" **New generation CEM Motor contactors from** ETI Polam**„**

Modern wiring systems require the high grade of master devices with electric receivers. On last year's „ENERGETAB 2005" Trade Fairs in Bielsko-Biala, ETI - Polam from Pułtusk traditionally introduced new family of electric devices - electromagnetic motor contactors- aerial CEM, along with thermal relays and comprehensive optional accessories.

Roman Kłopocki

Usage and application

The typical usage of electromagnetic motor contactors- as its name shows - is the coupling of engines (usage category AC-3), electric induction receivers (usage category AC-1), different character and power light sources.
Depending on rated load capacity (AC-3, 400V), CEM contactors are divided in four groups:

- mini contactors CE07 – P max. 3 kW
- contactors CEM9 - CEM105 for Pmax. 4 kW – 55 kW
- high current contactors CEM112 – CEM250 for Pmax. 55 kW – 132 kW
- auxiliary contactors CAE04 (AC) – CAEM4 (AC/DC) for I_{th} = 20A (AC-1)

CEM motor contactors have in the wide range of master voltages, controlling electromagnet coil. This voltages are AC - 24V, 48V, 110V, 230V 400V and DC - 24V, 220V. Contactors coils are adapted for very easy replacement and in CEM9 - CEM40 - contactors without the use of tools. This means the very quick and easy adaptation of the contactor to required coil master voltage and for manufacturer and distributor - the lack of necessities to support large warehouse stocks states of all kinds contactors. Besides, coils on both sides have to supplying clamps A1 - A2, what considerably makes easy to supply them with power in the switch box. Fig. 1.

Coils supplied by impulse- power

The group of high current contactors marked as- (E) - CEM112 (E)- CEM250(E) have the electronic impulse- power system supplying coils - so-called the Coils Electronic Drive. The electronic drive is responsible for current flow control in the electromagnet coil in such way, to reach the optimum- dynamics of the attraction and drop off of contact points for the purpose of decreasing their wear. Besides, the absorbed power by coil during contact points holding on, should be small and the tighten power of contact points sufficient to ensure adequate short-circuit endurance and minimum- heating of contact points. The electronic element straightens the coil supplying voltage and holds voltage level through impulse-voltage stabilization in the dependence from the runtime mode of the contactor. Operation of the drive is stable aside from the kind and the value of the supplying voltage AC/DC. Control of the coil supplying voltage of the contactor through the electronic system ensures the independence of this coil voltage from the main supplying voltage and makes possible to use the contactor in the main AC and DC. To the main advantages of the coil impulse- power supply of contactors belong:

- operation of the contactor independent from the supply voltage
- possibility of the AC or DC power supply
- small absorbed power by coil during of holding up and consequently smaller quantity emitted heat
- "small power" steering - lets on direct steering of electronic drivers
- raised coupling durability

- quiet operation of contact points in the moment of the start-up

The new series of CEM contactors has the small width what provides space savings in the switch box. These widths are as follow:

- 45 mms for CEM9 - CEM25 contactors
  66 mms for CEM50 - CEM80 contactors

Accessories

To the accessories assembled outside contactors belong:

- thermal transmitters
- sets of auxiliary contact points
- mechanical blockades
- surges limiters
- cast-iron connecting rails (to making sets - systems of two contactors for reversional work or for start up in star – triangle mode)

The wide variety of contactors accessories of the CEM series increases possibilities of their usages .

CEM contactors are intended for the assembling in switch boxes on the mounting rail TH 35 or with screws on vertical plane surface with the possibility of the hade about 30^{o}.

Together with the contactor mounted on the rail TH35, it is possible to install the suitable thermal transmitter RW , however it is necessary to use the intermediary (adapter) element RW..D Fig. 2.

During rated operation of the contactor, especially when the frequency of power-ups and separation is large enough , the circuit of the contactor is subject to nascent surges as result of of quick changes of the current. For the purpose of the contactor coil drive protection against surges, surges limiter (RC) BAMRCE should be connected in parallel to coil clamps(A1 -- A2) . Fig. 3.

Wires connecting methods

Clamps {connectors} of the main poles with special construction so-called lift double cell - used in CEM32 - CEM105 contactors make possible to carry out the certain wire connection having different cross-section (diameters). This is very essential in the situation , when to one clamp must become connected two lines with very different diameters with ironed funnel ending. This construction of the clamp makes impossible the hanging indent of the wire with the smaller diameter. Double cell clamps of CEM contactors - Fig. 4 raise up the operational reliability of these devices.

Auxiliary contact points

Depending on needs and their functions, CEM contactors can be equipped with additional auxiliary contact points fastened frontally to the contactor or to its side. (Fig. 5). They extend coupling functionality of the contactor and considerable quantity of its combination improves the high-availability the system. About the choice of the kind of the auxiliary contact points decides the user. When the contactor will be installed in the switch box, whose the depth permits, can install auxiliary uni-polar contact points BCXMFE 10 (clenched - 1z) or BCXMFE 01 (unclenched - 1r). If auxiliary contact points can not be installed in the frontal part, can be used blocks of bipolar contact points BCXMLE 20 (2 clenched contact points -

2z) or BCXMLE 11 (1 clenched - 1z + 1 unclenched - 1r). Accessible are also auxiliary contact points with delayed operation.
For the limited power tension of the electromagnetic contactors system can be used for contactors CEM9 - CEM25 - max. 4 auxiliary (frontally and side-assembled) contact points, for contactors CEM32 - CEM40 - max. - 6 contact points, and for contactors CEM50 - CEM250 - max - 8 contact points.
In case, when contactors are operating in sets: SZR - automatic reserve switching on, the reversing work or the start up star-triangle is necessary usage of the mechanical (Fig. 6) blockade. This blockade makes possible the mechanical blocking of two contactors to the alternating operation i.e. in the moment of getting down to work one from contactors, there is not possible to switch on the second one. In case of mini contactors, they are available factory mounted sets of two contactors with the mechanical blockade- CEI07.10 or CEI07. 01. Motor CEM contactors have own set of thermal relays RE....D needed to protecting the electric motors (Fig. 7). Adjustable ranges of above-mentioned thermal relays are within the range from 0, 28 A to 310 A (Table 1).

Table 1. List of thermal relays and additional fuse links

Contactor	Current setting range - A	Additional fuse link gG/gL A	Relay type
CE07	0,28....0,4	2	RE17D- 0,4
	0,4....0,63	2	RE17D- 0,63
	0,56....0,8	2	RE17D- 0,8
	0,8....1,2	4	RE17D- 1,2
	1,2....1,8	6	RE17D- 1,8
	1,8....2,8	6	RE17D- 2,8
	2,8....4,0	10	RE17D- 4,0
	4,0....6,3	16	RE17D- 6,3
	5,6....8,0	20	RE17D- 8,0
	7,0....10,0	25	RE17D- 10
CEM9...CEM32	0,28....0,4	2	RE27D- 0,4
	0,4....0,63	2	RE27D- 0,63
	0,56....0,8	2	RE27D- 0,8
	0,8....1,2	4	RE27D- 1,2
	1,2....1,8	6	RE27D- 1,8
	1,8....2,8	6	RE27D- 2,8
	2,8....4,0	10	RE27D- 4,0
	4,0....6,3	16	RE27D- 6,3
	5,6....8,0	20	RE27D- 8.0
	7,0....10,0	25	RE27D- 10
	8,0....12,5	25	RE27D- 12,5
	10,0....15,0	35	RE27D- 15
	11,0....17,0	35	RE27D- 17
	15,0....23,0	50	RE27D- 23
	22,0....32,0	63	RE27D- 32
CEM32...CEM40	25,0....40,0	80	RE67.1D – 40
		100	RE67.1D-50
CEM50...CEM80	40,0....57,0	100	RE67.2D-57
	50,0....63,0	100	RE67.2D-63
	57,0....70,0	125	RE67.2D-70
	63,0....80,0	125	RE67.2D- 80
CEM95...CEM105	75,0....97,0	200	RE117.1D- 97
	90,0....112,0	250	RE117.1D- 112
CEM112(E)	75,0....97,0	200	RE117.2D- 97
	90,0....112,0	250	RE117.2D- 112
CEM150(E)...CEM250(E)	100,0....150,0	315	RE317D - 150
	140,0....215.0	355	RE317D - 215
	200,0....310,0	500	RE317D - 310

Fig. 6 Mechanical blockade 0912

Fig. 7 Thermal relay R…D 0908

Recapitulation

New generation CEM motor contactors along with the accessories can be used in all categories of currents - AC and DC accordingly to requirements of PN-IEC 60 947 and DIN VDE 0660 norms. For described above functions and proprieties, they determine complex and technically sensitively adapted offer. Their technical parameters ensure - the high resistance against impact of weather conditions, the generality and useful advantages. These contactors can work conditioned in the ambient temperature ranging from - 25 ^{o}C up to + 55 ^{o}C. They comply also with requirements of climatic norm PN-IEC 6068-2 regarding moist, dry and tropical climate.

Inż. Roman Kłopocki

Table 2. Most important technical parameters (Alternatywnie z Petryk plakat B1.)

Type	CEM 9	CEM 12	CEM 18	CEM 25	CEM 32	CEM 40	CEM 50	CEM 65	CEM 80	CEM 95	CEM 105	CEM 112(E)	CEM 150	CEM 180)	CEM 250
Norms	PN-IEC 60947, DIN VDE 0660, UL, CSA											PN-IEC60947, DIN VDE 0660			
Rated insulation voltage Ui (V)	1000 V														
Rated impulse endurance Uimp	6 kV						8 kV								
Frequency	25 - 400 Hz														
Protection degree	IP20				IP00										
Operational temperature	-25^{o}C - + 55 ^{o}C -55^{o}C - + 80 ^{o}C														
Usage level	Do 3000 m npm														
Surges cat./Pollution cat.	III/3														
Main poles															
Number of poles	3														
Control rated voltage	690 V														
Thermal current. Ith Rated control current AC1	25A	25A	32A	45A	60A	60A	90A	110A	110A	140A	140A	180A	180A	225A	350A
ClassAC3 Rated power															
230 V kW	2,2	3	4	6,5	9	11	15	18,5	22	25	30	30	45	55	75
400 V kW	**4**	**5,5**	**7,5**	**11**	**15**	**18,5**	**22**	**30**	**37**	**45**	**55**	**55**	**75**	**90**	**132**
415-440V kW	4,5	5,5	9	12,5	15	22	30	37	45	55	55	55	90	110	150
500V kW	5,5	7,5	10	15	18,5	25	30	40	45	55	65	75	90	110	160
690V kW	5,5	7,5	10	15	18,5	30	33	45	45	55	65	80	80	132	200
Max. Surge protection gG	25A	25A	35A	50A	63A	63A	100A	125A	125A	200A	200A	225A	225A	250A	355A
Max. Conn frequency															
AC1 cycl./h	1200					1200				600	600	50			
AC-3 cycl./h	1200					1200				1200	1200	500			
AC-4 cycl.h	360					200				200	200	250			
W/o load. Cycl./h	9000					9000				9000	9000	2000			
Mechanical endurance	15 x 10^6							12 x 10^6				105 x 10^6			
Electrical endurance	2 x 10^6						1,8 x 10^6	1,7 x 10^6	15 x 10^6	1,7 x 10^6	1,5 x 10^6	10^6			