Relays
Series 63 Constant Differential Flow Controllers

Introduction

Features & Benefits

▶ Versatile and design accommodates liquids or gases and wide range of OEM needs

▶ Powder coating provides improved corrosion resistance

Description

The Series 63 Constant-Differential Relays are used in conjunction with an external needle valve to provide constant volume flow rates of liquids or gases over a continuously adjustable range.

For gas flow applications, compressibility must be considered if a constant mass flow is desired. Therefore, models are available for constant upstream or downstream reference pressure.

For liquids, which are not compressible, the constant volume flow will also be a constant mass flow, regardless of upstream or downstream pressures. As such, mass flow is independent of pressure changes.

The relay's needle valve determines rangeability and capacity. Four models are available.

Specifications

Range Limits

@20 psig supply
Model 63BU & Model 63SU
Maximum: 1.1 scfm
Minimum: 0.01 scfm

Model 63BUL & Model 63SUL
Maximum: 2800 sccm
Minimum: 13 sccm

Supply Pressure

Minimum: At least 5 psi greater than the maximum downstream pressure of the needle valve-controller combination

Maximum:

Model	Needle Valve Closed	Open
63BU	50 psi	250 psig
63BUL	50 psig	250 psig
63SU	100 psig	500 psig
63SUL	50 psig	500 psig

Ambient Temperature Limits

Model 63BU & Model 63BUL: -40 to 180°F (-40 to 82°C)
Model 63SU & Model 63SUL: -40 to 250°F (-40 to 121°C)

Supply Pressure

Minimum: At least 5 psig greater than the maximum downstream pressure of the needle valve-controller combination

Maximum:

Model	Needle Valve Open	Closed
63BD	250 psig	100 psig
63BDL	250 psig	100 psig
63SD	500 psig	100 psig
63SDL	500 psig	100 psig

Ambient Temperature Limits

Model 63BD & BDL: -40 to 180°F (-40 to 82°C)
Model 63SD & SDL: -40 to 250°F (-40 to 121°C)

Controlled Differential

3.1 ±.5 psig (others optional)

Materials

	Brass Units	316 SS Units
Body	Brass	316 SS
Diaphragm	Neoprene	KYNAR
Differential Spring	18-8 SS	316 SS
Valve Plunger & Seat	303 SS	316 SS
Plunger Spring (used in "D" 63BD models only) 63BD-L	316 SS Phos. Br.	316 SS 316 SS

Ratings
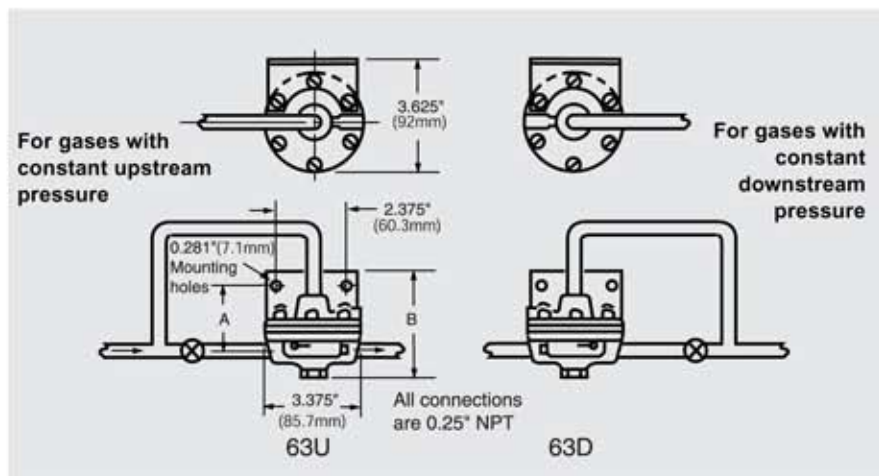
Ambient Temperature

-40 to 180°F (-40 to 82°C)

Flow Capacity Formula

	Higher Range Models 63BD and 63SD; 63BU and 63SU	Low Flow Models 63BD-L and 63SD-L; 63BU-L and 63SU-L
GAS FLOW-CAPACITY		
Maximum at less than critical flow[1]	$SCCM = 4000 \sqrt{\dfrac{\Delta P}{SG} \times Pd \times \dfrac{530}{T}}$	$SCCM = 400 \sqrt{\dfrac{\Delta P}{SG} \times Pd \times \dfrac{530}{T}}$
Maximum at critical flow[1]	$SCCM = 2000 \, Pu \sqrt{\dfrac{1}{SG} \times \dfrac{530}{T}}$	$SCCM = 200 \, Pu \sqrt{\dfrac{1}{SG} \times \dfrac{530}{T}}$
Minimum controllable flow	Approximately 1/200 of maximum	$SCCM = 8 \, \dfrac{\Delta P \, (Pu + Pd)}{Rv \, T}$
LIQUID FLOW-CAPACITY		
Maximum	$CCM = 470 \sqrt{\dfrac{\Delta P}{SG}}$	$CCM = 47 \sqrt{\dfrac{\Delta P}{SG}}$
Minimum	Approximately 1/200 of maximum	$CCM = .06 \, \dfrac{\Delta P}{Rv}$
NEEDLE VALVE SIZING (With 3 psi drop across valve)		
For any liquid	$Kn = \sqrt{\dfrac{CCM}{6550 \, \dfrac{1}{SG}}}$	
For any gas	$Kn = \sqrt{\dfrac{SCCM}{49000 \, \dfrac{1}{SG} \times Pn \times \dfrac{530}{T}}}$	

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Mounting Dimensions

Model	DIM. A	DIM. B
63BU	2 1/8"	3 1/4"
63BUL	2 1/8"	3 1/4"
63SU	2 3/8"	3 1/2"
63SUL	2 3/8"	3 1/2"
63BD	2 1/8"	3 1/2"
63BDL	2 1/8"	3 1/2"
63SD	2 3/8"	3 3/4"
63SDL	2 3/8"	3 3/4"

For gases with constant upstream pressure

3.625" (92mm)

2.375" (60.3mm)

0.281" (7.1mm) Mounting holes

3.375" (85.7mm)

63U

For gases with constant downstream pressure

All connections are 0.25" NPT

63D

Note: Dimensions for 63D are mirrored from 63U

1) Critical flow exists when the ratio of upstream pressure (Pu) to downstream pressure (Pd) is equal to or less than approximately 0.53