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ELECTROMAGNETIC DISC BRAKES 2H2SP WITH CONSTANT BRAKING TORQUE

PN-EN 81-20
PN-EN 81-50

Used in lifting mechanisms are mechanical brakes, electrically released spring actuated disk brakes, designed on the basis of brake H2SP. This brake immobilizes the weight during damage, incorrect manoeuver or breakdown. The brake must transfer all forces occurring in such situations. To meet such requirements while maintaining the drive as simple as possible in the mechanical part, simple asynchronous motor is used controlled by frequency converters, provided with electromagnetic disk brake of design specific for hoisting systems. Safety considerations have required designing a braking mechanism with dual safety circuit and maximum reduction of noise level during dynamic operation of brake unit. Drive system fitted with brake 2H2SP operates very quietly in spite of maintaining all electrical and mechanical parameters.

The specific feature of this brake is that there are two brake discs installed on the common motor shaft, each with independent electromagnetic circuit while ensuring the braking moment necessary for correct operation of the drive. It's simple and compact design permits applications in elevator mechanisms, drive motors, which should ensure smooth operation and redundant safety circuits. An additional feature is that the brake with this design has mechanical specifications necessary for the drive function, whereas the installation dimensions are equal to classic brakes, which allows them to be used in the space available on drive motors.

Applications:

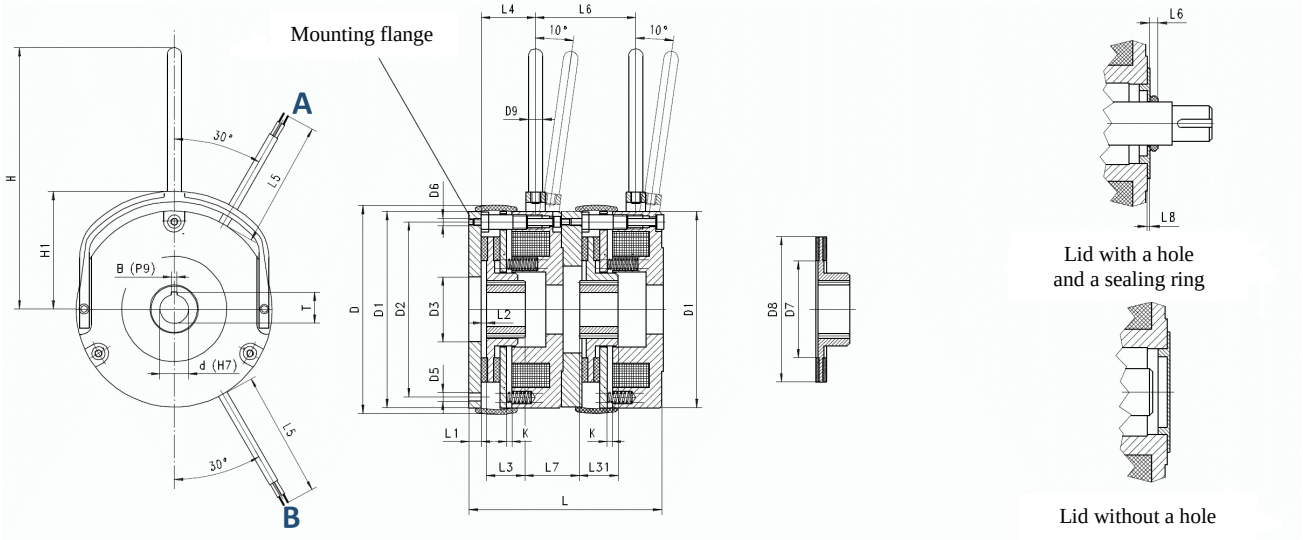
-passenger elevator drives, platforms, cranes, overhead travelling cranes - wherever one has to keep in mind strict regulations of technical supervisory authorities applicable to elevator equipment. Brakes meet strict safety regulations related to elevator design and installation defined in PN-EN 81-20, EN 81-50 standards.

Parameters			Unit	Brake type											
				2H2SP 63	**2H2SP 71**	**2H2SP 80**	**2H2SP 90**	**2H2SP 100**	**2H2SP 112**	**2H2SP 132**	**2H2SP 160**	**2H2SP 180**	**2H2SP 200**	**2H2SP 280**	**2H2SP 315**
Supply voltage		U_n	[V]	24 , 104 , 180 , 207										24, 104, 180	
Power		$P_{20°}$	[W]	2x20	2x25	2x30	2x30	2x40	2x50	2x55	2x65	2x75	2x100	2x250	2x340
Braking torque		M_h	[Nm]	2x4	2x8	2x16	2x20	2x32	2x60	2x100	2x150	2x240	2x500	2x1000	2x1600
Max. speed		n_{max}	min^{-1}	3000											
Weight		G	[kg]	2,1	4,4	7,8	7,8	12,5	17,0	25,0	36,0	58,0	92,0	163,0	245,0
Ambient temperature		T	^0C	-25 ÷ +40											
Operating time *	On direct voltage side	$t_{0,1}$	ms	35	65	90	90	120	150	180	300	400	500	500	600
		$t_{0,9}$		17	35	40	40	50	65	90	110	200	270	300	500
	On alternating voltage side	$t_{0,1}$	ms	35	65	90	90	120	150	180	300	400	500	500	600
		$t_{0,9}$		Brake disconnection on alternating current side causes about five-times growth in braking time t_{09} with respect to disconnection on direct current side											

$t_{0,1}$ - releasing time (from switching on current to drop in braking torque to 10% M_{nom})
$t_{0,9}$ - braking time (from switching off current to attaining 90% M_{nom})

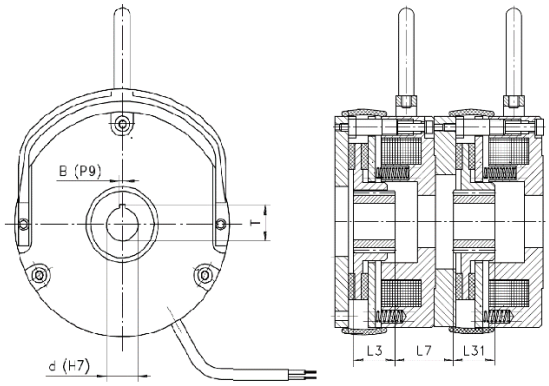
*) Values of releasing and braking times are given as approximations, since they depend on mode of assembly/installation, temperature and power supply.

Cable output :
A – 2H2SP100 , 2H2SP112 , 2H2SP132 , 2H2SP160, 2H2SP180, 2H2SP280, 2H2SP315
B – 2H2SP63 , 2H2SP71 , 2H2SP80 , 2H2SP90 , 2H2SP200



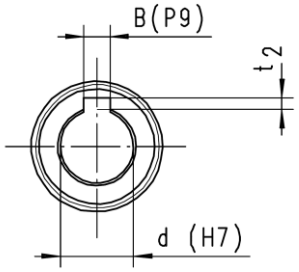
Type	M_h [Nm]	D	D1	D2	D3	D5	D6	D7	D8	D9	L	L1	L2	L3	L31	L4	L5	L6	L7	K	H	H1
2H2SP63	2x4	87	84	72	25	4,5x3	M4x3	47	62	8	86	6	1,8	18	24	25	450	45	23	0,2	100	51
2H2SP71	2x8	106	102	90	30	5,5x3	M5x3	59	76	8	97	7	2,5	20	27	28	450	50	25	0,2	115	61
2H2SP80	2x16	132	125	112	44	6,4x3	M6x3	61	95	10	118	9	3,5	20	28	34	450	61	32	0,2	170	73
2H2SP90	2x20	132	125	112	44	6,4x3	M6x3	61	95	10	118	9	3,5	20	28	34	450	61	32	0,2	170	73
2H2SP100	2x32	157	148	132	45	6,4x3	M6x3	74	114	10	133	9	3	25	34	37	450	69	34	0,3	184	94
2H2SP112	2x60	169	162	145	55	8,4x3	M8x3	90	124	12	156	11	3	30	42	40	450	80	37	0,3	191	102
2H2SP132	2x100	195	188	170	84	8,4x3	M8x3	100	154	12	170	11	3	30	42	40	450	88	45	0,3	204	116
2H2SP160	2x150	221	215	196	104	9,0x4	M8x6	130	176	12	190	11	4,5	35	45	52	450	110	55	0,3	230	129
2H2SP180	2x240	257	252	230	134	11x6	M10x6	148	207	14	220	11	5	40	55	62	800	115	60	0,5	339	157
2H2SP200	2x500	308	302	278	120	11x6	M10x6	198	255	14	250	12,5	6	50	65	80	800	130	70	0,5	466	182
2H2SP280	2x1000	356	342	308	150	13x6	M12x6	200	270	20	306	25	0	70	80	90	1500	150	70	0,6	408	206
2H2SP315	2x1600	412	400	360	170	13x6	M12x6	210	300	20	340	25	0	80	90	98	1500	180	76	0,6	434	232

Geared bushing hole diameters



Type	d	B	T	d_{max}	d_{smax} *	L3	L31	L7
2H2SP63	15	5	17,3	15		18	24	23
2H2SP71	15	5	17,3	15		20	27	25
2H2SP80	19	6	21,8	25		20	28	32
2H2SP90	19	6	21,8	25		20	28	32
2H2SP100	25	8	28,3	25		25	34	34
2H2SP112	25	8	28,3	35**		30	42	37
2H2SP132	35**	8	38,3	35**		30	42	45
2H2SP160	40	12	43,3	45	50	35	45	55
2H2SP180	42	12	45,3	45	50	40	55	60
2H2SP200	42	12	45,3	45	75	50	65	70
2H2SP280	55	16	59,3	75		70	80	70
2H2SP315	70	20	74,9	100		80	90	76

Normalized hole diameter ranges

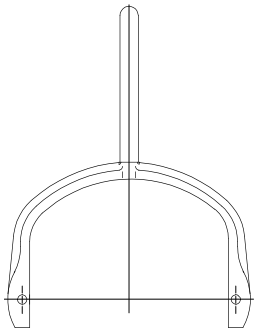


Hole diameter [mm]	B	t_2
above - to		
10 - 12	4	1,8
12 – 17	5	2,3
17 – 22	6	2,8
22 – 30	8	3,3
30 – 38	10	3,3
38 – 44	12	3,3
44 – 50	14	3,8
50 – 58	16	4,3
58 - 65	18	4,4
65 - 75	20	4,9
75 - 85	22	5,4
85 - 95	25	5,4
95 -110	28	6,4

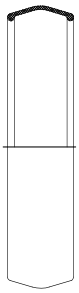
d - standard geared bushing hole diameters
d smax - maximum geared bushing hole diameters
d* smax - at extra charge it is possible to manufacture the brakes with the specially increased diameter of the gear hub
** for the 2H2SP112 and 2H2SP132 brakes and for the geared bushing hole diameters from 32 to 35mm, the key groove with the width of 8 mm (the width of the groove is incompatible with PN/M-85005 and DIN 6885 standards)

BRAKES EQUPMENT :

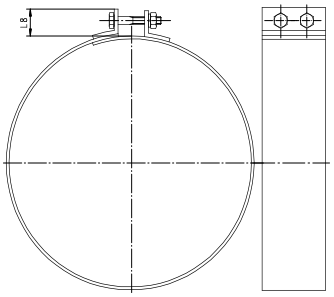
Mounting flange



Lever for manual release

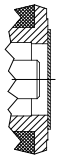


Brake cover

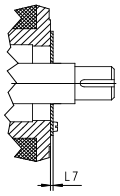


IP56 brake cover

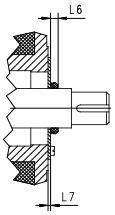
Type	L8
2H2SP56	10
2H2SP63	12
2H2SP71	12
2H2SP80	10
2H2SP90	10
2H2SP100	12
2H2SP112	14
2H2SP132	14
2H2SP160	14
2H2SP180	14
2H2SP200	14
2H2SP280	14
2H2SP315	14



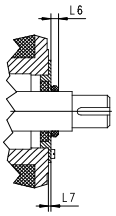
Lid
without a hole



Lid
with a hole



Lid with a hole
and a sealing ring



Lid with a hole
and special packing

ELECTRICAL EQUIPMENT

A number of modules, ranging from simple circuits with classic designs, to complex assemblies ensuring quick action and drives positioning have been designed to drive the brakes. Relevant brake applications with switching in the primary or secondary circuits are ensured by half- or full-wave rectifiers and fast electronic circuits. The manufacturer recommends to use as low alternating current voltages as possible to supply the brakes. Appropriate choice of the control voltage will prevent or at least limit surges that may occur in power supply circuits. It is not recommended to use extensively long control wiring, which would be a source of harmful surges.

Rectifier B2-1P

The B2–1P rectifiers series forms a complete wave rectifier unit for direct installation. The terminal strip provided facilitates installation and connection to the circuit.

Rectifier B2-1P cooperates with brakes 2H2SP63 ÷ 2H2SP200.

RECTIFIER PARAMETERS			
		B2-1P-400	B2-1P-600
Maximum input voltage (alternating voltage AC)	U_{IN}	400 VAC	600 VAC
Maximum output voltage (direct voltage DC)	U_{OUT}	0,45 U_{IN}	0,45U_{IN}
Maximum continuous output current rectifier	I_{OUT}	2A	2A

For example

Maximum input voltage
(alternating voltage) - U_{IN} = 230VAC,

The resulting output voltage of the rectifier
(direct voltage) - 0,45U_{IN}= 0,45 x 230=104VDC

Rectifier B5-1P

The B5–1P rectifiers series forms a complete wave rectifier unit for direct installation. The terminal strip provided facilitates installation and connection to the circuit.

Rectifier B5-1P cooperates with brakes 2H2SP63 ÷ 2H2SP315.

RECTIFIER PARAMETERS			
		B5-1P-400	B5-1P-600
Maximum input voltage (alternating voltage AC)	U_{IN}	400 VAC	600 VAC
Maximum output voltage (direct voltage DC)	U_{OUT}	0,45 U_{IN}	0,45U_{IN}
Maximum continuous output current rectifier	I_{OUT}	5A	5A

For example

Maximum input voltage
(alternating voltage) - U_{IN} = 230VAC,

The resulting output voltage of the rectifier
(direct voltage) - 0,45U_{IN}= 0,45 x 230=104VDC

Rectifier B2-2P

The B2–2P rectifiers series forms a complete full-wave rectifier unit for direct installation. The terminal strip provided facilitates installation and connection to the circuit. The rectifier allows feeding input voltage max. 400VAC, 2A which after rectification provides DC voltage of value equal to 0,9 input voltage.

Rectifier B2-2P cooperates with brakes 2H2SP63 ÷ 2H2SP200.

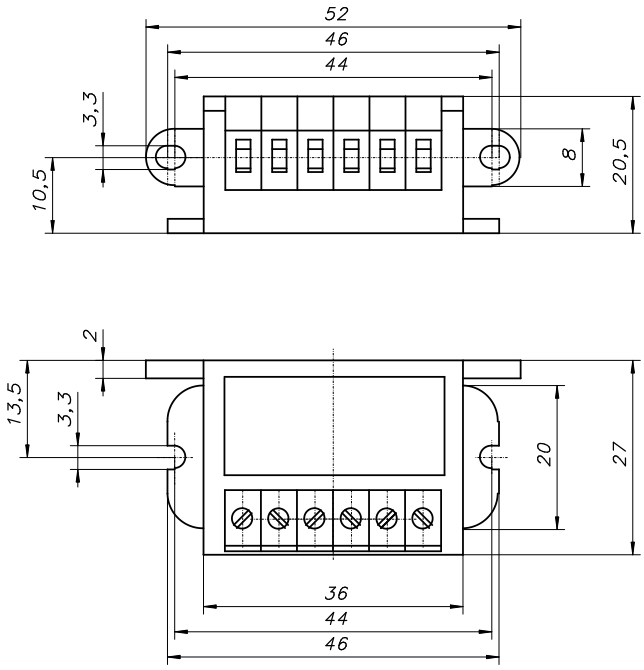
RECTIFIER PARAMETERS		
Maximum input voltage (alternating voltage AC)	U_{IN}	250 VAC
Maximum output voltage (direct voltage DC)	U_{OUT}	$0{,}9U_{IN}$
Maximum continuous output current rectifier	I_{OUT}	2A

For example

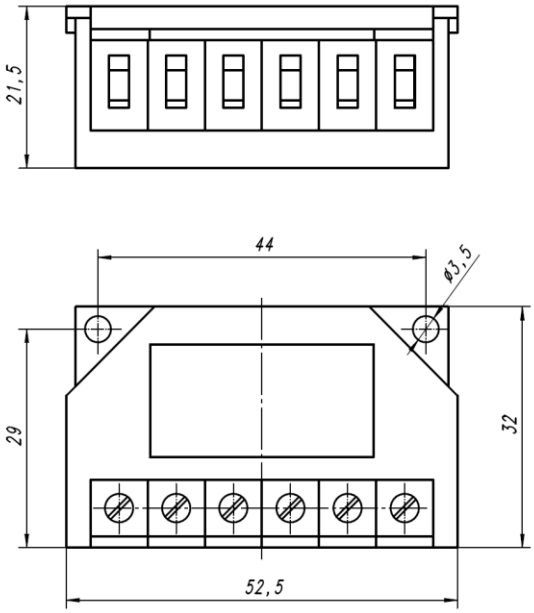
Maximum input voltage (alternating voltage) - U_{IN} = 230VAC,
The resulting output voltage of the rectifier (direct voltage) - $0{,}9U_{IN}$= 0,9 x 230=207VDC

Rectifiers dimensions

B2-1P-400,
B5-1P-400,
B2-2P

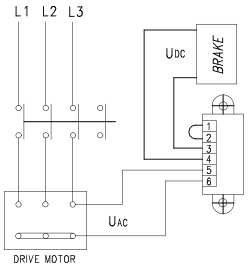


B2-1P-600,
B5-1P-600



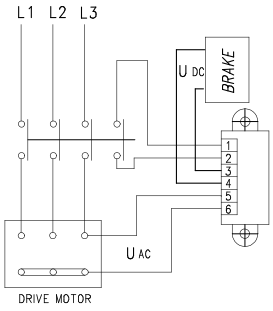
Disconnection of power supply on AC side

The diagram presents connection of rectifiers to supply circuit of motor. When disconnecting the voltage, the magnetic field causes the coil current to flow further through the rectifying diodes and drops slowly. The magnetic field reduces gradually causing prolonged time of braking action and consequently delayed increase of braking torque. If action time is irrelevant, brake should be connected on the AC side. When switching off, the supply circuits act as rectifying diodes.

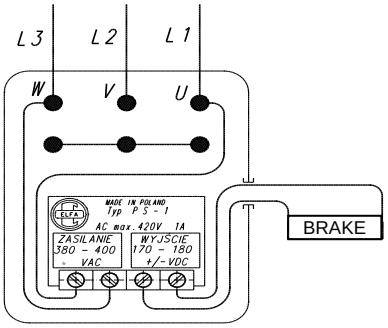


Disconnection of power supply on DC side

The diagram presents connection of rectifiers into electric motor circuit. The coil current is interrupted between the coil and supply (rectifier) circuit. The magnetic field reduces very quickly, **giving short time of braking action and consequently rapid growth of braking torque**. When switching off on DC voltage side, a high peak voltage is generated in the coil causing faster wear of contacts due to sparking. For protecting the coil against peak voltages and protecting the contacts against excessive wear, the rectifier circuit is provided with protective facility allowing brake connection on DC voltage side.



Rectifier PS-1



Circuit PS-1 is built on the basis of MOSFET type semiconductor technique which enabled achieving effects not available in traditional designs. The brake electromagnet energized through circuit of this construction enables the brake to achieve connection and disconnection time parameters analogous to breaking of circuit on direct current side. The parameters obtained are not however gained through utilization of additional electrical circuits and switches.

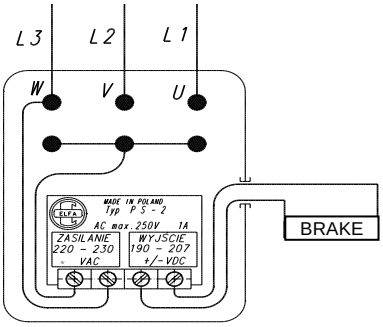
Simplicity of installation and parameters achieved enable very wide application, particularly in cases requiring positioning of drives, operation with high frequency of actuations compounded with repeatability of brake connecting and disconnecting times.

Supply circuit PS-1 forms a complete unit for direct installation. Provided with a four-terminal strip, it enables unhindered adaptation in every cooperating circuit. The circuit is adapted for supply from alternating current source of 380-400 VAC max. 420 VAC which after rectification and appropriate formation enables obtaining direct voltage of 170-180 VDC for brake supply.

The diagram below shows the method of connecting the circuit PS 1 into supply circuit of brake cooperating with 3x400 VAC electric motor with star-connected winding.

Rectifier PS-1 cooperates with brakes 2H2SP63 ÷ 2H2SP180.

Rectifier PS-2



Circuit PS-2 is built on the basis of MOSFET type semiconductor technique which enabled achieving effects not available in traditional designs. The brake electromagnet energized through circuit of this construction enables the brake to achieve connection and disconnection time parameters analogous to breaking of circuit on direct current side. The parameters obtained are not however gained through utilization of additional electrical circuits and switches.

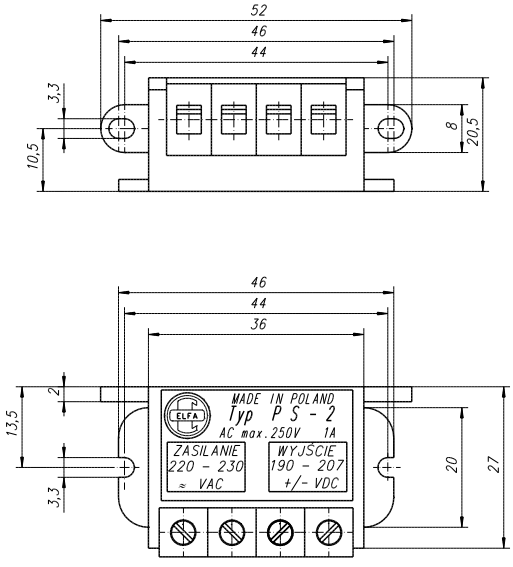
Simplicity of installation and parameters achieved enable very wide application, particularly in cases requiring positioning of drives, operation with high frequency of actuations compounded with repeatability of brake connecting and disconnecting times.

Supply circuit PS 2 forms a complete unit for direct installation. Provided with a four-terminal strip, it enables unhindered adaptation in every cooperating circuit. The circuit is adapted for supply from alternating current source of 220-230 VAC max. 250 VAC which after rectification and appropriate formation enables obtaining direct voltage of 190-207 VDC for brake supply.,

The diagram below shows the method of connecting the circuit PS 2 into supply circuit of brake cooperating with 3x400 VAC electric motor with star-connected winding.

Rectifier PS-2 cooperates with brakes 2H2SP63 ÷ 2H2SP200.

Rectifiers PS-1, PS-2 dimensions

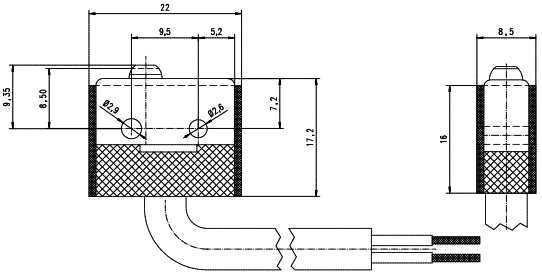


CONTROL AND SIGNALING CIRCUTS – microswitches

Having in mind the user who requires the control of the brake, we have designed special signaling and control circuits, which enable to control the state of the brake (engaged, disengaged) and the wear of the plate lining. The usage of these circuits enables to control the brake with the use of automatic elements, which ensure high level of safety and reliability. Due to its compact design, the microswitch can be used in any other applications, as long as its parameters meet design requirements.

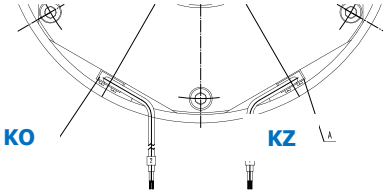
MICROSWITCHES - ELECTRIC PARAMETERS			
Switch parameter	**Switch KZ**	**Switch KO**	**Inductive sensor**
Max. voltage AC	250 V AC	250 V AC	
Max. AC switching current	5 A	6 A	
Max. Voltage DC	28V DC	220V DC	10 ÷ 30 VDC
Max. DC switching current	3 A / 28V DC	6A / 12V DC 3A / 24V DC 1A / 60V DC 0,5A / 110V DC 0,25A / 220V DC	100mA
Protection rating	IP 66	IP 66	IP 67
Terminals	NO /NC	NO /NC	NO

MICROSWITCH DIMENSIONS



Response monitoring microswitch – **KZ** or **IKZ** (KZ – microswitch, IKZ – inductive sensor) **–** control of the state of brake (engaged, disengaged),

Microswitch of the brake lining control – KO or **IKO** (KO – microswitch, IKO – inductive sensor) **–** the microswitch indicates approaching the maximum wear of the brake disc and the necessity of the brake's regulation or replacement of the disc brake, which enables further work of the brake. The regulation procedure is described in the brake operating manual.



SAMPLE INSTALATION

Microswitches set **KZ+KO** or **IKZ + IKO** is available from type H2SP80 inclusive.

PROCTECTIVE CIRCUITS – thermal protection

To protect electromagnet windings against heat build-up (slow-changing overloads) thermal sensor are used. In our offer we have PTC thermistors, which feature high resistance gradients when their rated temperature is reached - posistors - P or bimetallic thermal sensor - B.

Posistor-based sensors are made in the form of an insulated pill with connecting wires extending inside a teflon insulation, installed directly on the electromagnet windings. Sensor circuit terminals are routed outside the brake to the terminal box and connected to a separate connection block or terminal strip. So-called resistance relays are intended for thermistorbased PTC temperature sensors. When temperature of at least one of the sensors rises above the rated value, the circuit resistance suddenly increases triggering the relay.

Posistor thermal protection – **P**

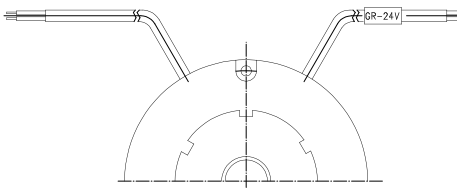
Note! PTC sensor terminals must not be connected directly to the contactor.

The brake protection has the form of a bimetallic sensor. Brake operation is controlled by a sensor or by a set of sensors, which ensure its safe operation; excessive temperature indication is obtained from the thermal switch installed inside the brake electromagnet's housing rated for a specific temperature. When the limit temperature for the sensor is exceeded, the information for the automatic control equipment is sent or the brake circuit is disconnected.

Bimetallic thermal protection – **B**

AUXILIARY CIRCUITS – anti-condensation heaters

The so-called parking heating is used to prevent vapours condensation inside the brake. The equipment is particularly useful in negative temperatures or in high humidity environments. The heater is supplied through its dedicated pair of wires. The heater power supply voltage matches customer requirements. – the need to define the voltage during order.



SAMPLE INSTALATION

Anti-condensation heaters – **GR -____V**

Note that simultaneous supply of the heater and brake electromagnet is not permitted.

2H2SP [ ] . [ ] [ ] . [ ] **VDC** [ ] **Nm d** [ ] [ ] **...**

MECHANICAL SIZE
63,71,80,90,100,112,132, 160,180,200,280,315

CONFIGURATION	
WITHOUT FITTING / ACCESORIES	1
LEVER FOR MANUAL RELEASE	2
MOUNTING FLANGE	3
LEVER FOR MANUAL RELEASE + MOUNTING FLANGE	4

Execution options for the customer's request:
- non-standard diameter of the sleeve gear brake d(H7)
- equipped with heating elements in the winding (need to define the voltage supply) – e.g. **GR___V**
- work at low temperatures -400C - **Z**
- posistor thermal protection - **P**
- bimetallic thermal protection - **B**
- other voltage brake
- response monitoring microswitch (engaged, disengaged) - **KZ** or **IKZ** (KZ – microswitch, IKZ – inductive sensor)
- microswitch of the brake lining control - **KO** or **IKO** (KO – microswitch, IKO – inductive sensor)
- microswitches set or inductive sensors set - **KZ+KO** or **IKZ+IKO**

EXAMPLE :

2H2SP 100. 10. 104VDC 2x32Nm d25 GR230VAC
2H2SP 80. 32. 180VDC 12Nm d19
2H2SP 112. 22. 24VDC 60Nm d25 KZ KO

DIAMETER OF SLEEVE GEAR d(H7)

CLIMATIC VERSION
ACCORDING TO STANDARDS : e.g. MT, TH

NOMINAL BRAKING TORQUE [Nm]											
2H2SP 63	2H2SP 71	2H2SP 80	2H2SP 90	2H2SP 100	2H2SP 112	2H2SP 132	2H2SP 160	2H2SP 180	2H2SP 200	2H2SP 280	2H2SP 315
2x4	2x8 2x6 2x3	2x16 2x12 2x5	2x20 2x16 2x12 2x5	2x32 2x24 2x16	2x60 2x45 2x30	2x100 2x80 2x60	2x150 2x120 2x75	2x240 2x180 2x120	2x500 2x360 2x270	2x1000 2x900 2x800 2x700 2x600	2x1600 2x1300 2x1050

OPERATING VOLTAGE [V DC]
24 , 104 , 180 , 207

PROTECTION RATING	
BASIC VERSION – WITH HOLE D4	0
VERSION IP 54 - WITHOUT HOLE D4	1
VERSION IP 54 - WITH HOLE D4 + V-RING SEALING	2
VERSION IP 55 - WITHOUT HOLE D4	3
VERSION IP 55 - WITH HOLE D4 + V-RING SEALING	4
VERSION IP 56 - WITHOUT HOLE D4 + IP56 BRAKE COVER	5
VERSION IP 56 – WITH HOLE D4 + SPECIAL SEALING + IP56 BRAKE COVER	6

The producer reserves the right to modify as a result of developing the product.
It is possible to realize special versions.