TYPE 726: PROPORTIONAL LIGHTING CONTROLLER

General Description

This component returns a control signal between a user defined minimum value and 1 that is related to the value of an input signal at the current time step and compared to user defined minimum and maximum values. The component can be used to simulate an ON/OFF controller by setting the minimum and maximum set point values equal to one another. The controller differs from other proportional controllers in that it generates its maximum signal at the lower set point and its minimum signal at its upper set point. In this regard, the output is inverted from that of a typical controller.

Nomenclature

γ	-	The output controller signal (0..1)
MinValue	-	The user defined minimum value of the control signal.
Value	-	The current value of the input being watched.
UpperSetPt	-	The value of the upper set point; the value at which the controller will return its minimum signal.
LowerSetPt	-	The value of the lower set point; the value at which the controller will return a signal of 1.

Detailed Description

In some energy efficient control schemes, lighting is proportionally dimmed relative to the amount of daylight currently available. This controller models such a scheme, returning a value between (nominally) 0 and 1. The user is able to set the minimum value because in some cases, it is not desirable for the lighting to be completely switched off. For example, retail stores may wish to dim their lights as far as 10% of their maximum but may not wish to turn them off completely. The user is able to set the minimum control signal value using parameter 3 of the model. The value of parameter 3 must be between 0 (inclusive) and 1 (exclusive) and is specified as a decimal value. A value of 0.1 corresponds to 10%. Figure 1 shows the behavior of the controller schematically.

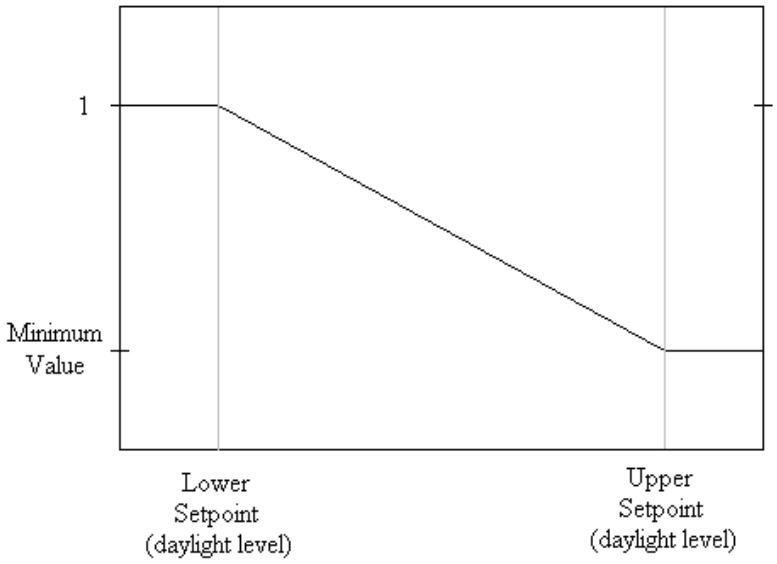


Figure 1: Proportional Control Diagram

Mathematically, the signal generated by the controller is described by Equation 726.1.

$$\gamma = 1 - \max\left(MinValue, \left(\min\left(1, \frac{Value - LowerSetPt}{UpperSetpt - LowerSetPt} \right) \right) \right) \quad \text{(Eq. 726.1)}$$

Nominally, the controller can output up to 10 signals. Users with a Fortran compiler wishing to increase this default should modify the value of the Fortran parameter NMAX in the file Type726.for.