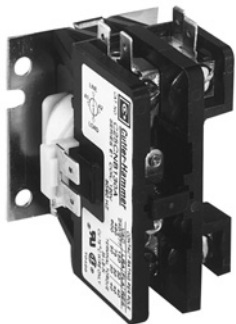




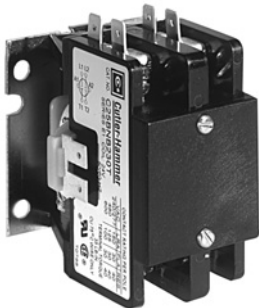
## Definite Purpose Contactors & Starters

Application Note

January 2005  
New Information



*Compact 1-Pole with Shunt*



*Compact 2-Pole*



*50 mm DP Contactor*

### History and Background

The concept for Definite Purpose (DP) Contactors and Starters actually originated in the 1950s at the request of several large Heating, Ventilating, Air Conditioning and Refrigeration (HVACR) OEMs. Until this time, these OEMs had used NEMA Rated Contactors and Starters in their equipment. However, these NEMA Rated devices were very robust and expensive and they were outlasting the equipment in which they were installed.

The HVACR OEMs called in several electrical control companies, including Cutler-Hammer, and asked them to design a line of Contactors and Starters that would have a much lower electrical life and a reduced cost based on this performance, while maintaining the high quality of the NEMA rated products. This new line became known as Definite Purpose Contactors and Starters because they were designed for specific requirements and a specific market.

### Market

The market for Definite Purpose Contactors and Starters is primarily a North American market. Outside North America, IEC Rated Contactors and Starters are used for similar HVACR applications. The 2004 market for Definite Purpose Control is estimated at \$95 million.

### Target Market Segments and Applications

While Definite Purpose Control products were originally designed for the HVACR Industry, over the years their use has expanded to many other market segments. A good rule of thumb for DPs is if a customer has an application that "heats, cools, refrigerates, controls or moves air", then he is probably a good candidate for DP Contactors or Starters.

Within the Air Conditioning OEM Segment, DP Contactors can be grouped into two main categories depending on the application: Compact 1- and 2-Pole DP Contactors (20A to 40A) and Standard Frame DP Contactors (15A to 360A).

**Residential Unitary Air Conditioning Applications:** Compact 1- and 2-Pole DP Contactors, rated 20A and 40A, are the product of choice for the unitary central air conditioning units installed in many homes. Carrier, Trane, York and Goodman are just a few of the major OEMs who manufacture these air conditioning products. The standard AC coil voltages are: 24V, 120V and 240V.

**Commercial/Industrial Air Conditioning Applications:** Standard frame DP Contactors, 2- and 3-Pole units rated 15A to 360A, are used in the larger commercial/industrial air conditioning units that you see mounted on the rooftops of Industrial Plants, Hotels, Hospitals, Office Buildings and other Commercial and Industrial installations. These air conditioning units carry ratings from a few tons to 500 ton.

The following is a listing of other Standard Industrial Classification (SIC) Code Numbers where DP Contactors/Starters are typically applied:

**Standard Industrial Classification (SIC) Numbers Where Definite Purpose Contactors Are Typically Applied**

**Table 1. Four Digit SIC Numbers**

SIC Codes	Description
2449	Hot tubs, manufacturing
3088	Hot tubs, plastic/fiberglass manufacturing
3563	Air gas compressors manufacturing
3564	Fans/blowers/air purification manufacturing
3567	Industrial processing furnace/oven manufacturing
3581	Automatic vending machine manufacturing
3582	Dry cleaning and pressing machine manufacturing
3585	Air conditioning and heating equipment manufacturing
3629	Battery chargers rectifying/non-rotating manufacturing
3842	Whirlpool baths/equipment manufacturing
3548	Welding and cutting apparatus, gas or electric manufacturing
3634	Humidifiers, electric, portable manufacturing
3582	Washing machines, commercial manufacturing
3639	Water heaters, electric, manufacturing
3556	Ovens, bakery manufacturing
3821	Ovens, laboratory manufacturing
3556	Meat grinders
3589	Garbage disposers, commercial manufacturing

**Table 2. Six Digit SIC Numbers**

SIC Codes	Description
308802	Hot Tubs and Spas Manufacturers
356701	Ovens — Industrial Manufacturers
358101	Vending Machine Manufacturers
358298	Commercial — Laundry Dry Clean Machine Manufacturers
369402	Battery Charging Equipment Manufacturers
363908	Water Heaters — Manufacturers
399934	Tanning Salons Equipment — Manufacturers
358501	Air Conditioning Equipment — Manufacturers
358598	Air Conditioning/Heating/Refrigeration Equipment Manufacturers
356301	Compressors — Air — Manufacturers
356398	Air and Gas Compressors — Manufacturers
354801	Welding Equipment Supplies — Manufacturers
356498	Industrial and Commercial Fans and Blowers
356401	Fans — Industrial and Commercial Manufacturers
356402	Air Cleaning and Purifying Equipment
355605	Ovens — Bakers — Manufacturers
356413	Ventilating Equipment Manufacturers
356789	Industrial Process — Furnaces/Ovens
358903	Compactors — Waste — Industrial/Commercial Manufacturers
358512	Marine Refrigeration and Air Conditioning Manufacturers
358513	Air Conditioners Room Units — Manufacturers
356303	Spraying Equipment — Manufacturers
358203	Pressing Machine — Manufacturers
363410	Water Jet Cutting

## Industry Standards

**Air Conditioning & Refrigeration Institute (ARI):** The Air Conditioning & Refrigeration Institute Standard 780/790, Definite Purpose and Limited Duty Definite Purpose Magnetic, is the main *design* standard for Definite Purpose Contactors. Conformance to this standard is self-certified and completely voluntary. In addition to its recommendations on design, ARI 780/790 also defines Performance Requirements and additional testing not covered in the UL Standards such as Part Winding and Endurance tests. ARI 780/790 sets the minimum electrical operations for a DP Contactor at 200K operations and the minimum mechanical operations at 500K.

**Underwriters Laboratories (UL) and Canadian Standards Association (CSA):** UL and CSA are mainly concerned with the *safety* of electrical products and the requirements for DP Contactors are covered in UL Standard 508, Industrial Control equipment. Conformance is mandatory in order to apply the UL Listing or Recognition mark to products or equipment. UL508 defines the tests that need to be conducted and UL will witness the testing in our facility or outside test lab. UL also served as a Third Party Witness for all of our IEC testing.

CSA is responsible for the terminal and wiring pullout and secureness testing.

**IEC Standards and CE Mark:** Many of the DP Contactors have been self-certified and tested to IEC 60947-4-1, EN 60947-4-1 and carry AC-1, AC-3, AC-4 and AC-8a ratings.

**DEMKO:** DEMKO is a Danish Third Party Test facility owned by Underwriters Laboratories. Our main involvement with DEMKO on DPs is that they witnessed and certified that we meet the IEC Requirements of IEC 60947-4-1, EN 60947-4-1 and this third party certification allows us to apply the CE Mark on our DP products.

**CCC:** We are applying for China Compulsory Certification (CCC) Mark on our new 50 mm DP Contactors. Applying the CCC Mark will allow us to market our DP products in China. The use of DEMKO as a third party witness and test facility facilitates the CCC approval process because DEMKO is an approved organization in China.

## Competition

The main Competitors for DP Contactors and Starters are:

- Siemens (Furnas)
- General Electric
- Tyco (Products Unlimited)
- Schneider Electric (Square D)
- Joslyn-Clark
- Honeywell

**Note:** ABB Controls and Rockwell private label their entire line of DP Control Products from Tyco (Products Unlimited).

Siemens, General Electric, Schneider Electric and Eaton have complete lines of DP Contactors and Starters up to 360A. ABB Controls, Rockwell, Joslyn-Clark and Honeywell offer only DP Contactors (no Starters) and their offering is very limited.

## New 50 mm DP Contactors

In 2005, we released the new re-designed 50 mm DP Contactors and Starters. Several new features were added as well as product quality improvements. The following is a list of the new features and improvements that were made and how they impact our customers:



50 mm DP Contactor



Reversing DP Contactor

**Current Rating Increased to 50A:** The maximum current rating for the new 50 mm DP Contactors has been increased to 50A from 40A. This enables us to offer the smallest 50A DP Contactor in the industry and it is 20% smaller than competitive products.

**Sealed Housing and Plastic Side Shields:** One of the main complaints from customers about Contactors in general is *noise*. External contaminants on the surface of the contactor magnets will cause the contactor to buzz or hum at increased levels because the magnets are not able to close completely or close unevenly.

To eliminate or minimize noise with the new 50 mm DPs, we designed the housing to seal it as much as possible to prevent external contaminants from getting onto the magnet surfaces. In addition, we added plastic side shields to the sides of the contactor to cover the openings for side-mounted accessories. These side shields can be easily removed by hand or with a screwdriver when adding accessories such as side-mounted auxiliary contacts.

**Removable Contact Inspection Cover:** The ability to be able to inspect for contact wear on our DP Contactors was requested by many customers and allows us to meet competitive product offerings. While we do not offer replacement contacts for our 50 mm DPs, this removable inspection cover enables maintenance personnel to inspect for contact wear and replace the contactor based on their maintenance schedule.

**Universal Metal Mounting Plate:** With the new 50 mm DP design, we have gone away from the "U" shaped wrap-around metal mounting plate in favor of a metal mounting plate that is assembled to the housing with four screws. In the past, there were instances where the old wrap-around metal plate would loosen during shipment, causing the contactor to separate. Our new design eliminates this problem while allowing easy coil changeout or replacement. Our new mounting plate is a Universal mounting plate and permits replacement of all competitive contactors.

**DIN Rail Mount Capability:** Available as a factory installed option, the new 50 mm DP Contactors are offered with a DIN rail mounting adapter. The DIN rail mounting adapter replaces the metal mounting plate and mounts to the housing with the same four screws as the metal mounting plate. Several competitors offer this feature as well.



*DIN Rail*

**Reversible Coil Terminals:** The coil terminals for the new 50 mm DP Contactors can be rotated 180 degrees from the top of the contactor to the bottom to permit easy wiring for those customers who prefer to wire from the bottom. This can be done easily in the field or we can do it as a factory installed option.

**Lower Sealed Coil VA and Wattage Ratings:** The sealed coil VA and wattage ratings of the new 50 mm DP have been reduced by a minimum of 50%. This reduces the amount of energy consumed by the coil and may allow the use of a smaller, less expensive control transformer. This feature will enable customers to downsize their panels and save money.

**Line and Load Terminals:** The new 50 mm DPs offer more line and load terminal options than any of our competitors. Binding head screw terminals, screw/pressure plate terminals and box lugs are offered for the 15A to 50A DP Contactors. Also, Horizontal (Side-by-Side) or Vertical (In-Line) Quick Connect terminals are available for any of the line and load lugs. Box lugs are offered with either a Posidrive Screw or with a Hex Socket Allen Head Screw giving our customers more wiring and assembly options.

## New 50 mm DP Starters

We plan to continue to offer the New 50 mm DP Starter for both single- and three-phase motor applications up to 50A utilizing the C306 Overload and Heater Packs. The advantage is the ability to offer both Class 10 or Class 20 Heater packs which gives our customers an additional option.



*DP Starter with C306 Overload*

We also plan to offer a second new 50 mm DP Starter which will incorporate a fixed, bimetallic overload with Class 10 Trip. This new DP Starter will be much smaller than the DP Starter with C306 Overload and will allow us to be more price competitive. This new DP Starter will be offered with either a metal mounting plate or DIN rail mounting adapter.



*DP Starter with Fixed Overload and Metal Mounting Plate*

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