**Project 1: Simple Motor Control**

**Functional Specification Document: Motor Control Logic**

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**1.0 Overview** This document outlines the functional requirements for a basic Motor Control system. The project's purpose is to demonstrate fundamental PLC programming concepts, including digital I/O handling, latching (seal-in) logic, and fault handling. The entire system is designed to be simulated using Siemens TIA Portal, PLCSIM, and a WinCC HMI.

**2.0 Scope**

- **In-Scope:**
    - Control logic for a single motor with Start, Stop, and Overload inputs.
    - Implementation of a reusable Function Block (FB) for the motor logic.
    - An HMI interface for manual operation and status visualization.
    - Simulation within the TIA Portal environment.
- **Out-of-Scope:**
    - Physical hardware wiring and commissioning.
    - Network communication protocols.
    - Variable speed or reversing control.

**3.0 System Components (Simulated)**

- **Controller:** Siemens S7-1200/S7-1500 PLC
- **HMI:** Siemens WinCC Basic/Comfort Panel
- **Inputs:**
    - Start_Button (Momentary Push Button)
    - Stop_Button (Momentary Push Button, wired NC)
    - Overload_Input (Maintained Switch, simulates a thermal overload relay)
- **Outputs:**
    - Motor_Run_Command (Digital output to motor contactor)

- Fault_Indicator (Digital output to a fault lamp)

**4.0 Functional Requirements 4.1 Operational Logic**

1. **Motor Start:** When the Start_Button is pressed, the Motor_Run_Command output shall be activated (latched ON). The motor shall remain running after the button is released.
2. **Motor Stop:** When the Stop_Button is pressed, the Motor_Run_Command output shall be deactivated. The Stop command shall have priority over the Start command.
3. **Fault Condition:**
    - If the Overload_Input becomes active at any time, the Motor_Run_Command shall be immediately deactivated.
    - The Fault_Indicator output shall be activated.
    - The system shall remain in a fault state until the Overload_Input is cleared and a new Start_Button command is issued.

**4.2 HMI Requirements** The HMI shall contain a single screen with the following elements:

- A "START" button (momentary) to trigger the Start_Button input.
- A "STOP" button (momentary) to trigger the Stop_Button input.
- A motor graphic (e.g., a circle) that is **grey** when stopped and **green** when running.
- A "FAULT" indicator light that is **red** when the Fault_Indicator is active.

**5.0 Tag List (I/O)**

| Tag Name | Data Type | I/O Address | Description |
|---|---|---|---|
| iStart_PB | Bool | %I0.0 | Start Push Button Input |
| iStop_PB | Bool | %I0.1 | Stop Push Button Input (NC Logic) |
| iOverload_Fault | Bool | %I0.2 | Motor Thermal Overload Input |
| qMotor_On | Bool | %Q0.0 | Command to run the Motor |
| qFault_Status | Bool | %Q0.1 | Fault Indicator Status |