Ratio Control: Ratio Setting and Scaled Ratio for Transmitter Spans

Ratio setting between a controlled and a wild flow, and the scaled ratio to enter when the two transmitters have different spans or dp signals.

Method: Seborg; Edgar; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Required ratio controlled/wild flow (engineering units)	0.050000	
Wild flow transmitter span	100.00	
Controlled flow transmitter span	10.000	
Signal type	Linear in flow	
Present wild flow (for the set point)	60.000	

Calculated results

Parameter	Value	Unit
Scaled ratio (signal units)	0.50000	
Controlled flow set point	3.0000	
Controlled flow set point (% of span)	30.000	%

Notes for this case

- Extract square roots before the ratio station where possible; ratio on unextracted dp signals makes the loop gain vary with flow.

Formula and method

$$R_s = R\frac{S_w}{S_c}\ \text{(linear)}, \quad R_s = \left(R\frac{S_w}{S_c}\right)^2\ \text{(unextracted dp)}$$

Variables

R	Required ratio controlled/wild flow (engineering units)	-
S_w	Wild flow transmitter span	-
S_c	Controlled flow transmitter span	-
signal	Signal type	-
F_w	Present wild flow (for the set point)	-
R_s	Scaled ratio (signal units)	-
F_c	Controlled flow set point	-
y_c	Controlled flow set point (% of span)	-

Method and standards

Signal scaling.

Assumptions and limits

- Steady-state ratio.

References

- Seborg
- Edgar
- Mellichamp and Doyle
- Process Dynamics and Control

- 4th ed. (Wiley, 2016)
- ch. 15 (ratio control)

Report details

Report reference	FCC-9R7J-DNP0 (the same inputs always give the same reference)
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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/control-loops/ratio-control-scaling

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.