

NFPA Cylinders

Type DNA



FESTO

Info 115 US

Slim Modern NFPA Cylinders

Long service life is a required feature in today's and tomorrow's industrial environment. A cylinder made for demanding applications does not need to be bulky and heavy. Current technology and Festo's renowned experience in the field of pneumatic actuator design has resulted in the development of a versatile, economical and tough cylinder for applications in many industries.

Festo took the challenge; we designed and built a cylinder based on these requirements. The result is the DNA cylinder which exceeds our own benchmark specifications, and is compatible with the NFPA Standard. DNA cylinders are rugged, state-of-the-art actuators for OEMs and end users. Install DNA cylinders in your machine or process operation and downtime is a thing of the past!

- Extruded aluminum barrel for light weight. Integrated sensor grooves achieves a space-saving design.
- Popular and universal proximity sensors, also used for a wide variety of Festo cylinder types – reduces inventory and spare parts.
- Roller burnished piston rods and threads for superior service life.
- Made to order – fast delivery
- Built-in adjustable cushioning screws (optional) and port connections (same face) on both end caps – more convenient accessibility.
- Wide variety of mountings are factory assembled or supplied separately – no need to stock all cylinder variations.
- Innovative mounting attachment system simplifies configuration of desired mounting styles – saves disassembly time whenever changes are made.

NFPA Standards

DNA series square head cylinders meet the mounting, rod, bore and thread dimension specifications as described in the following NFPA documents:

ANSI/B93.8-1968[R1992]/NFPA T3.6.4-1967

- Bore and rod size combinations and rod end configurations for cataloged square head industrial fluid power cylinders.

ANSI/[NFPA] T3.6.7R2-1996

- Mounting dimensions, fluid power systems and products, square head industrial cylinder.

ANSI/B93.29M-1986/NFPA T3.6.8M R1-1984

- Accessory dimensions for cataloged square head industrial types, fluid power systems, cylinders.

NFPA T3.6.17-1971[1990]

- Port nominal pipe sizes for merged inch and metric series cataloged square head industrial pneumatic fluid power cylinders.

Festo...Your Automation Partner Worldwide

As a global leader in industrial automation components and systems, with over \$1.8 billion sales worldwide, Festo has the resources and application experience to be your long term partner for cost-effective automation solutions.

- 56 independent subsidiaries worldwide
- Representation in 180 countries
- Worldwide networking for consistent standards of products, consultancy, sales and services.
- Worldwide support provided by over 11,000 team members

Festo Quality Assurance, ISO 9001 Certification

Festo Corporation is committed to provide Festo products and services that will meet or exceed our customers' requirements in product quality, delivery, customer service and satisfaction.



All Festo locations within the United States are registered to ISO 9001.

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NFPA Cylinders, Type DNA

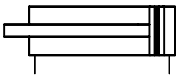
Double-acting

FESTO

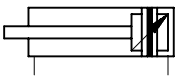


Key Features

DNA-...-P-A



DNA-...-PPV-A



Square Head Industrial Cylinders

- **Bore Sizes:** 1½" ... 5"
- **Stroke Lengths:** ½" ... 80"

Two Basic Models

- Double-acting standard cylinder for non-contact end-position sensing (A) with flexible end position cushioning (P)
Example: DNA-...-P-A

- Double-acting standard cylinder for non-contact end-position sensing (A) with adjustable end-position cushioning (PPV)
Example: DNA-...-PPV-A

- Standard cylinders are NFPA interchangeable.
- DNA NFPA cylinders can be ordered as a product module assembled with selected accessories (see pages 8-9).
- DNA NFPA cylinders can also be ordered as standard cylinders without variants, just specify stroke length (see pages 12-13).
- Of course, A broad range of accessories are available.

NFPA Cylinders, Type DNA

Double-acting

Cylinder Variations (See pages 10-11 for details)

S1: Reinforced piston rod



K3: Piston rod with female thread (NFPA style SF; short female)



S2: Double-ended piston rod



K5: Piston rod with special thread (NFPA style IM; intermediate male)



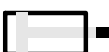
K0: Piston rod without thread (NFPA style PL; plain)



K8: Extended piston rod



K2: Piston rod with extended male thread



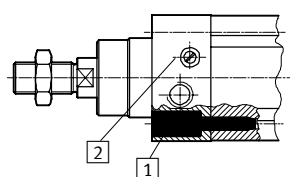
S6: Heat-resistant seals, max. 302° F



Note: Standard cylinder comes with small male thread (NFPA style SM; short male)

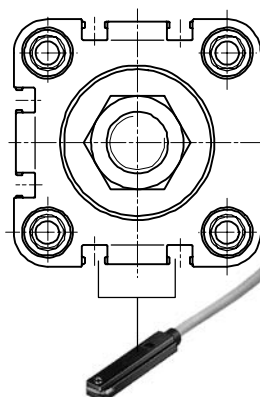
Key Features

- Allen screws with internal threads for mounting NFPA accessories **1**
- No protruding sensors - low profile sensors mount flush in grooves



- Additional cushioning rings on the piston and adjustable air cushioning **2** is available for absorbing the residual energy from high speeds and machine cycles

- Internal mounting SME/SMT-8 cylinder sensor (no brackets or hardware required)
- Slot covers protect sensor cables and form smooth surface

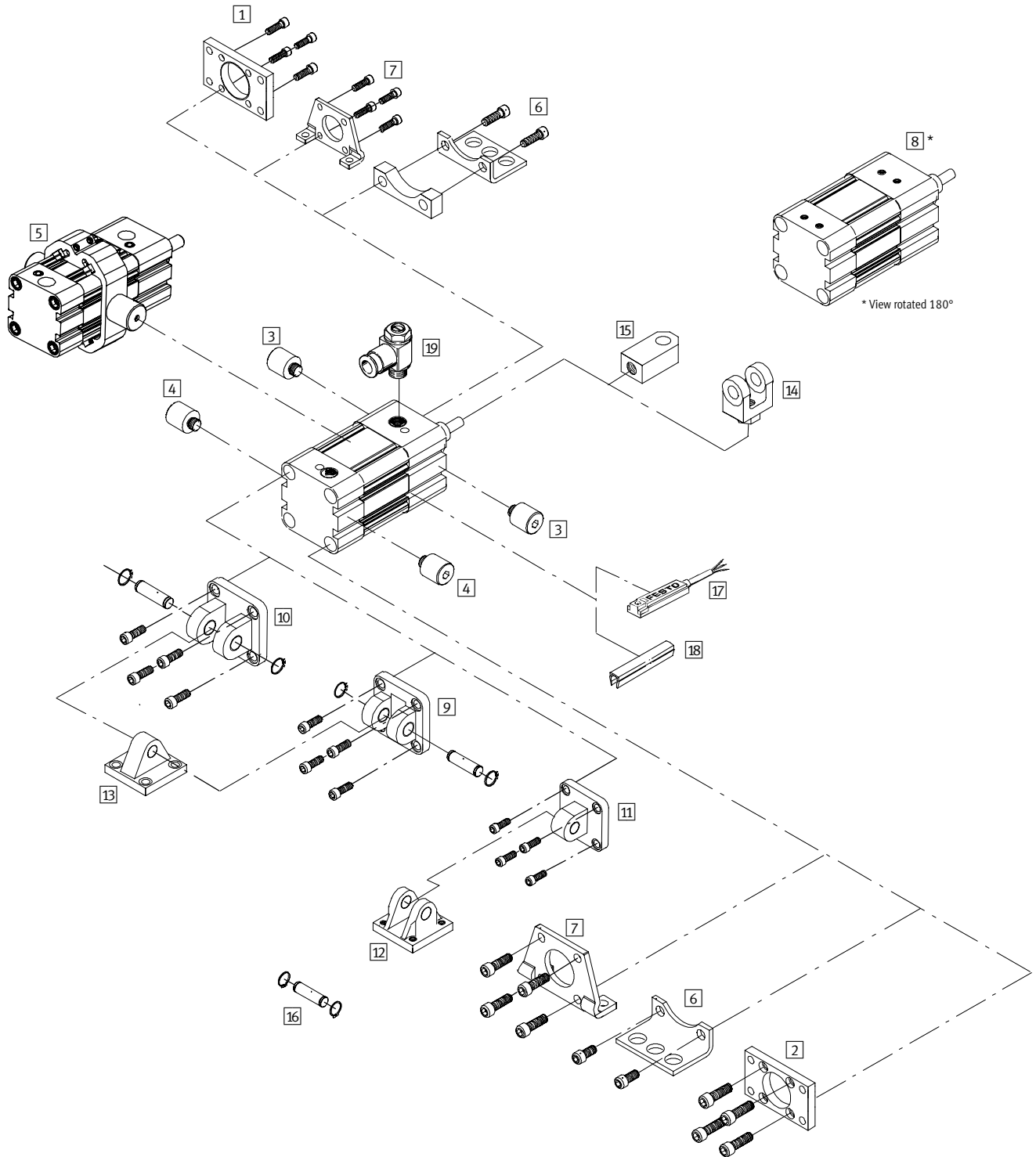


NFPA Cylinders, Type DNA

Double-acting

Overview

Mounting Attachments and Accessories



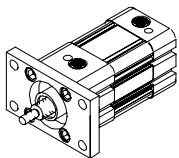
NFPA Cylinders, Type DNA

Double-acting

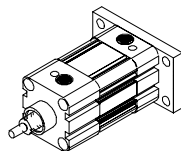
Overview

Mounting Attachments and Accessories

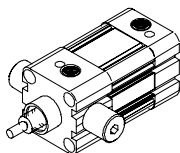
1 Head Rectangular Flange, MF1-...



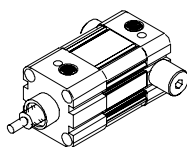
2 Cap Rectangular Flange, MF2-...



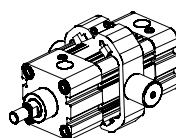
3 Head Trunnion Mounting, MT1-...



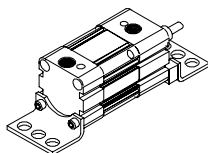
4 Cap Trunnion Mounting, MT2-...



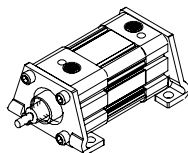
5 Mid Trunnion Mounting, MT4-... (patent pending)



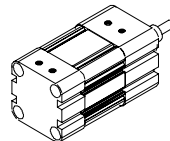
6 Side End Angle Mount, MS1-...



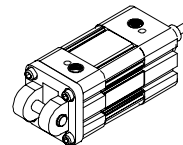
7 Side Lug Mount, MS2-...



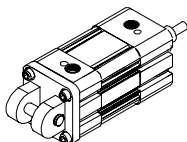
8 Side Tap Mount, MS4-...



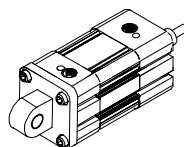
9 Cap Fixed Clevis, MP1-...



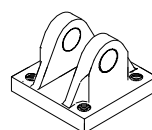
10 Cap Detachable Clevis, MP2-...



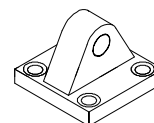
11 Cap Detachable Eye, MP4-...



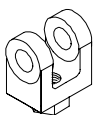
12 Clevis Bracket, LNA-...



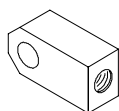
13 Eye Bracket, LNB-...



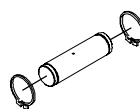
14 Female Clevis, SSA-...



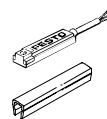
15 Female Eye, SSB-...



16 Pivot Pin, BO-...



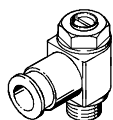
17 Integrable Cylinder Sensor, SME/SMT-8-...



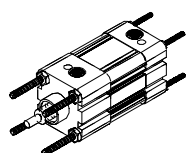
18 Slot Cover for Sensor Slot (19.5" long) ABP-5-S



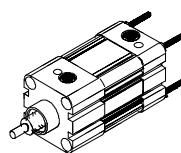
19 Flow Control, GRLA-...



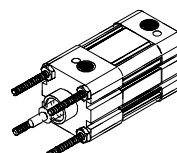
Both Ends Tie Rods Extended Mounting, MX1-...



Cap Tie Rods Extended Mounting, MX2-...



Head Tie Rods Extended Mounting, MX3-...



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Double-acting

Ordering Example

The procedure for constructing the correct order code consists of 2 steps.

Step 1
Determining if a permissible cylinder variation combination is available:

The desired cylinder variations in this example are S2, K3, K8, S6, and MF1. Arrange these variations in sequence as they appear from top to bottom in the “Desired Cylinder Variation” column from the table on the right.

Once you have determined that all of the desired cylinder variations are available in combination, choose the mounting style. Furthermore, make sure the required bore and stroke are also possible, then proceed to step 2.

Step 2

Create an order code:
 Use the example below and the “Order Code Table” as your guide. When you have chosen your desired configuration, transfer the code to the bottom of page 9. This is your order code.

Part No. 193384 DNA - 2 - 10 - PPV-A - S2 - K3 - 6K8 - S6 - MF1

Type	
DNA	Standard cylinder

Bore Size [Inch]	
2	2"

Stroke Length [Inch]	
10	10"

End Position Cushioning/Magnet For Position Sensing	
P-A	Position cushioning with magnet
PPV-A	Adjustable end-position cushioning with magnet

Variations	
S1	Reinforced piston rod
S2	Double-ended piston rod
K0	Piston rod without thread
...K2	Piston rod with extended male thread (example, 1.5" = 1.5K2)
...K3	Piston rod with female thread
...K5	Piston rod with special thread (example, 1" = 1K5)
...K8	Extended piston rod (example, 6" = 6K8)
S6	Heat-resistant seals

Mounting Style	
MF1	Head rectangular flange
MF2	Cap rectangular flange
MT1	Head trunnion mount
MT2	Cap trunnion mount
MT4	Mid trunnion mount (patent pending)
MS1	Side end angle mount
MS2	Side lug mount
MS4	Side tap mount
MP1	Cap fixed clevis
MP2	Cap detachable clevis
MP4	Cap detachable eye
MX1	Both ends tie rods extended mounting
MX2	Cap tie rods extended mounting
MX3	Head tie rods extended mounting

NFPA Cylinders, Type DNA

Double-acting

Cylinder Variations - The DNA cylinder modular system permits the following variants; these can be combined with each other with some exceptions (→ See Page 9).

S1: Reinforced Piston Rod



Larger diameter piston rod, see page 21.

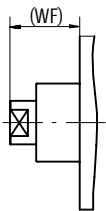
S2: Double Ended Piston Rod



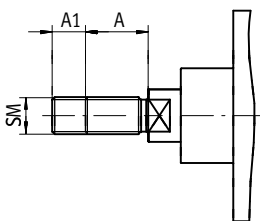
Order Code: ...-S2-...

Note: The thread design on both pistonrod ends are identical.

K0: Piston Rod Without Thread



K2: Piston Rod with Extended Male Thread

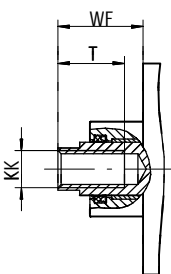


Order Code: ...-xxK2-...

Example: xx = 2¼ inches → ...-2.25K2-...

Bore Ø [inch]	A	A1 max.	Standard Thread [SM]
1½"	0.750"	1.375"	7/16-20 UNF-2B
1½"-S1	1.125"		¾-16 UNF-2B
2"	0.750"	2.250"	7/16-20 UNF-2B
2"-S1	1.125"		¾-16 UNF-2B
2½"	0.750"		7/16-20 UNF-2B
2½"-S1	1.125"		¾-16 UNF-2B
3¼"	1.125"		¾-16 UNF-2B
3¼"-S1	1.625"		1-14 UNF-2B
4"	1.125"		¾-16 UNF-2B
4"-S1	1.625"		1-14 UNF-2B
5"	1.125"	¾-16 UNF-2B	
5"-S1	1.625"	1-14 UNF-2B	

K3: Piston Rod with Female Thread



Order Code: ...-K3-...

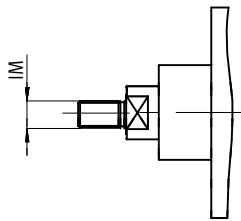
Bore Ø [inch]	T	WF	Standard Thread [KK]
1½"	0.79"	1.000"	7/16-20 UNF-2B
1½"-S1	1.18"	1.375"	¾-16 UNF-2B
2"	0.79"	1.000"	7/16-20 UNF-2B
2"-S1	1.18"	1.375"	¾-16 UNF-2B
2½"	0.79"	1.000"	7/16-20 UNF-2B
2½"-S1	1.18"	1.375"	¾-16 UNF-2B
3¼"	1.18"	1.375"	¾-16 UNF-2B
3¼"-S1	1.67"	1.675"	1-14 UNF-2B
4"	1.18"	1.375"	¾-16 UNF-2B
4"-S1	1.67"	1.675"	1-14 UNF-2B
5"	1.18"	1.375"	¾-16 UNF-2B
5"-S1	1.67"	1.675"	1-14 UNF-2B

NFPA Cylinders, Type DNA

Double-acting

Cylinder Variations - The DNA cylinder modular system permits the following variants; these can be combined with each other with some exceptions (➔ See Page 9).

K5: Special Thread On Piston Rod



Order Code: ...-...K5-...

Example: ... = 1/2-20-UNF-2A ➔ ...-K5-...

Bore ∅ [inch]	Piston rod ∅ [inch] Nominal (Actual)	Standard thread	Special thread
		[SM]	[IM]
1½"	5/8" (0.630")	7/16-20 UNF-2A	1/2-20-UNF-2A
1½"-S1	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
2"	5/8" (0.630")	7/16-20 UNF-2A	1/2-20-UNF-2A
2"-S1	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
2½"	5/8" (0.630")	7/16-20 UNF-2A	1/2-20-UNF-2A
2½"-S1	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
3¼"	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
3¼"-S1	1¼" (1.260"*)	1-14 UNF-2A	1¼-20-UNF-2A
4"	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
4"-S1	1¼" (1.260"*)	1-14 UNF-2A	1¼-20-UNF-2A
5"	1" (0.984")	3/4-16 UNF-2A	7/8-14 UNF-2A
5"-S1	1¼" (1.260"*)	1-14 UNF-2A	1¼-20-UNF-2A

* Deviates from NFPA dimension [NFPA = 1.375"]

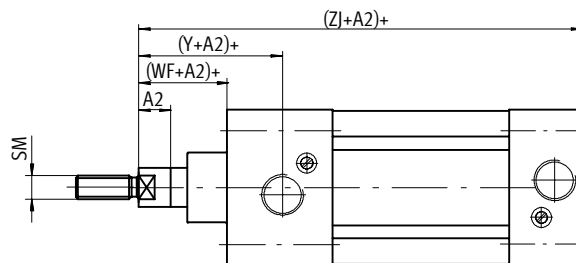
K8: Extended Piston Rod

Order Code: ...-xxK8-...

Example: xx = 6 inch ➔ ...-6K8-...

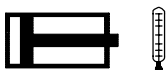
Note:

If variant K8 is required in combination with S2, the piston rod extension will occur only on one side.



Bore ∅ [inch]	A2		WF	Y	Z	Standard Thread [SM]
	max.	max.				
1½"	0.04"	20"	1.000"	1.878"	4.625"	7/16-20 UNF-2A
1½"-S1	0.04"	20"	1.375"	2.252"	5.000"	3/4-16 UNF-2A
2"	0.04"	20"	1.000"	1.882"	4.625"	7/16-20 UNF-2A
2"-S1	0.04"	20"	1.375"	2.252"	5.000"	3/4-16 UNF-2A
2½"	0.04"	20"	1.000"	1.953"	4.750"	7/16-20 UNF-2A
2½"-S1	0.04"	20"	1.375"	2.307"	5.125"	3/4-16 UNF-2A
3¼"	0.04"	20"	1.375"	2.441"	5.625"	3/4-16 UNF-2A
3¼"-S1	0.04"	20"	1.625"	2.697"	5.875"	1-14 UNF-2A
4"	0.04"	20"	1.375"	2.441"	5.625"	3/4-16 UNF-2A
4"-S1	0.04"	20"	1.625"	2.697"	5.875"	1-14 UNF-2A
5"	0.04"	20"	1.375"	2.441"	5.875"	3/4-16 UNF-2A
5"-S1	0.04"	20"	1.625"	2.693"	6.125"	1-14 UNF-2A

S6: Heat-Resistant Seals [302 °F]



Order Code: ...-S6-...

Material: Seals are made of FKM (Viton)

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Ordering Data

Standard Cylinders

	Stroke [inch]	Bore Size 1½"		Bore Size 2"		Bore Size 2½"	
		Part No.	Type	Part No.	Type	Part No.	Type
X-stroke length	...	193383	DNA-1½-...-P-A	193384	DNA-2-...-P-A	193385	DNA-2½-...-P-A
X-stroke length	...	193383	DNA-1½-...-PPV-A	193384	DNA-2-...-PPV-A	193385	DNA-2½-...-PPV-A
Technical Data → See Page 14							

Accessories

	Type	Bore Size 1½"	Bore Size 2"	Bore Size 2½"
Head Rectangular Flange	MF1	→ Page 22		
Cap Rectangular Flange	MF2	→ Page 22		
Cap Trunnion-Mounting	MT1	→ Page 23		
Head Trunnion-Mounting	MT2	→ Page 23		
Mid Trunnion-Mounting	MT4*	→ Page 23		
Side End Angle Mount	MS1	→ Page 24		
Side Lug Mount	MS2	→ Page 25		
Side Tap Mount	MS4	→ Page 26		
Cap Fixed Clevis	MP1	→ Page 27		
Cap Detachable Clevis	MP2	→ Page 28		
Cap Detachable Eye	MP4	→ Page 29		
Both Ends Tie Rods Extended Mounting	MX1	→ Page 30		
Cap Tie Rods Extended Mounting	MX2	→ Page 30		
Head Tie Rods Extended Mounting	MX3	→ Page 30		
Clevis Bracket	LNA	→ Page 31		
Eye Bracket	LNB	→ Page 32		
Female Clevis	SSA	→ Page 33		
Female Eye	SSB	→ Page 34		
Pivot Pin	BO	→ Page 35		
Hex Jam Nut	B	→ Page 35		
Slot Cover (for sensor groove)	ABP-5-S	→ Page 36		
Flow Control	GRIA	→ Page 36		
Sensor	SME-8	→ Page 37		
Sensor	SMT-8	→ Page 38		

* Patent Pending

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Ordering Data

Standard Cylinders

	Stroke [inch]	Bore Size 3¼"		Bore Size 4"		Bore Size 5"	
		Part No.	Type	Part No.	Type	Part No.	Type
X-stroke length	...	193386	DNA-3¼-...-P-A	193387	DNA-4-...-P-A	193388	DNA-5-...-P-A
X-stroke length	...	193386	DNA-3¼-...-PPV-A	193387	DNA-4-...-PPV-A	193388	DNA-5-...-PPV-A
Technical Data → See Page 14							

Accessories

	Type	Bore Size 3¼"	Bore Size 4"	Bore Size 5"
Head Rectangular Flange	MF1	→ Page 22		
Cap Rectangular Flange	MF2	→ Page 22		
Cap Trunnion-Mounting	MT1	→ Page 23		
Head Trunnion-Mounting	MT2	→ Page 23		
Mid Trunnion-Mounting	MT4	→ Page 23		
Side End Angle Mount	MS1	→ Page 24		
Side Lug Mount	MS2	→ Page 25		
Side Tap Mount	MS4	→ Page 26		
Cap Fixed Clevis	MP1	→ Page 27		
Cap Detachable Clevis	MP2	→ Page 28		
Cap Detachable Eye	MP4	→ Page 29		
Both Ends Tie Rods Extended Mounting	MX1	→ Page 30		
Cap Tie Rods Extended Mounting	MX2	→ Page 30		
Head Tie Rods Extended Mounting	MX3	→ Page 30		
Clevis Bracket	LNA	→ Page 31		
Eye Bracket	LNB	→ Page 32		
Female Clevis	SSA	→ Page 33		
Female Eye	SSB	→ Page 34		
Pivot Pin	BO	→ Page 35		
Hex Jam Nut	B	→ Page 35		
Slot Cover (for sensor groove)	ABP-5-S	→ Page 36		
Flow Control	GRLA	→ Page 36		
Sensor	SME-8	→ Page 37		
Sensor	SMT-8	→ Page 38		

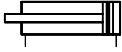
NFPA Cylinders, Type DNA

Double-acting

Technical Data

Square Head Industrial Cylinders

DNA-...-P-A

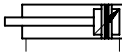


Two Basic Models

- Double-acting standard cylinder for non-contact end-position sensing (A) with flexible end position cushioning (P)

Example: DNA-...-P-A

DNA-...-PPV-A



- Double-acting standard cylinder for non-contact end-position sensing (A) with adjustable end-position cushioning (PPV)

Example: DNA-...-PPV-A

- **Bore Sizes:** 1½" ... 5"
- **Stroke Lengths:** ½" ... 80"



Technical Data

Medium	Dried compressed air [lubricated or unlubricated]
Design	Double-acting pneumatic cylinder with piston rod
Operating pressure	9 to 180 psi
Temperature range	-4 to 176° F
Variant S6	-4 to 302° F
Material	
Bearing and end caps	Anodized Aluminum
Cylinder barrel	Anodized Aluminum
Piston rod	Stainless steel 316
Seals	Polyurethane
Variant S6	FKM (Viton)

Bore Size [inch]	Extended Force at 90psi* [lbf]	Return Force at 90psi* [lbf]	Head Cushioning Length Air Cushioning [inch]	Cap Cushioning Length Air Cushioning [inch]	Port Connection Thread
1½	170	142	0.8	0.6	¾ - 18 NPT
1½-S1	170	103	-	0.6	¾ - 18 NPT
2	265	238	0.7	0.6	¾ - 18 NPT
2-S1	265	200	1.0	0.6	¾ - 18 NPT
2½	420	394	0.7	0.6	¾ - 18 NPT
2½-S1	420	355	1.0	0.6	¾ - 18 NPT
¾	678	612	1.2	0.8	½ - 14 NPT
¾-S1	678	570	1.0	0.8	½ - 14 NPT
4	1059	994	1.2	0.8	½ - 14 NPT
4-S1	1059	952	1.0	0.8	½ - 14 NPT
5	1655	1591	1.2	0.7	½ - 14 NPT
5-S1	1655	1548	1.0	0.7	½ - 14 NPT

* Theoretical values

Note: Values calculated with 5/8" and 1" rod sizes.

NFPA Cylinders, Type DNA

Double-acting

Technical Data

Square Head Industrial Cylinders

Type	Weights	
	Basic Weight [lbs]	Weight per 1 inch Stroke [lbs]
DNA-1½-...	1.575	0.218
DNA-1½-...-S1	2.067	0.347
DNA-2-...	2.392	0.300
DNA-2-...-S1	2.841	0.429
DNA-2½-...	3.330	0.373
DNA-2½-...-S1	3.816	0.502
DNA-3¼-...	6.429	0.608
DNA-3¼-...-S1	7.179	0.748
DNA-4-...	8.870	0.716
DNA-4-...-S1	9.602	0.858
DNA-5-...	12.821	0.949
DNA-5-...-S1	13.575	1.089

NFPA Cylinders, Type DNA

Double-acting

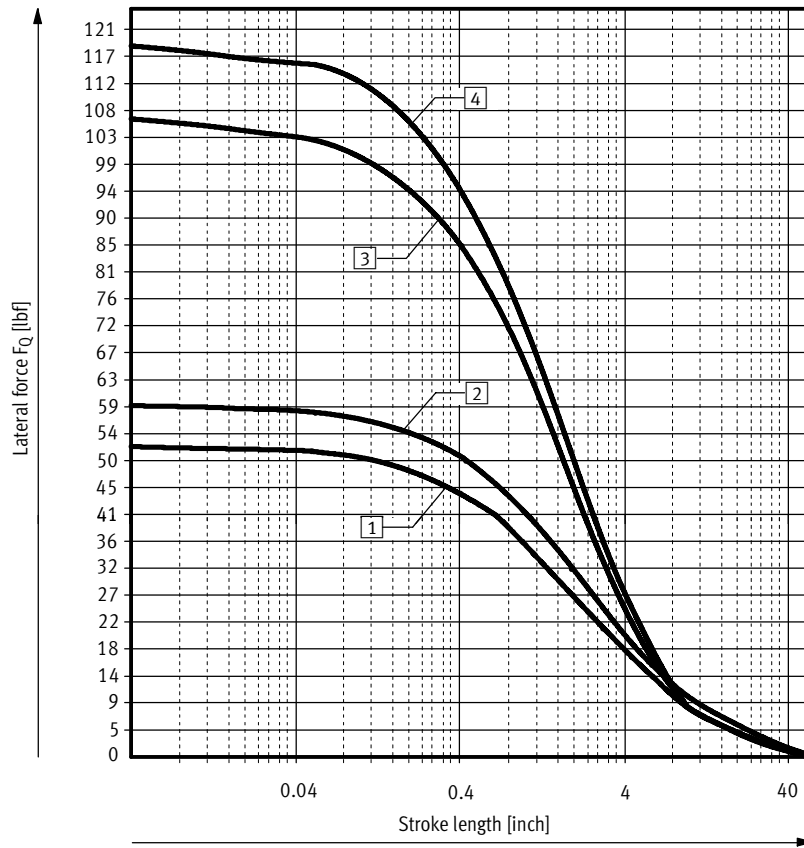
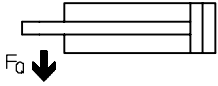
Technical Data

Standard Cylinder

Cylinder Bore Size: 1½", 2", 2½"

Rod Size: 5/8" (Standard)

Lateral force F_Q in relation to stroke length



- 1 S6
- 2 Standard
- 3 S6-S2
- 4 S2

NFPA Cylinders, Type DNA

Double-acting

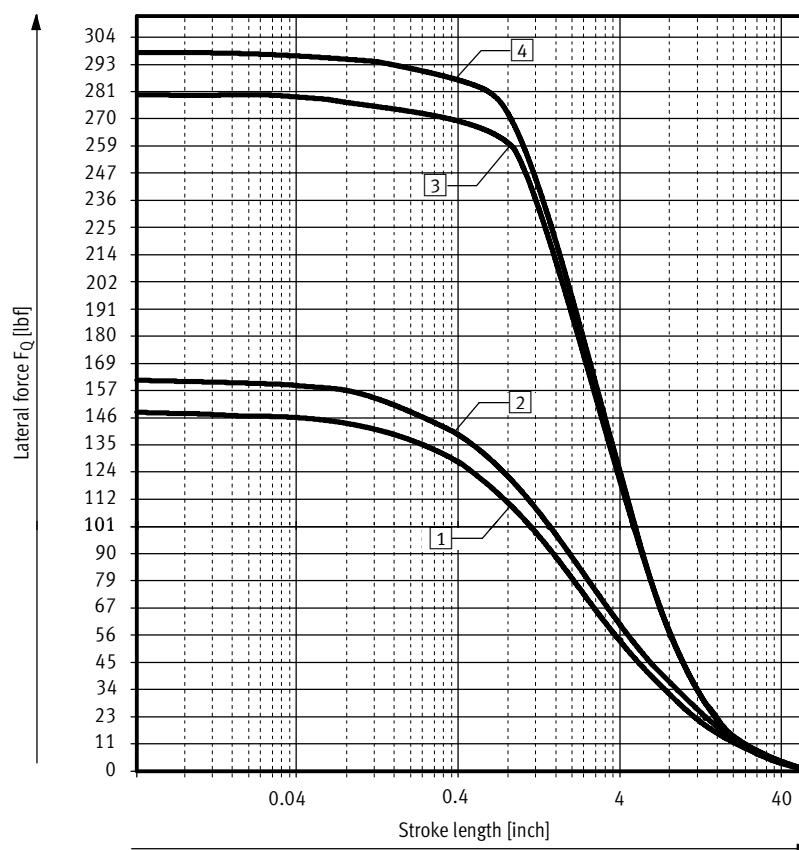
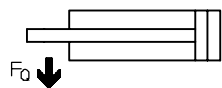
Technical Data

Standard Cylinder

Cylinder Bore Size: 1½", 2", 2½"

Rod Size: 1" (Reinforced)

Lateral force F_Q in relation to stroke length



- 1 S1-S6
- 2 S1
- 3 S1-S6-S2
- 4 S1-S2

NFPA Cylinders, Type DNA

Double-acting

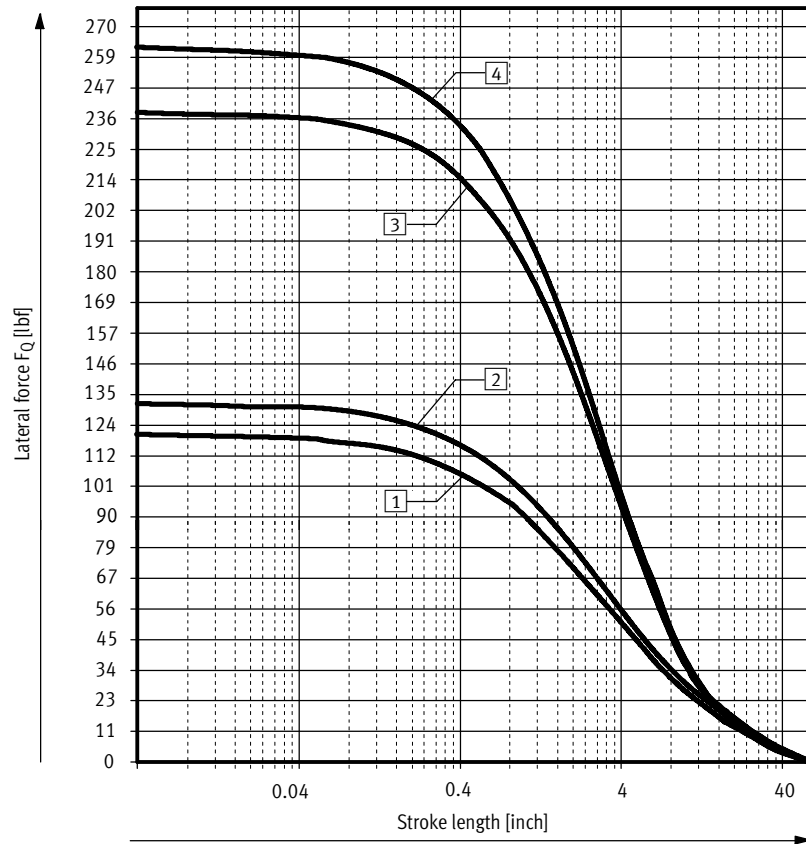
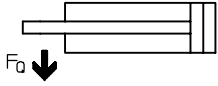
Technical Data

Standard Cylinder

Cylinder Bore Size: 3¼", 4", 5"

Rod Size: 1" (Standard)

Lateral force F_Q in relation to stroke length



- 1 S6
- 2 Standard
- 3 S6-S2
- 4 S2

NFPA Cylinders, Type DNA

Double-acting

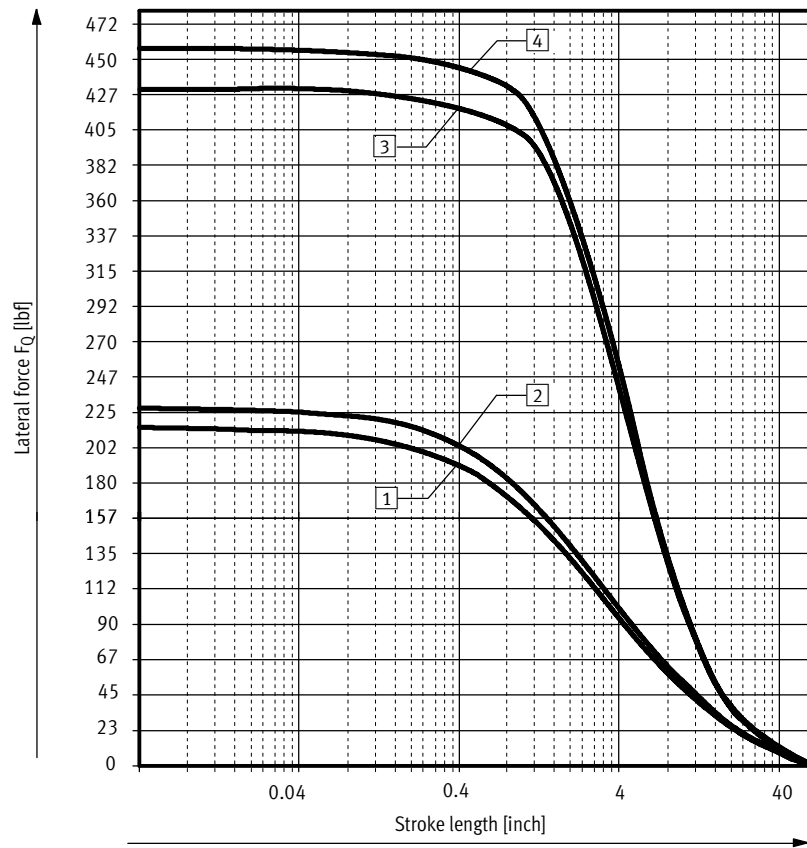
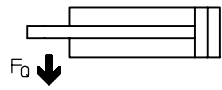
Technical Data

Standard Cylinder

Cylinder Bore Size: 3¼", 4", 5"

Rod size: 1¼" (Reinforced)

Lateral force F_Q in relation to stroke length



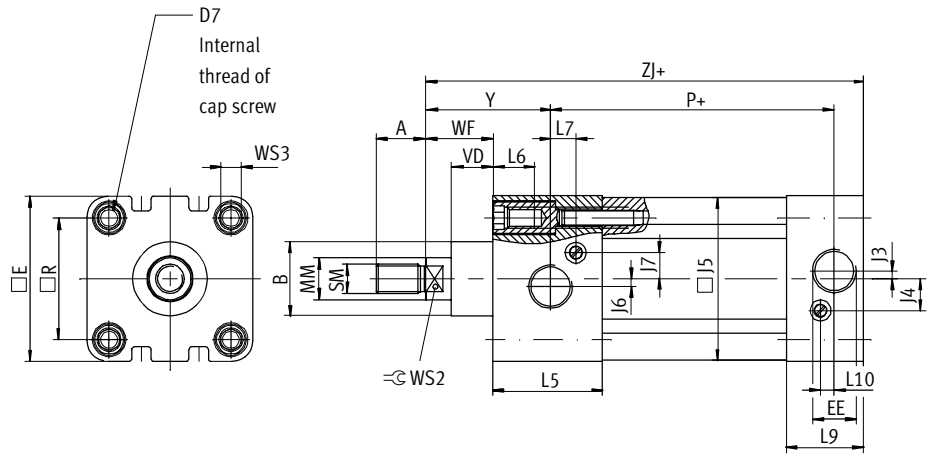
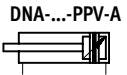
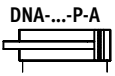
- 1 S1-S6
- 2 S1
- 3 S1-S6-S2
- 4 S1-S2

NFPA Cylinders, Type DNA

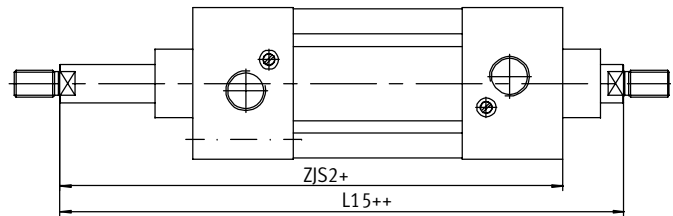
Double-acting

Dimensions

Standard Cylinders



Variant S2



+ = plus stroke length
 ++ = plus 2 x stroke length

NFPA Cylinders, Type DNA

Double-acting

Dimensions Standard Cylinders

Type	A	∅B -0.01" -0.03"	D7	E	EE	J3	J4	J5	J6
DNA – 1½"	0.750"	1.125"	¼-28 UNF	2.00"	⅜-18 NPT	0.08"	0.35"	1.99"	–
DNA – 1½"-S1	1.125"	1.500"	¼-28 UNF	2.00"	⅜-18 NPT	0.08"	0.35"	1.99"	–
DNA – 2"	0.750"	1.125"	⅕ ₁₆ -24 UNF	2.50"	⅜-18 NPT	0.12"	0.48"	2.47"	0.12"
DNA – 2"-S1	1.125"	1.500"	⅕ ₁₆ -24 UNF	2.50"	⅜-18 NPT	0.12"	0.48"	2.47"	–
DNA – 2½"	0.750"	1.125"	⅕ ₁₆ -24 UNF	3.00"	⅜-18 NPT	0.10"	0.48"	2.96"	0.20"
DNA – 2½"-S1	1.125"	1.500"	⅕ ₁₆ -24 UNF	3.00"	⅜-18 NPT	0.10"	0.48"	2.96"	–
DNA – 3¼"	1.125"	1.500"	⅜-24 UNF	3.75"	½-14 NPT	–	0.62"	3.68"	–
DNA – 3¼"-S1	1.625"	2.000"	⅜-24 UNF	3.75"	½-14 NPT	–	0.62"	3.68"	–
DNA – 4"	1.125"	1.500"	⅜-24 UNF	4.50"	½-14 NPT	1.16"	0.62"	4.43"	0.16"
DNA – 4"-S1	1.625"	2.000"	⅜-24 UNF	4.50"	½-14 NPT	1.16"	0.62"	4.43"	–
DNA – 5"	1.125"	1.500"	½-20 UNF	5.50"	½-14 NPT	–	0.79"	5.35"	0.16"
DNA – 5"-S1	1.625"	2.000"	½-20 UNF	5.50"	½-14 NPT	–	0.79"	5.35"	–

Type	J7	L5	L6	L7	L9	L10	L15	MM Nominal (Actual)	P	R
DNA – 1½"	0.39"	1.70"	0.63"	0.37"	1.20"	0.35"	6.14"	5/8" (0.630")	2.313"	1.429"
DNA – 1½"-S1	–	1.70"	0.63"	–	1.20"	0.35"	6.88"	1" (0.984")	2.313"	1.429"
DNA – 2"	0.39"	1.66"	0.63"	0.38"	1.16"	0.21"	6.14"	5/8" (0.630")	2.313"	1.839"
DNA – 2"-S1	0.60"	1.66"	0.63"	0.27"	1.16"	0.21"	6.88"	1" (0.984")	2.313"	1.839"
DNA – 2½"	0.39"	1.66"	0.63"	0.29"	1.16"	0.34"	6.28"	5/8" (0.630")	2.375"	2.193"
DNA – 2½"-S1	0.60"	1.66"	0.63"	0.29"	1.16"	0.34"	6.99"	1" (0.984")	2.375"	2.193"
DNA – 3¼"	0.62"	1.88"	0.63"	0.37"	1.38"	0.37"	7.51"	1" (0.984")	2.625"	2.758"
DNA – 3¼"-S1	0.79"	1.88"	0.63"	0.37"	1.38"	0.37"	8.02"	1¼" (1.260"*)	2.625"	2.758"
DNA – 4"	0.62"	1.86"	0.63"	0.23"	1.36"	0.23"	7.51"	1" (0.984")	2.625"	3.323"
DNA – 4"-S1	0.79"	1.86"	0.63"	0.23"	1.36"	0.23"	8.02"	1¼" (1.260"*)	2.625"	3.323"
DNA – 5"	0.62"	1.76"	1.00"	0.28"	1.26"	0.29"	7.76"	1" (0.984")	2.875"	4.101"
DNA – 5"-S1	0.79"	1.76"	1.00"	0.28"	1.26"	0.29"	8.27"	1¼" (1.260"*)	2.875"	4.101"

Type	SM	WS2 ≅	WS3	VD	WF	Y	ZJ	ZJS2
DNA – 1½"	7/16 20 UNF-2A	½"	HEX ¼"	0.625"	1.000"	1.878"	4.625"	5.125"
DNA – 1½"-S1	¾-16 UNF-2A	7/8"	HEX ¼"	0.875"	1.375"	2.252"	5.000"	5.500"
DNA – 2"	7/16 20 UNF-2A	½"	HEX ⅕ ₁₆ "	0.625"	1.000"	1.882"	4.625"	5.125"
DNA – 2"-S1	¾-16 UNF-2A	7/8"	HEX ⅕ ₁₆ "	0.875"	1.375"	2.252"	5.000"	5.500"
DNA – 2½"	7/16 20 UNF-2A	½"	HEX ⅕ ₁₆ "	0.625"	1.000"	1.953"	4.750"	5.250"
DNA – 2½"-S1	¾-16 UNF-2A	7/8"	HEX ⅕ ₁₆ "	0.875"	1.375"	2.307"	5.125"	5.625"
DNA – 3¼"	¾-16 UNF-2A	7/8"	HEX ¼"	0.875"	1.375"	2.441"	5.625"	6.125"
DNA – 3¼"-S1	1-14 UNF-2A	1⅛"	HEX ¼"	1.000"	1.625"	2.697"	5.875"	6.375"
DNA – 4"	¾-16 UNF-2A	7/8"	HEX ¼"	0.875"	1.375"	2.441"	5.625"	6.125"
DNA – 4"-S1	1-14 UNF-2A	1⅛"	HEX ¼"	1.000"	1.625"	2.697"	5.875"	6.375"
DNA – 5"	¾-16 UNF-2A	7/8"	–	0.875"	1.375"	2.441"	5.875"	6.375"
DNA – 5"-S1	1-14 UNF-2A	1⅛"	–	1.000"	1.625"	2.697"	6.125"	6.625"

* Deviates from NFPA dimension [NFPA = 1.375"]

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

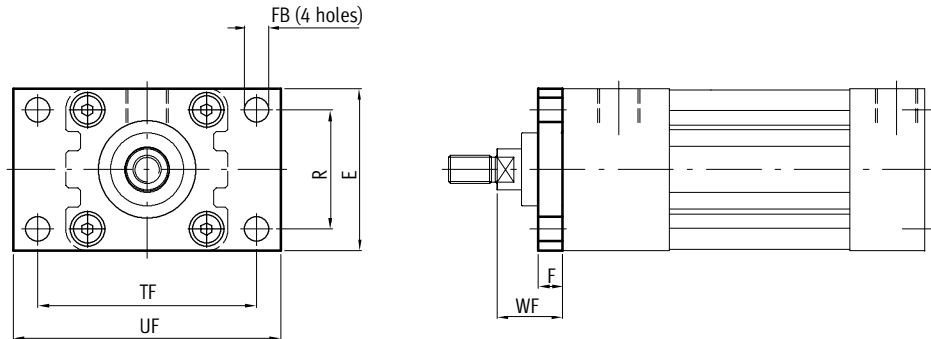
Head Rectangular Flange, MF1-...

Includes the following:

- 1x Flange
- 4x Screw

Material:

C1117 Steel, black oxide coated



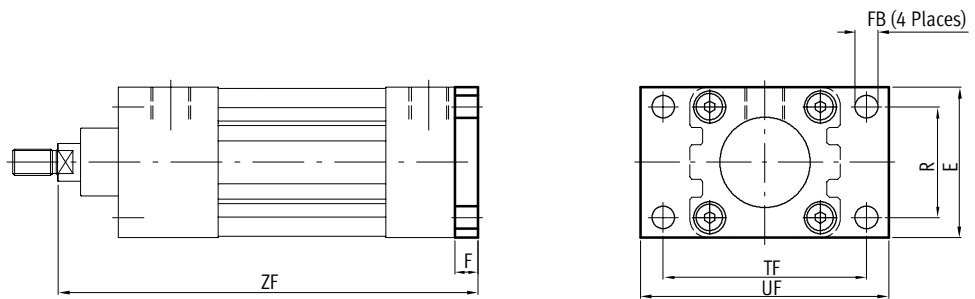
Cap Rectangular Flange, MF2-...

Includes the following:

- 1x Flange
- 4x Screw

Material:

C1117 Steel



Bore size	Rod size [MM] Nominal (Actual)	E	F	FB	R	TF	UF	WF	ZF
1½"	5/8" (0.630")	2.00"	0.375"	0.313"	1.43"	2.750"	3.375"	1.000"	5.000"
1½"-S1	1" (0.984")	2.00"	0.375"	0.313"	1.43"	2.750"	3.375"	1.375"	5.375"
2"	5/8" (0.630")	2.50"	0.375"	0.375"	1.84"	3.375"	4.125"	1.000"	5.000"
2"-S1	1" (0.984")	2.50"	0.375"	0.375"	1.84"	3.375"	4.125"	1.375"	5.375"
2½"	5/8" (0.630")	3.00"	0.375"	0.375"	2.19"	3.875"	4.625"	1.000"	5.125"
2½"-S1	1" (0.984")	3.00"	0.375"	0.375"	2.19"	3.875"	4.625"	1.375"	5.500"
3¼"	1" (0.984")	3.75"	0.625"	0.438"	2.76"	4.688"	5.500"	1.375"	6.250"
3¼"-S1	1¼" (1.260**)	3.75"	0.625"	0.438"	2.76"	4.688"	5.500"	1.625"	6.500"
4"	1" (0.984")	4.50"	0.625"	0.438"	3.32"	5.438"	6.250"	1.375"	6.250"
4"-S1	1¼" (1.260**)	4.50"	0.625"	0.438"	3.32"	5.438"	6.250"	1.625"	6.500"
5"	1" (0.984")	5.50"	0.625"	0.563"	4.10"	6.625"	7.625"	1.375"	6.500"
5"-S1	1¼" (1.260**)	5.50"	0.625"	0.563"	4.10"	6.625"	7.625"	1.625"	6.750"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type	Part No.	Type
1½"	0.50	195898	MF1-1½	195898	MF2-1½
2"	0.86	195899	MF1-2	195899	MF2-2
2½"	1.24	195900	MF1-2½	195900	MF2-2½
3¼"	2.96	195901	MF1-3¼	195901	MF2-3¼
4"	4.30	195902	MF1-4	195902	MF2-4
5"	6.64	195903	MF1-5	195903	MF2-5

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

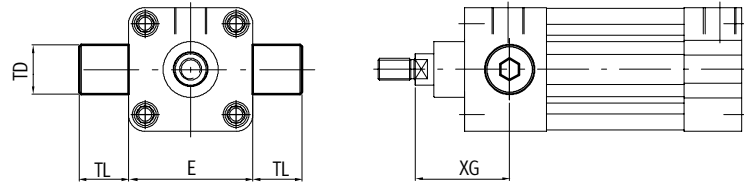
Head Trunnion Mounting, MT1-...

Includes the following:

1x Trunnion mount
(Order 2 per cylinder)

Material:

C1018 Steel, hardened



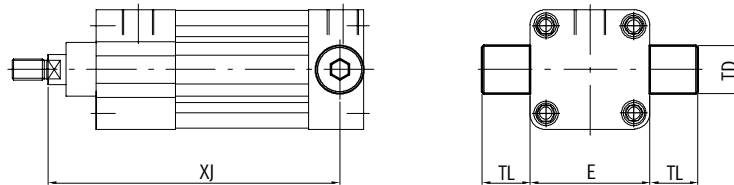
Cap Trunnion Mounting, MT2-...

Includes the following:

1x Trunnion mount
(Order 2 per cylinder)

Material:

C1018 Steel, hardened



Mid Trunnion Mounting, MT4-... (patent pending)

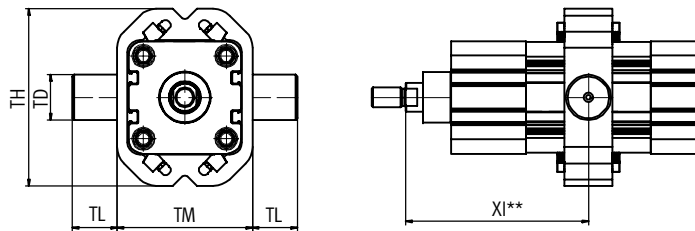
Includes the following:

1x Trunnion mount
(Order 1 per cylinder)

Note: MT4 trunnions are delivered assembled with cylinder

Material:

C1018 Steel, Zinc coated



Bore size	Rod size [MM] Nominal (Actual)	E	TD -0.0008" 0.0016"	TH	TL	TM	XG	XJ	Min. stroke length for MT4 option
1½"	5/8" (0.630")	2.00"	1.000"	3.31"	1.00"	2.50"	1.75"	4.125"	1"
1½"-S1	1" (0.984")	-	1.000"†				-	-	
2"	5/8" (0.630")	2.50"	1.000"	3.94"		3.00"	1.75"	4.125"	1"
2"-S1	1" (0.984")	2.50"	1.000"				2.13"	4.500"	
2½"	5/8" (0.630")	3.00"	1.000"	4.45"		3.50"	1.75"	4.250"	1"
2½"-S1	1" (0.984")	3.00"	1.000"				2.13"	4.625"	
3¼"	1" (0.984")	3.75"	1.000"	6.10"		4.50"	2.25"	5.000"	1.3"
3¼"-S1	1¼" (1.260"*)	3.75"	1.000"				2.50"	5.250"	
4"	1" (0.984")	4.50"	1.000"	6.89"		5.25"	2.25"	5.000"	1.3"
4"-S1	1¼" (1.260"*)	4.50"	1.000"				2.50"	5.250"	
5"	1" (0.984")	5.50"	1.000"	7.91"	6.25"	2.25"	5.250"	1.3"	
5"-S1	1¼" (1.260"*)	5.50"	1.000"			2.50"	5.500"		

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

** XI to be specified by customer (if not specified, then it will be located in the center of the cylinder profile).

† Not for MT1, MT2

Bore size	Weight [lbs]	Part No.	Type	Weight [lbs]	Part No.	Type
1½"	0.21	396276	MT1/MT2-1½-...-2½ *	-	193383	MT4-1½
2"	0.21	396276	MT1/MT2-1½-...-2½ *	-	193384	MT4-2
2½"	0.21	396276	MT1/MT2-1½-...-2½ *	-	193385	MT4-2½
3¼"	0.22	652475	MT1/MT2-3¼-...-5 *	-	193386	MT4-3¼
4"	0.22	652475	MT1/MT2-3¼-...-5 *	-	193387	MT4-4
5"	0.22	652475	MT1/MT2-3¼-...-5 *	-	193388	MT4-5

* You need to order MT1 and MT2 with Loctite 648, part no. 654803.

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

Side End Angle Mount, MS1-...

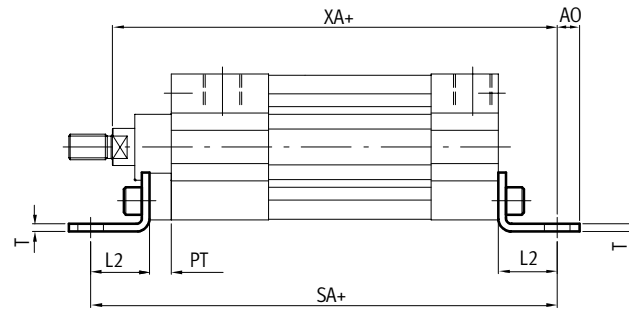
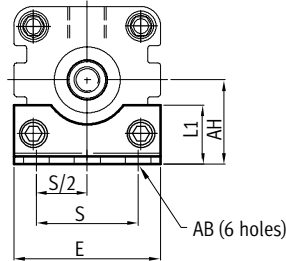
Includes the following:

2x Angle bracket

4x Screw

Material:

C1018 Steel, black oxide coated



Bore size	Rod size [MM] Nominal (Actual)	AB	AH	AO	E	L1	L2	PT	S	SA	T	XA
1½"	5/8" (0.630")	0.438"	1.188"	0.38"	2.00"	0.75"	1.000"	0.375"	1.25"	6.000"	0.125"	5.625"
1½"-S1	1" (0.984")	0.438"	1.188"	0.38"	2.00"	0.75"	1.000"	0.375"	1.25"	6.000"	0.125"	6.000"
2"	5/8" (0.630")	0.438"	1.438"	0.38"	2.50"	1.00"	1.000"	0.375"	1.75"	6.000"	0.125"	5.625"
2"-S1	1" (0.984")	0.438"	1.438"	0.38"	2.50"	1.00"	1.000"	0.375"	1.75"	6.000"	0.125"	6.000"
2½"	5/8" (0.630")	0.438"	1.625"	0.38"	3.00"	1.25"	1.000"	0.375"	2.25"	6.125"	0.125"	5.750"
2½"-S1	1" (0.984")	0.438"	1.625"	0.38"	3.00"	1.25"	1.000"	0.375"	2.25"	6.125"	0.125"	6.125"
3¼"	1" (0.984")	0.560"	1.938"	0.50"	3.75"	1.25"	1.250"	0.625"	2.75"	7.375"	0.125"	6.875"
3¼"-S1	1¼" (1.260"*)	0.560"	1.938"	0.50"	3.75"	1.25"	1.250"	0.625"	2.75"	7.375"	0.125"	7.125"
4"	1" (0.984")	0.560"	2.250"	0.50"	4.50"	1.75"	1.250"	0.625"	3.50"	7.375"	0.125"	6.875"
4"-S1	1¼" (1.260"*)	0.560"	2.250"	0.50"	4.50"	1.75"	1.250"	0.625"	3.50"	7.375"	0.125"	7.125"
5"	1" (0.984")	0.690"	2.750"	0.625"	5.50"	2.50"	1.375"	0.625"	4.25"	7.875"	0.188"	7.250"
5"-S1	1¼" (1.260"*)	0.690"	2.750"	0.625"	5.50"	2.50"	1.375"	0.625"	4.25"	7.875"	0.188"	7.500"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type
1½"	0.34	195904	MS1-1½"
2"	0.58	195905	MS1-2"
2½"	0.84	195906	MS1-2½"
3¼"	1.50	195907	MS1-3¼"
4"	2.34	195908	MS1-4"
5"	4.70	195909	MS1-5"

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

Side Lug Mount, MS2-...

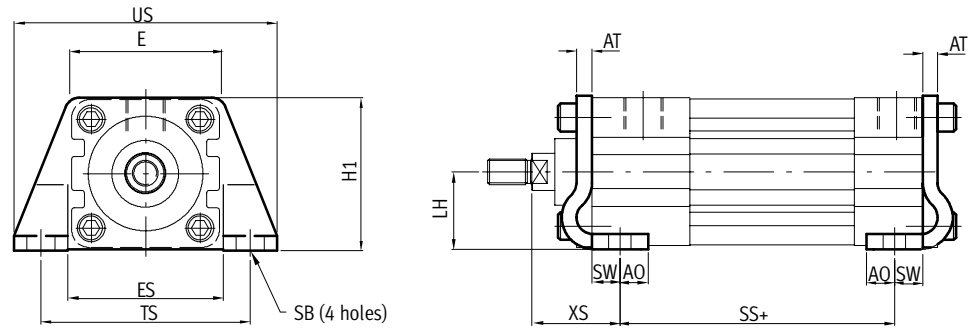
Includes the following:

2x Lug bracket

8x Screw

Material:

C1018 Steel



Bore size	Rod size [MM] Nominal (Actual)	AO	AT	E	ES	H1	LH	SB	SS	SW	TS	US	XS
1½"	5/8" (0.630")	0.45"	0.20"	2.00"	2.04"	2.02"	1.016"	0.375"	2.875"	0.375"	2.750"	3.457"	1.375"
1½"-S1	1" (0.984")	0.45"	0.20"	2.00"	2.04"	2.02"	1.016"	0.375"	2.875"	0.375"	2.750"	3.457"	1.750"
2"	5/8" (0.630")	0.45"	0.24"	2.50"	2.54"	2.52"	1.264"	0.375"	2.875"	0.375"	3.250"	3.957"	1.375"
2"-S1	1" (0.984")	0.45"	0.24"	2.50"	2.54"	2.52"	1.264"	0.375"	2.875"	0.375"	3.250"	3.957"	1.750"
2½"	5/8" (0.630")	0.45"	0.24"	3.00"	3.04"	3.01"	1.516"	0.375"	3.000"	0.375"	3.750"	4.457"	1.375"
2½"-S1	1" (0.984")	0.45"	0.24"	3.00"	3.04"	3.01"	1.516"	0.375"	3.000"	0.375"	3.750"	4.457"	1.750"
3¼"	1" (0.984")	0.57"	0.24"	3.75"	3.80"	3.76"	1.894"	0.500"	3.250"	0.500"	0.500"	5.693"	1.875"
3¼"-S1	1¼" (1.260"*)	0.57"	0.24"	3.75"	3.80"	3.76"	1.894"	0.500"	3.250"	0.500"	0.500"	5.693"	2.125"
4"	1" (0.984")	0.57"	0.24"	4.50"	4.56"	4.51"	2.268"	0.500"	3.250"	0.500"	5.500"	6.445"	1.875"
4"-S1	1¼" (1.260"*)	0.57"	0.24"	4.50"	4.56"	4.51"	2.268"	0.500"	3.250"	0.500"	5.500"	6.445"	2.125"
5"	1" (0.984")	0.76"	0.31"	5.50"	5.57"	5.52"	2.776"	0.750"	3.125"	0.688"	6.875"	8.213"	2.063"
5"-S1	1¼" (1.260"*)	0.76"	0.31"	5.50"	5.57"	5.52"	2.776"	0.750"	3.125"	0.688"	6.875"	8.213"	2.313"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

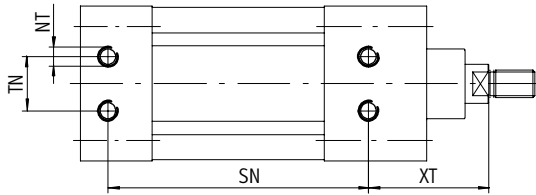
Bore size	Weight [lbs]	Part No.	Type
1½"	0.48	195910	MS2-1½
2"	0.92	195911	MS2-2
2½"	1.35	195912	MS2-2½
3¼"	2.10	195913	MS2-3¼
4"	3.03	195914	MS2-4
5"	6.57	195915	MS2-5

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

Side Tap Mount, MS4...



Bore size	Rod size [MM] Nominal (Actual)	NT		SN	TN	XT
		Thread	Depth			
1½"	5/8" (0.630")	¼-20 UNC	0.37"	2.250"	0.625"	1.938"
1½"-S1	1" (0.984")	¼-20 UNC	0.37"	2.250"	0.625"	2.313"
2"	5/8" (0.630")	⅜-18 UNC	0.43"	2.250"	0.875"	1.938"
2"-S1	1" (0.984")	⅜-18 UNC	0.43"	2.250"	0.875"	2.313"
2½"	5/8" (0.630")	⅝-16 UNC	0.63"	2.375"	1.250"	1.938"
2½"-S1	1" (0.984")	⅝-16 UNC	0.63"	2.375"	1.250"	2.313"
3¼"	1" (0.984")	½-13 UNC	0.75"	2.625"	1.500"	2.438"
3¼"-S1	1¼" (1.260"*)	½-13 UNC	0.75"	2.625"	1.500"	2.688"
4"	1" (0.984")	½-13 UNC	0.75"	2.625"	2.063"	2.438"
4"-S1	1¼" (1.260"*)	½-13 UNC	0.75"	2.625"	2.063"	2.688"
5"	1" (0.984")	⅝-11 UNC	0.94"	2.875"	2.688"	2.438"
5"-S1	1¼" (1.260"*)	⅝-11 UNC	0.94"	2.875"	2.688"	2.688"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type
1½"	1.575	193383	MS4-1½ *
1½"-S1	2.067	193383	MS4-1½ *
2"	2.392	193384	MS4-2 *
2"-S1	2.841	193384	MS4-2 *
2½"	3.330	193385	MS4-2½ *
2½"-S1	3.816	193385	MS4-2½ *
3¼"	6.429	193386	MS4-3¼ *
3¼"-S1	7.179	193386	MS4-3¼ *
4"	8.870	193387	MS4-4 *
4"-S1	9.602	193387	MS4-4 *
5"	12.821	193388	MS4-4 *
5"-S1	13.575	193388	MS4-5 *

* Complete cylinder with MS4 option.

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

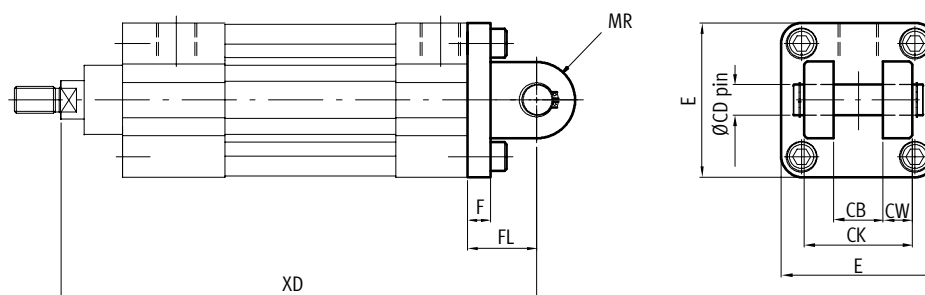
Cap Fixed Clevis, MP1-...

Includes the following:

- 1x Clevis
- 4x Screw
- 1x Pivot pin
- 2x Retaining ring

Material:

Cast Iron



Bore size	Rod size [MM]	CB	ØCD pin	CK	CW	E	F	FL	MR	XD
	Nominal (Actual)		+0.000" -0.003"							
1½"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	2.00"	0.38"	0.75"	0.62"	5.375"
1½"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	2.00"	0.38"	0.75"	0.62"	5.750"
2"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	2.50"	0.38"	0.75"	0.62"	5.375"
2"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	2.50"	0.38"	0.75"	0.62"	5.750"
2½"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	3.00"	0.38"	0.75"	0.62"	5.500"
2½"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	3.00"	0.38"	0.75"	0.62"	5.875"
3¼"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	3.75"	0.63"	1.25"	0.87"	6.875"
3¼"-S1	1¼" (1.260"*)	1.265"	0.75"	2.515"	0.625"	3.75"	0.63"	1.25"	0.87"	7.125"
4"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	4.50"	0.63"	1.25"	0.87"	6.875"
4"-S1	1¼" (1.260"*)	1.265"	0.75"	2.515"	0.625"	4.50"	0.63"	1.25"	0.87"	7.125"
5"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	5.50"	0.63"	1.25"	0.87"	7.125"
5"-S1	1¼" (1.260"*)	1.265"	0.75"	2.515"	0.625"	5.50"	0.63"	1.25"	0.87"	7.375"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type
1½"	0.64	195916	MP1-1½
2"	0.96	195917	MP1-2
2½"	1.20	195918	MP1-2½
3¼"	3.14	195919	MP1-3¼
4"	4.18	195920	MP1-4
5"	5.96	195921	MP1-5

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

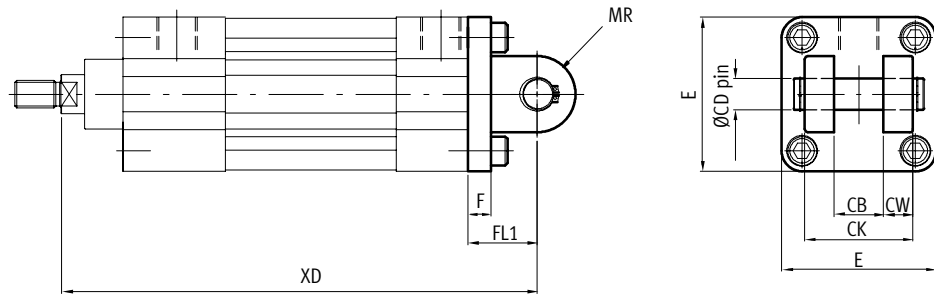
Dimensions

Cap Detachable Clevis, MP2-...

Includes the following:

- 1x Clevis
- 4x Screw
- 1x Pivot pin
- 2x Retaining ring

Material: Cast iron



Bore size	Rod size [MM] Nominal (Actual)	CB	ØCD pin +0.000" -0.003"	CK	CW	E	F	FL1	MR	XD
1½"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	2.00"	0.38"	1.125"	0.62"	5.750"
1½"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	2.00"	0.38"	1.125"	0.62"	6.125"
2"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	2.50"	0.38"	1.125"	0.62"	5.750"
2"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	2.50"	0.38"	1.125"	0.62"	6.125"
2½"	5/8" (0.630")	0.765"	0.50"	1.765"	0.500"	3.00"	0.38"	1.125"	0.62"	5.875"
2½"-S1	1" (0.984")	0.765"	0.50"	1.765"	0.500"	3.00"	0.38"	1.125"	0.62"	6.250"
3¼"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	3.75"	0.63"	1.875"	0.87"	7.500"
3¼"-S1	1¼" (1.260")*	1.265"	0.75"	2.515"	0.625"	3.75"	0.63"	1.875"	0.87"	7.750"
4"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	4.50"	0.63"	1.875"	0.87"	7.500"
4"-S1	1¼" (1.260")*	1.265"	0.75"	2.515"	0.625"	4.50"	0.63"	1.875"	0.87"	7.750"
5"	1" (0.984")	1.265"	0.75"	2.515"	0.625"	5.50"	0.63"	1.875"	0.87"	7.750"
5"-S1	1¼" (1.260")*	1.265"	0.75"	2.515"	0.625"	5.50"	0.63"	1.875"	0.87"	8.000"

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type
1½"	0.80	195922	MP2-1½"
2"	1.14	195923	MP2-2"
2½"	1.40	195924	MP2-2½"
3¼"	3.62	195925	MP2-3¼"
4"	4.62	195926	MP2-4"
5"	6.46	195927	MP2-5"

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

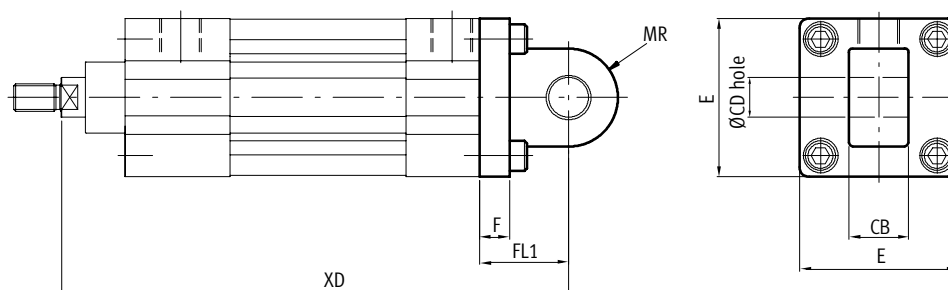
Dimensions

Cap Detachable Eye, MP4-...

Includes the following:

- 1x Eye
- 4x Screw

Material: Cast iron



Bore size	Rod size [MM] Nominal (Actual)	CB	ØCD hole +0.002" -0.000"	E	F	FL1	MR	XD
1½"	5/8" (0.630")	0.75"	0.502"	2.00"	0.38"	1.125"	0.62"	5.750"
1½"-S1	1" (0.984")	0.75"	0.502"	2.00"	0.38"	1.125"	0.62"	6.125"
2"	5/8" (0.630")	0.75"	0.502"	2.50"	0.38"	1.125"	0.62"	5.750"
2"-S1	1" (0.984")	0.75"	0.502"	2.50"	0.38"	1.125"	0.62"	6.125"
2½"	5/8" (0.630")	0.75"	0.502"	3.00"	0.38"	1.125"	0.62"	5.875"
2½"-S1	1" (0.984")	0.75"	0.502"	3.00"	0.38"	1.125"	0.62"	6.250"
3¼"	1" (0.984")	1.25"	0.752"	3.75"	0.63"	1.875"	0.87"	7.500"
3¼"-S1	1¼" (1.260"*)	1.25"	0.752"	3.75"	0.63"	1.875"	0.87"	7.750"
4"	1" (0.984")	1.25"	0.752"	4.50"	0.63"	1.875"	0.87"	7.500"
4"-S1	1¼" (1.260"*)	1.25"	0.752"	4.50"	0.63"	1.875"	0.87"	7.750"
5"	Not Available							
5"-S1	Not Available							

Cylinder Dimensions → See Pages 20/21

* Deviates from NFPA dimension [NFPA = 1.375"]

Bore size	Weight [lbs]	Part No.	Type
1½"	0.70	195928	MP4-1½
2"	0.92	195929	MP4-2
2½"	1.18	195930	MP4-2½
3¼"	3.30	195931	MP4-3¼
4"	4.30	195932	MP4-4
5"	Not Available		

NFPA Cylinders, Type DNA

Cylinder Accessories – Mounting

Dimensions

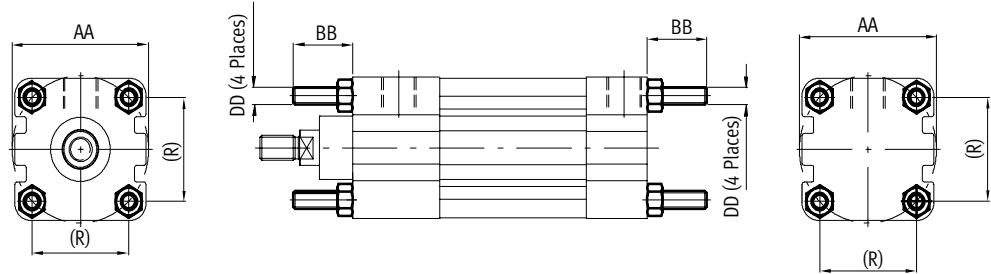
Both Ends Tie Rods Extended Mounting, MX1-...

Includes the following:

- 8x Tie rod
- 8x Nut
- 2x Loctite 243

Material:

Steel, zinc coated



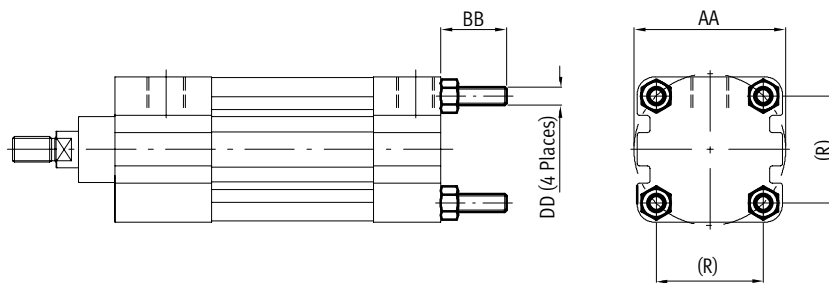
Cap Tie Rods Extended Mounting, MX2-...

Includes the following:

- 4x Tie rod
- 4x Nut
- 1x Loctite 243

Material:

Steel, zinc coated



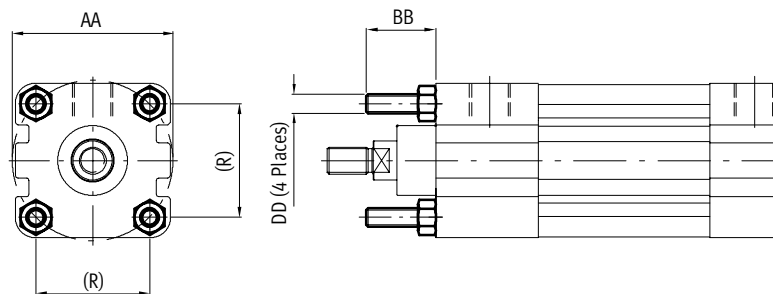
Head Tie Rods Extended Mounting, MX3-...

Includes the following:

- 4x Tie rod
- 4x Nut
- 1x Loctite 243

Material:

Steel, zinc coated



Bore size	∅AA	BB	DD	(R)
1½"	2.02"	1.000"	¼-28 UNF	1.429"
2"	2.60"	1.125"	⅕-24 UNF	1.839"
2½"	3.10"	1.125"	⅕-24 UNF	2.193"
3¼"	3.90"	1.375"	⅜-24 UNF	2.758"
4"	4.70"	1.375"	⅜-24 UNF	3.323"
5"	5.80"	1.813"	½-20 UNF	4.101"

Cylinder Dimensions → See Pages 20/21

Bore size	Weight [lbs]	Part No.	Type	Weight [lbs]	Part No.	Type	Weight [lbs]	Part No.	Type
1½"	0.20	195940	MX1-1½"	0.10	195946	MX2-1½"	0.10	195946	MX3-1½"
2"	0.36	195941	MX1-2"	0.18	195947	MX2-2"	0.18	195947	MX3-2"
2½"	0.36	195942	MX1-2½"	0.18	195948	MX2-2½"	0.18	195948	MX3-2½"
3¼"	0.64	195943	MX1-3¼"	0.32	195949	MX2-3¼"	0.32	195949	MX3-3¼"
4"	0.64	195944	MX1-4"	0.32	195950	MX2-4"	0.32	195950	MX3-4"
5"	1.56	195945	MX1-5"	0.78	195951	MX2-5"	0.78	195951	MX3-5"

NFPA Cylinders, Type DNA

Cylinder Accessories – Rod Attachments

Dimensions

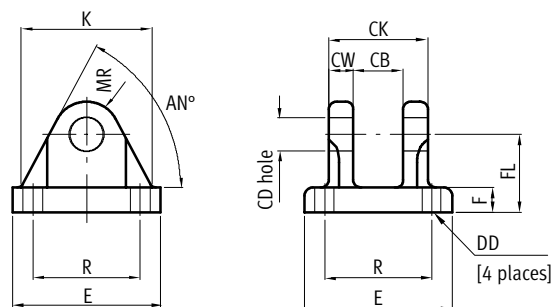
Clevis Bracket, LNA...

Includes the following:

1 Bracket

Material:

C1144 Steel



CD hole +0.002" -0.000"	AN	CB	CK	CW	DD Thread	E	F	FL	K	MR	R
0.502"	60.4"	0.765"	1.765"	0.500"	3/8-24 UNF-2B	2.50"	0.375"	1.125"	2.0"	0.50"	1.625"
0.752"	62.4"	1.265"	2.515"	0.625"	1/2-20 UNF-2B	3.50"	0.625"	1.875"	3.0"	0.75"	2.562"
1.002"	61.9"	1.515"	3.015"	0.750"	5/8-18 UNF-2B	4.50"	0.750"	2.250"	4.0"	1.00"	3.250"
1.377"	69.7"	2.032"	4.032"	1.000"	5/8-18 UNF-2B	5.00"	0.875"	3.000"	4.5"	1.38"	3.812"

CD Hole +0.002" -0.000"	Weight [lbs]	Part No.	Type
0.502"	0.88	195960	LNA – 500
0.752"	3.10	195961	LNA – 750
1.002"	6.14	195962	LNA – 1000
1.377"	9.80	195963	LNA – 1375*

* Material: Ductile Iron 65-42-12

Note: Pivot pin type BO... is optional. See page 35 for technical data.

NFPA Cylinders, Type DNA

Cylinder Accessories – Rod Attachments

Dimensions

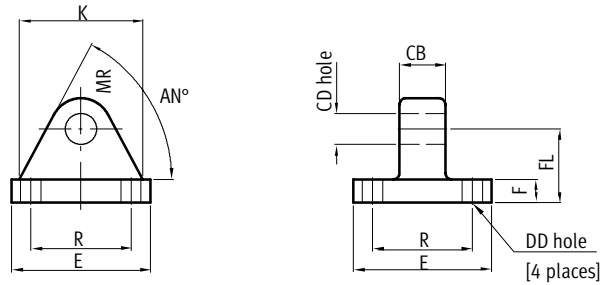
Eye bracket, LNB-...

Includes the following:

1 Bracket

Material:

C1144 Steel



CD hole +0.002" -0.000"	AN	CB	DD hole	E	F	FL	K	MR	R
0.502"	60.4"	0.750"	0.406"	2.50"	0.375"	1.125"	2.0"	0.50"	1.625"
0.752"	62.4"	1.250"	0.531"	3.50"	0.625"	1.875"	3.0"	0.75"	2.562"
1.002"	61.9"	1.500"	0.656"	4.50"	0.750"	2.250"	4.0"	1.00"	3.250"
1.377"	69.7"	2.000"	0.656"	5.00"	0.875"	3.000"	4.5"	1.38"	3.812"

CD hole +0.002" -0.000"	Weight [lbs]	Part No.	Type
0.502"	0.90	195956	LNB – 500
0.752"	3.20	195957	LNB – 750
1.002"	6.32	195958	LNB – 1000
1.377"	10.02	195959	LNB – 1375*

* Material: Ductile Iron 65-42-12

NFPA Cylinders, Type DNA

Cylinder Accessories – Rod Attachments

Dimensions

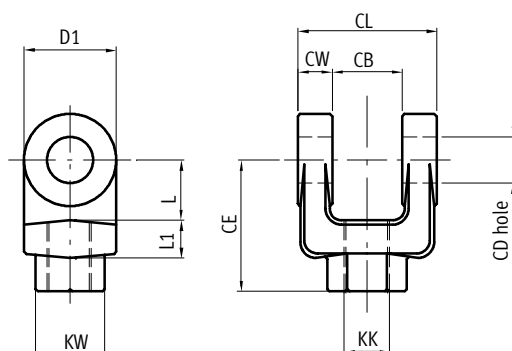
Female Clevis, SSA-...

Includes the following:

1 Clevis

Material:

C1144 Steel



KK	CB	CD +0.002" -0.000"	CE	CL	CW	D1	KW Key width	L	L1
7/16-20 UNF-2B	0.765"	0.502"	1.50"	1.765"	0.500"	1.00"	1.000"	0.75"	0.38"
1/2-20 UNF-2B	0.765"	0.502"	1.50"	1.765"	0.500"	1.00"	1.000"	0.75"	0.38"
3/4-16 UNF-2B	1.265"	0.752"	2.13"	2.515"	0.625"	1.50"	1.375"	1.02"	0.56"
7/8-14 UNF-2B	1.515"	1.002"	2.94"	3.015"	0.750"	2.00"	1.500"	1.33"	0.81"
1-14 UNF-2B	1.515"	1.002"	2.94"	3.015"	0.750"	2.00"	1.500"	1.33"	0.81"
1 1/4-12 UNF-2B	2.032"	1.377"	3.77"	4.032"	1.000"	2.75"	2.000"	1.86"	1.00"

KK	Weight [lbs]	Part No.	Type
7/16-20 UNF-2B	0.44	195967	SSA – 7/16-20
1/2-20 UNF-2B	0.44	195964	SSA – 1/2-20
3/4-16 UNF-2B	1.22	195968	SSA – 3/4-16
7/8-14 UNF-2B	2.70	195965	SSA – 7/8-14
1-14 UNF-2B	2.63	195969	SSA – 1-14
1 1/4-12 UNF-2B	5.96	195966	SSA – 1 1/4-12*

* Material: Ductile Iron 65-42-12

NFPA Cylinders, Type DNA

Cylinder Accessories – Rod Attachments

Dimensions

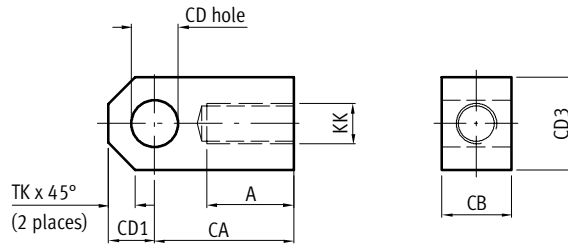
Female Eye, SSB-...

Includes the following:

2 Eye

Material:

C1117 Steel



KK	A	CA	CB	CD Hole +0.002" -0.000"	CD1	CD3	TK
7/16-20 UNF-2B	0.94"	1.50"	0.75"	0.502"	0.500"	1.00"	0.3"
1/2-20 UNF-2B	0.94"	1.50"	0.75"	0.502"	0.500"	1.00"	0.3"
3/4-16 UNF-2B	1.13"	2.06"	1.25"	0.752"	0.750"	1.50"	0.5"
7/8-14 UNF-2B	1.13"	2.38"	1.50"	1.002"	1.000"	2.00"	0.6"
1-14 UNF-2B	1.63"	2.81"	1.50"	1.002"	1.000"	2.00"	0.6"
1 1/4-12 UNF-2B	2.00"	3.44"	2.00"	1.377"	1.375"	2.75"	0.8"

KK	Weight [lbs]	Part No.	Type
7/16-20 UNF-2B	0.32	195973	SSB - 7/16-20
1/2-20 UNF-2B	0.32	195970	SSB - 1/2-20
3/4-16 UNF-2B	0.94	195974	SSB - 3/4-16
7/8-14 UNF-2B	2.12	195971	SSB - 7/8-14
1-14 UNF-2B	2.34	195975	SSB - 1-14
1 1/4-12 UNF-2B	5.48	195972	SSB - 1 1/4-12

NFPA Cylinders, Type DNA

Cylinder Accessories – Rod Attachments

Dimensions

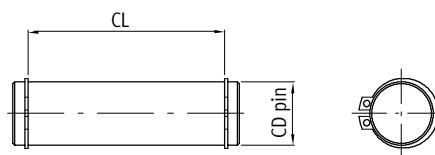
Pivot Pin, BO...

Includes the following:

- 1 Pivot pin
- 2 Retaining rings

Material:

Steel

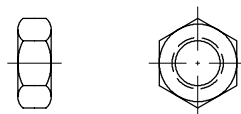


CL	CD pin +0.000" -0.003"	Weight [lbs]	Part No.	Type
1.875"	0.500"	0.12	195976	BO-0.5-1.875-A2
2.625"	0.750"	0.36	195977	BO-0.75-2.625-A2
3.125"	1.000"	0.76	195978	BO-1-3.125-A2
4.125"	1.375"	1.86	195979	BO-1.375-4.125-A2

Hex Jam Nut, B...

Material:

Steel, Zinc



Size	Dimensions according to	Part No.	Type
7/16-20	ANSI B 18.2.2-1987	13014940	B-7/16-20
1/2-20	ANSI B 18.2.2-1987	13000268	B-1/2-20
3/4-16	ANSI B 18.2.2-1987	13000270	B-3/4-16
7/8-14	ANSI B 18.2.2-1987	13014941	B-7/8-14
1-14	ANSI B 18.2.2-1987	13014942	B-1-14
1 1/4-12	ANSI B 18.2.2-1987	13014943	B-1 1/4-12

NFPA Cylinders, Type DNA

Cylinder Accessories – Sensors

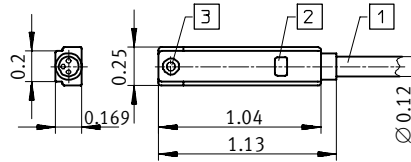
Dimensions (shown in inches)

Cylinder Sensor, SME-... (with reed contact)

Material:

Body: PET
Plate: Stainless steel
Cable: PUR

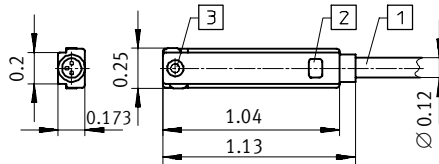
SME-8-K-LED-24
SME-8-K5-LED-24
SME-8-K-24-S6



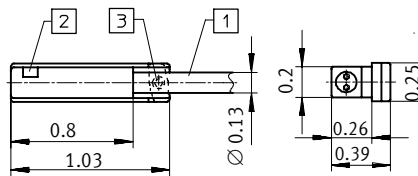
Material ...-S6:

Body: PET
Plate: Stainless steel
Cable: TPE-S

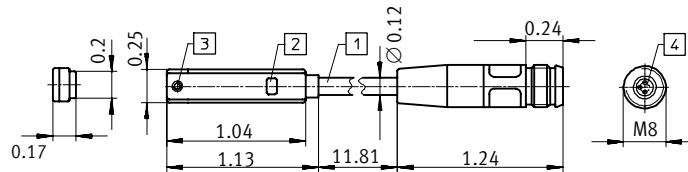
SME-8-O-K-LED-24
(Normally closed)



SME-8-K-LED-230



SME-8-K-LED-230
SME-8-S-LED-24



- 1 SME-8-K-LED-24,
3-wire cable, 8.2 ft
- SME-8-O-K-LED,
3-wire cable, 24.6 ft
- SME-8-S-LED-24,
3-wire cable, 0.98 ft
- SME-8-K-24-S6,
2-wire cable, 8.2 ft
- SME-8-K-LED-230,
2-wire cable, 8.2 ft

- 2 Yellow LED
- 3 Max. tightening torque 0.148 lbf
- 4 Suitable for plug-socket SIM-M8-...

Weight [lb]	Part No.	Type
0.11	150855	SME-8-K-LED-24
0.18	175404	SME-8-K5-LED-24
0.11	161756	SME-8-K-24-S6*
0.19	160251	SME-8-O-K-LED-24
0.13	152820	SME-8-K-LED-230
0.02	150857	SME-8-S-LED-24

* Without LED; Heat-resistant

NFPA Cylinders, Type DNA

Cylinder Accessories – Sensors

Dimensions (shown in inches)

Cylinder Sensor, SMT-... (with electronic output)

Material:

Body: PET

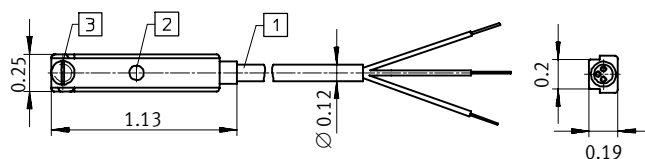
Plate: Stainless steel

Cable: PUR

SMT-8-PS-K-LED-24-B

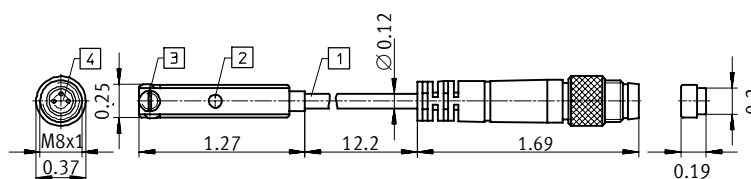
SMT-8-PS-K5-LED-24-B

SMT-8-NS-K-LED-24-B



SMT-8-PS-S-LED-24-B

SMT-8-NS-S-LED-24-B



- 1 SMT-8-...-K-LED-24-B
3-wire cable, 8.2 ft
SMT-8-...-S-LED-24-B
3-wire cable, 11.81 inches

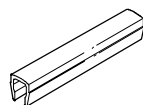
- 2 Yellow LED
- 3 Max. tightening torque 0.148 lbf
- 4 Suitable for plug-socket SIM-M8-...

Weight [lbs]	Part No.	Type
0.18	175436	SMT-8-PS-K-LED-24-B
0.09	175434	SMT-8-PS-K5-LED-24-B
0.18	171180	SMT-8-NS-K-LED-24-B
0.04	175484	SMT-8-PS-S-LED-24-B
0.04	171181	SMT-8-NS-S-LED-24-B

Slot Cover, ABP-...

For Sensor Groove

Material: Plastic



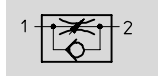
Part No. Type
151680 ABP-5-S

NFPA Cylinders, Type DNA

Cylinder Accessories – Flow Controls

Exhaust Air Flow Controls – Inch Series

GRLA



- Adjustable
- Swivel Connector Rotates 360°
- Knurled Adjustment Screw

Materials:

- Swivel Connector: Die-cast zinc
- Seals: NBR



Part No.	Type	Connection Thread	Tubing O.D.	Weight [oz]
165012	GRLA-3/8NPT-QS-1/4-U	3/8 NPT	1/4"	2.27
165015	GRLA-3/8NPT-QS-5/16-U	3/8 NPT	5/16"	2.29
190950	GRLA-3/8NPT-QS-3/8-U	3/8 NPT	3/8"	2.40
190951	GRLA-3/8NPT-QS-1/2-U	3/8 NPT	1/2"	2.50
190952	GRLA-1/2NPT-QS-3/8-U	1/2 NPT	3/8"	3.70
190953	GRLA-1/2NPT-QS-1/2-U	1/2 NPT	1/2"	3.81

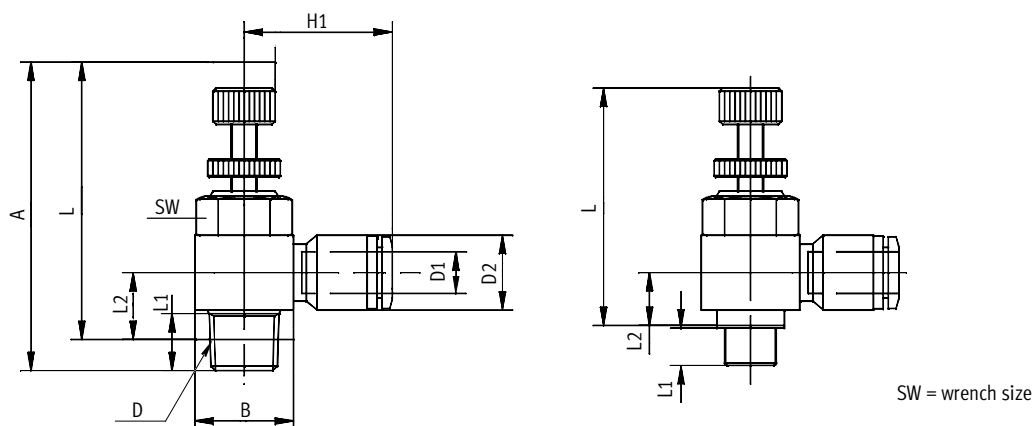
Note: GRLA-...-QS-... flow controls have an integral "Quick Star" (QS) push-pull fitting which requires a tubing O.D. tolerance of ± 1 mm. Festo PUN/PAN tubing should be used with these flow controls.

NFPA Cylinders, Type DNA

Cylinder Accessories – Flow Controls

Dimensions

GRLA...



Part No.	Type	A		B	D	D1	D2	H1	L		L1	L2	SW
		min.	max.						min.	max.			
165012	GRLA-3/8NPT-QS-1/4-U	2.12"	1.85"	0.87"	3/8 NPT	1/4	0.56"	1.15"	1.85"	1.57"	0.51"	0.61"	HEX3/4
165015	GRLA-3/8NPT-QS-5/16-U	2.10"	2.06"	0.87"	3/8 NPT	5/16	0.56"	1.14"	1.85"	1.57"	0.52"	0.61"	HEX3/4
190950	GRLA-3/8NPT-QS-3/8-U	2.11"	1.83"	0.87"	3/8 NPT	3/8	0.70"	1.22"	1.87"	1.59"	0.47"	0.64"	HEX3/4
190951	GRLA-3/8NPT-QS-1/2-U	2.11"	1.83"	0.87"	3/8 NPT	1/2	0.84"	1.45"	1.87"	1.59"	0.47"	0.70"	HEX3/4
190952	GRLA-1/2NPT-QS-3/8-U	2.31"	2.03"	1.10"	1/2 NPT	3/8	0.70"	1.32"	1.99"	1.71"	0.59"	0.70"	HEX1
190953	GRLA-1/2NPT-QS-1/2-U	2.31"	2.03"	1.10"	1/2 NPT	1/2	0.84"	1.43"	1.99"	1.71"	0.59"	0.76"	HEX1

Conversion Factors

The conversion table below includes the most commonly used for designing a system. They are given to enable the user to make necessary calculations.

Length or Distance

$$\text{m} \rightarrow \text{ft} = \times 3.281$$

$$\text{mm} \rightarrow \text{inch} = \div 25.4$$

Volume

$$\text{cm}^3 \rightarrow \text{in}^3 = \times 0.061$$

Mass

$$\text{g} \rightarrow \text{lb} = \times 0.002$$

$$\text{kg} \rightarrow \text{lb} = \times 2.2046$$

Pressure

$$\text{bar} \rightarrow \text{psi} = \times 14.7$$

Temperature

$$\text{C}^\circ \rightarrow \text{F}^\circ = \times [1.8] + 32$$

Flow

$$\text{l/min} \rightarrow \text{Cv} = \times 0.001$$

$$\text{l/min} \rightarrow \text{scfm} = \times 0.0353$$

Force

$$\text{N} \rightarrow \text{lbf} = \times 0.2248$$

$$\text{kgf} \rightarrow \text{N} = \times 9.80665$$

Moment

$$\text{Nm} \rightarrow \text{in-lb} = \times 8.8507$$

$$\text{Nm} \rightarrow \text{ft-lb} = \times 0.7376$$

Moment of Inertia

$$\text{kg}\cdot\text{cm}^2 \rightarrow \text{lb}\cdot\text{in}^2 = \times 0.3417$$

$$\text{kg}\cdot\text{m} \rightarrow \text{lb}\cdot\text{ft} = \times 7.233$$

$$\text{kg}\cdot\text{m}^2 \rightarrow \text{oz}\cdot\text{in}^2 = \times 5.4675$$

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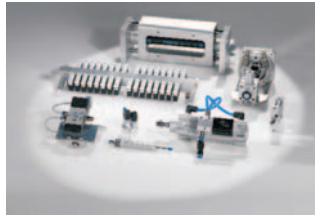
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Custom Designed Automation Solutions



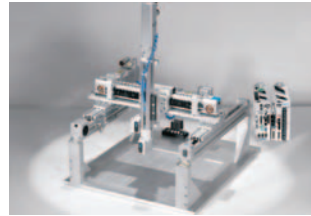
Custom Automation Components

- › Optimized automation components
- › Pneumatic & electromechanical
- › Clean room, wash down, vacuum, hazardous, and corrosion resistant
- › Assembly and Kitting Services



Custom Control Cabinets

- › 24VDC, 110VAC, 220VAC
- › UL, CE, NEMA, ETL, and IEC
- › Class 10 clean room, hazardous location and corrosion resistant



Complete Systems

- › Designed and built to your specifications
- › Pneumatic & electromechanical
- › Clean room & corrosion resistant

Electromechanical



Electric Linear Actuators

- › Ball screw, lead screw & belt driven
- › Repeatability up to +/- 0.005mm
- › Speeds up to 10m/s
- › Clean room and corrosion resistant



Motors & Controllers

- › Servo and stepper motors
- › 1, 3, 8, and 16-axis controllers
- › 24VDC, 115VAC, 230VAC
- › UL, CE, NEMA, ETL, and IEC

PLCs and I/O Devices



Controls and I/O Devices

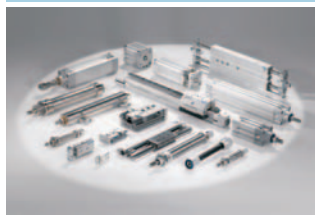
- › Programmable Logic Controllers
- › Remote Access Panels and Displays
- › I/O systems & handheld interfaces
- › Protocols (Ethernet, DeviceNet™, Profibus, and others)



Sensors and Feedback Devices:

- › Proximity and position sensors
- › Optical sensors
- › Pressure, vacuum & flow sensors
- › Limit switches & actuator feedback

Pneumatics



Pneumatic Actuators and Cylinders

- › NFPA and ISO standard cylinders
- › Guided rod & rodless actuators
- › Stainless steel & clean design
- › Bore sizes 2.5mm (0.1in) to 320mm (12.5in)



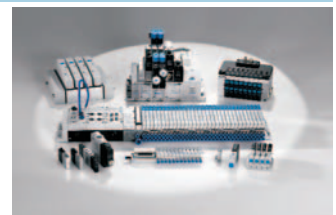
Pneumatic Rotary Actuators

- › Rotary vane & semi-rotary
- › Twin piston rack-and-pinion
- › Rotary/linear actuators
- › Process valve control



End Effectors

- › Grippers – micro, 3-point, radial, angle, T-slot, long-stroke, parallel, rotary/parallel, servo pneumatic
- › Escapements – feed separators
- › Vacuum grippers & generators



Valves and Valve Manifolds

- › Valve manifolds with multi-pin and fieldbus connections
- › High flow and high speed valves
- › ISO, IP65, Plug-in, clean design and hazardous location valves



Air Preparation

- › Air service units – flow rates up to 22,000L/min
- › Air filters, regulators, lubricators, dryers
- › Air pressure boosters
- › Lockout valves – OSHA compliant



Fittings, Connectors, Flow Controls, and Tubing

- › Inch, metric, and hybrid sizes
- › Fittings and Connectors – various geometries
- › Flow control, check, ball and shutoff valves, and pressure regulators
- › Tubing – various materials



Servo Pneumatic Controllers

- › Closed loop positioning accuracy with pneumatics
- › Pneumatic logic elements
- › Controls acceleration and velocity
- › Measured value converters

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