

SCALE: Scale



Description

Use the "Scale" instruction to convert the integer at the IN parameter into a floating-point number, which can be scaled in physical units between a low limit and a high limit. You can use the LO_LIM and HI_LIM parameters to specify the low limit and high limit of the value range to which the input value is scaled. The result of the instruction is output at the OUT parameter.

The "Scale" instruction works with the following equation:

$$\text{OUT} = [((\text{FLOAT}(\text{IN}) - \text{K1})/(\text{K2} - \text{K1})) * (\text{HI_LIM} - \text{LO_LIM})] + \text{LO_LIM}$$

The values of the constants "K1" and "K2" are determined by the signal state of the BIPOLAR parameter. The following signal states are possible at the BIPOLAR parameter:

- Signal state "1": It is assumed that the value at the IN parameter is bipolar and in a value range between -27648 and 27648. In this case the "K1" constant has the value "-27648.0" and the "K2" constant the value "+27648.0".
- Signal state "0": It is assumed that the value at the IN parameter is unipolar and in a value range between 0 and 27648. In this case the "K1" constant has the value "0.0" and the "K2" constant the value "+27648.0".

When the value at the IN parameter is greater than the value of the constant "K2", the result of the instruction is set to the value of the high limit (HI_LIM) and an error is output.

When the value at the IN parameter is less than the value of the constant "K1", the result of the instruction is set to the value of the low limit (LO_LIM) and an error is output.

When the indicated low limit is greater than the high limit (LO_LIM > HI_LIM), the result is scaled in reverse proportion to the input value.

Parameters

The following table shows the parameters of the "Scale" instruction:

Parameter	Declaration	Data type	Memory area	Description
EN	Input	BOOL	I, Q, M, D, L	Enable input
ENO	Output	BOOL	I, Q, M, D, L	Enable output
IN	Input	INT	I, Q, M, D, L, P, or constant	Input value to be scaled
HI_LIM	Input	REAL	I, Q, M, D, L, P, or constant	High limit
LO_LIM	Input	REAL	I, Q, M, D, L, P, or constant	Low limit
BIPOLAR	Input	BOOL	I, Q, M, D, L or constant	Indicates if the value at the IN parameter is to be interpreted as bipolar or unipolar. The parameter can assume the following values: 1: Bipolar 0: Unipolar

OUT	Output	REAL	I, Q, M, D, L, P	Result of the instruction
RET_VAL	Output	WORD	I, Q, M, D, L, P	Error information

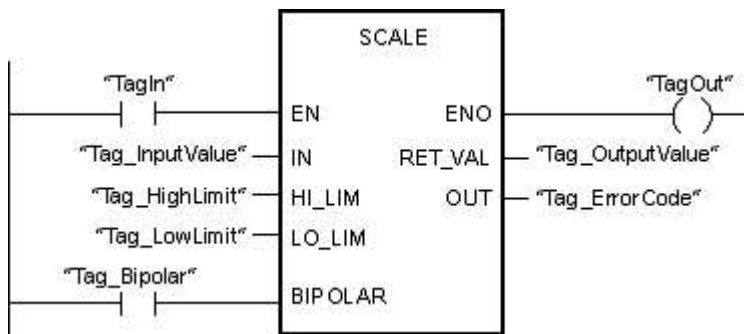
RET_VAL parameter

The following table shows the meaning of the values of the RET_VAL parameter:

Error code* (W#16#...)	Explanation
0000	No error
0008	The value of the IN parameter is greater than the value of the constant "K2" or less than the value of the constant "K1"
8xyy	For more information on errors, refer to "See also".
*The error codes can be displayed as integer or hexadecimal value in the program editor. For additional information on switching display formats, refer to "See also".	

Example

The following example shows how the instruction works:



The following table shows how the instruction works using specific operand values:

Parameter	Operand	Value
IN	Tag_InputValue	22
HI_LIM	Tag_HighLimit	100.0
LO_LIM	Tag_LowLimit	0.0
BIPOLAR	Tag_Bipolar	1
OUT	Tag_OutputValue	50.03978588
RET_VAL	Tag_ErrorCode	W#16#0000

See also

[Overview of the valid data types](#)
[Basics of the EN/ENO mechanism](#)
[Switching display formats in the program status](#)
[Evaluating errors with output parameter RET_VAL](#)
[Basic information on LAD](#)
[Memory areas](#)