1. Hybrid Contactors - Innovations in High Voltage switching technology.

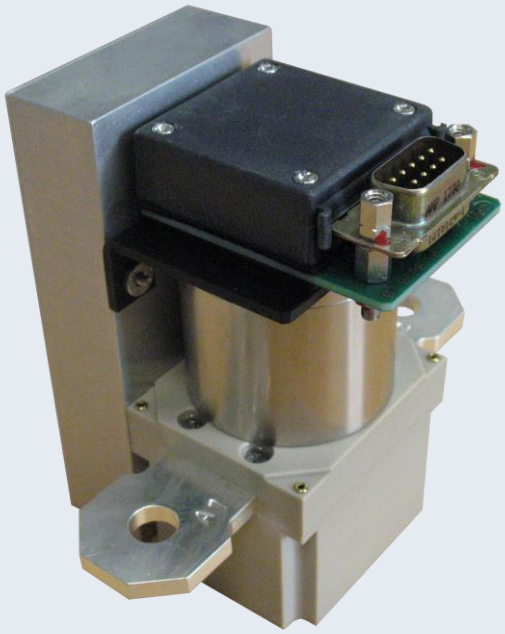
The use of high voltage networks in aerospace market has been growing for a decade, on the one hand due to the need to increase the electrical power in aircrafts, and on the other hand with the emergence of electric airplanes, like e-VTOL but not only, that are powered by HV-DC. Thus, introducing new HV-DC switching devices such as power contactors makes sense.

The main challenge in high voltage DC systems is the ability to interrupt the electrical arc, whilst maintaining the galvanic insulation. This cannot be achieved with conventional contactors.

Leach International Europe has patented a hybrid switching technology (patent number US20180350533A1), made of a conventional mechanical contact associated with an electronic switch. The electronic switch does not require any external power supply.

ADVANTAGES

High speed breaking,
Reduced contact erosion,
Life capability more than doubled,
Galvanic insulation ensured,
Not susceptible to indirect effects of lightning,
Lower EMI emission than conventional contactors,
No need of external power supply,
Very short electronics supply duration (<1ms)
Unidirectional or bidirectional on request



TECHNOLOGY TEST STATUS

✓ Life cycling,
✓ Temperature,
✓ Altitude, tested up to 55,000 ft,
✓ Overload,
✓ Break capability,
✓ Technology tested so far up to 800A/3.6 kVdc.

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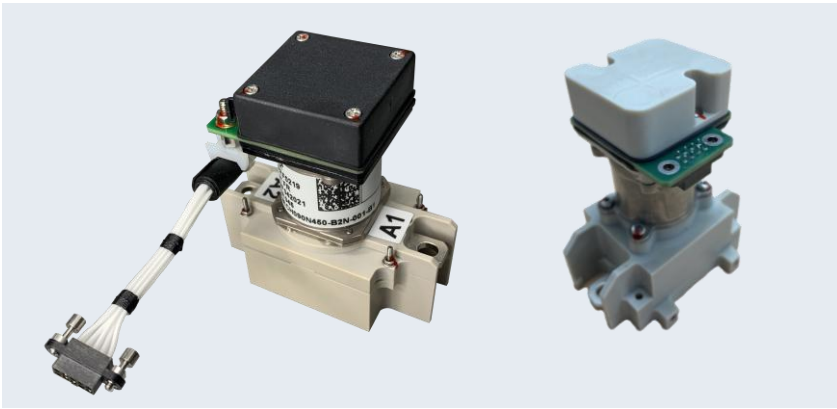
2. Safety concerns

For safety reasons, Leach International Europe hybrid contactors also integrate a dissimilar technology so that the breaking function is ensured in case of electronic switch failure.

3. Small ratings HV-DC contactors

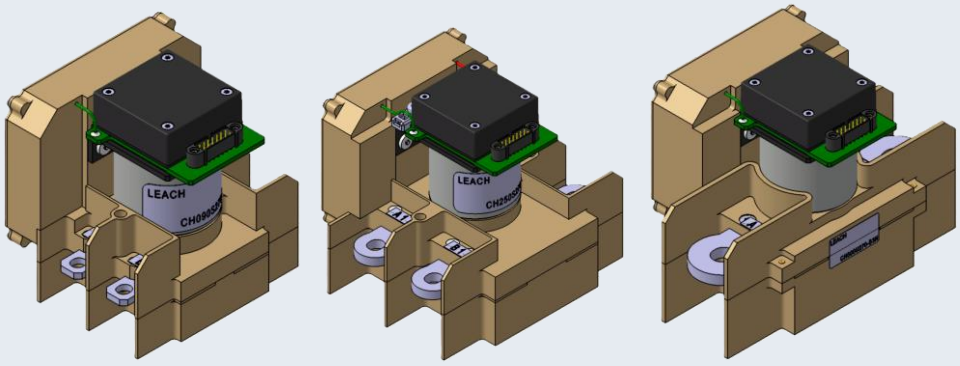
Those contactors are capable to make, carry and break the nominal current under maximum voltage at least 50,000 times. They can operate overload no less than 3 times the nominal current and are operational up to 35,000 ft.



90A and 50A/450Vdc latch contactors

4. 'Family Concept'

Leach International Europe introduces a new generation of Family Concept HV-DC Hybrid Contactors customizable to specific customer requirements. Through the innovative usage of common sub-assemblies, this new family of contactors offers lightweight, flexible designs with the high reliability needed for increasing demands of more electric aircraft, helicopter applications, and power systems. Inspired from legacy 28Vdc busbars styles contactors, they are also the ideal footprint for primary power distribution assemblies. The reuse of common parts significantly reduces the design phase of such devices.



BENEFITS

✓ All advantages seen in 1.
✓ Optimized size,
✓ Flexible concept,
✓ Less weight,
✓ Lower cost,
✓ Cadmium free contacts,
✓ High reliability,
✓ Safe with two dissimilar blowing technologies

5. Products range

Main poles	Rating [2]	Arc blow technologies				Coil			Auxiliary contacts	
		270Vdc	450Vdc	600Vdc	>600Vdc	Non-latch		Latch	2PDT	3PDT
						28Vdc	PWM	28Vdc		
SPST-NO	50A	✓	✓			✓	✓	✓	✓	
	90A	✓	✓	✓	✓	✓	✓	✓	✓	
	175A	✓	✓	✓	✓	✓	✓	✓		✓
	250A	✓	✓	✓	✓	✓	✓	✓		✓
	350A	✓	✓	✓	✓	✓	✓	✓		✓
	500A	✓	✓	✓	✓	✓	✓	✓		✓
DPST-NO	30A	✓	✓			✓	✓	✓	✓	
	50A	✓	✓			✓	✓	✓	✓	
	90A	✓	✓	✓	✓	✓	✓	✓		✓
	175A	✓	✓	✓	✓	✓	✓	✓		✓
	250A	✓	✓	✓	✓	✓	✓	✓		✓

✓ : Standard configurations
✓ : Optional
✓ : On-going R&T activities

6. Customizable options [1]

CH 175 S 270 - B 3 N - S - 001

1. **Basic series code:**
   CH: code for HV-DC Contactors series
2. **Rating in amperes [2]:**
   30, 50, 90, 175, 250, 350 and 500
3. **Power configuration:**
   One or two poles,
   non-latch or latch
4. **Nominal Voltage [5]:**
   270Vdc, 450Vdc, 600Vdc, >600Vdc
5. **Mounting options, all being busbar style:**
   With or without barriers,
   Oblong through-holes,
   Metric or imperial captive screws,
6. **Number of auxiliary contacts [3] [4]:**
   2PDT or 3PDT form C
7. **Coil type:**
   28Vdc economized,
   with or without coil suppression,
   Single coil for external PWM drive
8. **Connector type:**
   Fixed connector or flying lead,
   Straight or right-angle fixed connector,
   Nicomatic or sub-D.
9. **Specific variants:**
   Upon specific requirements from customers

7. Notes

[1] Because designing contactors, and particularly for HV-DC contactors, is time consuming and cost effective, Leach has decided to launch the design of the desired contactor only upon request from customers. However, predesigns were made to be prepared as much as possible as soon as a demand comes. The 'family concept' allows reducing the design time significantly. Consult Leach for availability conditions by submitting the following key drivers which will help us choosing the right contactor for the related usage (black fonts show mandatory items and green fonts relate to less important ones):

- Number of poles: 1 or 2,
- Non-latch or latch,
- Nominal current,
- Nominal and maximum voltage,
- Overload current, voltage, and duration,
- Line inductance, at least order of magnitude,
- Dielectric strength over altitude range,
- Environmental conditions, at least altitude and temperature,
- Number of auxiliary contacts,
- Preferred interface connector.

[2] Nominal current for which the contactor is capable to make, carry with no limit of time, and break under maximum voltage, no less than 50,000 times, assuming 50% at ambient temperature and 50% at maximum temperature.

[3] The auxiliary contacts are mechanically linked to the main contact(s), in both directions.

[4] Low level compatible auxiliary contacts (2mA/6Vdc). The use of the auxiliary contacts at low level current is possible only if current higher than 100mA/6Vdc was never applied before.

[5] Unless otherwise specified by the customer, the maximum voltages are:

- 320Vdc for 270Vdc nominal,
- 500Vdc for 450Vdc nominal,
- 700Vdc for 600Vdc nominal.