SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 23AUB201 – AUTOMOTIVE ELECTRICAL DRIVES AND CONTROL

II YEAR / III SEMESTER

Unit 1 – Electrical Systems

Topic : Contactors and Power distribution Unit

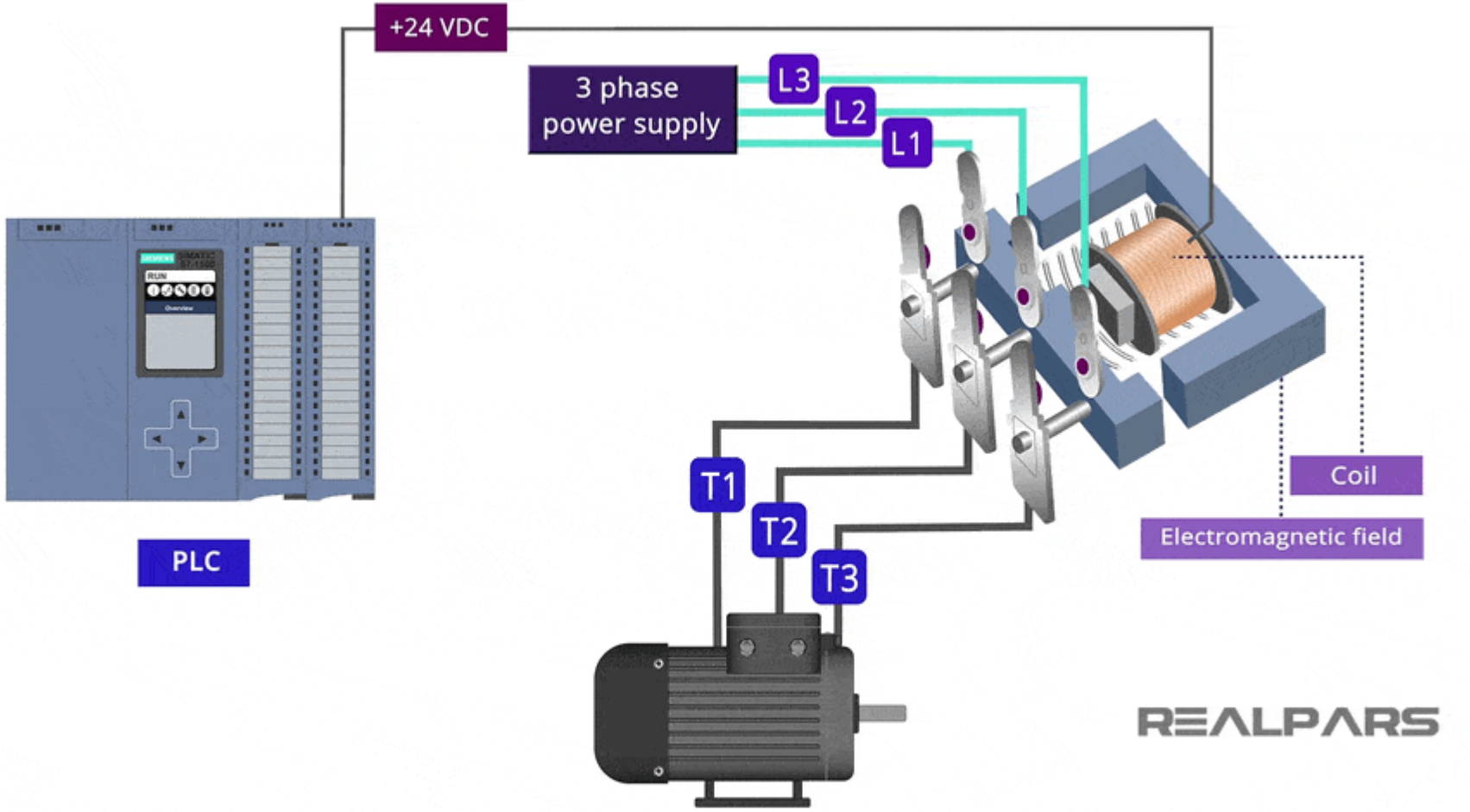
CONTACTORS

- A contactor is an electrically controlled switch used for switching an electrical power circuit, similar to a relay but with higher current ratings.
- They are commonly used in electrical systems to control electric motors, lighting systems, heating, and other electrical loads.

FEATURES

- Contactors are typically operated by an electromagnet.
- When the control circuit energizes the coil, the electromagnet pulls in the contactor's contacts, which closes or opens the power circuit.
- Contactors are designed to handle much higher currents than relays, often rated for loads ranging from a few amps to hundreds of amps.
- They are designed to handle the arc produced when breaking high-current circuits, with features like arc chutes to safely dissipate the energy.
- Contactors often have auxiliary contacts that are used for control and signaling purposes, separate from the main power contacts.

CONTACTORS


+24 VDC
3 phase
power supply
L3
L2
L1
T1
T2
T3
Coil
Electromagnetic field
PLC
REALPARS

APPLICATION

- **Motor Control**: Used to start and stop motors, often in combination with overload relays for motor protection.
- **Lighting Control**: In industrial and commercial settings to manage large lighting loads.
- **HVAC Systems**: Commonly used to control compressors, pumps, and fans in heating, ventilation, and air conditioning systems.

TYPES

- **Magnetic Contactors**: These are the most common type, where the contactor is actuated by an electromagnetic coil.
- **Vacuum Contactors**: Used for high-voltage applications where the contacts are enclosed in a vacuum to reduce arcing.
- **Latching Contactors**: These contactors remain in their last position (open or closed) even when the control signal is removed, usually requiring a separate signal to reset them.

CONSIDERATION

- **Coil Voltage**: Contactors require a specific voltage for the control coil, which could be AC or DC. The control voltage is usually much lower than the power circuit voltage.
- **Contact Ratings**: The contacts are rated for a maximum voltage and current, and it is crucial to choose a contactor that matches the electrical load requirements.
- **Mechanical Durability**: Contactors are designed to handle frequent switching and can have a high mechanical lifespan.

POWER DISTRIBUTION UNIT

- **Power Distribution Unit (PDU)**, often referred to as a **Power Distribution Box (PDB)** or **Power Distribution Module (PDM)**, plays a critical role in managing and distributing electrical power to various vehicle components.
- These units are responsible for ensuring that power is safely and efficiently delivered to the vehicle's electrical systems, such as lighting, infotainment, HVAC, and engine control systems.

KEY FEATURES

- The PDU acts as a central hub for power distribution in the vehicle, taking power from the battery or alternator and distributing it to different systems through various fuses, relays, and circuit breakers.
- PDUs in automotive systems are equipped with fuses and relays to protect the vehicle's electrical circuits from overloads, short circuits, and other faults.
- Each critical component, such as the headlights, wipers, or fuel pump, is connected to the PDU via a dedicated fuse or relay.
- Modern vehicles often have complex electrical systems with various subsystems that require different power levels.

KEY FEATURES

- The PDU helps manage these different power needs, ensuring that each system receives the appropriate voltage and current.
- This is especially important in hybrid and electric vehicles.
- Automotive PDUs are often modular, meaning they can be designed to fit specific vehicle models or configurations.
- This allows manufacturers to customize the power distribution system based on the vehicle's electrical demands and layout.

KEY FEATURES

- The PDU is typically located in the engine compartment, near the battery, or inside the passenger cabin (such as under the dashboard).
- Some vehicles may have multiple PDUs to manage power distribution in different areas, such as front and rear sections.
- In advanced vehicles, especially electric and hybrid models, the PDU is integrated with the vehicle's control systems.
- It may communicate with the car's central computer to monitor and manage power distribution based on driving conditions, battery state, and system demands.

KEY FEATURES

- **Fuses**: Protect circuits from excessive current and prevent damage to electrical components in case of a fault.
- **Relays**: Used to control high-power devices with a low-power control signal. For example, a relay might be used to turn on the headlights or control the fuel pump.
- **Circuit Breakers**: Provide resettable protection for circuits, which is useful for systems that experience temporary overloads.
- **Wiring Harnesses**: Connect the PDU to various components and systems throughout the vehicle.

COMPONENTS

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- **Wiring Harnesses**: Connect the PDU to various components and systems throughout the vehicle.

APPLICATION

- In electric and hybrid vehicles, PDUs are even more critical due to the complexity of managing both high-voltage and low-voltage systems.
- The PDU ensures that power is efficiently distributed from the high-voltage battery to the electric motors, onboard chargers, and auxiliary systems, while also protecting these components from electrical faults.

THANK YOU !!!