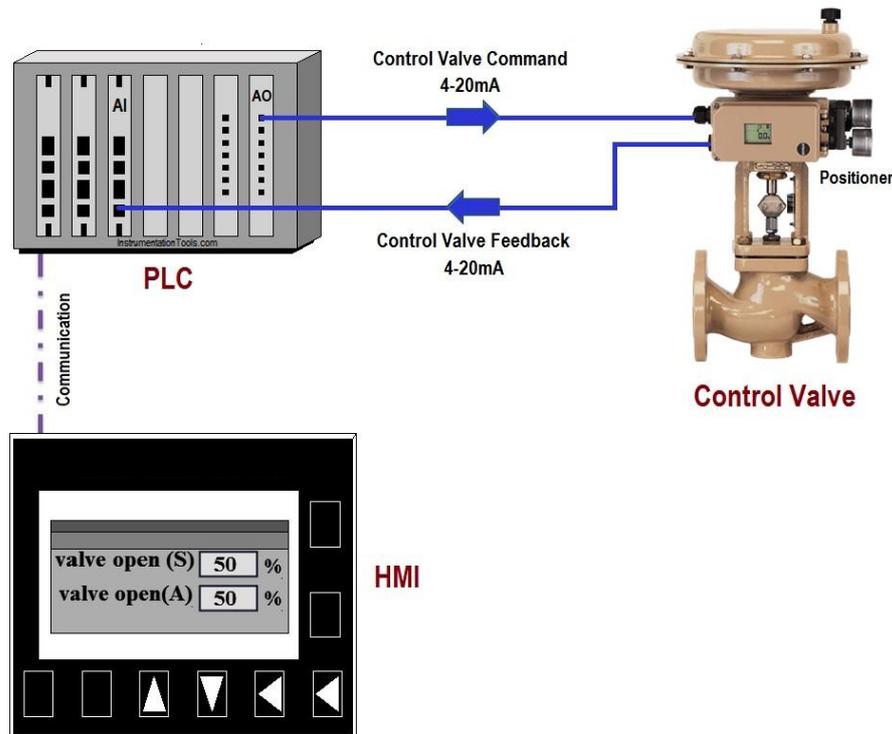


PLC Program for Control Valve



Of course we can measure all physical quantity by using analog sensors, but for example and explanation purpose here we take one example of control valve.

As shown in figure, here we consider one control valve and it has 4-20mA output (valve feedback) and 4-20mA input (valve command) for operation. Hence, when PLC will give 20mA to flow control valve, valve will be open 100% and for 4mA it will be 0% (close).

In other way flow control valve is also providing output signal that can be used for close loop system/for valve percentage indication. If valve is 100% open, PLC will get 20mA signal and for 0% it will get 4mA.



Now as per close loop system, control valve will provide output signal (valve feedback) and by using SCALE instruction, operator can see actual valve open parameter on graphics.

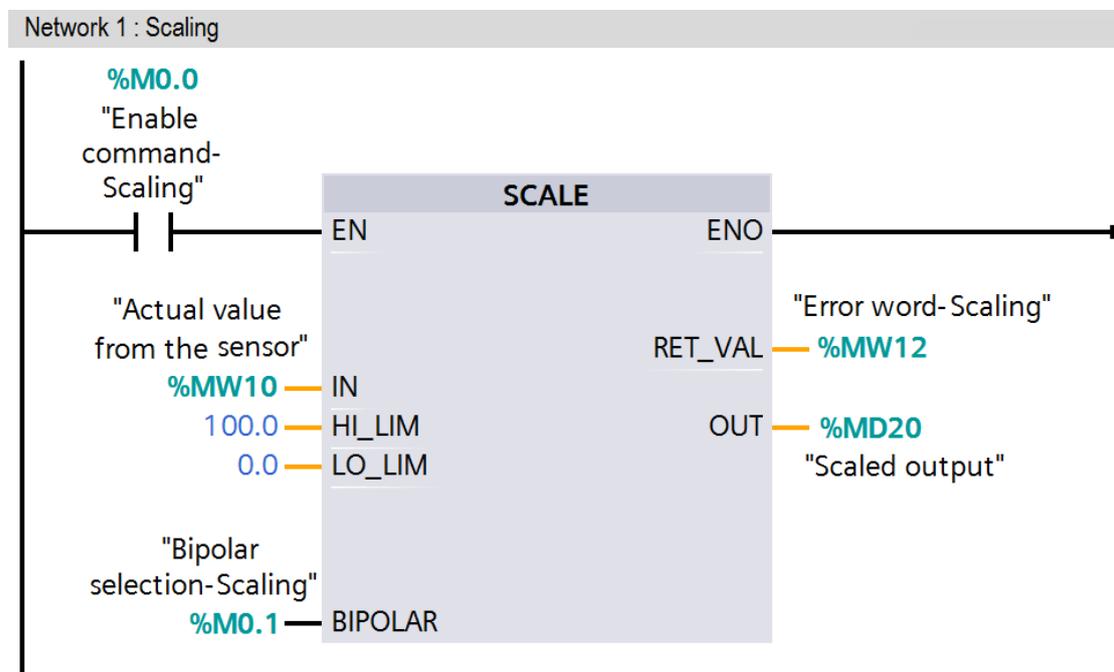


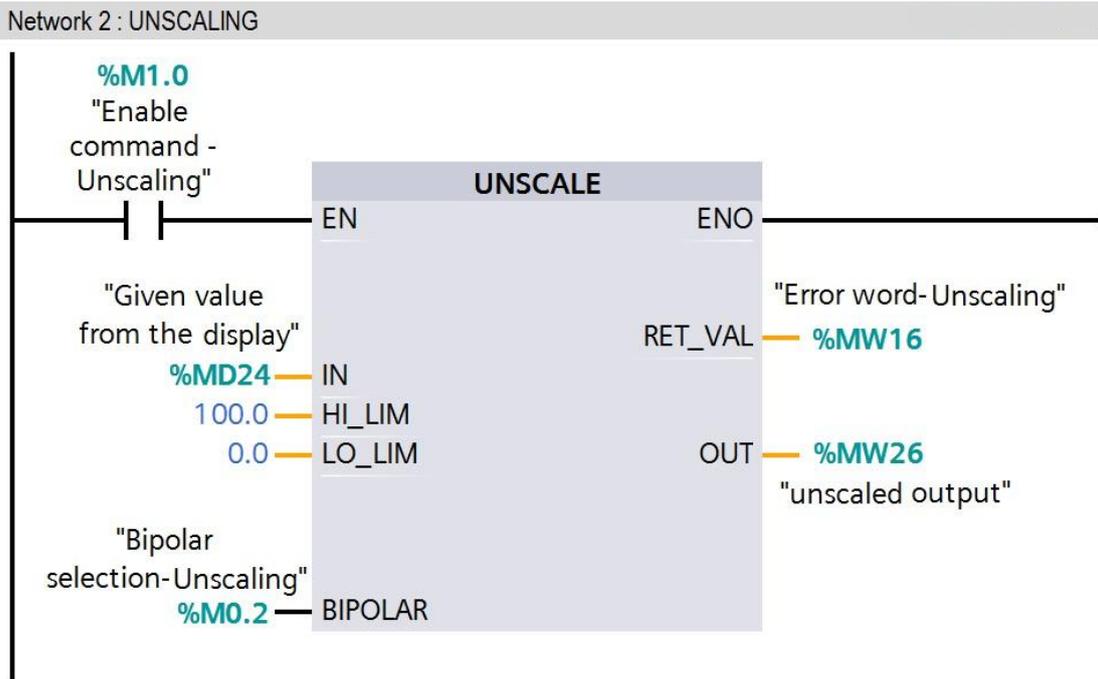
List of inputs/outputs

M memory

- Enable command-Scaling :- M0.0
- Bipolar selection-Scaling :- M0.1
- Actual value from the sensor or transmitter :- MW10
- Error word –Scaling :- MW12
- Scaled output :- MD20
- Enable command-Unscaling :- M1.0
- Bipolar selection- Unscaling :- M0.2
- Given value from the display :- MD24
- Error word-Unscaling :- MW16
- Unscaled output :- MW26

PLC Ladder Diagram for Valve Scaling





Ladder Logic Explained

For this application, we use S7-300 PLC and TIA portal software for programming. We can implement this logic by using other PLC also.

Network 1:

In this network, scaling logic is executed when Enable command (M0.0) is ON.

The “Scale” instruction is to convert the integer (here 4-20mA signal from the **control valve** or MW10) at the IN parameter which can be scaled in physical units between a low limit (0% output) and a high limit (100% output).

The result or scaled output (MD20) of the instruction is output at the OUT parameter.

If bipolar selection (M0.1) is ON, it is assumed that the value at the IN parameter is bipolar (range between -27648 to +27648).

If bipolar selection (M0.1) is OFF, it is assumed that the value at the IN parameter is unipolar (range between 0 to 27648).

Network 2:

The “Unscale” instruction is used to unscaled the floating-point number (given value from the display or MD24) on the IN parameter into physical units between a low limit and a high limit.

The result of the **instruction** is output (unscaled output MW26) at the OUT parameter. If bipolar selection (M0.2) is ON, it is assumed that the value at the IN parameter is bipolar (range between -27648 to +27648).

If bipolar selection (M0.2) is OFF, it is assumed that the value at the IN parameter is unipolar (range between 0 to 27648).

Error code table:

Error code ((W#16#...))	
0000	No error
0008	The value of the IN parameter is greater than the value of the constant "27648" or less than the value of the constant "0"

Result

PLC Program for Control Valve Scaling

Inputs	Outputs	Physical Elements
M0.0=1,M0.1=0&MD24=50%	MW26=13838 (approx.)	Valve OPEN(S) 50%
M1.0 ,M0.2=0&MW10=13838	MD20=50% (approx...)	Valve OPEN(A) 50%