## 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

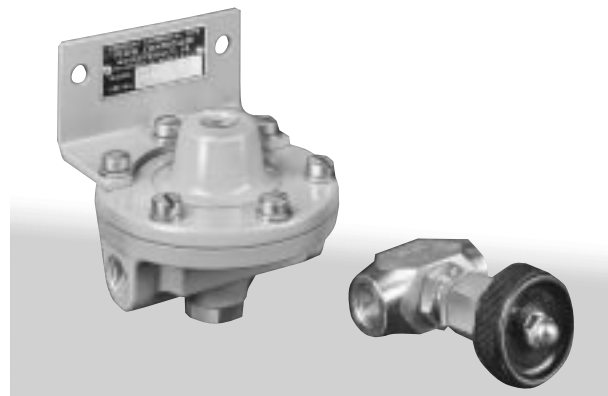Model 63BUL & Model 63SUL
Maximum: 2800 sccm
Minimum: 13 sccm

**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 | 100 psig | 250 psig |
| 63BUL | 50 psig | 250 psig |
| 63SU | 50 psig | 500 psig |
| 63SUL | 250 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 |
|-------|-------------------|
| 63BD | 250 psig |
| 63BDL | 250 psig |
| 63SD | 500 psig |
| 63SDL | 500 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)

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# Relays
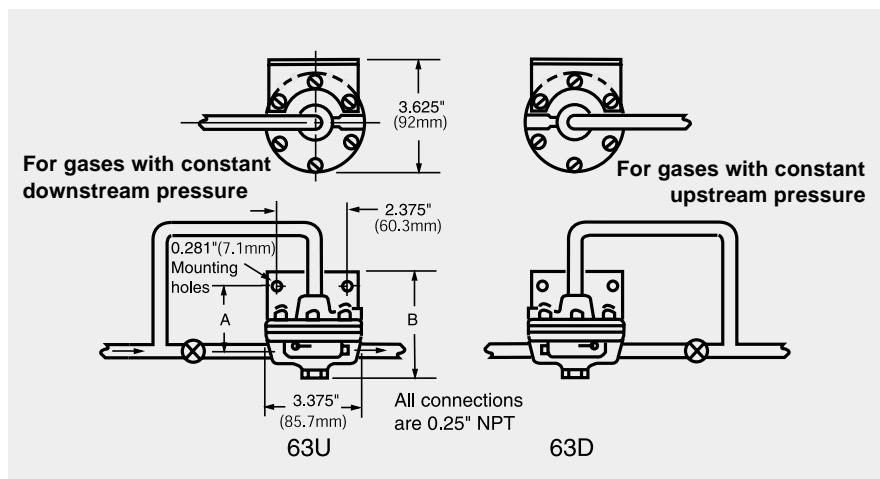## Series 63 Constant Differential Flow Controllers

**Technical data**

### Flow Capacity Formula

| | Higher Range<br>Models 63BD and 63SD;<br>63BU and 63SU | Low Flow<br>Models 63BD-L and 63SD-L;<br>63BU-L and 63SU-L |
|---|---|---|
| **GAS FLOW-CAPACITY** | | |
| Maximum at less than critical flow[1] | $SCCM = 4000 \sqrt{\dfrac{\Delta P \times Pd}{SG} \times \dfrac{530}{T}}$ | $SCCM = 400 \sqrt{\dfrac{\Delta P \times Pd}{SG} \times \dfrac{530}{T}}$ |
| 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 | $Kn = \dfrac{CCM}{6550 \sqrt{\dfrac{1}{SG}}}$ | |
| For any gas | $Kn = \dfrac{SCCM}{49000 \sqrt{\dfrac{1}{SG} \times Pn \times \dfrac{530}{T}}}$ | |

### 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 downstream pressure

3.625" (92mm)

2.375" (60.3mm)

0.281"(7.1mm) Mounting holes

A

3.375" (85.7mm)

63U

For gases with constant upstream 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

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