FACTORY OF ELECTRIC APPARATUS

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ELECTROMAGNETIC DISC BRAKES

NE SERIES

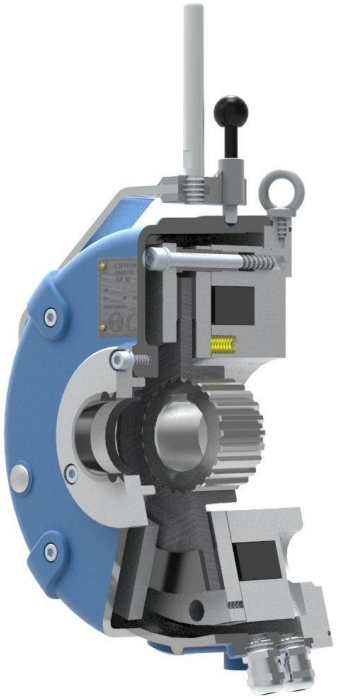
WITH CONSTANT BRAKING TORQUE

HIGH LEVEL OF PROTECTION

K-EN-NE-20180907

NE series is direct current electromagnetic brakes, spring-loaded with electromagnetic release. Intended for rotating machine parts stopping and precise positioning. Can be used for positioning and as safety brakes. These brakes are designed, built and tested in conformance with requirements of ISO 9001 and ISO 14001 quality management standards. Our products, described in this information sheet, have CE marks, which means that they are compatible with EU safety-related directives.

NE series brakes feature high repeatability, also at high operatingrates. They can be powered from alternating current sources through a rectifier, which can be delivered with the brake if so requested by the customer. Brakes are equipped with releasing screws and optionally can be fitted with manual release levers to allow their emergency releasing. An additional feature is their stable operation, which is particularly important if a machine is powered by several drives, working at high on-off rates. The design of the brake ensures simple and trouble-free installation. Various versions are available with different equipment, brake power supply types, allowing users to select the right option for their needs. When coupled with electric motors, a self-locking device can be created, i.e. a drive unit meeting safe drive positioning and operation requirements.



It is intended for stopping rotating machine parts, which can be used for:

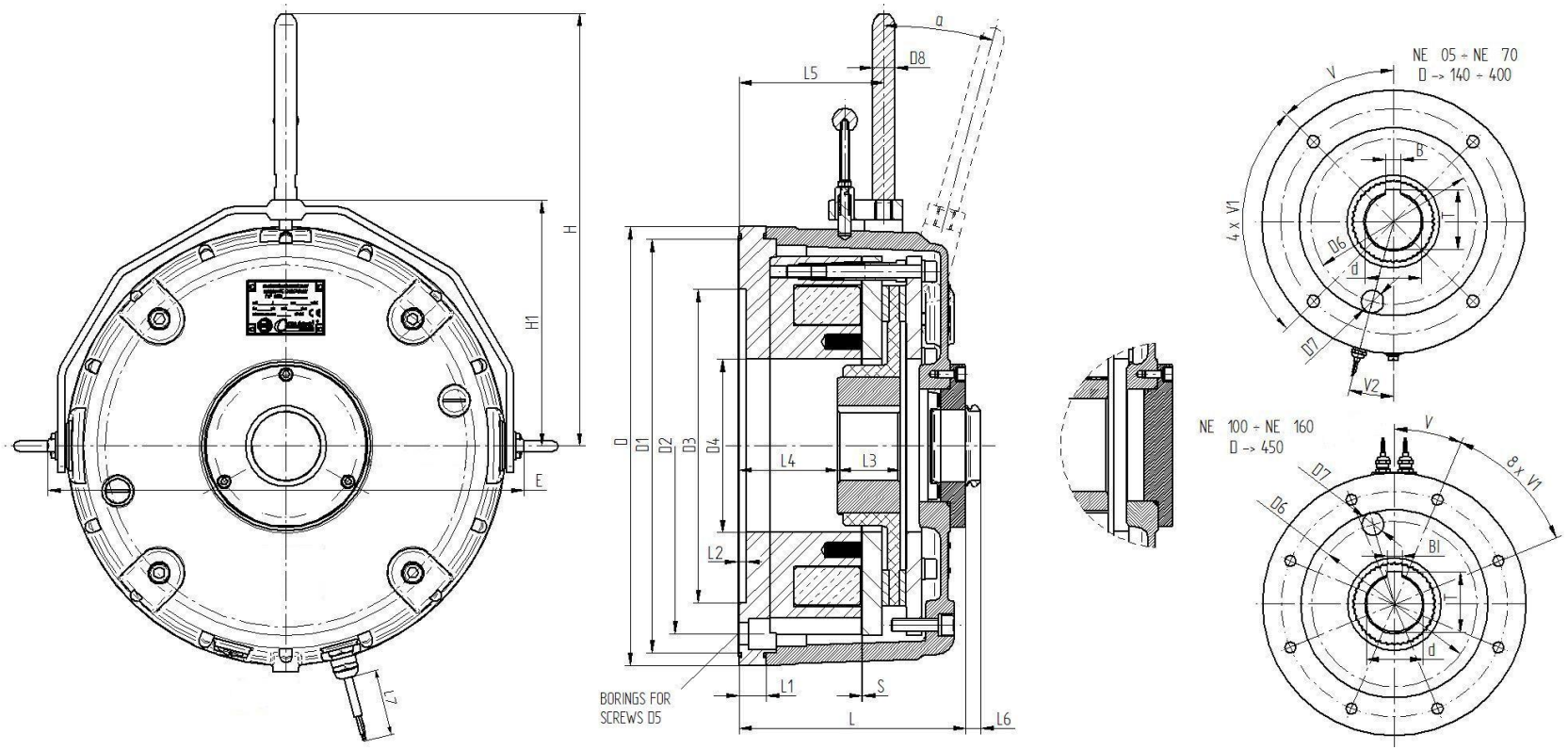
- emergency stopping, in order to ensure drive safety functions,
- immobilizing machine actuators, acting as a positioning device,
- minimizing run-on times of drives (to meed safety requirements according to Office of Technical Inspection (UDT) regulations)

Brakes can be manufactured in variants suitable for various direct-current voltages: 24V, 104V, 180V, which allows them to be supplied from standard alternating current sources, through appropriate rectifier.

Parameter			Unit.	Brake type								
				NE 05	**NE 10**	**NE 16**	**NE 25**	**NE 30**	**NE 50**	**NE 70**	**NE 100**	**NE 160**
Supply voltage		Un	[V]	24 ,104, 180								
Power		$P_{20°}$	[W]	30	50	75	90	110	145	250	250	340
Max. speed		$n_{max.}$	min^{-1}	3000								
Braking torque		M_h	Nm	50	100	160	250	360	500	700	1000	1600
Weight		m	kg	10	20	30	54	80	80	124	141	160
Ambient temperature			°C	-20 ÷ +45								
Level of protection			-	IP 67								
Operating time *	On direct voltage side	t_{01}	ms	90	150	300	400	500	500	500	500	600
		t_{09}		40	65	110	200	270	270	300	300	500
	On alternating voltage side	t_{01}	ms	90	150	300	400	500	500	500	500	600
		t_{09}		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.



Type	D	D1	D2	D3	D4	D5	D6	D7	D8	L	L1	L2	L3	L4	L5	L6	L7	H	H1	α	E	V	V1	V2	$S_{nom.}$	$S_{max.}$	d	B	T	d_{max}
NE 05	160	145	130	110 H7	44	4 x M8	80	18	12	119	18	4	35	50	57	10,5	400	185	95	15°	189	45°	90°	20°	$0,2^{\pm0,05}$	0,5	25 H7	8 P9	28,3	25 H7
NE 10	200	180	165	130 H7	62	4 x M10	110	18	12	151	20	5	75	46,5	72	10,5	400	206	116	15°	229	45°	90°	15°	$0,3^{\pm0,05}$	0,8	35 H7	8 P9	38,3	35 H7
NE 16	250	232	215	180 H7	87	4 x M12	144	30	12	140	18	5	35	55,5	80	13	600	245	145	15°	278	45°	90°	15°	$0,4^{\pm0,05}$	1,0	40 H7	12 P9	43,3	50 H7
NE 25	300	285	265	230 H7	92	4 x M12	186	30	16	165	20	5	40	75,5	104,5	13	850	322	170	15°	334	45°	90°	15°	$0,4^{\pm0,05}$	1,2	42 H7	12 P9	45,3	50 H7
NE 30	350	330	300	250 H7	138	4 x M16	194	30	18	181	22	6	50	79	115,5	13	850	445	196	15°	380	45°	90°	15°	$0,5^{\pm0,05}$	1,4	42 H7	12 P9	45,3	75 H7
NE 50	350	330	300	250 H7	138	4 x M16	194	30	18	181	22	6	50	79	115,5	13	850	445	196	15°	380	45°	90°	15°	$0,5^{\pm0,05}$	1,4	55 H7	16 P9	59,3	75 H7
NE 70	400	382	350	300 H7	150	4 x M16	264	30	20	210	24	6	70	79	133	13	1500	580	223	15°	438	45°	90°	15°	$0,6^{\pm0,05}$	1,1	55 H7	16 P9	59,3	75 H7
NE 100	450	430	400	350 H7	146	8 x M16	320	30	20	217	30	6	70	80	134	9	1500	705	243	20°	446	22,5°	45°	---	$0,6^{\pm0,05}$	1,1	55 H7	16 P9	59,3	75 H7
NE 160	450	430	400	350 H7	150	8 x M16	320	30	20	234	30	6	90	85	152	15	1500	730	268	20°	471	22,5°	45°	---	$0,6^{\pm0,05}$	1,5	70 H7	20 P9	74,9	75 H7

*** d_{max} - at an extra charge, brakes can be produced with custom maximum diameter of the toothed bush**

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 NE05÷ NE50.

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 NE05-NE160.

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 NE05 ÷ NE50.

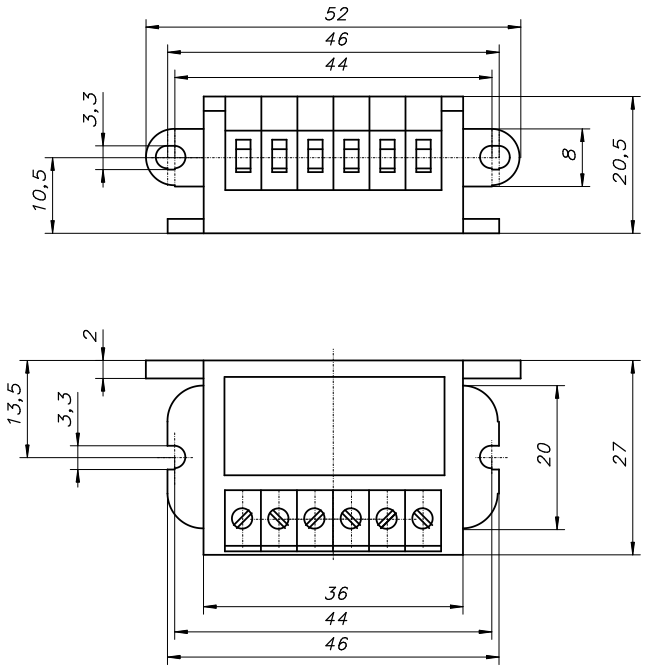
RECTIFIER PARAMETERS		
Maximum input voltage (alternating voltage AC)	U_{IN}	250 VAC
Maximum output voltage (direct voltage DC)	U_{OUT}	0,9U_{IN}
Maximum continuous output current rectifier	I_{OUT}	2A

For example

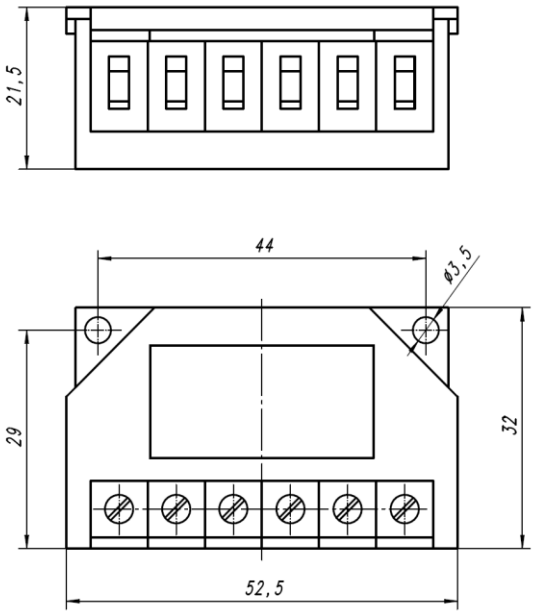
Maximum input voltage (alternating voltage) - U_{IN} = 230VAC,
The resulting output voltage of the rectifier (direct voltage) - 0,9U_{IN}= 0,9 x 230=207VDC

Rectifiers dimensions

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

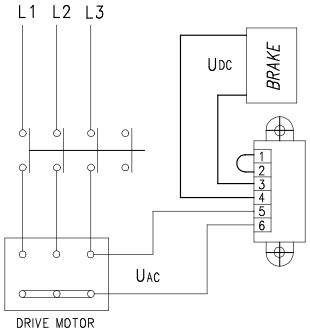


B2-1P-600,
B5-1P-600



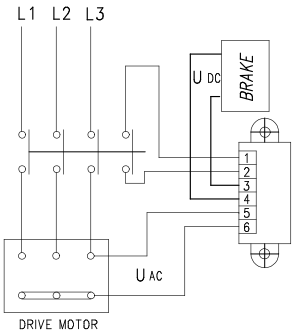
Disconnection of power supply on AC side

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.

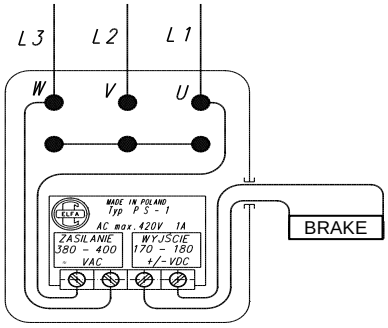


Disconnection of power supply on DC side

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, **<u>giving short time of braking action and consequently rapid growth of braking torque</u>**. 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.

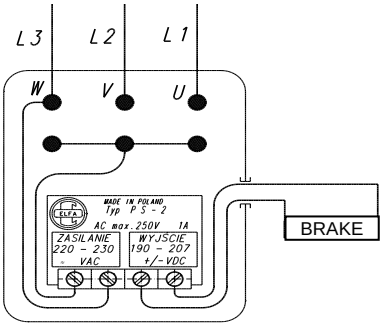
Simplicity of installation and parameters achieved enable very wide application, particularly in cases requiring positioning of drives, operation with high frequency of actuations compounded with repeatability of brake connecting and disconnecting times.

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 NE05 ÷ NE25.

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.

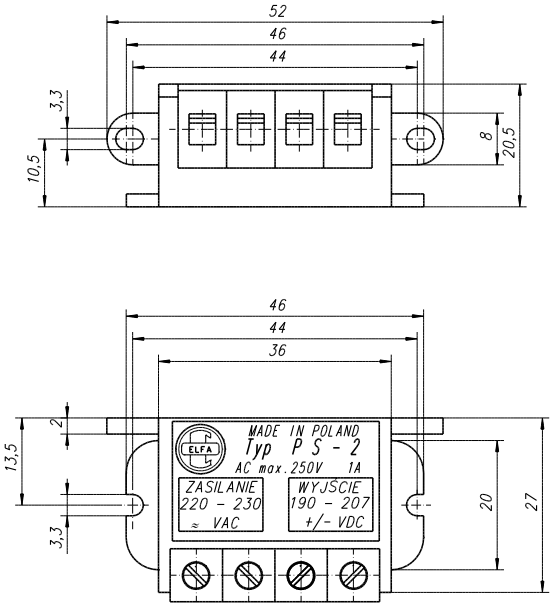
Simplicity of installation and parameters achieved enable very wide application, particularly in cases requiring positioning of drives, operation with high frequency of actuations compounded with repeatability of brake connecting and disconnecting times.

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 NE05 ÷ NE50.

Rectifiers PS-1, PS-2 dimensions

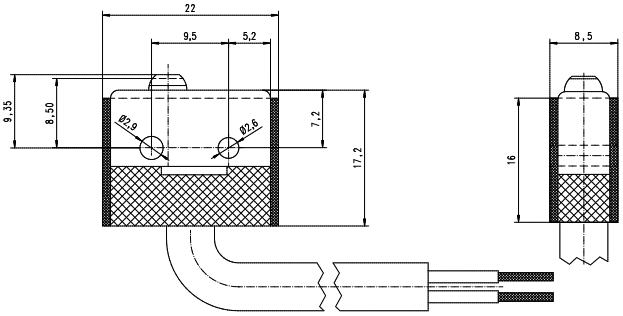


CONTROL AND SIGNALING CIRCUTS – microswitches

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**
Max. voltage AC	250 V AC	250 V AC
Max. AC switching current	5 A	6 A
Max. Voltage DC	28V DC	220V DC
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
Protection rating	IP 66	IP 66
Terminals	NO /NC	NO /NC

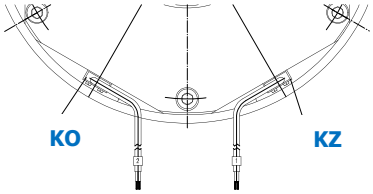
MICROSWITCH DIMENSIONS



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

Microswitch of the brake lining control – KO – 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.

Response monitoring microswitch and microswitch of the brake lining control – KZ KO



SAMPLE INSTALATION

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.

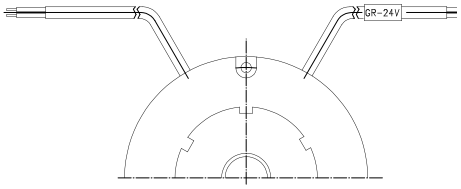
The brake protection has the form of a bimetallic sensor. Brake operation is controlled by a sensor or by a set of sensors, which ensure its safe operation; excessive temperature indication is obtained from the thermal switch installed inside the brake electromagnet's housing rated for a specific temperature.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

Zabezpieczenie termiczne bimetalowe – **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.

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



SAMPLE INSTALATION

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

NE [ ] . [ ] [ ] . [ ] **VDC** [ ] **Nm** **d** [ ] [ ] **...**

MECHANICAL SIZE
05, 10, 16, 25, 30, 50, 70, 100, 160

CONFIGURATION	
BASE (CABLE GUIDED THROUGH THE D7 HOLE)	0
CABLE GUIDED THROUGH A GLAND	1
BASIC + HOLE WITH V-RING	2
CABLE GUIDED THROUGH A GLAND + HOLE WITH V-RING	3

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.....VAC**
- work at low temperatures -400C - **Z**
- posistor thermal protection - **P**
- bimetallic thermal protection - **B**
- other voltage brake
- response monitoring microswitch
(engaged, disengaged) - **KZ**
- microswitch of the brake lining control - **KO**
- microswitches set – **KZ KO**

EXAMPLE :

NE 25 . 30 . 104VDC 180Nm d42 KZ+KO
NE 160. 23 . PTC 180VDC 1600Nm d75 MT

DIAMETER OF THE SLEEVE GEAR d(h7)

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

NOMINAL BRAKING TORQUE [Nm]								
NE 05	**NE 10**	**NE 16**	**NE 25**	**NE 30**	**NE 50**	**NE 70**	**NE 100**	**NE 160**
50	100	160	250	360	500	700	1000	1600
35	75	120	180	270	420	600	900	1300
25	50	75	120		360		800	1050

OPERATING VOLTAGE [V DC]
24 , 104 , 180

OPTIONS	
STANDARD CONFIGURATION	0
MANUAL RELEASE LEVER	1

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