



556 SERIES PNEUMATIC ANALOG COMPUTER

The 556 Series Analog Computers receive pneumatic signals and provide a pneumatic output signal proportional to a mathematical function of the input signals. The functions performed are multiplication, division, squaring, or square root extraction.

HIGH ACCURACY

The mechanism features precision-milled 17-4 PH stainless steel flexures, rather than knife-edge or rotating pivots. This minimizes errors due to friction and wear, ensuring the precise accuracy required of analog computing systems.

WIDE RANGE OF APPLICATIONS

Scaling flexibility for multiplying and dividing functions permits a wide range of applications, such as pressure and temperature compensation of gas flows, ratio computations, and Btu computations.

BUILT-IN FUNCTION CHANGING

A built-in switch plate can be set in the field to enable the 556 Series to perform any one of the four computing functions.

WEATHERPROOF CONSTRUCTION

The plastic cover and die-cast low copper content aluminum alloy manifold meet IEC IP53 and provide the environmental protection of NEMA Type 3.

FUNCTIONAL SPECIFICATIONS

Functions and Related Equations The 556 Series perform any one of four functions and solve an equation as shown in the table:

Function	Equation
Multiplication	$A = fB(z + sC)$
Multiplication	$A = f(B - K_b)(z + sC) + K_a$
Division	$B = \frac{A}{(f)(z + sC)}$
Division	$B = \frac{A - K_a}{f(z + sC)} + K_b$
Square Root	$B = \sqrt{A}$
Square	$A = C^2$

A, B, and C are pneumatic signals expressed as decimal equivalents of percent of span.

K_a = Zero elevation of A signal. (Limits: 0 and 1.0)

K_b = Zero elevation of B signal. (Limits: 0 and 1.0)

f = Scaling factor. (Limits: 0.750 and 3.500)

s = Span factor for C signal. (Limits: 0.050 and 1.000)

z = Zero suppression of C signal. (Limits: 0.000 and 0.950)

NOTE

The sum of s and z must equal 1.000.

Input and Output Signals 20 to 100 kPa, 3 to 15 psi, or 0.2 to 1.0 bar or kg/cm², as specified.

Supply Pressure Limits 130 and 150 kPa, 19 and 22 psi, or 1.3 and 1.5 bar or kg/cm².

Ambient Temperature Limits -40 and +80°C (-40 and +180°F).

Air Consumption Under Normal Operation 0.5 m³/h (0.3 cfm) at standard conditions.

Air Connections All air connections are tapped for 1/4 NPT.

Mounting A bracket is supplied for vertical mounting on a rack, or on a DN 50 or 2 inch pipe. The bracket is designed for either horizontal or vertical pipes or rack struts.

PERFORMANCE SPECIFICATIONS

Accuracy

Multiplication ±0.5% of output span referred to input.

Division ±0.5% of output span referred to input.

Square Root ±0.25% of output span referred to input.

Square ±0.5% of output span.

Dead Band 0.02% of output span.

Repeatability 0.1% of output span.

Supply Pressure Effect The effect of a 10 kPa (1.5 psi, 0.1 bar or kg/cm²) change in supply pressure, within the specified limits, in percent of output span is:

Multiplication 0.2f (for f greater than 1.0).

Division $\frac{0.2}{C}$

Square Root $\frac{0.2}{\sqrt{A}}$

Square 0.2 maximum.

Ambient Temperature Effect Zero and span error in percent of output span per 55°C (100°F) change:

Function	Zero Error	Span Error
Multiplication	1.5f (For f greater than 1.0)	1.0f
Division	$\frac{1.5}{C}$	$\frac{1.0}{C}$
Square Root	$\frac{(A + 1.5)}{\sqrt{A}}$	
Square	1.5	1.0

Mounting Effect The percent change in output signal for a 5° tilt in any direction from vertical is as follows:

Multiplication and Squaring ±0.5, which can be zeroed out.

Division $\pm \frac{0.5}{C}$

Square Root $\pm \frac{0.5}{\sqrt{A}}$

PHYSICAL SPECIFICATIONS

Materials of Construction

Cover Molded plastic with textured gray finish.

Manifold Low copper content aluminium alloy die casting with a gray epoxy finish.

Flexures 17-4 PH stainless steel.

A and C Bellows Brass.

B Diaphragm Copper alloy.

Environmental Protection The housing construction is weatherproof. It is dust-protected as defined in IEC IP53 and, with its constant air purging, provides the environmental protection of NEMA Type 3.

Mass (Approximate) 2 kg (4.5 lb).

MODEL CODE

556 = Pneumatic Analog Computer

Function:

- 8 = Multiplication
- 8E = Multiplication with elevated A and B signals
- 9 = Division
- 9E = Division with elevated A and B signals
- 10 = Square Root
- 11 = Square

Computer Element—A Bellows Scaling Factor (f):

- 3 = 0.750 to 1.000
- 4 = 1.001 to 1.280
- 5 = 1.281 to 1.600
- 6 = 1.601 to 2.050
- 7 = 2.051 to 2.420
- 8 = 2.421 to 3.500

Computer Element—C Bellows Span Factor (s):

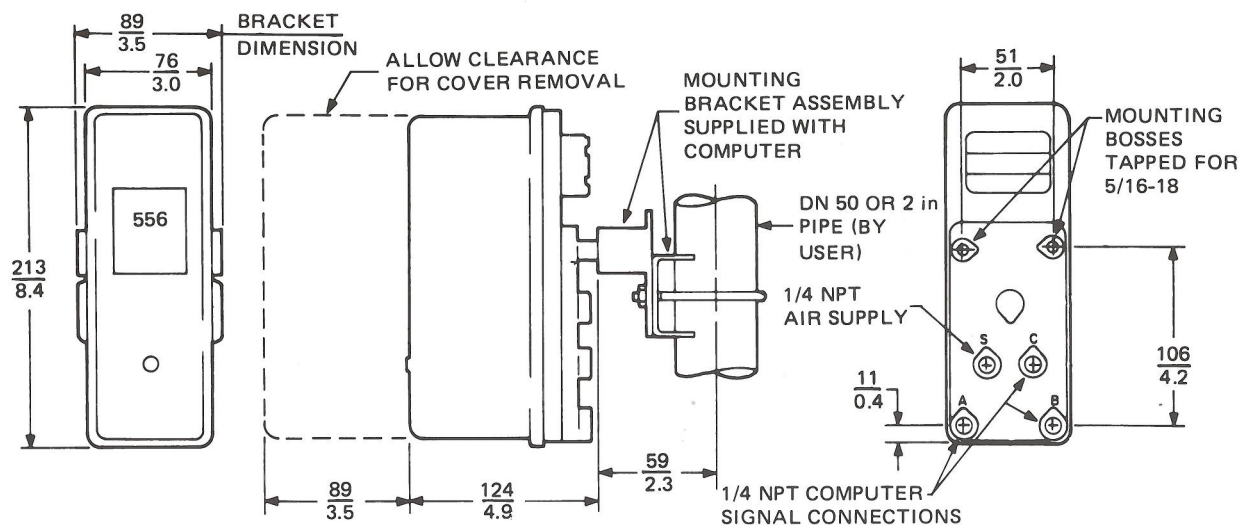
- 0 = 0.625 to 1.000
- 1 = 0.486 to 0.624
- 2 = 0.286 to 0.485
- 3 = 0.169 to 0.285
- 4 = 0.050 to 0.168

Example: 556-8E-40

ORDERING INSTRUCTIONS

1. Model Number
2. Input and Output Signal Pressure Range
3. For multipliers and dividers, express the values of scaling factor (f), span factor (s), and bias constants (K_a and K_b) to three decimal places; or provide a table of input/output values.
4. Tag

DIMENSIONS—NOMINAL



MODEL CODE	FUNCTION	INPUTS	OUTPUT
556-8	MULTIPLICATION	B,C	A
556-9	DIVISION	A,C	B
556-10	SQUARE ROOT	A	B
556-11	SQUARING	C	A