

LP

Linear pneumatic piston actuators



Measurement made easy

—
High performance
actuators for
precision damper control

Overview

LP linear piston actuators are typically used to control the position of airflow regulating dampers, butterfly valves, and other similar process regulating devices on furnaces, boilers and air distribution systems.

They are most often used on windbox dampers in NO_x reduction control systems. When directly connected to a lever on the damper shaft, these actuators provide accurate positioning control at minimum.

For more information

Further publications for the LP series of linear pneumatic piston actuators are available for free download from:

www.abb.com/actuators

(see links and reference numbers below) or by scanning this code:



Search for or click on

Data Sheet
LP
Linear pneumatic piston actuators

[DS/LP-EN](#)

WARNING notices as used in this manual apply to hazards or unsafe practices which could result in personal injury or death.

CAUTION notices apply to hazards or unsafe practices which could result in property damage.

NOTES highlight procedures and contain information which assist the operator in understanding the information contained in this manual.

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WARNING

INSTRUCTION MANUALS

Do not install, maintain or operate this equipment without reading, understanding and following the proper ABB Inc. instructions and manuals, otherwise injury or damage may result.

POSSIBLE PROCESS UPSETS

Operation and maintenance must be performed only by qualified personnel and only after securing equipment controlled by this product. Adjusting or removing this product while it is in the system may upset the process being controlled. Some process upsets may cause injury or damage.

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READ FIRST

WARNING

INSTRUCTION MANUALS

Do not install, maintain, or operate this equipment without reading, understanding and following the proper ABB Inc. instructions and manuals, otherwise injury or damage may result.

RETURN OF EQUIPMENT

All equipment being returned to ABB Inc. for repair must be free of any hazardous materials (acids, alkalis, solvents, etc). A Material Safety Data Sheet (MSDS) for all process liquids must accompany returned equipment. Contact ABB Inc. for authorization prior to returning equipment.

Read these instructions before starting installation; save these instructions for future reference.

WARNING

Stay clear of moving components when performing procedures that require the equipment to be energized. The equipment can operate automatically. There is a risk of entanglement of body parts if caution is not observed. When possible, remove the supply source or remove the equipment from the process before servicing.

Contacting ABB Inc.

Should assistance be required with any ABB Instrumentation product, contact the following:

Telephone:

**Automation Services Call Center
1-800-HELP-365**

Internet:

www.abb.com

- Select **Instrumentation & Analytical** from the **Our Offerings** section
- Select **Contact Directory** from the **Products & Services** tab. Then select your country location from the **Your Country** drop-down menu in the center of the page.
- Select **Service** from the **Instrumentation & Analytical** Product Group listing and complete the requested information in the pop-up window.

1.0 SPECIFICATIONS / FEATURES

Simple Cylinder Actuators From 2¹/₂" dia. x 5" Stroke to 10" dia. x 16" Stroke

Linear Piston Actuator Assemblies

The LP series of damper drives provide a linear actuation solution that is ideally suited for applications to control the position of air dampers or louvers on furnaces, boilers, and air distribution systems. They are also used on Burner Tilts and Overfire air dampers. They are suitable for Windbox damper control in NOx reduction control systems.

Operation with TZIDC Smart Positioners offers digital communication, self-calibration, diagnostics and performance monitoring functions.

The "AutoStroke" feature calibrates and tunes the LP assembly automatically.

FEATURES :

High resolution, sensitivity, and fast response with proven AV and TZIDC Positioners.

- Cylinders available with Buna-N or Viton seals.
- Temperature range up to 250°F with AV15, 185°F with TZIDC.
- Easy adaptability to air dampers and louvers via clevis and pivot pin mounting.
- Drop in replacement for many "older" piston actuators.
- Available with built-in 4 to 20ma. position feedback.

The conventional assembly, which uses the AV Positioner series, offers a high-temperature option up to 250°F. In comparison our digital TZIDC solution allows for operation up to 185°F.

LP sizes range from a 2.5" diameter cylinder with a 5" stroke (2.5"x 5") up to a 10"x 16" diameter cylinder. The most common sizes, 2.5"x 5" and 4"x 4," are readily available.

TZIDC Digital Features

- Microprocessor-based
- Local keypad, two line LCD and position indicator
- Easy local configuration and operation
- Digital communication via HART, FOUNDATION Fieldbus, and Profibus
- Remote configuration and monitoring Configurable operating parameters
- Easy set-up of direct/reverse action, limit stops, etc.
- Integrated position feedback
- Analog and/or digital feedback without additional external devices to calibrate and maintain
- Diagnostics and self-monitoring capabilities
- Easy trouble-shooting and preventive maintenance
- Immunity to shock and vibration allows installation in high vibration areas

2.0 RATINGS

Thrust Ratings

The basic thrust rating of a pneumatic piston is equal to the area of the piston times the supply pressure. The minimum supply pressure for both the TZIDC and the AV1 is 20 psi.

The maximum supply pressure for the TZIDC is 90 psi and 125 psi for the AV positioner.

The area of the piston is $A = \pi D^2/4$. Subtract approximately 10% for friction losses and because the rod side of the piston has less area. An example is shown for an 80 psi air supply:

To find the lever length that would result in 90° rotation of the damper shaft, multiply the cylinder stroke length by 0.707.

Please refer to the individual Product Specifications for details on the AV and TZIDC Positioner performance.

Operating Torque/Thrust Characteristic	Actuator Type						
	LP10	LP20	LP30	LP32	LP40	LP50	LP60
Area-Retracting (Rod Side)	4.71 in. ²	11.2 in. ²	26.8 in. ²	26.8 in. ²	48.8 in. ²	48.8 in. ²	76.1 in. ²
Area-Extending (other side)	4.91 in. ²	11.94 in. ²	28.3 in. ²	28.3 in. ²	50.3 in. ²	50.3 in. ²	78.5 in. ²
Force out @ 80 psi ¹	339 lbs.	806 lbs.	1930 lbs.	1930 lbs.	3514 lbs.	3514 lbs.	5479 lbs.
Lever Length for 90° Rotation	3.54 in.	2.83 in.	5.66 in.	11.32 in.	5.66 in.	11.32 in.	11.32 in.
Operating Torque @ 80 psi ²	71 ft. lbs.	134 ft. lbs.	643 ft. lbs.	1286 ft. lbs.	1172 ft. lbs.	2341 ft. lbs.	3651 ft. lbs.

Note 1: Use the rod side area x psi to calculate force. Subtract 10% for friction loss.

Note 2: Torque at mid-stroke is 1.4x torque at +/- 45°

Suggested Maximum Operating Force vs Pressure

The following tables show the maximum operating force at minimum & maximum supply pressure for the various LP cylinder sizes.

Note: The Torque calculation values are provided based on the stroke length of the LP and the required lever arm dimension for 90 deg damper travel.

LP10		
Cylinder diameter		2.5"x5"
Lever for 90 deg		3.53"
Supply psi	Force lbf	Torque ft-lb
40	170	35
45	191	40
50	212	44
55	233	48
60	254	53
65	276	57
70	297	62
75	318	66
80	339	71
85	360	75
90	382	79

Table 1

LP20		
Cylinder diameter		4"x4"
Lever for 90 deg		2.83"
Supply psi	Force lbf	Torque ft-lb
40	403	67
45	454	76
50	504	84
55	554	92
60	605	101
65	655	109
70	706	118
75	756	126
80	806	134
85	857	143
90	907	151

Table 2

LP30		
Cylinder diameter		6"x8"
Lever for 90 deg		5.66"
Supply psi	Force lbf	Torque ft-lb
40	965	322
45	1,085	362
50	1,206	402
55	1,327	442
60	1,447	483
65	1,568	523
70	1,688	563
75	1,809	603
80	1,930	643
85	2,050	684
90	2,171	724

Table 3

LP32		
Cylinder diameter		6"x16"
Lever for 90 deg		11.31"
Supply psi	Force lbf	Torque ft-lb
40	965	643
45	1,085	723
50	1,206	804
55	1,327	884
60	1,447	964
65	1,568	1,045
70	1,688	1,125
75	1,809	1,205
80	1,930	1,286
85	2,050	1,366
90	2,171	1,447

Table 4

LP40		
Cylinder diameter		8"x8"
Lever for 90deg		5.66"
Supply psi	Force lbf	Torque ft-lb
40	1,757	586
45	1,976	659
50	2,196	732
55	2,416	806
60	2,635	879
65	2,855	952
70	3,074	1,025
75	3,294	1,098
80	3,514	1,172
85	3,733	1,245
90	3,953	1,318

Table 5

LP50		
Cylinder diameter		8"x16"
Lever for 90deg		11.31"
Supply psi	Force lbf	Torque ft-lb
40	1,757	1,171
45	1,976	1,317
50	2,196	1,463
55	2,416	1,610
60	2,635	1,756
65	2,855	1,902
70	3,074	2,049
75	3,294	2,195
80	3,514	2,341
85	3,733	2,488
90	3,953	2,634

Table 6

LP60		
Cylinder diameter		10"x16"
Lever for 90deg		11.31"
Supply psi	Force lbf	Torque ft-lb
40	2,740	1,826
45	3,082	2,054
50	3,425	2,282
55	3,767	2,510
60	4,109	2,738
65	4,452	2,966
70	4,794	3,195
75	5,137	3,423
80	5,479	3,651
85	5,822	3,879
90	6,164	4,107

Table 7

3.0 NOMENCLATURE

“Simple Cylinder” type Linear pneumatic piston actuators are supplied with either type AV conventional or type TZID intelligent positioners mounted on the cylinder. Cylinders are supplied with a threaded clevis on the rod end and a standard MP pivot on the base. Base mounting pivots may be ordered as an accessory.

The cylinders can be supplied with either Buna-N nitrile rubber seals suitable for 200°F (93°C) operation or Viton seals suitable for 300°F (148°C) operation. The Buna-N seals have a lower breakaway pressure, offering smoother modulating control. High temperature Viton seals are inherently higher friction and tend to stick and breakaway, causing somewhat jerky motion. The operating temperature for the AV15 & AV16 is 250°F (121°C). All other positioners have a 185°F (85°C) maximum ambient. Buna-N seals are recommended unless temperatures > 200°F (93°C) dictate Viton.

The TZIDC-200 is for Explosion Proof application Class I Div 1 Gr. C-G. Refer to the AV or TZIDC positioner specifications for positioner details and specifications.

The maximum supply pressure with type TZIDC positioners is 90 psi. The maximum supply pressure with type AV positioners is 125 psi.

Please refer to the individual Instruction Books for the AV and the TZIDC positioners for details on the two types of positioners (Refer to table of Reference Documentation shown below).

Document	Description
D-APE-AV1234_	Characterizable Positioner Type AV1, AV2, AV3, AV4 specification
10/18-0.22 EN	Electro-Pneumatic Positioner TZIDC specification
10/18-0.32 EN	Electro-Pneumatic Positioner TZIDC-200 specification
PN25039	Characterizable Positioner Type AV1 and AV2 instruction
PN25058	Characterizable Positioner Type AV3 and AV4 instruction
P-E88-25-001	Closed Loop Control Using Type AV Positioner
P-P88-001	Installing a Type AV Positioner in a Hazardous Location
42/18-84 EN	TZIDC Positioner Operating Instructions
42/18-73 EN	TZIDC-200 Positioner Operating Instructions
45/18-79 EN	TZIDC/TZIDC-200 Configuration Instructions

Refer to table on next page for LP Nomenclature details.

Code

Linear Pneumatic Piston Actuator

LP

For quantity greater than 3 call

1 : Cylinder Size

2-1/2 in. Diameter, 5 in. Stroke (63.5 mm x 127 mm)	10
4 in. Diameter, 4 in. Stroke (101.6 mm x 101.6 mm)	20
6 in. Diameter, 8 in. Stroke (152.4 mm x 203.2 mm)	30
6 in. Diameter, 16 in. Stroke (152.4 mm x 406.4 mm)	32
8 in. Diameter, 8 in. Stroke (203.2 mm x 203.2 mm)	40
8 in. Diameter, 16 in. Stroke (203.2 mm x 406.4 mm)	50
10 in. Diameter, 16 in. Stroke (254 mm x 406.4 mm)	60
Non Standard Option	X

2 : Cylinder Seals

Buna-N Cylinder Seals -40 ... 185 °F (-40 °C ... 85 °C)	B
Viton Cylinder Seals 30 ... 250 °F (-1 °C ... 121 °C)	V
Non Standard Option	X

3 : Positioner Type (See Note A)

AV15, Input 3 ... 15 psi (0.2 ... 1 bar) 250 °F (121 °C)	1
AV16, Input 3 ... 27psi (0.2 ... 1.86 bar), 250 °F (121 °C)	2
AV232__00, 4 ... 20 mA, 185 °F (85 °C)	3
AV11, 3 ... 15 psi (0.2 ... 1 bar), 185 °F (85 °C)	4
AV12, 3 ... 27 psi (0.2...1.9 bar), 185 °F (85 °C)	5
TZIDC, HART 4 ... 20 mA, 185 °F (85 °C), Fail Safe	A
TZIDC, HART 4 ... 20 mA, 185 °F (85 °C), Fail in Place	B
TZIDC-200 (Explosion proof), HART, 4 ... 20 mA, 85 °C (185 °F), Fail Safe	C
TZIDC-200 (Explosion proof), HART, 4 ... 20 mA, 185 °F (85 °C), Fail in Place	D
TZIDC-110, Profibus PA, 185°F (85 °C), Fail Safe	K
TZIDC-110, Profibus PA, 185°F (85 °C), Fail in Place	L
TZIDC-210 (Explosion proof), Profibus PA, 185°F (85 °C), Fail Safe	M
TZIDC-210 (Explosion proof), Profibus PA, 185°F (85 °C), Fail in Place	N
TZIDC-120, Foundation Fieldbus, 185°F (85 °C), Fail Safe	P
TZIDC-120, Foundation Fieldbus, 185°F (85 °C), Fail in Place	R
TZIDC-220 (Explosion proof), F. Fieldbus, 185°F (85 °C), Fail Safe	S
TZIDC-220 (Explosion proof), F. Fieldbus, 185°F (85 °C), Fail in Place	T
Non Standard Option	X

4 : Position Feedback and Direction Control (See Note B)

No Position Feedback, Piston Retracted at 4 mA/min Input signal		0
With 4 ... 20 mA Position Feedback, Piston Retracted at 4 mA/min Input signal	(Note: 1)	1
No Position Feedback, Piston Extended at 4 mA/min Input signal		2
With 4-20 mA Position Feedback, Piston Extended at 4 mA/min Input signal	(Note: 1)	3
Non Standard Option		X

5 : Travel Switches

No Travel Switches		0
With 2 Digital Switches in TZIDC Only (with FM / CSA Approval)	(Note: 2)	1
With 2 Micro Switches in TZIDC (no FM/CSA Approval) (See Note C)	(Note: 3)	2
Non Standard Option		X

6 : Equalizing Manifold/Gage Block

No Equalizing Manifold or Gage Block		0
Equalizing Manifold with Gage Ports only (See Note D)	(Note: 4)	1
Gage Block including Gages (for TZIDC only) No Equalizing Manifold	(Note: 3)	2
Gage Block with Gage ports only (for AV only) No Equalizing Manifold (See Note D)	(Note: 5)	3
Non Standard Option		X

7 : Mounting/Enclosure Classification Rating (See Note E)

Standard Clevis & Pivot Tab, NEMA 3R for AV / NEMA 4X for TZIDC	0
Standard Clevis & Pivot Tab with Cylinder Shaft Protective Boot, NEMA 3R for AV / NEMA 4X for TZIDC	1
Standard Clevis & Pivot Tab, NEMA 4X for AV	2
Standard Clevis & Pivot Tab with Cylinder Shaft Protective Boot, NEMA 4X for AV	3
Non Standard Option	X

8 : Tubing

Tubing with Brass Fittings (see note F)	0
Stainless Steel Tubing (304) with Stainless Steel Fittings (Parker)	S
Non Standard Option	X

LP Notes:

- Note 1: Not available with Positioner Type (See Note A) code 1, 2, K, L, M, N, P, R, S, T
- Note 2: Not available with Positioner Type (See Note A) code 1, 2, 3, 4, 5, K, L, M, N, P, R, S, T
- Note 3: Not available with Positioner Type (See Note A) code 1, 2, 3, 4, 5
- Note 4: Not available with Positioner Type (See Note A) code 1, 2
- Note 5: Not available with Positioner Type (See Note A) code 1, 2, A, B, C, D, K, L, M, N, P, R, S, T

Linear Pneumatic Piston actuators are supplied with either type AV analog or type TZIDC digital positioners mounted on the cylinder. Cylinders are supplied with a threaded clevis on the end. Base mounting pivots can be ordered as an accessory. A protective boot is optional.

The cylinders can be supplied with either Buna-N nitrile rubber seals suitable for 200 F (93 C) operation or Viton seals suitable for 148 C (300 F) operation.

The Buna-N seals have a lower breakway pressure, offering smoother modulating control.

The operating temperature for the AV15 & AV16 is 250 F (121 C). All other positioners have a 185 F (85 C) maximum ambient.

Buna-N seals are recommended unless temperature >200 F (93 C) dictate Viton.

The TZIDC-200 is for Explosion Proof application Class 1 Div 1 Gr C-G. Refer to the AV or TZIDC positioner specifications for positioner details and specifications.

The maximum supply pressure with type TZIDC positioners is 90 psi. The maximum supply pressure with type AV positioners is 125 psi.

Note A: All positioners have FM/CSA approval, as standard, however see Note C for application exception

Note B: Direction Control refers to Stroke direction (Direct Action), position feedback signal will follow Input signal

Note C: Cam operated microswitch option for TZIDC cannot be used in hazardous areas that require FM/CSA approval.

Cam operated microswitch option for TZIDC-200 can be used in Class 1 Div 1 Gr C-G application for FM/CSA. Refer to TZIDC-200 Data Sheet

Note D: Refer to accessories for Gages, supplied separate for field installation

Note E: Refer to accessories for Mounting Base/Pin or Retainer

4.0 MAINTENANCE INSTRUCTIONS

Very little maintenance is required for the operation of the LP actuator; the cylinders are permanently lubricated at the factory.

MAJOR MAINTENANCE:

To replace rod bushing seals:

1. Remove socket head cap screws that hold the bushing retainer to the cylinder and remove the bushing. Remove old seals and replace with new seals making sure that you use some lubricant such as Magnalube "G" (supplied with kit) to aid inserting seals into grooves.
2. To replace the rod bushing assembly, lubricate the inside and outside of the bushing lightly and slide over the piston rod by turning the bushing clockwise while pushing the bushing gently over the piston rod.
3. Replace the retainer; replace the socket head cap screws one by one being sure that all screws are loosely assembled so as not to cock the bushing in the head. Now tighten each screw just a little at a time to prevent binding of the bushing in the head. The following are the torque values of these socket head cap screws that hold the retainer in place:

#10-32 S.H.C.S used on 2" & 2 1/2" Bore	5 ft-lbs
1/4-28 S.H.C.S. Used on 3 1/4" to 10" Bore	12 ft-lbs

To Replace Piston seals:

1. Disassemble the cylinder by loosening the tie rod nuts at either end of the cylinder, using standard box end or open-end wrenches. Remove the head and bushing assembly from remaining cylinder; now pull piston rod assembly gently from the cylinder tube. Remove piston seals from grooves in piston, being careful not to scratch the bottom of the grooves, as this may allow some small amount of leakage by the piston when the cylinder is put into operation again. Place new seals in piston grooves, being careful not to cut or nick the new piston seals.

Be sure the seal lips are pointing outward toward each end of the piston. It is usually wise to remove and replace the tube end seal in the head and cap at the same time.

2. Clean entire inside of the cylinder tube, piston rod assembly, and all other parts of the cylinder to be assembled. Coat piston O.D. and seals with a light grease, (Magnalube "G" is recommended) before assembly of cylinder.

Reassemble cylinder in the following manner:

1. Place cap end on table with tube groove facing up.
2. Position cylinder tube in tube groove.
3. Insert piston rod assembly into tube making sure lip of the piston seal enters the tube properly. Insert fully to bottom of tube.
4. Place head and bushing over the end of the piston rod pushing gently while turning the head bushing assembly clockwise until the bushing has cleared the wrench flat area of the piston rod.
5. Be sure the cylinder tube is seated into the cylinder tube groove in the head.
6. Replace the tie rods one by one, being sure that all four are loosely assembled so as to allow the head and cap to rotate slightly so that the head and cap will be squarely in line while you finish torquing the tie rod nuts. Be sure to tighten each nut a little at a time so as to prevent binding of the cylinder. Use the following torque on the tie rod nuts:

2" – 2 1/2" Bore	12-14 ft-lbs
4" Bore	35 ft-lbs
6" Bore	50-55 ft-lbs
8" Bore	110 ft-lbs
10" Bore	125 ft-lbs

CYLINDER LUBRICATION:

The pneumatic cylinders are designed to perform without the need for additional lubrication. To meet the demands and life expectancy the cylinder lubricant must possess the broadest scope of properties. Magnalube G, <http://www.magnalube-g.com/>, made by the Carleton-Stuart Corp., is the lubricant of choice that exceeds our performance specifications. Magnalube G is a PTFE-based grease that deposits a fine protective and lubricating film on all moving cylinder components, offering excellent resistance to lubrication migration.

Temperatures: Magnalube G is rated up to 236°C (458°F) it will not experience a viscosity breakdown either in higher temperature applications or in high-speed applications, where heat is generated due to normal internal operating friction.

Low temperature rating to -37°C (-35 °F)

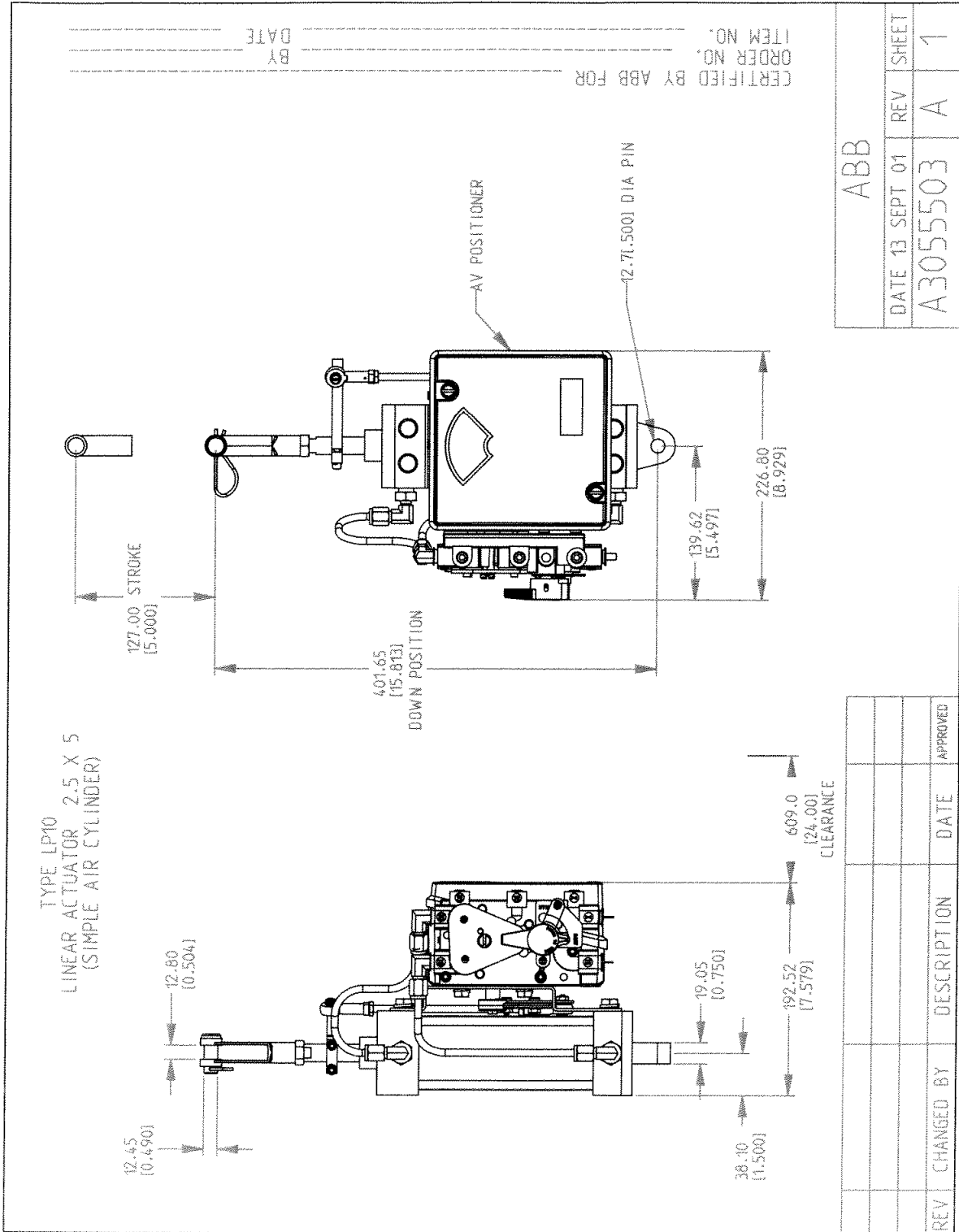
Vertical applications, rod down: Cylinder orientation and actuation can allow for quick and easy lubrication migration. The non-migratory characteristic of Magnalube G eliminates lubrication loss in vertical applications.

Typical life expectancy: While lubrication is a key component to cylinder life, there are many other contributing factors which could decrease a cylinder's useful life. The typical life expectancy of cylinder components is usually rated as 4,023,360 m (158,400,000") of rod travel which translates into millions of cycles.

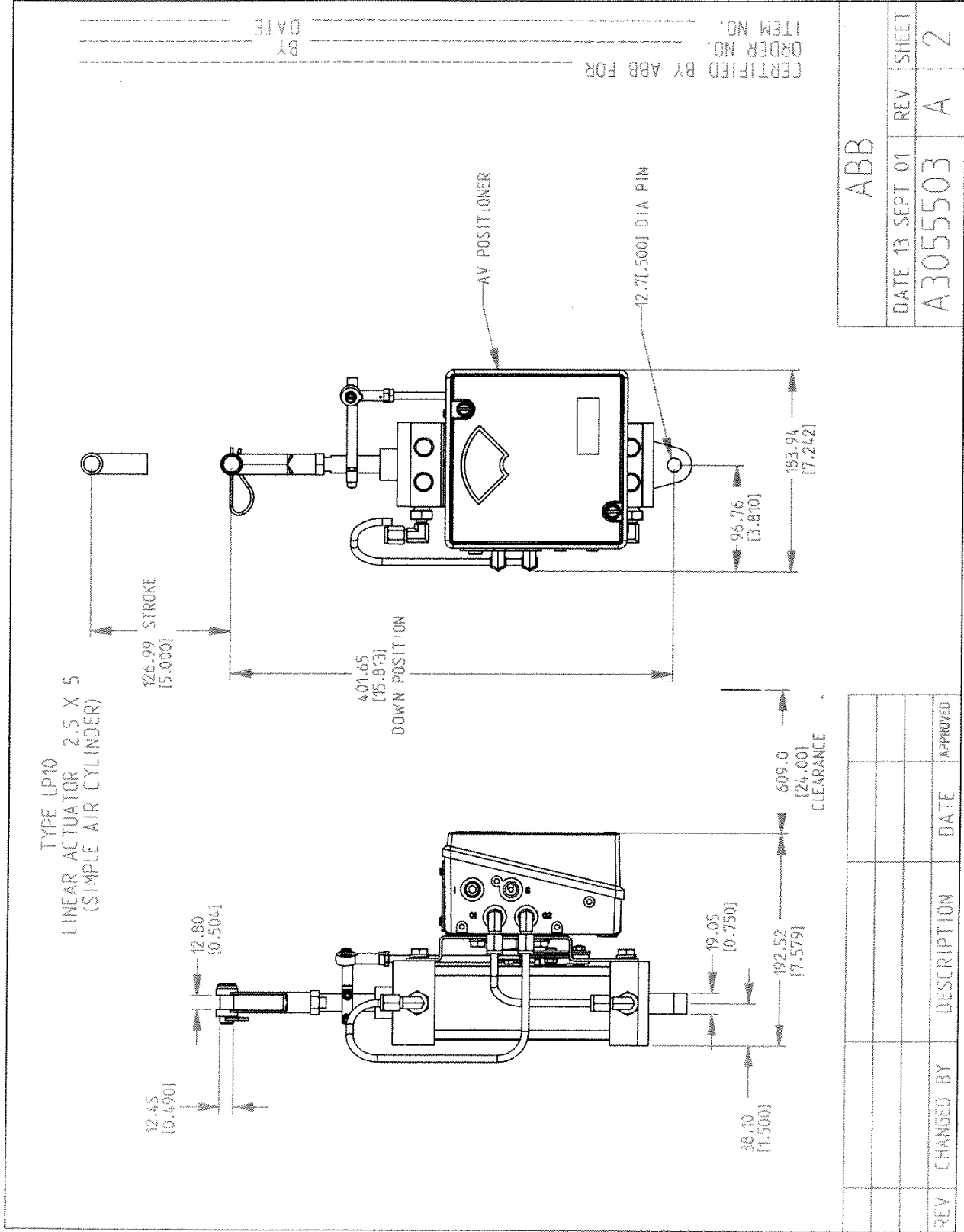
It is recommended to use the cylinder rod protective boot in dirty environments; this will extend the life expectancy of the rod and rod seal.

5.0 OUTLINE DIMENSION DRAWINGS

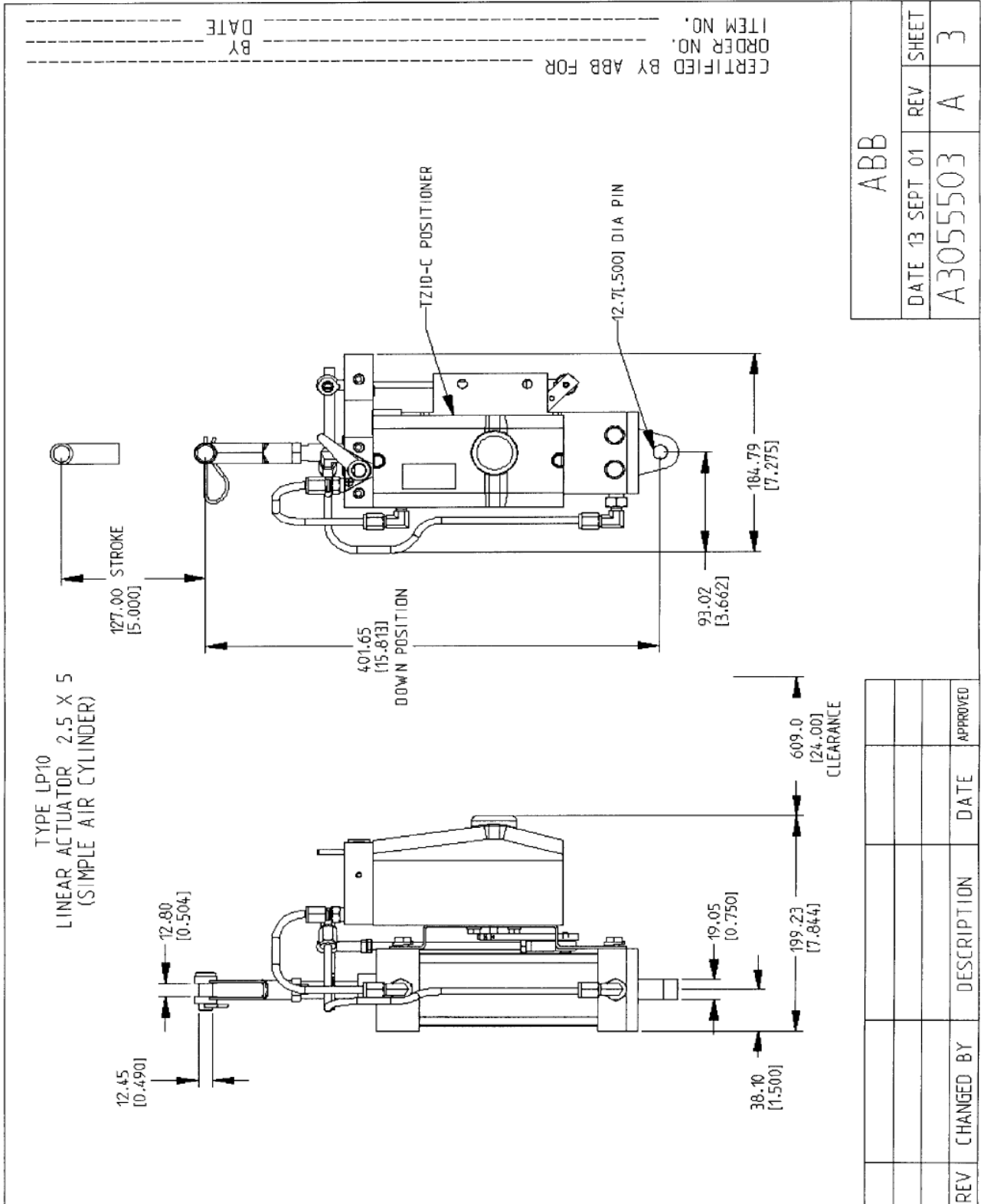
(Certified Drawings available on request).



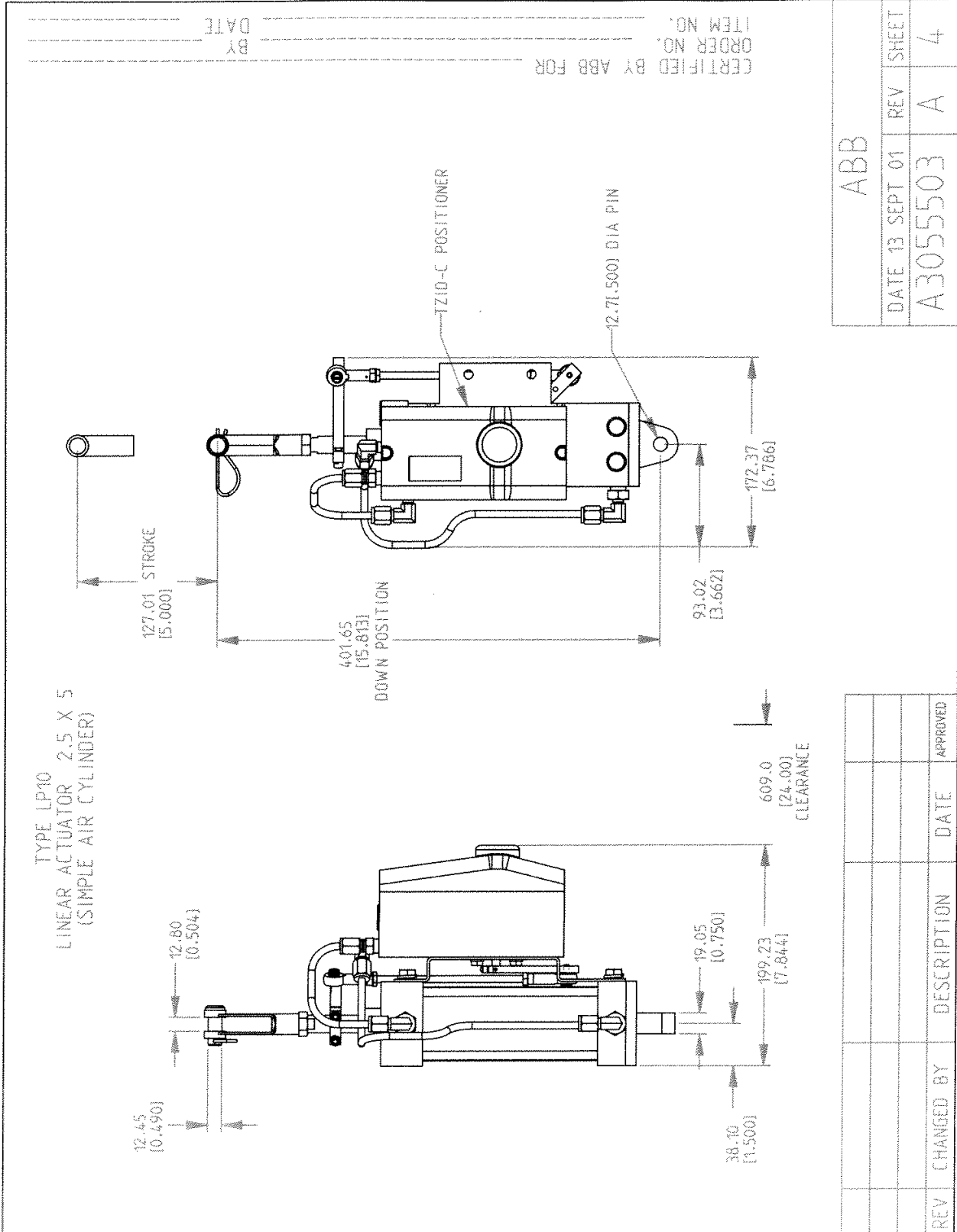
LP 10: 2.5 x 5 Linear Piston
Shown With AV Positioner and Manifold



LP 10: 2.5 x 5 Linear Piston
Shown With AV Positioner Without Manifold



LP 10: 2.5 x 5 Linear Piston
Shown with TZ10C Smart Positioner With Manifold



LP 10: 2.5 x 5 Linear Piston
Shown with TZIDC Smart Positioner Without Manifold

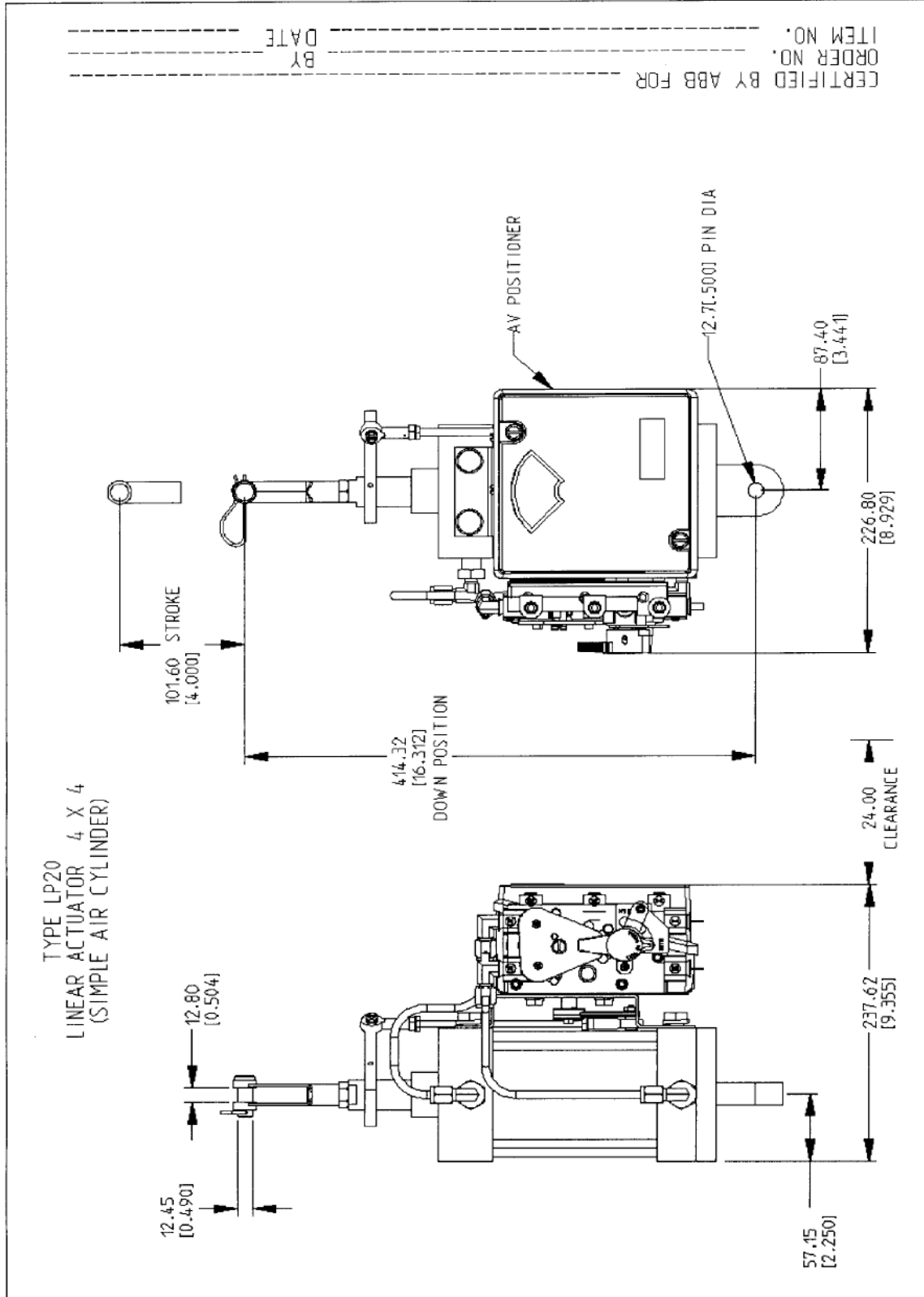
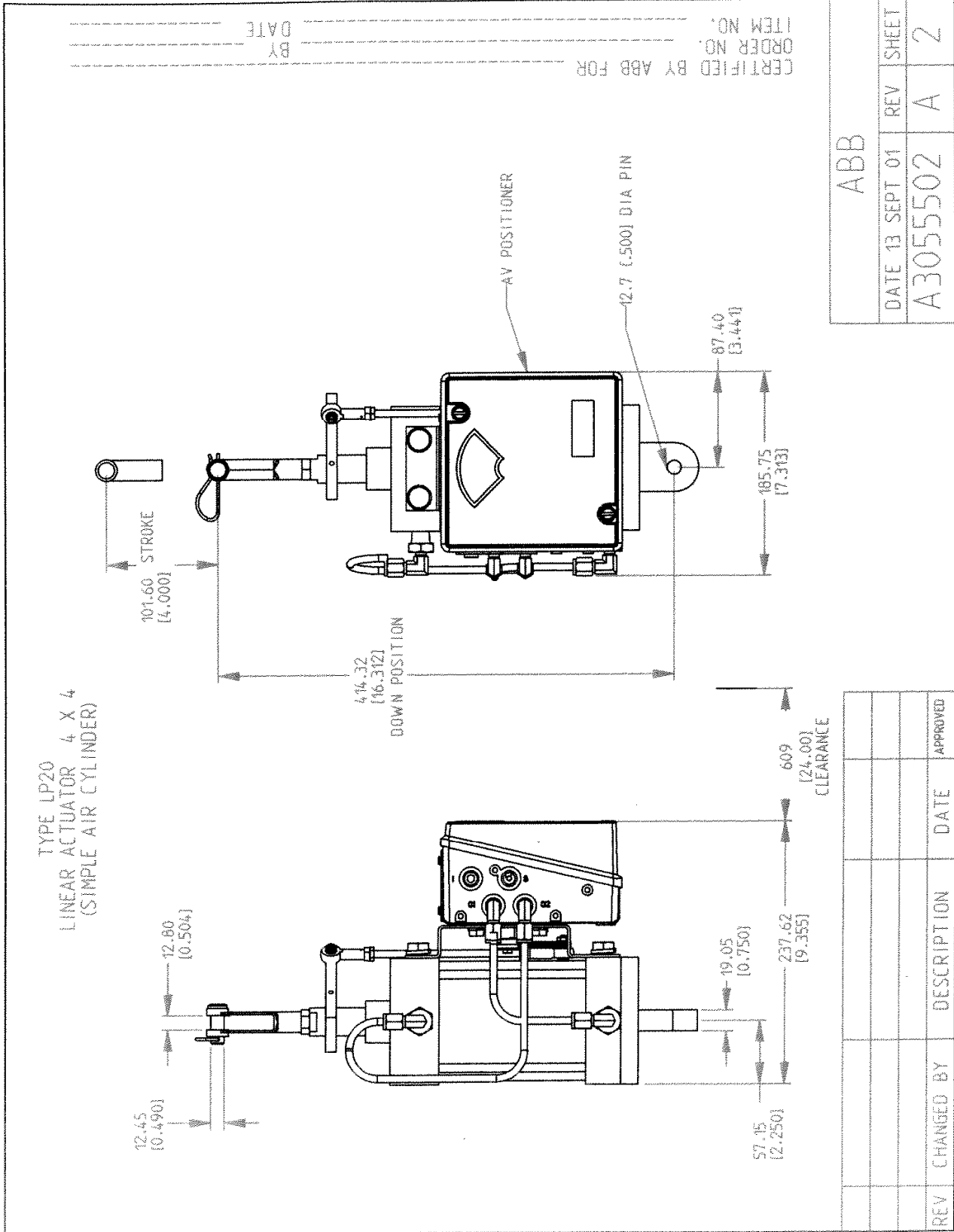


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REV	CHANGED BY	DESCRIPTION	DATE	APPROVED

LP 20 : 4 x 4 Linear Piston
Shown with AV Positioner and Manifold



LP 20 : 4 x 4 Linear Piston
Shown with AV Positioner Without Manifold

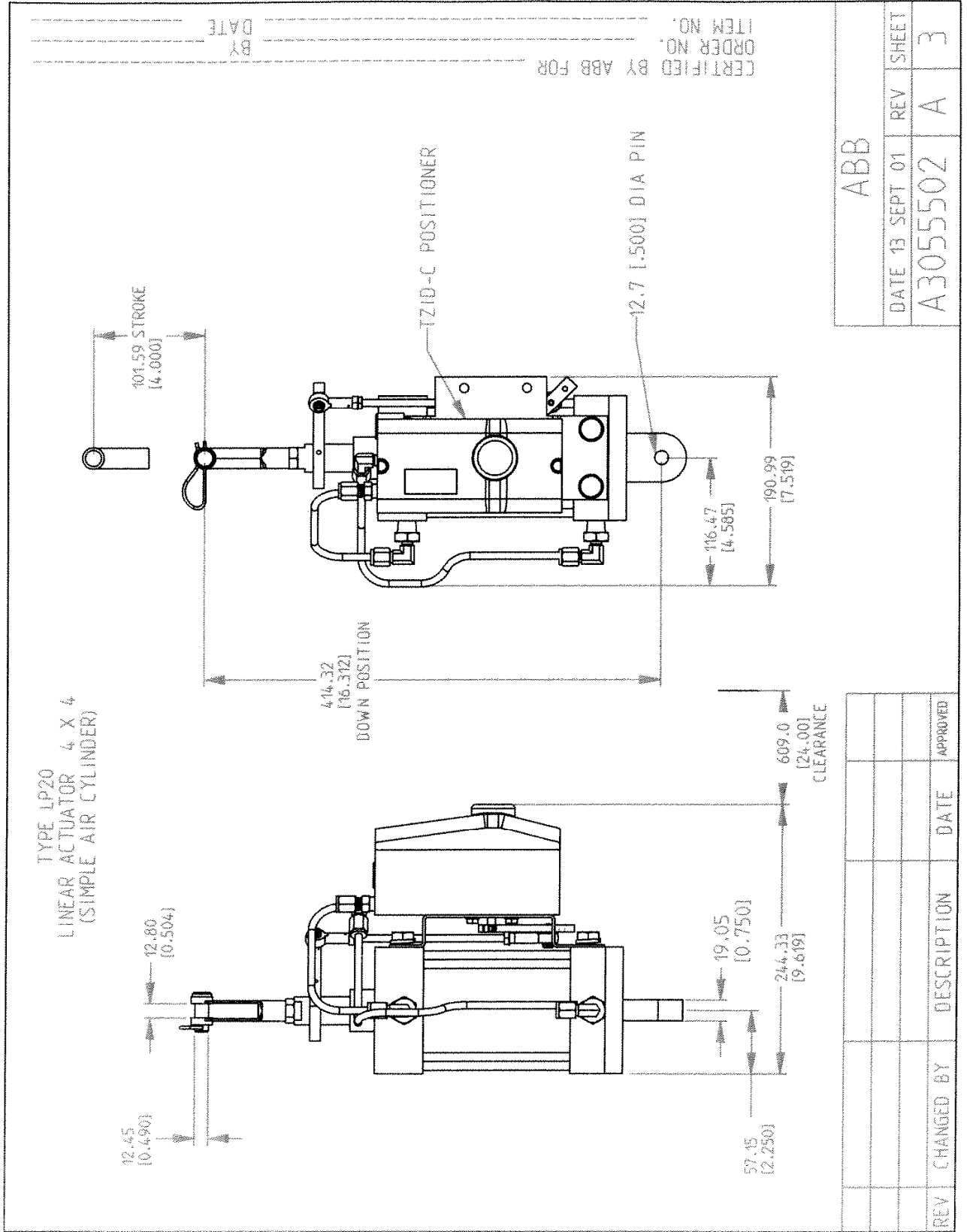
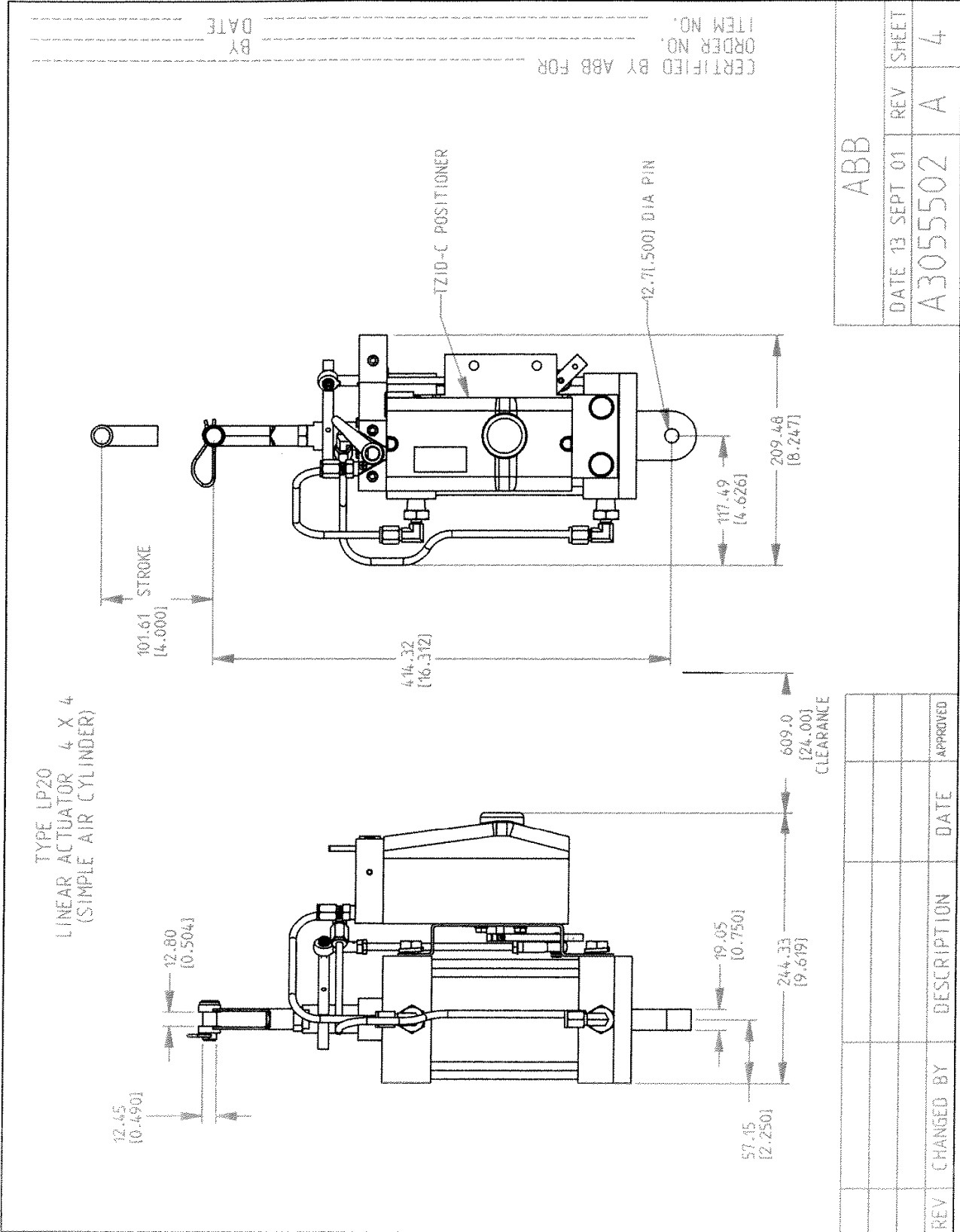


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LP 20 : 4 x 4 Linear Piston
Shown with TZIDC Positioner Without Manifold

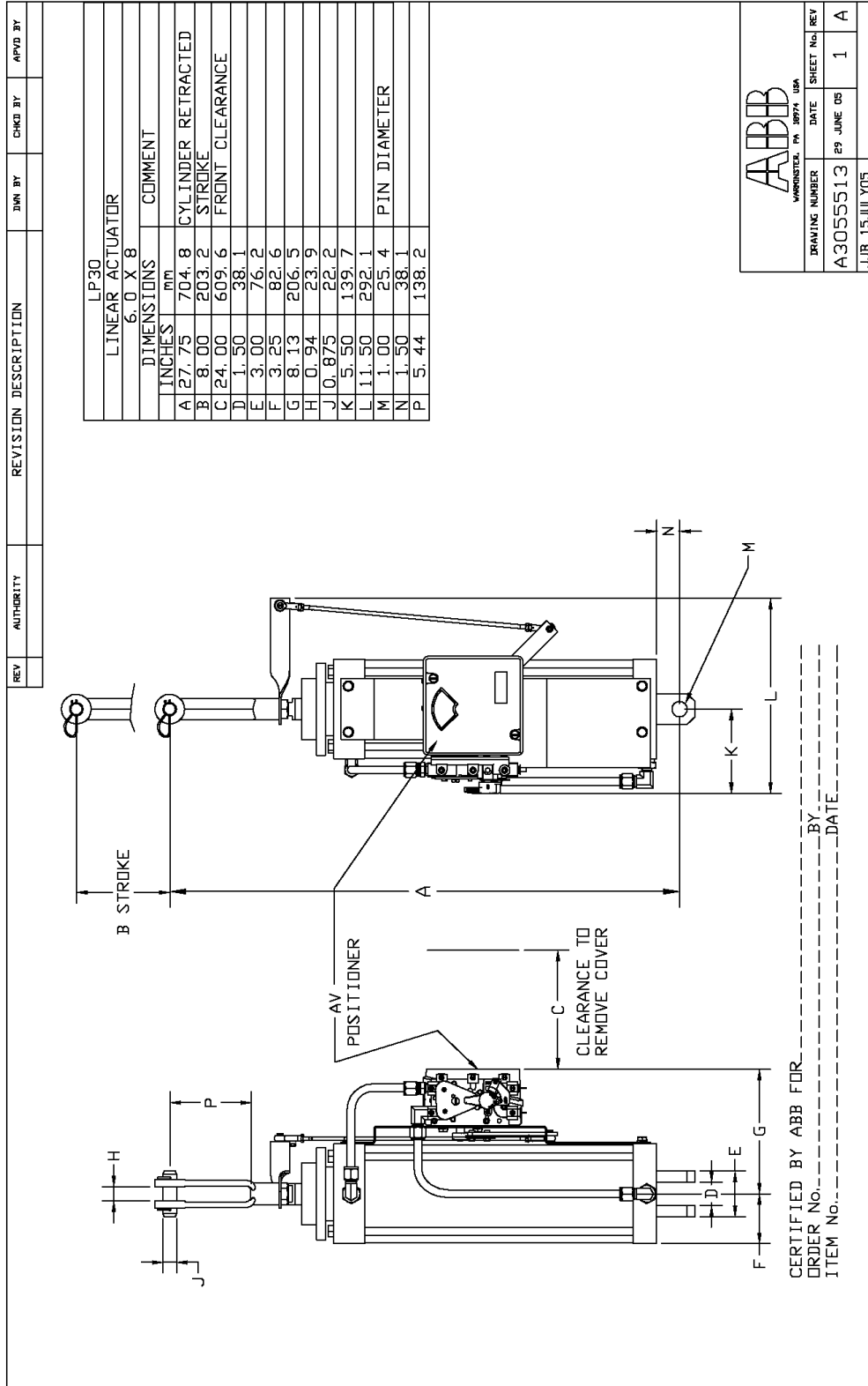


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ORDER NO. _____
ITEM NO. _____
BY _____
DATE _____

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LP 20 : 4 x 4 Linear Piston
Shown with TZIDC Positioner and Manifold



LP 30 : Linear Piston
Shown with AV Positioner and Manifold

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

CERTIFIED BY ABB FOR _____ BY _____

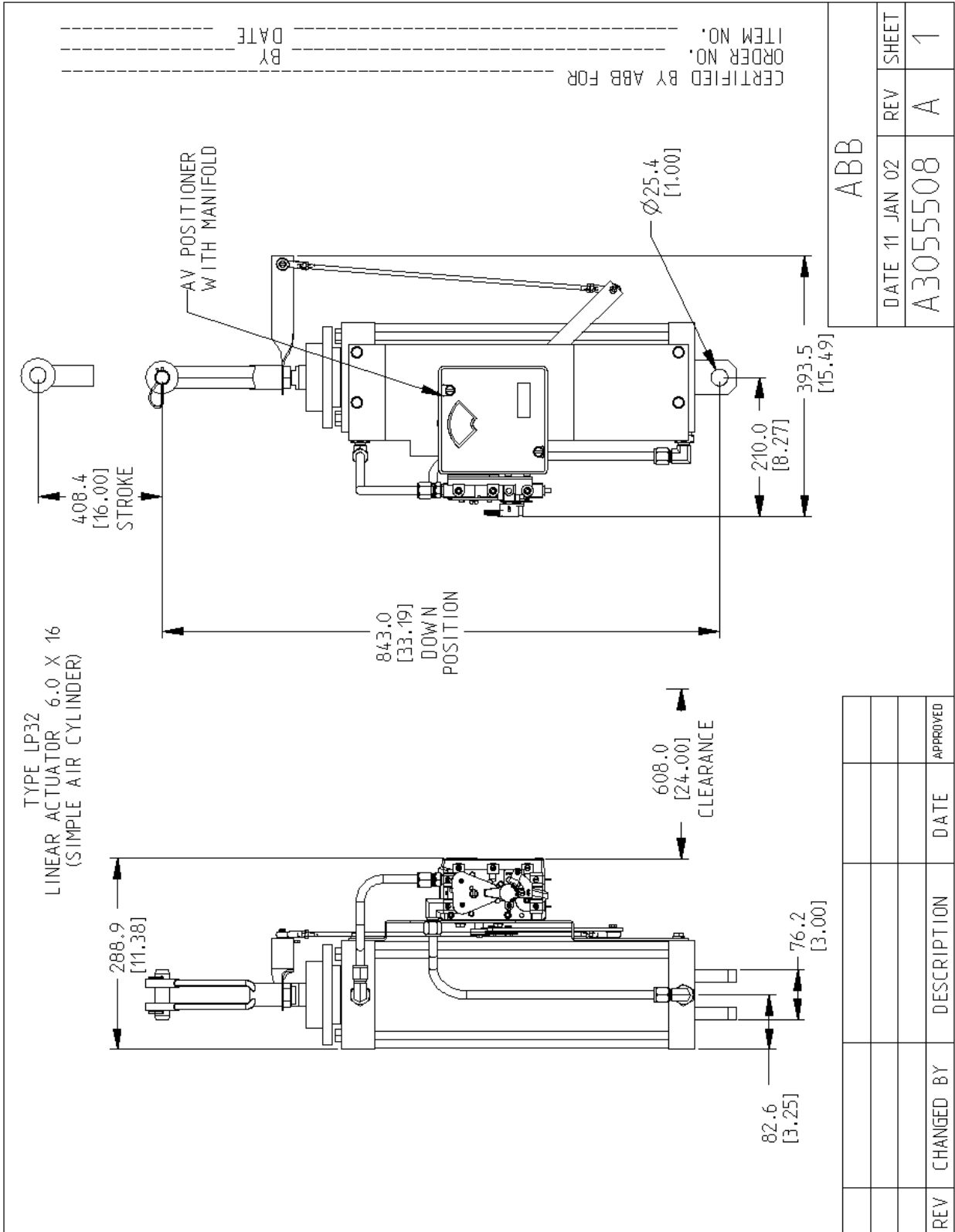
ORDER No. _____ DATE _____

ITEM No. _____

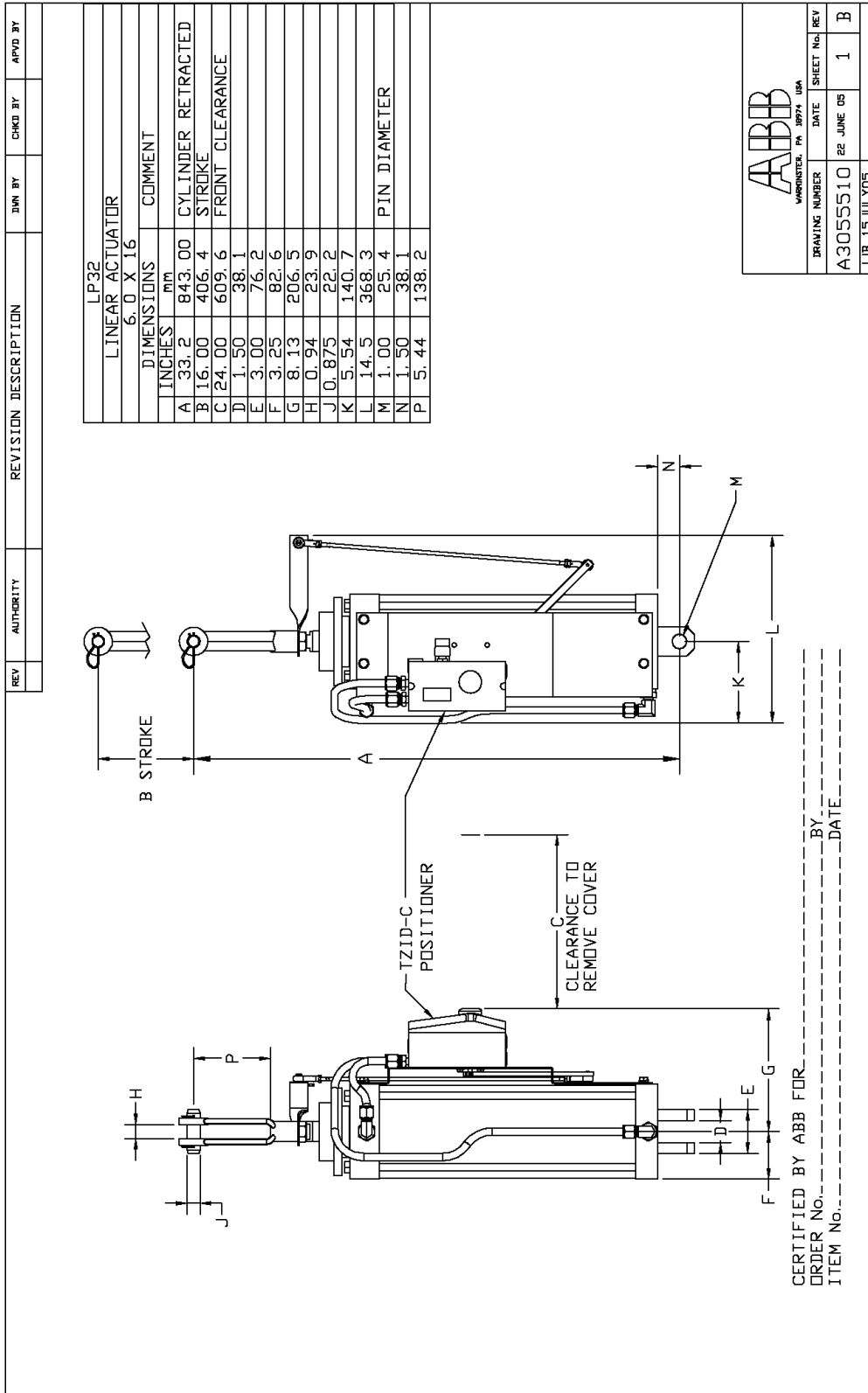
LP30 LINEAR ACTUATOR 6.0 X 8		
DIMENSIONS	COMMENT	
INCHES	mm	
A 27.75	704.8	CYLINDER RETRACTED
B 8.00	203.2	STROKE
C 24.00	609.6	FRONT CLEARANCE
D 1.50	38.1	
E 3.00	76.2	
F 3.25	82.6	
G 8.13	206.5	
H 0.94	23.9	
J 0.875	22.2	
K 5.50	139.7	
L 11.25	285.8	
M 1.00	25.4	PIN DIAMETER
N 1.50	38.1	
P 5.44	138.2	

ABB WARRENDALE, PA. 15074 USA	
DRAWING NUMBER A3055512	DATE 28 JUNE 05
SHEET No 1	REV A
JJB 15-JULY05	

LP 30 : Linear Piston
Shown with TZIDC Positioner Without Manifold



LP 32 : 6 x 16 Linear Piston
Shown with AV Positioner With Manifold



LP 32 : 6 x 16 Linear Piston
Shown with TZIDC Positioner Without Manifold

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP40 W/AV LINEAR ACTUATOR	
8.0 X 8	
DIMENSIONS	COMMENT
A	26.23 666.2 CYLINDER RETRACTED
B	8.00 203.2 STROKE
C	24.00 609.6 FRONT CLEARANCE
D	1.50 38.1
E	3.00 76.2
F	4.25 108.0
G	9.19 233.4
H	1.06 26.9
J	1.00 25.4
K	5.50 139.7
L	12.50 317.5
M	1.00 25.4 PIN DIAMETER
N	1.50 38.1
P	6.00 152.4

CERTIFIED BY ABB FOR
ORDER No. _____ BY _____
ITEM No. _____ DATE _____

ABB
MORGANTHAU, PA. 15074 USA

DRAWING NUMBER	DATE	SHEET No.	REV
A3055515	11 AUG 05	1	A
JJB 25 AUG 05			

LP 40 : Linear Piston
Shown with AV Positioner With Manifold

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP40 W/TZIDC LINEAR ACTUATOR 8.0 X 8		
DIMENSIONS	COMMENT	
INCHES	MM	
A 26.23	666.2	CYLINDER RETRACTED
B 8.00	203.2	STROKE
C 24.00	609.6	FRONT CLEARANCE
D 1.50	38.1	
E 3.00	76.2	
F 4.25	108.0	
G 9.50	241.3	
H 1.06	26.9	
J 1.00	25.4	
K 5.50	139.7	
L 12.50	317.5	
M 1.00	25.4	PIN DIAMETER
N 1.50	38.1	
P 6.00	152.4	

TZIDC POSITIONER

CLEARANCE TO REMOVE COVER

B STROKE

A

C

D

E

F

G

H

J

K

L

M

N

P

ABB VANHESTER, PA 18974 USA	
DRAWING NUMBER	DATE
A3055514	11 AUG 05
SHEET No.	REV
1	A
JOB 25 AUG 05	

CERTIFIED BY ABB FOR
ORDER No. _____ BY _____
ITEM No. _____ DATE _____

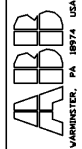
LP 40 : Linear Piston
Shown with TZIDC Positioner Without Manifold

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP50 W/AV LINEAR ACTUATOR 8.0 X 16		
DIMENSIONS	COMMENT	
INCHES	MM	
A 34.23	869.4	CYLINDER RETRACTED
B 16.00	406.4	STROKE
C 24.00	609.6	FRONT CLEARANCE
D 1.50	38.1	
E 3.00	76.2	
F 4.25	108.0	
G 9.50	241.3	
H 1.06	26.9	
J 1.00	25.4	
K 8.28	210.3	
L 17.03	432.6	
M 1.00	25.4	PIN DIAMETER
N 1.50	38.1	
P 6.00	152.4	

CERTIFIED BY ABB FOR _____
 ORDER No. _____
 ITEM No. _____
 BY _____
 DATE _____



DRAWING NUMBER	DATE	SHEET No.	REV
A3055517	11 AUG 05	1	A
JJB 25 AUG 05			

LP 50 : Linear Piston
Shown with AV Positioner With Manifold

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP50 W/TZID LINEAR ACTUATOR 8.0 X 16	
DIMENSIONS	COMMENT
INCHES	MM
A 34.23	869.4
B 16.00	406.4
C 24.00	609.6
D 1.50	38.1
E 3.00	76.2
F 4.25	108.0
G 9.38	238.3
H 1.06	26.9
J 1.00	25.4
K 5.54	140.7
L 14.5	368.3
M 1.00	25.4
N 1.50	38.1
P 6.00	152.4

CERTIFIED BY ABB FOR
ORDER No. _____ BY _____
ITEM No. _____ DATE _____

ABB
WARRINGTON, PA 15074 USA

DRAWING NUMBER	DATE	SHEET No.	REV
A3055516	11 AUG 05	1	A
JOB 25 AUG 05			

LP 50 : Linear Piston
Shown with TZIDC Positioner Without Manifold

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP60 W/AV LINEAR ACTUATOR 10.0 X 16		
DIMENSIONS	COMMENT	
INCHES	mm	
A 37.0	940	CYLINDER RETRACTED
B 16.00	406.4	STROKE
C 24.00	609.6	FRONT CLEARANCE
D 1.50	38.1	
E 3.00	76.2	
F 5.32	135.1	
G 10.16	258.1	
H 1.06	26.9	
J 1.00	25.4	
K 8.28	210.3	
L 17.28	438.9	
M 1.38	35.1	PIN DIAMETER
N 2.12	53.8	
P 6.00	152.4	

CERTIFIED BY ABB FOR
ORDER No. _____ BY _____
ITEM No. _____ DATE _____

LP 60 : Linear Piston
Shown with AV Positioner With Manifold

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

LP60 W/TZIDC LINEAR ACTUATOR 10.0 X 16		
DIMENSIONS	COMMENT	
INCHES	MM	
A 37.0	940	CYLINDER RETRACTED
B 16.00	406.4	STROKE
C 24.00	609.6	FRONT CLEARANCE
D 1.50	38.1	
E 3.00	76.2	
F 5.32	135.1	
G 8.13	206.5	
H 1.06	26.9	
J 1.00	25.4	
K 7.0	178	
L 16.0	406	
M 1.38	35.1	PIN DIAMETER
N 2.12	53.8	
P 6.00	152.4	

CERTIFIED BY ABB FOR _____ BY _____
 ORDER No. _____ DATE _____
 ITEM No. _____

ABB <small>WARMINSTER, PA 18974 USA</small>	
DRAWING NUMBER A3055518	DATE 11 AUG 05
SHEET No. 1	
REV A	
JOB 6 OCT 05	

LP 60 : Linear Piston
Shown with TZIDC Positioner Without Manifold

NOMENCLATURE	ITEM 2	ITEM 3	ITEM 15
LP100	5400405A1		
LP1000	5400405A2		
LP10000		AV1520000	
LP20000		AV1620000	
LP1000		AV1520000	
LP20000		AV1620000	
LP1000		AV1520000	
LP20000		AV1620000	
LP1000		AV1520000	
LP20000		AV1620000	

VIEW WITH MANIFOLD

20	2	NEWACT0008	PHIL PAN HD SCREW - 10-32
19	1	1923310 *	IMMEDIATE UNIVERSAL
18	2	NSESC1602	SEF. SEPS INT PAN HD SLIT -190-32
17	2	NLJLCO030	SPRNGS LW ASHER -190
16	3	NMBAC16000	FIN HEX NUT W/EXT TH KEPS C STL -190-32
15	3	SEE TABLE 540042948	PROTECTIVE ROOT
14	1	5130248226	CONNECTING LINKAGE
13	1	540040743	POSITIONER M16 PLATE
12	2	NBABA6014	HEX SKT CAP SCR -190-32
11	2	NLJLCT030	SPRNGS LW ASHER -312
10	2	NALJCT3012	HEX HD CAP SCR -312-18
9	4	NLJLCT3030	SPRNGS LW ASHER -375
8	4	NALJCT25018	HEX HD CAP SCR -375-16
7	1	540041041	LEVER EXT
6	4	4-4C112-B	ELBOW
5	1	540040843	DRIVE ARM LEVER (CYLINDER)
4	2	3/8X1/2-PTR-B	PIPE REDUCER 3/8 TO 1/2
3	1	SEE TABLE	AV POSITIONER
2	1	SEE TABLE	2.5 X 5 CYLINDER WITH BASE
1	2	R1021-0022	.250 OD TUBING

RUBBER STAMP DATE CODE PER 16615-1

PNEUMATIC TUBING DIAGRAM

REV.	CHANGE BY	DATE	DESCRIPTION
B	L.RICHMAN	9/10/01	A-0-D
			FP-DC-01-107

ABB

UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN MILLIMETERS
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN MILLIMETERS
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES

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PRO-ENGINEER, VER. 2000Z

REL. DOC. NO.	REL. DATE	REL. REV.

REL. DOC. NO.	REL. DATE	REL. REV.

REL. DOC. NO.	REL. DATE	REL. REV.

UNITS	SCALE	REV.	REV. SHEET NO.	REV. SHEET NO. OF SIZE
MM(10)	1:000	WE	5400410 B	2 F

UNITS	SCALE	REV.	REV. SHEET NO.	REV. SHEET NO. OF SIZE
MM(10)	1:000	WE	5400410 B	2 F

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

NOMENCLATURE	ITEM 2	ITEM 3	ITEM 20
LP20B	5400412A1		
LP20V	5400412A2		
LP	10000	AV6S20000	
LP	20000	AV6S20000	
LP	10000	AV6S20200	
LP	20000	AV6S20200	
LP	10000	AV6S21000	
LP	20000	AV6S21000	
LP	10000	AV6S21000	
LP	20000	AV6S21000	
			T. REED

VIEW OF
AV POSITIONER
WITH MAINFOLD

NOTES :
ITEM 15: COMPLETE P/VN VARIATION DETERMINED BY ORIGIN
OF MANUFACTURING. MARKING PER 619-13

PNEUMATIC TUBING DIAGRAM

ITEM	REV'D.	PART NO.	DESCRIPTION
19	2	123174-PTR-B	PROTECTIVE BOOT
17	1	NT-LAC10030	PIPE REDUCER 1/2 TO 1/4
16	1	NHAC10000	SPRING W/ASHER -90
15	1	196388 *	FIN HEX NUT W/EXT TH REPS C STL -190-32
14	1	531249A26	NAMEPLATE UNIVERSAL
13	1	500413A1	CONNECTING LINKAGE
12	2	NHSA16004	POSITIONER MTE PLATE
11	2	NT-LAC12030	SCR. SEHS INT PAN HD SLOT -190-32
10	2	NHAC12030	SPRING W/ASHER -312
9	4	NT-LAC15030	HEX HD CAP SCR -312-R
8	4	NHAC15030	SPRING W/ASHER -5
7	1	NHAC16018	HEX HD CAP SCR -500-13
6	4	4-CR12-R	ELBOW
5	1	500416A1	LINKAGE BRACKET
3	1	SEE TABLE	AV POSITIONER
2	1	SEE TABLE	AIR CYLINDER 4X4
1	2	R1021-0222	-250 OD TUBING

ABB

UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN MILLIMETERS
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES
 UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS ARE IN INCHES

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PRO-ENGINEER, VER. 20002

REL. DOC. NO.	REL. FILE	ISSUE NO.	ISSUE DATE
-	5400414	1	1991/05/20
-	5400414	2	1991/05/20

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
D	L. RICHMAN	90DEC01		
C	L. RICHMAN	FP-DC-01-10Z		
B	L. RICHMAN	FP-DC-01-10Z		

LP LINEAR PISTON ACTUATORS INSTRUCTION MANUAL

NOTES :

△ ITEM & COMPLETE P/N VARIATION DETERMINED BY ORIGIN OF MANUFACTURING. MARKING PER 6.15-19

ITEM 21	ITEM 22	ITEM 12	ITEM 22
LP320-.....	540042241		
LP320-.....	540042242		
LP...A1000			
LP...B1000			
LP...A1100			
LP...B1100			
LP...A...10			
LP...B...10			
LP...A...1			
LP...B...1			

ITEM	REF. NO.	DESCRIPTION
26	2000 DA06051 20	HEX HEAD CAP SCREW, ZINC PLATED, M6 X 12, DINM 6.8
27	2000S2A0850A1 016	FLAT WASHER, M6
28	2000S2A050A1 012	LOCKWASHER, HELICAL SPRING, M6
29	2000R09A050S3000	SOCKET HEAD CAP SCREW, M6X30, STAINL.S STL
30	2000S2A0850A1 016	LOCKWASHER, HELICAL SPRING, M6
31	2000S2A0850A1 016	SOCKET HEAD CAP SCREW, M6X30, STAINL.S STL
32	540042241	BOOT
33	540042241	MANIFOLD ASSY
34	19119000	WASHER, 100 INT TOOTH L.
35	19119000	WASHER, 100 INT TOOTH L.
36	19119000	WASHER, 100 INT TOOTH L.
37	19119000	WASHER, 100 INT TOOTH L.
38	19119000	WASHER, 100 INT TOOTH L.
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ABB

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS (INCHES). DIMENSIONS IN PARENTHESES ARE IN INCHES (MILLIMETERS). DIMENSIONS IN PARENTHESES ARE NOT TO BE USED FOR FABRICATION.

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DATE: 01 OCT 01

SCALE: 1:1

UNIT: MM (IN)

MODEL FILE: 5400421

ISSUE: 01

PRO-ENGINEER, VER. 2000Z

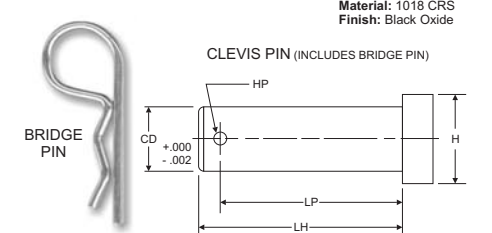
REV.	CHANGE BY	DESCRIPTION	DATE	APPROVED
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2				
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ITEM	REF. NO.	DESCRIPTION
1	SEE TABLE	E X 16 CYLINDER
2	SEE TABLE	E X 16 CYLINDER
3	195140241	1/4 NPT TO 500.00 TUBE BRASS ELBOW
4	195140241	1/4 NPT TO 500.00 TUBE BRASS ELBOW
5	5312449A29	CONNECTING LINKAGE
6	540042241	DRIVE ARM LINKAGE (POSITIONER)
7	1983318 *	MANIFOLD UNIVERSAL
8	1983318 *	MANIFOLD UNIVERSAL
9	195156248	500.00 X .082 WALL NYLON TUBING
10	195156248	500.00 X .082 WALL NYLON TUBING
11	540042241	POSITIONER MIG PLATE
12	540042241	POSITIONER MIG PLATE
13	3/4X1/4-PTR-B	P PIPE REDUCER 3/4 TO 1/4
14	19119000	E IN HEX NUT W/EXT TH KEPS C STL 180-33
15	19119000	E IN HEX NUT W/EXT TH KEPS C STL 180-33
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100	19119000	E IN HEX NUT W/EXT TH KEPS C STL 180-33

7.0 ACCESSORIES: CLEVIS, PINS & MOUNTS

ALL DIMENSIONS ARE SHOWN IN INCHES

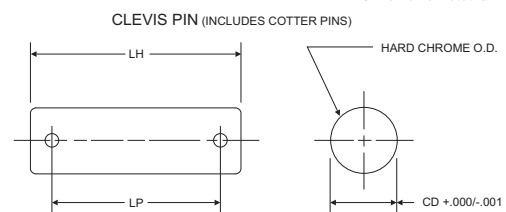
CLEVIS PIN (WITH BRIDGE PIN – STANDARD)					
PART NO.	CD	H	HP	LH	LP
398B203U03 (for LP10-LP20)	.50	.63	.16	2.25	2.09
398B203U02 (for LP30-LP50)	1.0	1.19	.20	3.50	3.31



Material: 1018 CRS
Finish: Black Oxide

CLEVIS PIN (INCLUDES BRIDGE PIN)

CLEVIS PIN (WITH COTTER PINS)			
PART NO.	CD	LH	LP
398B203U04 (for LP60)	1.38	5.0	4.25

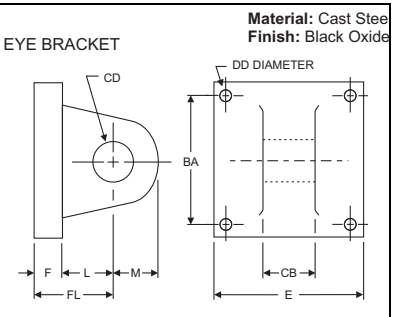


Material: 1045 CRS
Finish: Chrome Plated O.D.

CLEVIS PIN (INCLUDES COTTER PINS)

HARD CHROME O.D.

EYE BRACKET									
PART NO.	BA	CB	CD	DD	E	F	FL	L	M
353E435U02 (for LP30-LP50)	3.25	1.5	1.0	.66	4.5	.75	2.25	1.5	1.0
353E435U01 (for LP60)	3.81	2.0	1.38	.66	5.0	.88	3.0	2.13	1.38

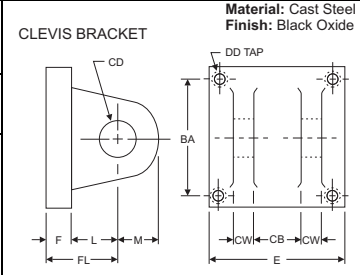


Material: Cast Steel
Finish: Black Oxide

EYE BRACKET

(Clevis Pins sold separately from Eye Brackets)

CLEVIS BRACKET										
PART NO.	BA	CB	CD	CW	DD	E	F	FL	L	M
353E435U04 (for LP10 & LP20)	1.63	.75	.50	.50	.38-24	2.5	.38	1.13	.75	.50



Material: Cast Steel
Finish: Black Oxide

CLEVIS BRACKET

(Clevis Pins sold separately from Clevis Brackets)

NOTES:

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