



# AMPGARD®

## medium voltage fused starters

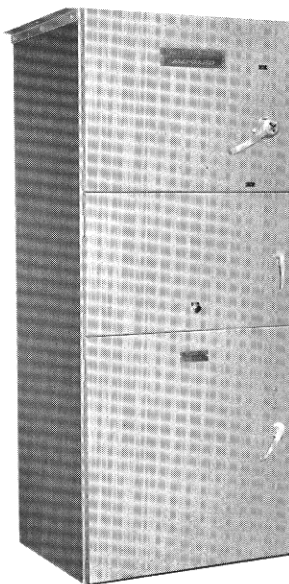
descriptive  
bulletin

11-011

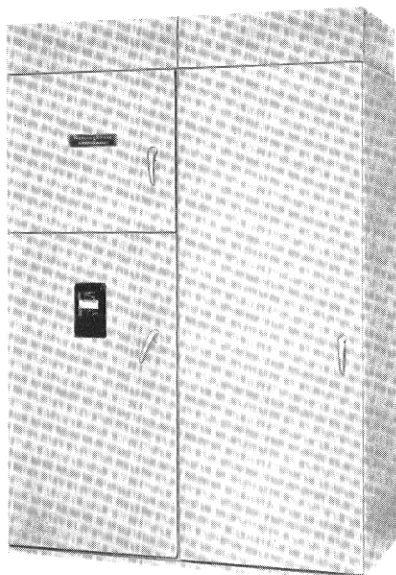
2200-5000 volt class  
squirrel cage • wound rotor • synchronous

page 1

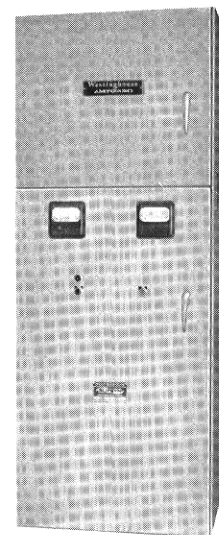
squirrel cage



wound rotor



synchronous



### application

Westinghouse Ampgard medium-voltage fused starters comprise a complete line for magnetic control of squirrel cage, wound rotor, and synchronous motors of the 2200 to 5000 volt class. They are designed to conform to NEMA standards for high-interrupting-capacity high-voltage class E2 starters.

application	maximum capacity	
	2300 volts	4600 volts
squirrel cage, wound rotor	1500 hp	2500 hp
synchronous		
unity power factor	1750 hp	3000 hp
80% power factor	1500 hp	2500 hp
system fault capacity	150,000 kv-a	250,000 kv-a

DESIGN TESTED AND VERIFIED  
in the  
Westinghouse

HIGH POWER LABORATORY

These starters provide system fault protection, motor protection, and personnel protection. Through the use of type CLS current limiting fuses, the starter and motor are protected against damage from faults on systems having a maximum fault capacity as indicated above. Motor overload protection is provided by temperature-compensated thermal overload relays. Personnel protection is provided through the use of complete steel-enclosed compartmentation of all starter components. These starters have been given rigorous tests in the Westinghouse High Power Laboratory and meet or better all test requirements of NEMA industrial control standards.

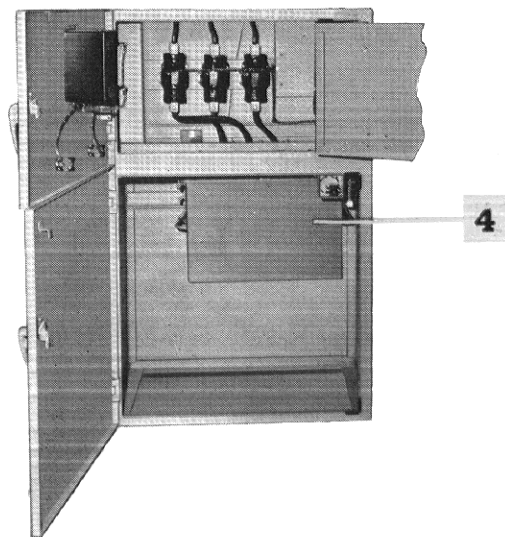
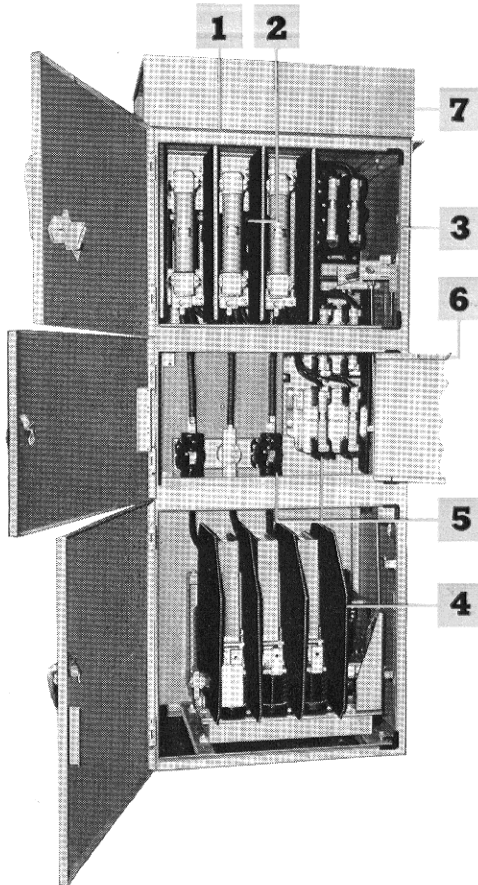
October, 1964

supersedes db 11-011 dated December, 1957

mailed to: E/1121, 1124, 1125/DB; D/792, 795, 797/DB; C/238, 240, 244, 254/DB



## front accessible starters



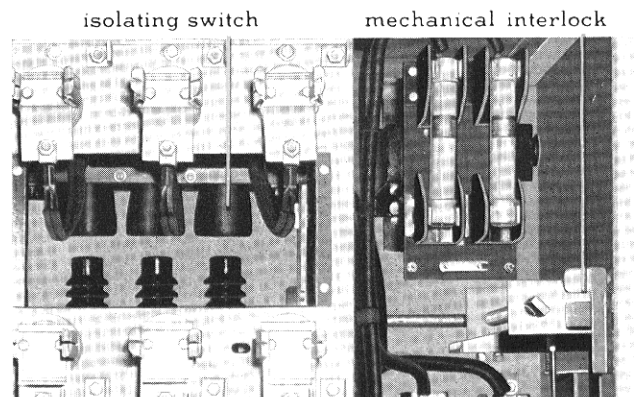
typical oil immersed contactor

Ampgard front accessible high voltage induction and synchronous motor starters are available with air break or oil immersed contactors for full and reduced voltage, reversing and non-reversing applications.

### 1 enclosure

For full voltage starting, the overall NEMA 1 starter dimensions are approximately 30" deep, 38" wide and 90" high. All components are completely accessible from the front through three doors opening into separate compartments. The starters can be mounted against a wall or back-to-back in a group line up.

### 2 isolating switch



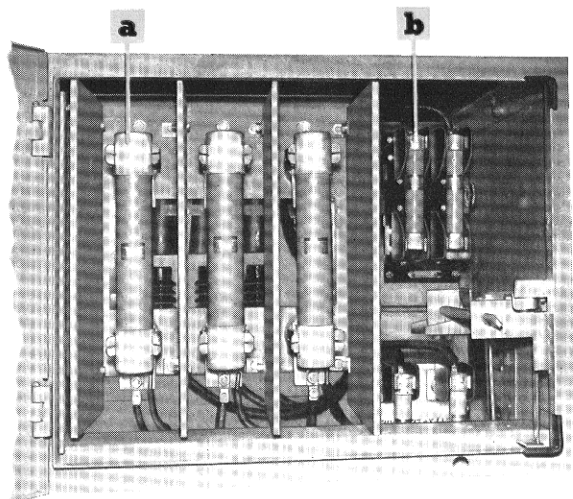
### gang-operated isolating switch

An externally operated, three pole isolating switch, having plug type contacts, disconnects the high voltage components from the line. The open position is visible. There are no exposed live parts. Opening the switch automatically grounds the starter high voltage components through stab contact on the ground bus. The position of the breaker type handle is clearly marked to indicate "ON", "LOCKED OPEN", and "OFF". In "LOCKED OPEN" position, the isolating switch is open but the compartment door is closed. As a safeguard for maintenance personnel, the switch can be locked in position by as many as three padlocks.

### mechanical interlocks

The isolating switch, high voltage contactors, high voltage compartment doors, and control panel are all mechanically interlocked. The isolating switch cannot be opened or closed if the contactors are closed. High voltage compartment doors cannot be opened until the isolating switch is opened, and the isolating switch cannot be closed until the high voltage compartment doors are re-closed. The hinged control panel cannot be swung out until the isolating switch is opened.

**3 fuse compartment**



**a current limiting power fuses**

Mounted in the upper high voltage compartment are the type CLS current limiting power fuses used.

**b control circuit transformer**

The control circuit transformer is located in the compartment adjacent to the power fuses. In this location the transformer primary fuses are easily changed from the front.

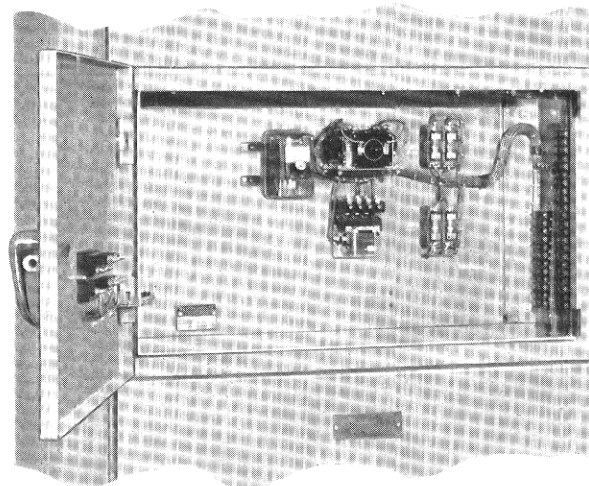
**4 contactors**

The main line contactor, either air-break or oil immersed, is completely mounted and wired in the lower compartment at the factory. During installations, the only connections necessary on the contactor are the three load or motor leads, which are easily pulled into the starter without removing the contactors. The photo on page 2 shows a front accessible starter with the type H air break contactor. Because of the exclusive tilt-out arc chutes, the contacts of these contactors can be inspected or replaced quickly without removing or dismantling the contactor. Other routine maintenance such as replacing or adjusting the operating coils can also be done easily without removing the contactor. As with the air break contactor, the type K contactor can also be serviced from the front without removal. A removable tank lowering mechanism is provided to lower the oil tank placing the coils and contacts in position for easy inspection and maintenance.

**5 current and potential transformers**

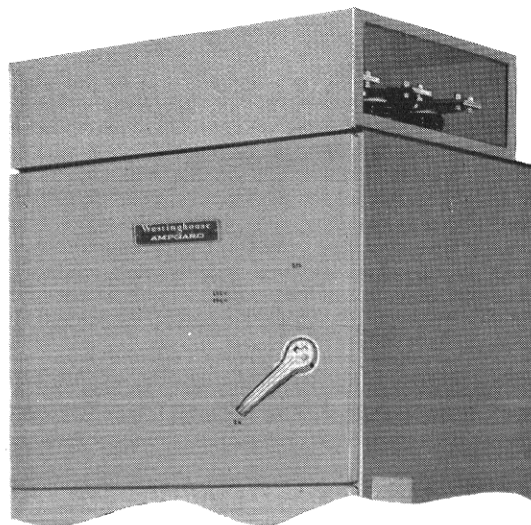
When the control panel is swung out, the instrument transformers, when used, are readily accessible from the front. The mechanically interlocked control panel prevents access when the isolating switch is closed.

**6 a-c control panel**



Access to low voltage and control devices is through the middle door. The picture above shows some of the control devices used in a simple squirrel cage starter. Such relays as overload, auxiliary relays and control circuit fuses are mounted and wired on an offset hinged panel. The panel is hinged on the right and fastened by captive screws on the left. For a synchronous motor starter the necessary field control devices would be similarly mounted on a hinged panel.

**7 a-c power bus**



When a-c power bus is required, it will be mounted in a 10" high enclosure on top of the starter as shown above. The enclosure is only 24" deep, allowing a 6" space behind the enclosure for incoming and outgoing control leads as well as outgoing motor leads. When a-c power bus is not used, cable connectors are provided along the left side of the cabinet for incoming line connections. These connections are shielded but require taping for safety of personnel.



## starters for semi-hazardous and hazardous locations

### semi-hazardous locations

#### class 1, group D, division 2

This line of Ampgard starters is designed for use in semi-hazardous locations especially for oil refineries where combustible gases might be present to the extent defined under class 1, group D, division 2 locations in the "National Electric Code." Starters for full voltage and reduced voltage starting of induction and synchronous motors are available.

These starters are similar in construction, function and principle components to the standard line of class E-2 starters using oil-immersed contactors but with the following distinctive features:

**door interlock:** A manually-operated, oil immersed door interlock switch to disconnect the primary of the control transformer is provided. The switch handle protrudes through the front of the cabinet between the fuse compartment and lower compartment doors. The switch is mechanically interlocked with the fuse compartment door and main contactor so that the fuse compartment door cannot be opened unless the disconnect switch handle is in the OFF position, and the switch handle cannot be moved to the OFF position until the main contactor is opened.

**fuses:** Current limiting fuses for fault protection are clamped securely. This special arrangement prevents any possibility of sparking during fault interruption.

**low voltage compartment:** All contact making and breaking devices are mounted and wired in explosion-proof boxes inside the low voltage compartment. Overload relays, auxiliary relays, secondary control circuit fuses and other a-c control devices are mounted in a separate explosion-proof box. For synchronous starters, field application relays, and field contactor are mounted in another separate explosion-proof box.

**switches:** Switches such as start-stop pushbuttons, heater switches, etc., will be explosion-proof.

**modifications:** Modifications available in the standard class E-2 starters apply to division 2 starters except as follows:

- (a) Ammeter and voltmeter transfer switches will not be mounted on the starter.
- (b) Exciter field rheostat will not be mounted on or in these starters, because of the large size of the necessary explosion-proof enclosure and derating of rheostat when so mounted.
- (c) Starting and discharge resistors, space heaters and tapped fixed field resistors will be designed so that the surface temperature does not exceed 200° C with 40° C ambient which should be safely below the flash point of normal gaseous vapors.
- (d) Indicating lights will not be supplied on these starters.

### hazardous locations

#### class 1, group D, division 1

A line of type DN-O starters is designed for use in hazardous locations such as oil refineries, tank farms, petroleum pump stations and chemical plants where combustible gases might be present to the extent defined under class 1, group D, division 1 locations in the "National Electric Code." These starters are available with all contact joints, terminals and arcing contacts at least six inches under oil.

For interrupting capacities up to 25,000 kva, these starters are supplied for wall mounting only. This DN-O linestarter is a completely assembled and wired piece of apparatus ready for connection to the motor, supply lines, and pushbutton station. Overload protection is provided by means of two current transformers and thermal induction overload relays which require no adjustment and reset automatically after operation and overload. Type DN-OH oil immersed contactors with grid type arc boxes and blowout coils are used to provide 25,000 kva interrupting capacity. For interrupting capacity of 50,000 kva starters are either floor or frame mounted linestarters; frame mounted combination line-starters with manual disconnect breaker and optional oil-immersed bus; floor mounted synchronous motor linestarters; floor mounted autotransformer type reduced voltage induction motor starters; and frame and floor mounted incoming line or feeder units. In the floor mounted type DN-O, access to the starter is provided by removing the cover, disconnecting the leads, and lifting the assembly out of the tank. The frame mounted type supports the unit off the floor which allows sufficient clearance to remove the tank. Lugs are provided so that two chain blocks may be easily attached. A tank lowering device is standard equipment. The internal assemblies of these starters include oil immersed contactors with operating mechanism and auxiliaries, operating transformer, current transformers and two overload relays.

### further information:

#### price lists

squirrel cage full voltage starters: price lists 11-021 and 11-022  
squirrel cage reduced voltage starters: price lists 11-521 and 11-522

wound rotor motor starters: price lists 13-021 and 13-022

synchronous motor starters: price lists 14-021 and 14-022

incoming line units: price list 11-025

price modifications: price list 14-025

#### instruction leaflets

Ampgard 2500 and 5000 starters: IL 11-202-2

Ampgard starter: IL 7488

Static Slipsyn: IL 14-000-2A