



PACS Industries, Inc.

CONVERSIONS TO VACUUM ARC FURNACE CIRCUIT BREAKERS FROM CONTACTORS

13.8kV...52kV systems, to 3000 Amps, and to 250kV BIL

PACS Industries, Inc. can convert competitive arc furnace contactor installations (such as Joslyn) to vacuum **THIRD GENERATION Arc Furnace Circuit Breaker** installations in existing steel mill vaults. PACS, as the exclusive North American partners for Areva, Regensburg (formerly AEG), have developed a complete Arc Furnace Circuit Breaker and Metalenclosed switchgear system for use in steel mills. PACS can provide either factory assembled Arc Furnace switchgear system, or we can convert existing installations to VACUUM circuit breakers with ancillary equipment. Equipment is available for indoor or outdoor application. PACS can provide self-contained outdoor equipment buildings or outdoor stand-alone circuit breakers, as well. Over 250 Arc Furnace switchgears have been built to date.

The PACS conversion package can include as required by our customer, feasibility studies and proposals, and required installation drawings for field replacement of competitive contactors and any other equipment requiring replacement. In addition to circuit breakers, PACS can provide bus bars, insulators, cable, structural members, etc. PACS services can also include field installation of equipment, or supervision of installation.

The VACUUM **THIRD GENERATION Arc Furnace Circuit Breaker** has been designed and tested for 75,000 operations with scheduled maintenance. Unlike contactors these circuit breakers are capable of interrupting short circuit currents up to 40kA. Since these circuit breakers use only one vacuum interrupter per phase (through 40.5kV), pole synchronism remains within 1.5 milliseconds for the life of the circuit breaker. Circuit breakers are mounted on a truck, for ease of movement.

PACS Industries, Inc. also manufactures a complete line of disconnect switches, through 52 kV and 6,000 amperes. These switches utilize copper switch blades, and have been tested to 10,000 operations. PACS heavy-duty switches use ball bearing shaft supports. PACS switches are available with manual, electrical, and pneumatic operators. PACS also manufactures grounding (earthing) switches, and Wye-Delta switches.

The quickest way to determine the feasibility of a conversion from your existing contactor to a **THIRD GENERATION Arc furnace Circuit Breaker** system, is to first call us, and then to send us a physical drawing of your vault room showing the contactor location. Our engineers will evaluate the situation, and will respond with our suggestions and a proposal. On-site evaluations are available at per-diem rates.

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COMPARISON OF VACUUM SWITCH CONTACTORS WITH VACUUM ARC FURNACE CIRCUIT BREAKERS

The VACUUM *THIRD GENERATION* Arc Furnace Circuit Breakers have the following state-of-the-art characteristics as compared to competitive open construction vacuum switch contactors. As the exclusive North American partners to Areva, PACS Industries, Inc., mounts the Arc Furnace Vacuum Circuit Breaker module onto a withdrawable truck, and manufactures a complete Arc Furnace Circuit Breaker into a Metalenclosed switchgear system. This can include required disconnect and grounding switches, potential transformers, current transformers, relaying, metering, etc. The switchgear cubicle dimensions are approximately 60" wide x 108" high x 144" deep (1524mm x 2743mm x 3657mm). This switchgear package would be in lieu of indoor substation vault areas, and is very competitive. Being a true Circuit Breaker, the VACUUM Circuit Breaker can interrupt full rated short circuit fault current, and uses only one vacuum interrupter per phase through 3000 amperes, and 40.5kV. The VACUUM Circuit Breaker uses only one ganged operator for all three phases, so that interpole asynchronism will not exceed 3 milliseconds for the life of the breaker. The *THIRD GENERATION* Arc Furnace Circuit Breakers have been designed and tested to 75,000 operations with scheduled maintenance every 15,000 operations. The vacuum interrupter life is 25,000 to 30,000 full load operations, and 100 short circuit interrupting operations.

	Open Style Vacuum Contactors (similar to Joslyn)	PACS' VACUUM Arc Furnace Circuit Breaker
Number of vacuum interrupters required per phase (depends upon voltage & current).	Up to 5 per phase (15 vacuum interrupters per 3-phase contactor).	Only 1 per phase up to 40.5 kV and 3000 amps.
Number of operating mechanisms per 3 phases.	Uses one operator per phase. 3 separate operators per 3-phase assembly.	Uses only one mechanically ganged operator for 3 phases.
Lifelong tripping & closing time differential between poles.	Varies with time & periodic adjustments.	Does not exceed 3 milliseconds for life of circuit breaker.
Requires periodic critical adjustments between poles to maintain close differential synchronism.	Yes	No
Maximum Continuous Current	3000 amps	3000 amps
Short circuit current interrupting capability	4000 amps	Up to 40,000 amps
Voltage & B.I.L 50/60 Hertz	15kV, 110 kV B.I.L. 24kV, 125kV B.I.L. To 40.5kV, 200kV B.I.L. 52kV, 250kV B.I.L.	15kV, 110 kV B.I.L. 24kV, 125kV B.I.L. to 40.5kV, 200kV B.I.L.. 52kV, 250kV B.I.L.
Control Voltage	120v AC, per operator	120v AC or 125v DC
Available on withdrawable truck	No	Yes
Interchangeable in 30 minutes	No	Yes
Mechanical interlocks to disconnect switch	No	Yes, in PACS' switchgear
Available in indoor or outdoor Metalenclosed switchgear	No	Yes

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