacts ≤ 2 A (E) without arrangement with arrangement ²⁾ without arrangement with arrangement		3SX4 156 – 0A – 0□ ²⁾ – 1A – 1□ ²⁾	0.54	
Switching element		with 2 contacts ≤ 2 A, gold-plated (E) ¹⁾ with 2 contacts ≤ 4 A, silver	3SX4 144 3SX4 144-1	0.03
Cam discs	(1 set = 12 pieces)	3SX4 145	0.1	
Wire hook	for pulling the cam disc	3SX4 146	0.005	
Bellows		3SX4 103	0.1	
Switching lever	with grip	3SX4 100	0.12	
	with grip with mechanical zero position locking	3SX4 164	0.12	
	with grip with momentary-action pushbutton	3SX4 134	0.12	
	with grip with latch as pushbutton	3SX4 174	0.12	
	with ball	3SX4 165	0.12	
	with ball with dead man pushbutton	3SX4 166	0.12	
	with ball with momentary-action pushbutton	3SX4 167	0.12	
	with ball with horn button	3SX4 168	0.12	
	with ball for mechanical zero position locking	3SX4 170	0.12	
Microswitch	with mounting parts	3SX4 136	0.05	
Spring return		3SX4 138	0.12	
Friction brake		3SX4 171	0.12	
Gate 4 – 0 – 4		3SX4 140	0.04	
H-gate	for single-lever grab controller	3SX4 141	0.08	
Detent disc 4 – 0 – 4		3SX4 142	0.012	
Detent spring	(1 set with 3 pieces of different strength)	3SX4 143	0.005	
Detent lever	(1 set = 2 pieces)	3SX4 172	0.02	
Gear segment		3SX4 160	0.005	
Spur gear		3SX4 161	0.005	
Bevel gear		3SX4 162	0.012	
Connecting cable	with DA 15 male connector for OEC, digital	3SX4 175	0.2	
	with DA 15 male connector for OEC, analog	3SX4 232	0.2	
Wire-wound potentiometer	linear	6KA9 924-2	0.06	
	nonlinear	6KA9 924-1	0.07	
Opto-electronic encoder	6-bit, digital	6GA4 603-1AA00	0.35	
	8-bit, digital	6GA4 603-2AA00	0.35	
	analog, ± 10 V	6GA4 603-3AA00	0.35	
	analog, ± 20 mA	6GA4 603-4AA00	0.35	

1) E = suitable for electronics
2) For switches with arrangement: Insert Order No. suffix for the arrangement

(see page 4/12) and specify switch serial number.
3) Order No. suffixes such as duplex

master controller 3SJ3: Insert Order No. suffixes for the switching lever or grip according to page 4/10 and for

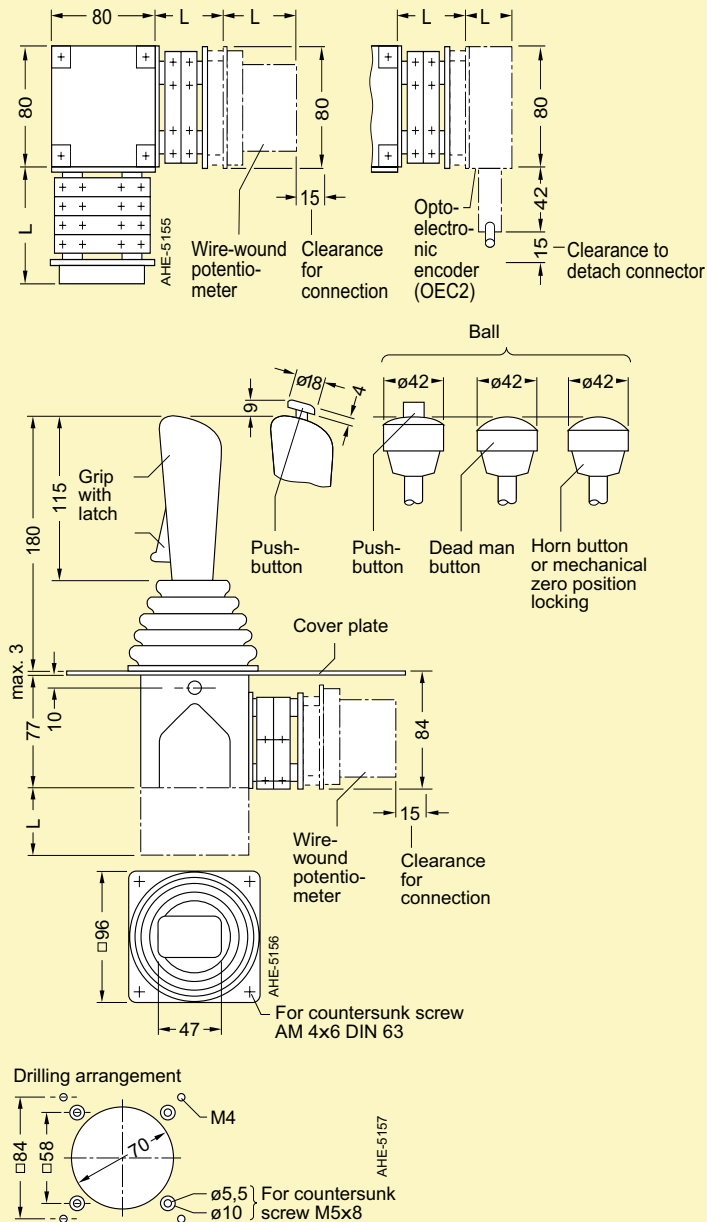
assignment of mounting surfaces to directions of movement of the switching lever according to page 4/12

Switchgear and control equipment

Master controllers, differential limit switches

Double master controller 3SJ3

Dimension drawings

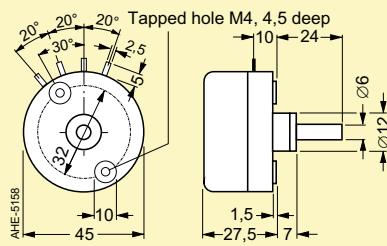


Type	Number of contacts	Dimension			
		L ₁ surface mounting switch	L ₂ Analog setpoint generator (wire-wound potentiometer)	L ₂ Opto-electronic encoder	L ₂ Digital setpoint generator (Opto-electronic encoder) 6-bit version 8-bit version
3SJ3	2	41.5	30	26	26
	4	54	30	26	26
	6	66.5	30	26	26
	8	79	30	26	26
	10	91.5	30	26	26
	12	104	30	26	26

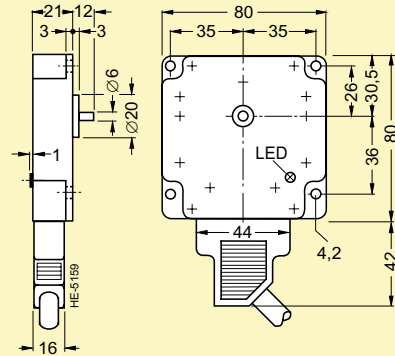
Double master controller 3SJ3

Dimension drawings

Wire-wound potentiometer 6KA9 924-2



Opto-electronic encoder 6GA4 603-1AA00, -2AA00, -3AA00, -4AA00



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2

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