



Write a self-contained 61131-3 structured text program, not a function block, to implement ratio control for mixing two reactants in a 2 to 1 ratio.



Here is a self-contained Structured Text (ST) program that implements a ratio control for mixing two reactants in a 2:1 ratio using IEC 61131-3 standard:

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```
PROGRAM RatioControl
VAR
    Reactant1FlowRate: REAL; // Flow rate of Reactant 1
    Reactant2FlowRate: REAL; // Flow rate of Reactant 2
    SetpointRatio: REAL := 2.0 / 1.0; // Desired ratio of Reactant 1 to Reactant 2
    Tolerance: REAL := 0.01; // Allowed deviation from the setpoint ratio
    StartMixing: BOOL := FALSE; // Start the mixing process
    MixingValve1: BOOL := FALSE; // Valve controlling the flow of Reactant 1
    MixingValve2: BOOL := FALSE; // Valve controlling the flow of Reactant 2
END_VAR

METHOD RunRatioControl
    // Read the flow rates of both reactants
    ReadFlowRates(Reactant1FlowRate, Reactant2FlowRate);

    IF StartMixing THEN
        // Calculate the current ratio
        IF Reactant2FlowRate > 0 THEN
            CurrentRatio := Reactant1FlowRate / Reactant2FlowRate;
        ELSE
            CurrentRatio := 0;
        END_IF

        // Control the valves based on the calculated ratio
        IF CurrentRatio >= (SetpointRatio - Tolerance) AND CurrentRatio <= (SetpointRatio + Tolerance) THEN
            MixingValve1 := TRUE;
            MixingValve2 := TRUE;
        ELSIF CurrentRatio < (SetpointRatio - Tolerance) THEN
            MixingValve1 := TRUE;
            MixingValve2 := FALSE;
        ELSE
            MixingValve1 := FALSE;
            MixingValve2 := TRUE;
        END_IF
    ELSE
        MixingValve1 := FALSE;
        MixingValve2 := FALSE;
    END_IF
END_METHOD

METHOD ReadFlowRates
    VAR_INPUT
        Reactant1Flow: REAL;
        Reactant2Flow: REAL;
    END_VAR_INPUT

    // In this example, we assume flow rates are provided as input values.
    // In a real-world scenario, you might read these values from sensors or other devices.
    Reactant1FlowRate := Reactant1Flow;
    Reactant2FlowRate := Reactant2Flow;
END_METHOD
END_PROGRAM
```

This program assumes that the flow rates of the reactants are provided as input values. In a real-world application, these values should be read from sensors or other devices. The program then calculates the current ratio of the reactants and controls the valves accordingly to maintain the desired 2:1 ratio within the specified tolerance.