

FOUNDATION™ Fieldbus Positioner Type 3787



Application

Single-acting or double-acting positioner for attachment to linear or rotary pneumatic control valves. Bus-powered field device conforming to the FOUNDATION™ Fieldbus specification based on EN 61158-2 standard transmission technology. Integrated process controller and Link Master capability.

Rated travel from 0.3 to 4.8" (7.5 to 120 mm)

Opening angle to 120°

Output signal range from 0 to 90 psi (0 to 6 bar)



The microprocessor-controlled positioner compares the reference variable cyclically transmitted over the FOUNDATION™ Fieldbus network to the travel or opening angle of the control valve and produces the corresponding signal pressure output. The Type 3787 positioner communicates according to FOUNDATION™ Fieldbus specification with field devices, programmable logic controllers and process control systems.

An integrated PID Function Block allows the control of the process variables required directly in the field. The shift to distributed control means the higher-level automation system does not need to carry out control functions which in turn means less analog inputs and outputs, as well control as lines, are required. The Link Master capability allows autonomous closed control loops to be set up in the field.

Features

- Attachment to both linear and rotary actuators
- Operation and monitoring using bi-directional data exchange
- Automatic start-up with a multitude of application-relevant configuration options
- Monitoring and diagnostic functions
- Control parameters can be changed online
- Automatic monitoring of zero point
- Permanent storage of all parameters in non-volatile EEPROM (protection against power failure)
- Temperature and supply air effects negligible

Accessories

The digital positioner's functions can be extended through the following optional equipment:

- 2 inductive limit switches (proximity switches) · Accessible over the terminal block
- Forced fail-safe venting action · Upon absence of an external signal, the 2/2-way on-off valve (Fig. 3, item number 4) causes air to be vented. In effect, the control valve is forced in the fail-safe position. The venting function acts directly on the pneumatic block and remains unaffected by the output variable of the micro-controller.



Fig. 1 · Type 3787 FOUNDATION™ Fieldbus Positioner



Fig. 2 · Type 3787 Positioner with open cover

Principle of operation (Fig. 3)

The travel of the final control element is detected via the non-contact inductive displacement sensor (1) and transmitted to the microcontroller (2) via the converter. In the micro-controller, the travel is compared to the set-point and the two pneumatic 2/2-way on-off valves (3,4) are activated whenever a deviation (ie: error) occurs. Depending on the error, these valves either supply air to the pneumatic actuator through (3) or vent air from the actuator through (4), via corresponding amplifiers (boosters).

The positioner communicates and is powered via EN 61158-2 standard transmission technology corresponding to FOUNDATION™ Fieldbus specifications.

LED's integrated inside the positioner's cover signal the operating mode.

As a standard feature, the positioner comes with a binary input used to signal process information via the FOUNDATION™ Fieldbus.

A write-protection switch located on the inside of the cover (6) prevents saved configurations from being overwritten unintentionally.

Configuration using TROVIS-VIEW (Fig.4)

The SAMSON configuration software TROVIS-VIEW can be used to configure the positioner. For this purpose, there is an additional digital interface which is connected to the RS 232 interface of a standard PC. TROVIS-VIEW adapts the positioner to any process requirements and allows the process to be checked online. The control valve is linked to the process over the FOUNDATION™ Fieldbus network.

The PID Function Block integrated in the positioner can likewise be configured using TROVIS-VIEW. The configuration of the network connections for the PID Function Block is made using the NI-FBUS Configurator or a corresponding digital process control system.

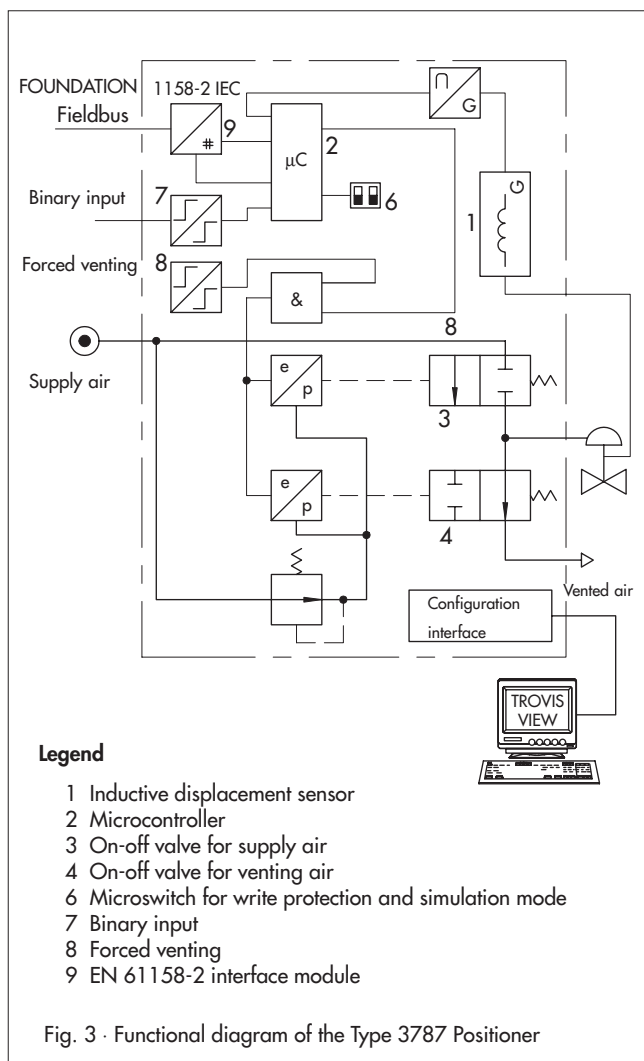


Fig. 3 · Functional diagram of the Type 3787 Positioner

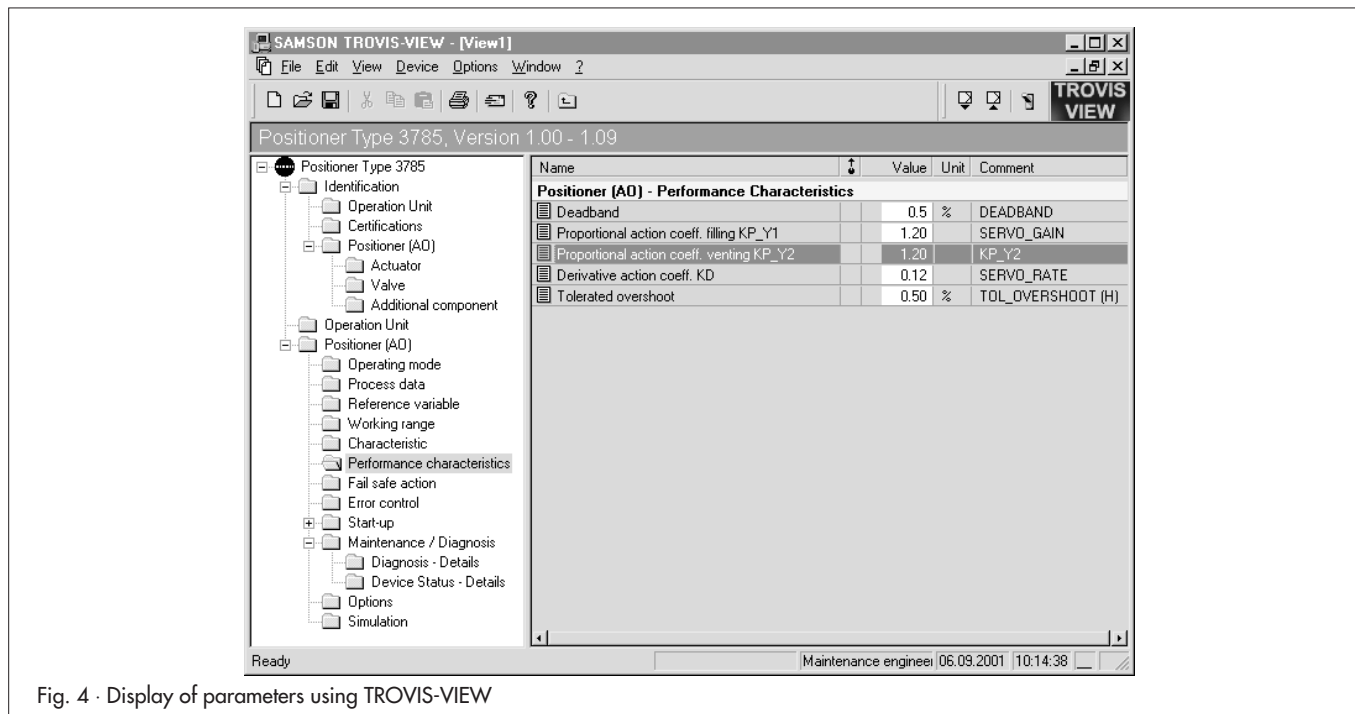


Fig. 4 · Display of parameters using TROVIS-VIEW

Table 1 · Technical data for Type 3787 positioner

Travel		Adjustable
Attachment to Type 3277 Actuator		0.3 to 1.2 inches (7.5 to 30 mm)
Attachment according to Namur (IEC 534)		0.3 to 4.8 inches (7.5 to 120 mm)
Attachment according to VDI/VDE 3845		Opening angle 30 to 120°
Bus connection		Fieldbus interface as per EN 61158-2, bus-powered Physical Layer Class: 113 (not explosion-protected version) 111 (explosion-protected version) Field device according to FM 3610 entity/FISCO applied for
Permissible operating voltage		9 to 32 VDC · Static destruction limit at 35 V · Power supply over bus
Operating current		15 mA
Additional current in case of fault		0 mA
Auxiliary power		Supply air from 20 - 90 psig (1.4 to 6 bar)
Signal pressure (output)		0 psig (bar) up to air supply pressure
Characteristic	Adjustable	Globe valve: linear · equal percentage · reverse equal percentage SAMSON butterfly valve linear · equal percentage VETEC rotary valve linear · equal percentage
	Deviation	< 1%
Dead band (based on rated travel/angle)		Adjustable from 0.1 to 10.0% · Cold start value: 0.5%
Resolution (internal measurement)		< 0.05% of the measuring range of the differential transformer
Transit time		For valve transit time up to 240 s · Set point ramp for venting and supply air separately adjustable
Moving direction		Reversible · Set using software
Air consumption		Independent of supply air < 3.3 scfh (90 l/h)
Air supply	Actuator filled	For $\Delta p = 90$ psig (6 bar): 345 scfh (9.3 m _n ³ /h) · For $\Delta p = 20$ psig (1.4 bar): 130 scfh (3.5 m _n ³ /h)
	Actuator vented	For $\Delta p = 90$ psig (6 bar): 576 scfh (15.5 m _n ³ /h) · For $\Delta p = 20$ psig (1.4 bar): 216 scfh (5.8 m _n ³ /h)
Permissible ambient temperature		-40 to 140 °F (-40 to 60 °C) · Extended temperature range on request
Effects	Temperature	≤ 0.15% / 18 °F (10 K) of the measured value
	Supply air	None
	Vibrations	None up to 250 Hz and 4 g
Hazardous locations certifications		Intrinsically safe, as per Table 2
Degree of protection		Nema 3, Nema 4 · IP 54, 65
Electromagnetic compatibility		EN 50 081 and EN 50 082 requirements are met
Binary input		Internal power supply 5 VDC · Ri approximately 100 kΩ for signaling function
Weight		Approximately 3 lb (1.3 kg)
Communication		
Data transmission		As per FOUNDATION™ Fieldbus specification · Communication Profile Class: 31 PS, 32
Accessory equipment		
Inductive limit switches		For connection to a Namur signal converter according to DIN 19 234 Two Type SJ2-SN Proximity Switches
Forced venting		Input: 6 to 24 VDC · Static destruction limit 45 V · Ri approx. 6 kΩ Switching point approx. 3V · Cv value 0.2 (Kv value 0.17)

Table 2 · Materials

Case	Die-cast aluminum, chromized and plastic-coated
External parts	Stainless steel AISI 316Ti and AISI 304 (WN 1.4571 and WN 1.4301)

Integrated PID process controller (Fig. 5)

Decentralized control can be achieved by using the PID function block as a master controller for the positioner:

- Freely selectable controller structure (P-, PI-, PID controller)
- Manual, automatic or cascade operating mode
- Rating and limitation of signals
- Rating and filtering of process data
- Feedforward control
- Detection and forwarding of alarms

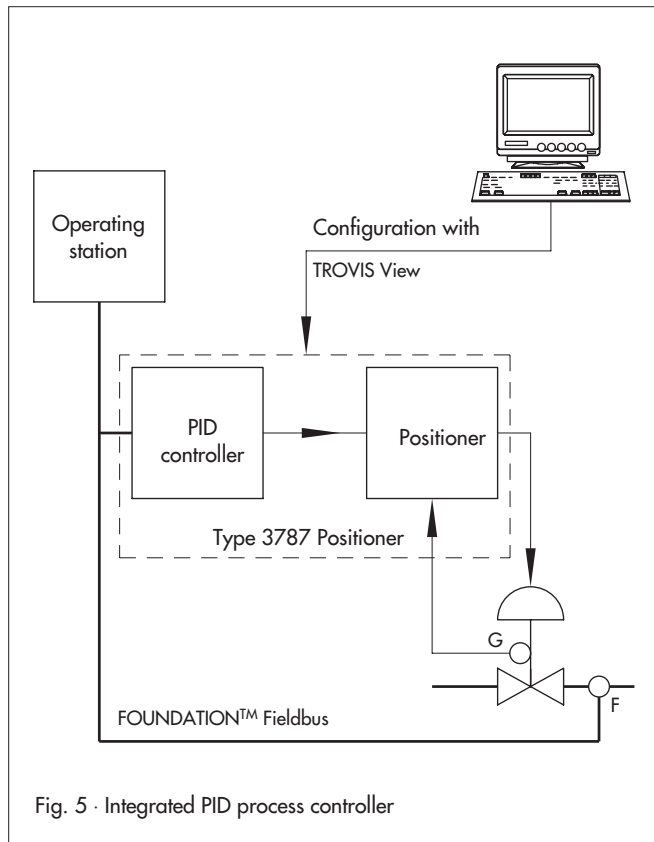


Fig. 5 · Integrated PID process controller

Network and positioner configuration with NI-FBUS™ Configurator

The positioner can also be configured using the NI-FBUS™ Configurator from National Instruments.

An interface card is required for connection to the FOUNDATION™ Fieldbus.

Using the NI-FBUS™ Configurator, the whole FOUNDATION™ Fieldbus network can be configured. It also enables the use of the PID controller in the positioner which allows autonomous control in the field.

Table 2 · Intrinsically Safe Certifications

Authority	Harzardous locations information
CSA	Class I, Zone 0: Ex ia IIC T6 Class I, Class II, Groups A,B,C,D,E,F,G Class I, Zone 2 Class I, Class II, Division 2, Groups A,B,C,D,E,F,G
FM	Class I,II,III,Div.1, Groups A,B,C,D,E,F,G Class I, Div.2, Groups A,B,C,D Class II, Div.2, Groups F,G Class III, Div.2
PTB	EEx ia IIC T6

Electrical and bus connection (Figs. 6 to 8)

The Type 3787 FOUNDATION™ Fieldbus Positioner must be connected to bus segments conforming to EN 61158-2. Power supply as well as data communications use shielded two-wire cables.

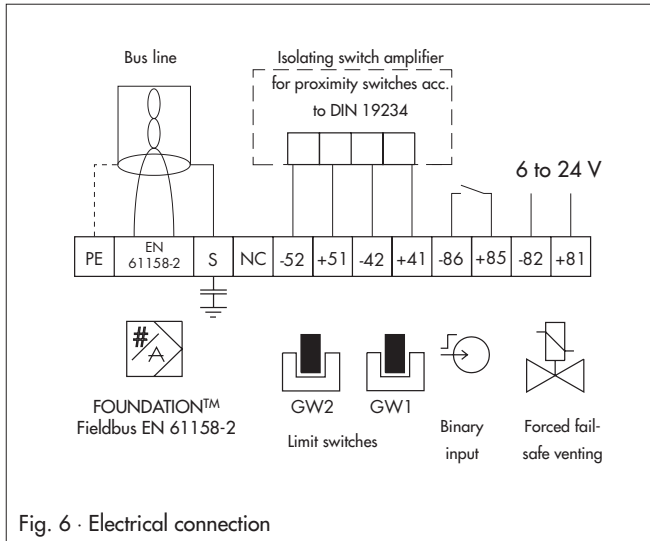


Fig. 6 · Electrical connection

Attaching the digital positioner

The Type 3787 Positioner can be attached directly onto the Type 3277 Actuator using a mounting block. In actuators with the fail-safe position actuator stem "extends" (fail close) or Type 3277-5 Actuator (120 cm² size), the signal pressure is led internally to the actuator through a hole inside the actuator yoke. In actuators with fail-safe action stem "retracts" (fail open) and effective areas of 240 cm² and larger, the signal pressure is led to the actuator through a ready-made external piping arrangement.

The positioner can also be attached using an adapter plate conforming to DIN IEC 534 (Namur recommendation). The positioner can be attached to either side of the control valve.

Attachment to the Type 3278 Actuator or other rotary actuators according to VDI/VDE 3845 requires an intermediate piece. The rotary motion of the actuator is converted into a linear motion via a cam disk. This cam disk is designed for an angle of either 0 to 90° or 0 to 120°. The characteristic can be selected via software.

For double-acting actuators, a reversing amplifier is required for the second, opposing signal pressure.

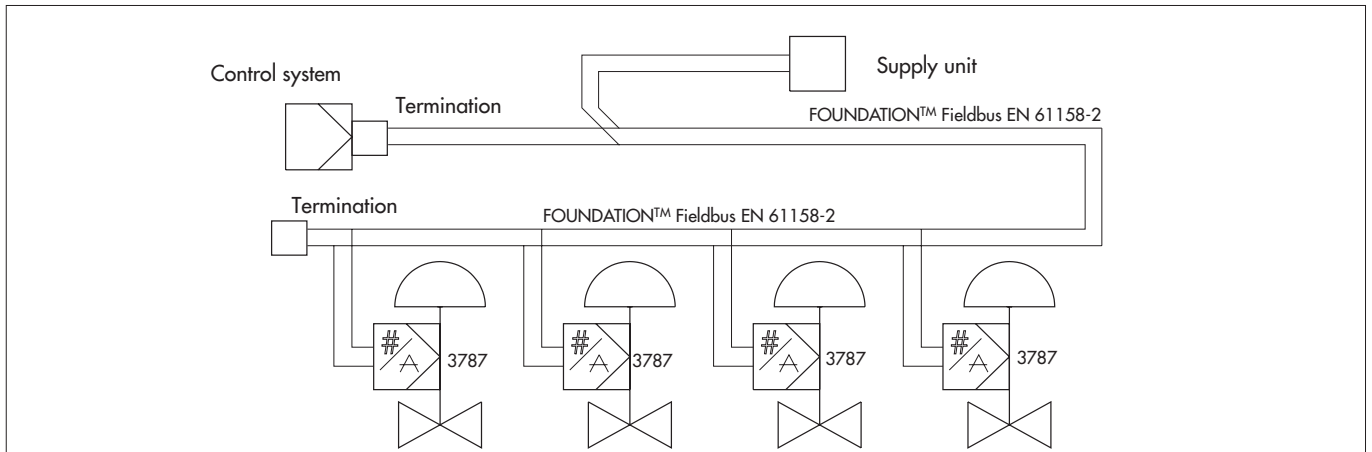


Fig. 7 · Fieldbus connection of the Type 3787 Positioner

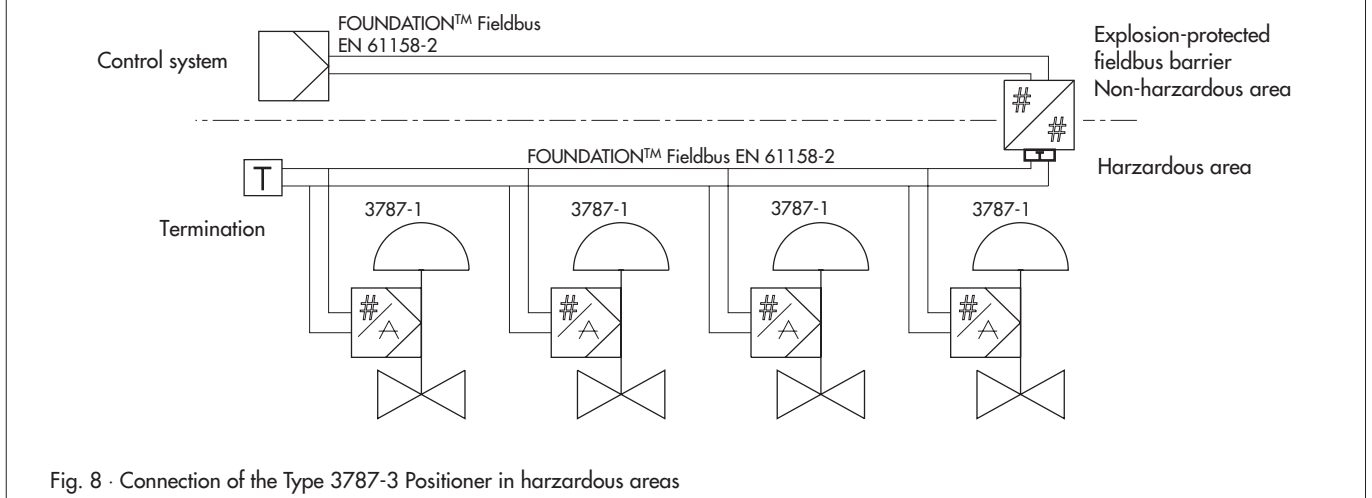


Fig. 8 · Connection of the Type 3787-3 Positioner in hazardous areas

Nomenclature when ordering

Positioner	Type 3787-	x	x	x	0	x	3	x
Explosion protection								
Without		0						
With (PTB)		1						
With (CSA/FM)		3						
Accessories								
Limit switches								
Without		0						
2 inductive		2					2	
Forced fail-safe venting								
Without				0				
With				1			2	
Pneumatic connections								
1/4-18 NPT						1		
ISO 228/1-G 1/4						2		
Electrical connections								
Cable gland M 20x1.5 or NPT 1/2								
Brass, nickel-plated								
Quantity:	1						1	
	2						2	

Ordering text

FOUNDATION™ Fieldbus Positioner Type 3787-... (See above)

Without/with pressure gauge for indicating signal pressure

For positioners with limit switches

- Metal tag in final position of the valve outside of the active zone
- Metal tag in final position of the valve inside of the active zone

Attached to Type 3277 Actuator:

- Actuator sizes: 120/240/350/700 cm²
- Fail-safe action: Actuator stem extends or retracts

Attachment according to Namur (IEC 534)

- Travel ... Inches (mm)
- Stem diameter, if applicable ... Inches (mm)
- Signal pressure restriction for actuator with small travel volume, if applicable

Attachment to Type 3278 Rotary Actuator

- Actuator sizes: 160/320 cm²

Attachment to single-acting/double-acting rotary actuators according to VDI/VDE 3845

- Signal pressure restriction, if applicable

Specifications subject to change without notice.



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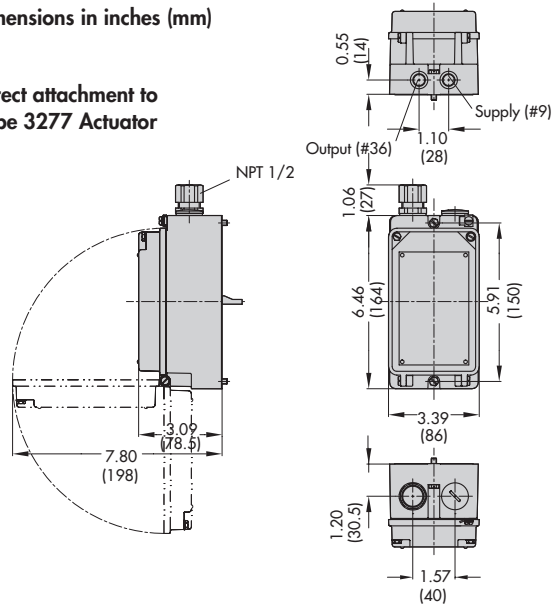
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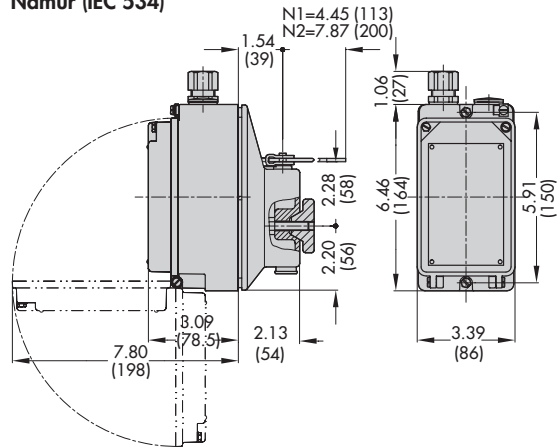
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Dimensions in inches (mm)

Direct attachment to Type 3277 Actuator



Attachment according to Namur (IEC 534)



Attachment to rotary actuators

