

PRA/802000/M, RA/802000/M, RA/8000, RA/8000/M ISOLine™ 15552 cylinder, double acting

- ø 32 ... 320 mm
- High performance adaptive cushioning system "ACS"
- Low temperature version up to -40 °C
- High temperature version up to +150 °C
- 16 bar version available
- Rail Cylinder Shock and vibration tested to EN 61373 Category 1; Class A + B



Technical features

Medium:
Compressed air, filtered, lubricated or non-lubricated

Standard:
ISO 15552

Operation:
Double acting, adjustable cushioning

Operating pressure:
ø 32 ... 125 mm (Profile barrel)
1 ... 12 bar (14 ... 174 psi)
ø 32 ... 200 mm (Round barrel)
1 ... 16 bar (14 ... 232 psi)
ø 250 & 320 mm (Round barrel)
1 ... 10 bar (14 ... 145 psi)

Ports:
G1/8 ... 1

Cylinder diameters:
32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320 mm

Standard strokes:
25, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500 mm

Non-standard strokes:
ø 32 ... 125 mm (5 ... 2800 mm)
ø 160 ... 320 mm (5 ... 2600 mm)

Operating temperature:
ø 32 ... 125 mm
"Standard version"
-20 ... +80 °C (-4 ... +176 °F)
ø 160 ... 320 mm
"Standard version"
-10 ... +80 °C (+14 ... +176 °F)
ø 32 ... 320 mm
"High temperature version" (T)
-20 ... +150 °C (-4 ... +302 °F)
ø 32 ... 200 mm
"Low temperature version" (L)
-40 max. ... +80 °C (-40 ... +176 °F)
Air supply must be dry enough to avoid ice formation at temperatures below +2 °C (+35 °F)

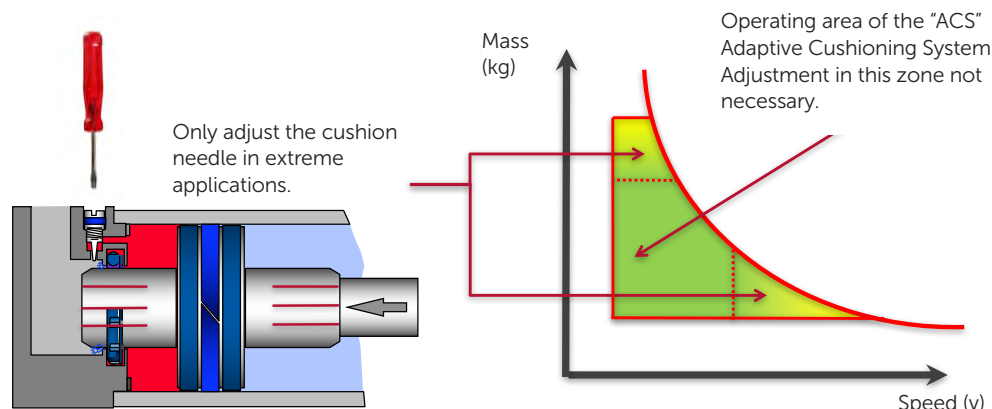
Standard Materials:
Barrel: Anodised aluminium
End covers: Pressure diecast aluminium (ø 200 ... 320 mm gravity cast aluminium)
Piston rod: Stainless steel (martensitic)
Piston rod seals: PUR (ø 160 ... 320 mm NBR)
Piston seals: PUR (ø 160 ... 320 mm NBR)
'O'-rings: NBR

Technical data

Cylinder ø (mm)	32	40	50	63	80	100	125	160	200	250	320
Profile barrel	•	•	•	•	•	•	•				
Round barrel	•	•	•	•	•	•	•	•	•	•	•
Port size	G1/8	G1/4	G1/4	G3/8	G3/8	G1/2	G1/2	G3/4	G3/4	G1	G1
Piston rod ø (mm)	12	16	20	20	25	25	32	40	40	50	63
Piston rod thread	M10 x 1,25	M12 x 1,25	M16 x 1,5	M16 x 1,5	M20 x 1,5	M20 x 1,5	M27 x 2	M36 x 2	M36 x 2	M42 x 2	M48 x 2
Cushion length (mm)	20	22	24	24	26	33	39	43	43	55	60
Cushioning Adaptive cushioning systems "ACS"	•	•	•	•	•	•	•				
Cushioning (adjustable cushion)								•	•	•	•
Initial cushion volume (cm3)	12,8	20,2	36	64	111	235	427	784	1273	2534	4559
Theoretical thrusts at 6 bar outstroke (N)	482	754	1178	1870	3016	4710	7363	12064	18840	29436	48228
Theoretical thrusts at 6 bar instroke (N)	414	633	990	1680	2722	4416	6882	11310	18090	28236	47292
Air consumption at 6 bar outstroke (l/cm)	0,056	0,088	0,137	0,218	0,35	0,55	0,86	1,41	2,2	3,44	5,63
Air consumption at 6 bar instroke (l/cm)	0,048	0,074	0,114	0,195	0,32	0,51	0,79	1,32	2,1	3,3	5,41

The function

The new "ACS" Adaptive Cushioning System provides a high performance pneumatic damping function. The system will automatically cushion for a wide range of general applications as delivered. Manual adjustment is still possible for extreme applications.



Design and sizing in pneumatics

Golden Rules

Design and sizing in pneumatics is often based upon experience coupled with an element of fear of under specifying crucial equipment. In an attempt to ensure enough power, engineers may select over sized cylinders and then select over sized valves to supply them with enough air. The same uncertainty can also lead to over sized specification of air line equipment, fittings and tubing. The outcome is components larger than necessary that use too much compressed air and waste energy and money. However when following some well proven golden rules and a few laws of pneumatics it is easy to achieve correctly sized pneumatic installations.

Basics to Consider

The force required, the pressure available, the speed of movement and air consumption. ISO and VDMA standard or compact style also cushioning and sensors. Cylinders are greased on assembly and operate under normal conditions without additional lubrication. However using a lubricator will extend the life of these products.

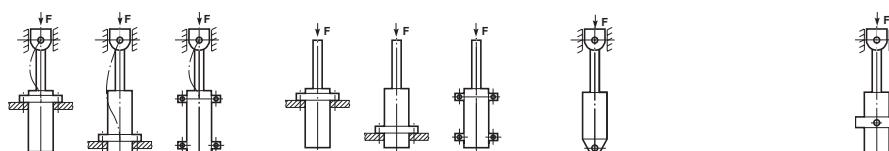
Golden Rule:

The theoretical force of the cylinder should be 25% extra for high speed, 50% extra for low speed and 100% extra for ultra low speed (positioning) applications.

The correct sizing is based upon the required force and applied pressure. Go to page 1 for more information on cylinder sizing and air consumption.

Load and Buckling

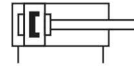
For applications with high side loading, use pneumatic slide actuators or standard cylinders fitted with guide units. Alternatively external guide bearings should be installed. When a long stroke length is specified, care must be taken to ensure the rod length is within the limits for prevention of buckling. The table shows the maximum stroke length for a variety of installation arrangements.



Cylinder ø (mm)	Piston rod ø (mm)	Load case 1 Pressure (bar)				Load case 2 Pressure (bar)				Load case 3 Pressure (bar)				Load case 4 Pressure (bar)			
		4	6	10	16	4	6	10	16	4	6	10	16	4	6	10	16
32	12	1100	860	650	500	500	390	290	210	650	520	380	290	760	600	450	340
40	16	1600	1200	950	730	730	580	430	320	940	750	560	430	1100	880	660	500
50	20	2000	1600	1200	930	930	740	550	420	1200	960	720	550	1400	1100	840	640
63	20	1500	1200	930	720	720	570	420	310	930	740	550	420	1100	860	650	490
80	25	1900	1500	1100	880	880	700	510	380	1100	910	680	510	1300	1100	800	600
100	25	1500	1200	880	670	670	520	380	270	880	690	510	370	1000	820	600	450
125	32	2000	1600	1200	910	910	710	520	380	1200	940	690	520	1400	1100	820	620
160	40	2400	1900	1500	1100	1100	880	640	480	1400	1200	860	640	1700	1400	1000	760
200	40	1900	1500	1100	860	860	670	480	350	1100	890	650	480	1300	1000	770	580
250	50	2400	1900	1400	1100	1100	850	620	440	1400	1100	830	610	1700	1300	980	730
320	63	2600	2400	1800	1400	1400	1100	780	570	1800	1400	1000	780	2100	1700	1200	930

RT/57200/M, RM/57200/M, Roundline cylinder Magnetic piston, double acting

- Ø 8 ... 63 mm
- Saves 20% space over the basic length of a corresponding ISO/VDMA cylinder
- Low friction, long life seals
- High strength, double crimped end cap design
- Standard magnetic piston for full control system versatility



Technical features

Medium:
Compressed air, filtered,
lubricated or non-lubricated
Operation:
Double acting with buffer
cushioning

Operating pressure:
1 ... 10 bar (14 ... 145 psi)
Cylinder diameters:
8, 10, 12, 16, 20, 25, 32, 40,
50, 63 mm
Strokes:
See page below
Non-standard strokes:
up to 500 mm max. on request

Operating temperature:
-5 ... +80°C max. (+23 ... +176°F)
Air supply must be dry enough
to avoid ice formation at
temperatures below +2°C (+35°F).

Materials:
Piston rod: stainless steel
(8 ... 16 mm bore austenitic,
20 ... 63 mm bore martensitic)
End covers: aluminium
Barrel: stainless steel
(austenitic)
Wiper: PUR
Seals and 'O'-rings: NBR

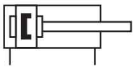
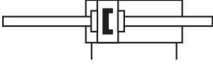
Technical data

Cylinder Ø (mm)	8	10	12	16	20	25	32	40	50	63
Port size RT/572** (RM/572**)	M3 (M3)	M5 (M5)	M5 (M5)	M5 (M5)	Rc 1/8 (M6)	Rc 1/8 (M6)	Rc 1/8 (G 1/8)	Rc 1/8 (G 1/8)	Rc 1/4 (G 1/4)	Rc 1/4 (G 1/4)
Piston rod Ø (mm)	3	4	4	6	8	10	12	14	16	20
Piston rod thread	M3	M4	M4	M6	M8	M10 x 1,25	M10 x 1,25	M12 x 1,25	M 12 x 1,25	M 16 x 1,5
Theoretical thrusts at 6 bar outstroke (N)	30	46,8	67,8	120	188	294	482	754	1178	1870
Theoretical thrusts at 6 bar instroke (N)	25,9	39,6	60	103	158	247	414	661	1057	1680
Air consumption at 6 bar outstroke (l/cm)	0,004	0,005	0,008	0,014	0,022	0,035	0,056	0,087	0,137	0,218
Air consumption at 6 bar instroke (l/cm)	0,003	0,004	0,006	0,013	0,019	0,02	0,048	0,074	0,114	0,195

Standard strokes

Cylinder Ø (mm)	Stroke length (mm)										
	10	25	40	50	80	100	125	160	200	250	320
8	•	•	•	•	•	•	—	—	—	—	—
10	•	•	•	•	•	•	—	—	—	—	—
12	•	•	•	•	•	•	•	•	•	—	—
16	•	•	•	•	•	•	•	•	•	—	—
20	•	•	•	•	•	•	•	•	•	•	•
25	•	•	•	•	•	•	•	•	•	•	•
32	•	•	•	•	•	•	•	•	•	•	•
40	•	•	•	•	•	•	•	•	•	•	•
50	•	•	•	•	•	•	•	•	•	•	•
63	•	•	•	•	•	•	•	•	•	•	•

Cylinder variants

Symbol	Model magnetic piston	Description	Dimensions
			Page
	R./57200/M	Standard cylinder, Ø 8 to 40 mm, integral eye mounting, Ø 50 and 63 mm	4 & 5
	R./57200/MC	Cylinder with central rear port	5
	R./57200/MF	Cylinder with flat rear cover	5
	R./57200/JM	Cylinder with double ended piston rod (Ø 16 to 63 mm)	4

Option selector

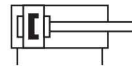
Port size	Cylinder Ø (mm)	Substitute
M3	8	T
M5	10	T
M5	12	T
M5	16	T
M6	20	M
Rc1/8	20	T
M6	25	M
Rc1/8	25	T
G1/8	32	M
Rc1/8	32	T
G1/8	40	M
Rc1/8	40	T
G 1/4	50	M
Rc 1/4	50	T
G 1/4	63	M
Rc 1/4	63	T

R★/572★/★/★/★

Stroke (mm)	
500 max.	
Cylinder variants	Substitute
Magnetic piston	M
Magnetic piston, central rear port, flat end	MC
Magnetic piston, side port, flat end	MF
Magnetic piston, double ended piston rod	JM
Cylinder Ø (mm)	Substitute
8	08
10	10
12	12
16	16
20	20
25	25
32	32
40	40
50	50
63	63

RA/192000/M, ISO Compact cylinder Magnetic piston, double acting

- $\varnothing$ 20 ... 125 mm
- Conforms to ISO 21287
- M/50 switches can be mounted flush with the profile
- Magnetic piston as standard
- Seals ensure low friction operation and long life
- Three different guiding systems:
RA/192000/N2, .../N4 or .../N6



Technical features

Medium:

Compressed air, filtered, lubricated or non-lubricated

Standard:

Based on ISO 21287

Operation:

RA/192000/M: Double acting, magnetic piston, male piston rod thread, buffer cushioning
RA/192000/MX: Double acting, magnetic piston, female piston rod thread, buffer cushioning

Operating pressure:

1 ... 10 bar (14 ... 145 psi)

Ports:

M5, G1/8 ... G1/4

Cylinder diameters:

20, 25, 32, 40, 50, 63, 80, 100 and 125 mm

Standard Strokes:

See table below (standard stroke lengths)

Non-standard strokes:

$\varnothing$ 20 ... 25 mm (5 ... 200 mm)
 $\varnothing$ 32 ... 40 mm (5 ... 300 mm)
 $\varnothing$ 50 ... 63 mm (10 ... 400 mm)
 $\varnothing$ 80 ... 125 mm (15 ... 500 mm)

Operating temperature:

-5 ... +80 °C max. (+23 ... +176 °F)
Air supply must be dry enough to avoid ice formation at temperatures below +2 °C (+35 °F).

Materials:

Profile barrel: Anodized aluminium
End covers: Pressure diecast aluminium
Piston rod: Stainless steel
Piston rod seals: PUR
Piston seals: NBR
O-rings: NBR

Technical data

Cylinder $\varnothing$ (mm)	20	25	32	40	50	63	80	100	125
Port size	M 5	M 5	G 1/8	G 1/8	G 1/8	G 1/8	G 1/8	G 1/8	G 1/4
Piston rod $\varnothing$ (mm)	10	10	12	16	20	20	25	25	32
Piston rod thread	M8x1,25	M8x1,25	M10x1,25	M10x1,25	M12x1,25	M12x1,25	M16x1,5	M16x1,5	M27x2
Energy (J) max.	0,2	0,3	0,45	0,75	1,1	1,3	1,9	2,3	3
Theoretical thrusts at 6 bar outstroke (N)	188	294	482	754	1178	1870	3016	4710	7363
Theoretical thrusts at 6 bar instroke (N)	141	247	414	633	990	1680	2722	4416	6882
Air consumption at 6 bar outstroke (l/cm)	0,022	0,035	0,056	0,088	0,137	0,218	0,35	0,55	0,86
Air consumption at 6 bar instroke (l/cm)	0,016	0,028	0,048	0,074	0,114	0,195	0,32	0,51	0,79

Technical data, Tandem Cylinder (increased force), RA/1920xx/TM.

For Model only RA/1920xx/TM..	20	25	32	40	50	63	80	100
Energy (J) max.	0,2	0,3	0,45	0,75	1,1	1,3	1,9	2,3
Theoretical thrusts at 6 bar outstroke (N)	330	542	897	1387	2168	3552	5737	9130
Theoretical thrusts at 6 bar instroke (N)	141	247	414	633	990	1680	2722	4416
Air consumption at 6 bar outstroke (l/cm)	0,038	0,063	0,105	0,162	0,253	0,414	0,669	1,065
Air consumption at 6 bar instroke (l/cm)	0,016	0,028	0,048	0,074	0,114	0,195	0,32	0,51

Standard strokes

Cylinder ø (mm)	Stroke length (mm)										
	5	10	15	20	25	30	40	50	60	80	100
20	•	•	•	•	•	•	•	•	—	—	—
25	•	•	•	•	•	•	•	•	—	—	—
32	•	•	•	•	•	•	•	•	—	—	—
40	•	•	•	•	•	•	•	•	—	—	—
50	—	•	•	•	•	•	•	•	•	•	•
63	—	—	•	•	•	•	•	•	•	•	•
80	—	—	•	•	•	•	•	•	•	•	•
100	—	—	•	•	•	•	•	•	•	•	•
125	—	—	•	•	•	•	•	•	•	•	•

Design and sizing in pneumatics

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Basics to Consider

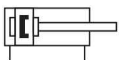
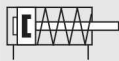
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The theoretical force of the cylinder should be 25% extra for high speed, 50% extra for low speed and 100% extra for ultra low speed (positioning) applications.

The correct sizing is based upon the required force and applied pressure. Go to page 1 for more information on cylinder sizing and air consumption.

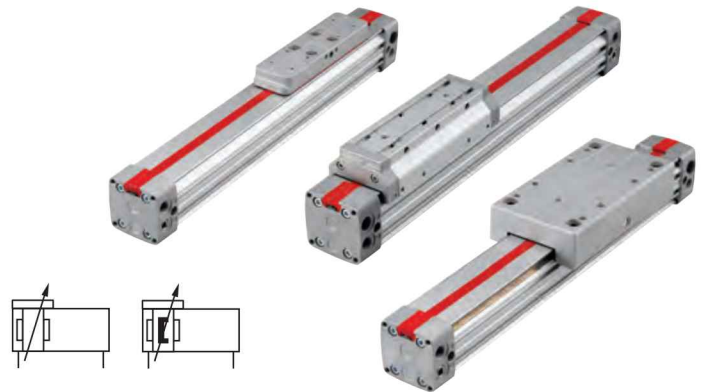
Additional ISO 15552 Cylinder ranges (Cylinder ranges in the red frame are shown in this data sheet)

													
Symbols		Profile barrel	Round Barrel	Industrial Automation	Food & Beverage	Automotive	ATEX II 2GD	Rail *1)	CE-marked	ø (mm)	Range	Discription	Datasheet
		•	•	•	•	•	•	•	•	20 ... 125	RA/192000	Double Acting Cylinder	de_1_5_084_RA_192000_M
										20 ... 125	RA/192000/M/EX		de_1_5_085_RA_192000_M_EX
		•	•	•	•	•				20 ... 63	RA/191000, RA/193000	Single Acting Cylinder	de_1_4_084_RA_191000_M

• Range available. For additional information please contact the technical service or <http://www.norgren.com> *1) Rail Cylinder Shock and vibration tested to EN 61373 Category 1: Class A + B

M/146000, M/146100, M/146200, LINTRA®PLUS rodless cylinder Magnetic & Non-magnetic piston, double acting

- $\varnothing$ 16 ... 80 mm
- New lightweight design extrusion with universal mounting grooves
- Proved and patented sealing system
- Dust protection as standard ($\varnothing$ 25 ... 63 mm)
- Interchangeability with series M/46000



Technical features

Medium:
Compressed air, filtered, lubricated or non-lubricated

Operation:
M/146000, M/146100, M/146200
Double acting, with adjustable cushioning
M/146000/M, M/146100/M, M/146200/M
Double acting with adjustable cushioning and magnetic piston

Models:
M/146000 with internal guide
M/146100 with external adjustable guide
M/146200 with precision roller guide

Operating pressure:
1 ... 8 bar (14 ... 116 psi)

Cylinder diameters:
16, 20, 25, 32, 40, 50, 63, 80 mm

Max strokes:
 $\varnothing$ 16 ... 40 mm 8500 mm
 $\varnothing$ 50 and 63 mm 8000 mm
 $\varnothing$ 80 mm 5500 mm

Operating temperature:
-30 ... +80°C max.
(-22 ... +176°F)
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

Materials:
End covers: aluminium diecast, moulded plastic ($\varnothing$ 16) and anodised aluminium ($\varnothing$ 20 & 80)
Yoke: anodised aluminium, moulded plastic ($\varnothing$ 16 & 20)
Carriage, closer & cover: aluminium diecast
Guiding bridge and profile barrel: anodised aluminium
Seal strip, wiper and piston seal: PUR
Cover strip: PA
Other seals: NBR
Mounting screws: A2E
Shim ring: stainless steel (A2)

Technical data

Cylinder $\varnothing$ (mm)	16	20	25	32	40	50	63	80
Port size	M5	G1/8	G1/8	G1/4	G1/4	G3/8	G1/2	G1/2
Cushion length (mm)	12	26	26	35	50	60	70	75
Theoretical thrusts at 6 bar outstroke (N)	120	188	294	482	754	1178	1870	3016
Air consumption at 6 bar outstroke (l/cm stroke)	0,014	0,022	0,035	0,056	0,088	0,137	0,218	0,35
Holding forces (N) of brake (on dry braking surface)								
Activ (L1 + L3) at 6 bar	—	—	500	900	1500	2500	4000	—
Passive (L2 + L4)	—	—	220	375	630	1000	1650	—

Alternative variants

Symbol	Model (non-magnetic piston)	Symbol	Model (magnetic piston)	Description	Page
	M/146000		M/146000/M	With internal guide	7, 8 & 16
	M/146100		M/146100/M	With external adjustable guide	7, 9 & 16
	M/146200		M/146200/M	With precision roller guide (ø 25 ... 63 mm)	10
	M/146200/P		M/146200/PM	With added caged ball linear motion guide (ø 25 ... 63 mm) Max. stroke length: ø 25 = 900 mm, ø 32 & 40 = 1500 mm, ø 50 & 63 = 2600 mm	11
	M/146000/IC		M/146000/MC	With alternative ports	12
	M/146100/IC		M/146100/MC	With alternative ports	12
	M/146200/IC		M/146200/MC	With alternative ports	12
	M/146100/ID		M/146100/MD	With external adjustable guide (ø 16 ... 80 mm)	7, 9 & 16
	M/146200/ID		M/146200/MD	With precision roller guide (ø 25 ... 63 mm)	10
	M/146000/L1		M/146000/L3	Active holding brake (ø 25 ... 63 mm)	13
	M/146200/L1		M/146200/L3	Applying pressure activates the brake The brake lining is pushed against a stainless steel strip. To release, depressurize.	14
	M/146000/L2		M/146000/L4	Passive holding brake; (ø 25 ... 63 mm)	13
	M/146200/L2		M/146200/L4	Applying pressure releases the brake. When the pressure is released the brake lining is pushed against the stainless steel strip by a spring loaded plate.	14
			M/146000/F1	With internal guide and linear position sensor (ø 32 ... 63 mm) Electrical data of linear position sensor: Operating voltage: 10 ... 30 V d.c., resolution 16 bit, Repeat accuracy 0,006 %, output 4 ... 20 mA, short-circuit protection, linearity 0,05 % of measuring range, protection class IP67 Min. stroke length = 110 mm	15
			M/146100/F1	With external adjustable guide and linear position sensor (ø 32 ... 63 mm) Min. stroke length = 110 mm	15
			M/146200/F1	With precision roller guide and linear position sensor (ø 32 ... 63 mm) Min. stroke length = 110 mm	15

Corrosion resistant cylinders see page N/en 1.6.011

Options selector

Guiding system	Substitute
Internal	0
External	1
Precision roller guide	2
Cylinder Ø (mm)	Substitute
16	16
20	20
25	25
32	32
40	40
50	50
63	63
80	80

Note:
Disregard option positions not used.
For combinations of cylinder variants consult our Technical Service.
This options selector explains only the cylinder variants. Additional variants/options are not possible.

M/146***/*/*/*/*

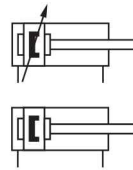
Strokes (mm)	
On request	
Variants (non-magnetic piston)	Substitute
Alternative ports	IC
Active brake	L1
Passive brake	L2
With added caged ball linear motion guide	P
Double carriages *1)	ID
M/146***/ID/***/****	Distance between carriage centres (mm)
Variants (magnetic piston)	Substitute
Alternative ports	MC
Active brake	L3
Passive brake	L4
With added caged ball linear motion guide	PM
With linear position sensor	F1
Double carriages *1)	MD
M/146***/MD/***/****	Distance between carriage centres (mm)

*1) For M/146100 & M/146200 only

KM/8000/M, ISO cylinder (stainless steel)

Magnetic piston, double acting

- Ø 12 ... 25 mm
- High corrosion and acid resistance
- Magnetic piston as standard
- Conforming to ISO 6432
- Suitable for applications in the Food Industry
- Buffer or adjustable cushioning
- Nose mounting nut and piston rod locknut as standard



Technical features

Medium:
Compressed air, filtered, lubricated or non-lubricated

Standard:
ISO 6432

Operation:
Double acting with magnetic piston and buffer or adjustable cushioning

Operating pressure:
1 ... 10 bar (14 ... 145 psi)

Cylinder diameters:
12, 16, 20, 25 mm (buffer)
20, 25 mm (adjustable cushioning)

Strokes:
See page below

Non-standard strokes:
up to 500 mm max. on request

Operating temperature:
-5 ... +80°C max. (+23 ... +176°F)
Air supply must be dry enough to avoid ice formation at temperatures below +2 °C (+35 °F).

Materials:
Cylinder barrel: X5 Cr Ni 18 10 (1.4301; AISI 304)
End covers: X10 Cr Ni S 18 9 (1.4305; AISI 303)
Piston rod: X10 Cr Ni S 18 9 (1.4305; AISI 303)
Piston: POM
Buffer: PUR
Piston rod seal: PUR
Piston and cushion seal: NBR
'O'-rings: NBR

Technical data

Cylinder Ø (mm)	12	16	20	25
Port size	M5	M5	G1/8	G1/8
Piston rod Ø (mm)	6	6	8	10
Piston rod thread	M6	M6	M6	M10x1,25
Cushion length mm	-	-	19	19
Theoretical thrusts at 6 bar outstroke (N)	67,8	120	188	294
Theoretical thrusts at 6 bar instroke (N)	51	104	158	247
Air consumption at 6 bar outstroke (l/cm)	0,008	0,014	0,022	0,035
Air consumption at 6 bar instroke (l/cm)	0,006	0,013	0,019	0,028

Standard strokes with buffer cushioning

Cylinder Ø (mm)	Stroke length (mm)									
	10	25	40	50	80	100	125	160	200	250
12	•	•	•	•	•	•	•	•	•	—
16	•	•	•	•	•	•	•	•	•	—
20	•	•	•	•	•	•	•	•	•	•
25	•	•	•	•	•	•	•	•	•	•

with adjustable cushioning

Cylinder Ø (mm)	Stroke length (mm)									
	10	25	40	50	80	100	125	160	200	250
20	—	•	—	•	•	•	•	•	•	•
25	—	•	—	•	•	•	•	•	•	•

Additional ISO 15552 Cylinder ranges (Cylinder ranges in the red frame are shown in this data sheet.)



Symbole		Profile barrel	Round Barrel	Industrial Automation	Food & Beverage	Automotive	ATEX II 2GD	Rail *1)	CE-marked	ø (mm)	Range	Discription	Datasheet
		•	•			•				Ø 10 ... 25	RM/8000/M	Double Acting Cylinder ISO 6432	de_1_5_021_RM_8000
							•						de_1_5_022_RM_8000_M_EX
		•	•	•	•	•				Ø 12 ... 25	KM/8000/M	Double Acting Cylinder ISO 6432	de_1_5_025_KM_8000_M
						•							de_1_5_026_KM_8000_M_EX
		•	•			•				Ø 32 ... 100	RM/55401/M	Double Acting Cylinder	de_1_5_073_RM_55401
		•	•	•	•	•				Ø 32 ... 125	KM/55001/M	Double Acting Cylinder	de_1_5_077_KM_55001_M
		•	•			•				Ø 8 ... 63	RT/57200/M	Double Acting Cylinder	de_1_5_041_RT_57200_M_RM_57200_M
							•						de_1_5_042_RT_57200_M_EX
		•	•			•				Ø 25 & 40	VSM/55600/N2	Double Acting Cylinder with hollow piston rod	de_1_5_063_VSM_55600_N2
		•	•			•				Ø 10 ... 25	RM/28000/M	Single Acting Cylinder ISO 6432	de_1_4_031_RM_28000_M
		•	•			•				Ø 8 ... 40	RT/57100/M RT/57300/M	Single Acting Cylinder	de_1_4_051_RT_57100_M

• Range available. For additional information please contact the technical service or <http://www..com>

*1) Rail Cylinder Shock and vibration tested to EN 61373 Category 1; Class A + B

M/60285 ... M/60288

Rotary vane actuators, double acting

- Torque at 6 bar
5,78 ... 241,73 Nm
- High torque from compact units
- Rotation angles from
90 ... 270°
- Suitable for torques
from 1,23 ... 402,46 Nm



Technical features

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting rotary vane with buffer cushioning
M/60285 to M/60288 single vane
M/60285/TI to M/60288/TI double vane

Operating pressure:

2 ... 10 bar (29 ... 145 psi)

Rotation angle:

90°, 180°, 270° single vane
90° double vane

Rotation tolerance:

0 ... +3°

Other features:

Featherkey supplied as standard

Operating temperature:

-5°C ... +60°C (+23 ... +140°F)
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F)

Materials:

Body: Cast aluminium
Shaft: Steel
Shaft bearing: Sintered bronze
Seals: NBR

Technical data, standard

Port size	Theoretical torque at 6 bar (Nm)	Permissible forces *1)		Permissible rotation energy *2) (Nm)	Maximum frequency *3)			Air consumption			Weight			Model
		axial (N)	radial (N)		90°	180°	270°	90°	180°	270°	90°	180°	270°	
G 1/8	5,8	44,1	588	49 x 10 ⁻³	180	90	60	51	51	61	0,82	0,79	0,73	M/60285
G1/8	12,8				180			42			0,82			M/60285/TI
G1/4	18	88,2	1176	225,4 x 10 ⁻³	120	78	48	146	146	179	2	1,9	1,7	M/60286
G1/4	41,5				120			127			2			M/60286/TI
G3/8	34,5	147	1960	1078 x 10 ⁻³	90	60	42	244	283	352	3,7	3,7	3,7	M/60287
G3/8	83				90			244			4,3			M/60287/TI
G1/2	123	490	4900	3920 x 10 ⁻³	66	45	30	754	869	1036	12,7	12,2	11,2	M/60288
G1/2	247				66			754			12,7			M/60288/TI

*1) Permissible load on rotary vane shaft

*2) Permissible rotational energy in Nm which may be applied to shaft. It can be calculated as follows:
Permissible rotational energy $\geq 1/2 I \times \omega^2$, I = Angular moment, ω = Mean angular velocity

*3) Maximum frequency at 5 bar pressure, no load

Hydro-cushion

Min. operating pressure (bar)	Operating temperature (C°)	Load range (kg x cm2)	Max. absorption energy (Nm)	Max. absorption energy per minute (Nm/min)	Absorbing angle (°)	Maximum collision angular velocity (°/s)	Weight (kg)	Model
3	+5 ... +50	981	2,9	20	11	850	0,24	QM/60285/60
3	+5 ... +50	2942	9,8	71	12	750	0,42	QM/60286/60
3	+5 ... +50	5884	19,6	137	14	650	0,78	QM/60287/60

Mini rotary vane actuators models with fixed or adjustable rotation angles

Rotation angle			Double vane	Single vane	Model
90°	180°	270°			
•	•	•		•	M/60285/*
•			•		M/60285/TI
•	•	•		•	M/60286/*
•			•		M/60286/TI
•	•			•	M/60287/*
•			•		M/60287/TI
•	•	•		•	M/60288/*
•			•		M/60288/TI

Option selector

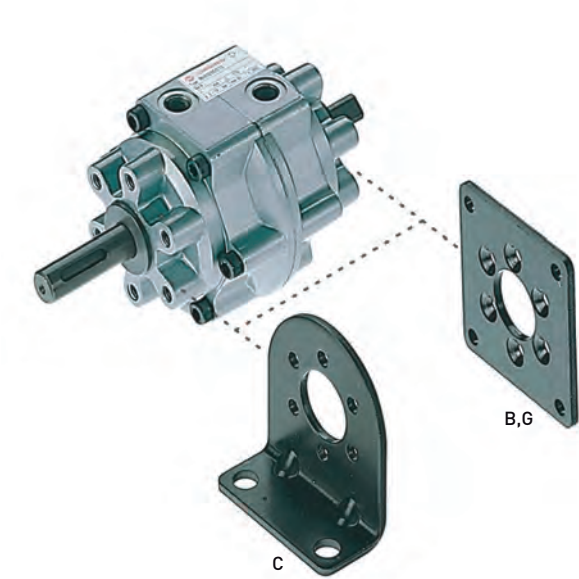
Size	Substitute
5, 6, 7, 8	X

M/6028*/**/***

Rotation	Substitute
Standard only	see table
Variants	Substitute
Single vane, fixed	None
Double vane, fixed	TI

Note: Please fill in only the numbers of digits required. Please order the mounting kit and hydro-cushion kit separately.

Mountings

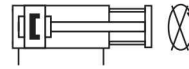


Model	B, G	C
		
	Page 4	Page 4
M/60285, .../TI	QM/60285/22	QM/60285/21
M/60286, .../TI	QM/60286/22	QM/60286/21
M/60287, .../TI	–	QM/60287/21
M/60288, .../TI	–	QM/60288/21

M/61000/M, M/61000/MR

Guiding and stopper cylinder

- Ø 32 ... 100 mm
- Guiding accuracy $\pm 0,02$ mm
- Non-rotation accuracy $\pm 0,02^\circ$
- Integrated heavy duty guide rods
- Linear ball bearing option provides precision guiding for higher speeds
- Plain bearing option offers higher side load capacity
- Easy installation
- Magnetic piston as standard
- Buffer pad for noise reduction



Technical features

Medium:

Compressed air, filtered, lubricated or non-lubricated

Operation:

Double acting with magnetic piston and buffer cushioning

Operating pressure:

1 ... 10 bar (14 ... 145 psi)

Cylinder diameters:

32, 40, 50, 63, 80 (plain bearings)
32, 40, 50, 63, 80, 100 (ball bearings)

Standard Strokes:

25, 50, 75, 100 mm
(non-standard strokes <100 mm available.
They have the dimensions of the next longer standard stroke.)

Operating temperature:

-10°C ... +80°C max.
(+14 ... +176°F)
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (+35°F).

Materials:

Profile barrel: anodized aluminium
Piston rod: stainless steel (martensitic)
Guide rod: stainless steel martensitic (plain bearings), hardened steel, hard-chrome plated (ball bearings)
Bearing: solid bronze (plain bearings), steel roller (ball bearings)
Mounting plate: stainless steel (austenitic)
Piston rod seals: PUR
Piston seals: NBR
'O'-ring: NBR

Technical data

Cylinder Ø (mm)	32	40	50	63	80	100
Port size	G1/8	G1/8	G1/4	G1/4	G1/4	G1/4
Theoretical forces at 6 bar outstroke (N)	482	754	1178	1870	3016	4710
Theoretical forces at 6 bar instroke (N)	414	633	990	1680	2722	4416
Air consumption at 6 bar outstroke (l/cm)	0,056	0,088	0,137	0,218	0,35	0,55
Air consumption at 6 bar instroke (l/cm)	0,048	0,074	0,114	0,195	0,32	0,51

Option selector

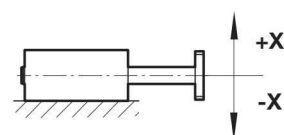
Cylinder Ø (mm)		Strokes (mm)	
32	032	25	25
40	040	50	50
50	050	75	75
63	063	100	100
80	080	Variants (magnetic piston) Substitute Plain bearings (Ø 32 ... 80 mm) M Ball bearings (Ø 32 ... 100 mm) MR Ball bearings, special wipers (Ø 32 ... 100 mm) W2R	
100	100		

Weights (kg)

Ø	Stroke (mm) 25	50	75	100	Model
32	1,50	1,99	2,48	2,97	M/61000/M Cylinder with slide bearing
40	1,70	2,21	2,72	3,23	
50	2,40	3,10	3,80	4,50	
63	3,10	3,91	4,72	5,53	
80	6,45	7,77	9,09	10,40	
32	1,25	1,65	2,05	2,45	M/61000/MR Cylinder with roller bearing
40	1,45	1,87	2,29	2,71	
50	2,10	2,68	3,26	3,84	
63	2,60	3,27	3,94	4,61	
80	5,99	7,14	8,29	9,44	
100	9,16	10,75	12,35	13,95	

Guiding accuracy

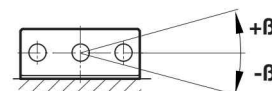
Deflection of the mounting platem at instroke and outstroke position without load.



Cylinder Ø (mm)	32		40		50		63		80		100	
	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke	Instroke	Outstroke
Position												
Slidebearing	± 0,06	± 0,11	± 0,06	± 0,11	± 0,06	± 0,11	± 0,06	± 0,11	± 0,07	± 0,11	–	–
Rollerbearing	+ 0,02	+ 0,04	+ 0,02	+ 0,04	+ 0,03	+ 0,05	+ 0,03	+ 0,05	+ 0,03	+ 0,05	+ 0,03	+ 0,05

Non-rotation Accuracy

Deflection of the mounting plate β (°) at instroke position without load.



Cylinder Ø (mm)	32	40	50	63	80	100
Slide bearing	± 0,06	± 0,06	± 0,05	± 0,05	± 0,04	–
Roller bearing	± 0,03	± 0,03	± 0,03	± 0,03	± 0,02	± 0,02

Load data General:

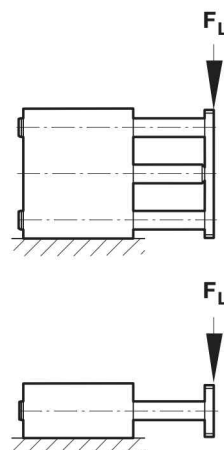
The combination of different load cases (e.g. load plus torque or eccentricity in two directions) will reduce the permissible load accordingly. Keep the guide rods free from any pollution.

Maximum load FL* (N)

at the front plate

Cylinder Ø (mm)	Stroke (mm) 25	50	75	100	Model
32	212	214	215	216	M/61032/M
32	163	179	187	191	M/61032/MR
40	227	224	223	222	M/61040/M
40	181	191	195	198	M/61040/MR
50	324	331	334	337	M/61050/M
50	223	236	242	246	M/61050/MR
63	343	343	343	344	M/61063/M
63	251	254	256	257	M/61063/MR
80	470	479	484	487	M/61080/M
80	423	459	477	488	M/61080/MR
100	902	761	799	821	M/61100/MR

* Dependent on stroke



PM/31000 Serviceable air bellows

Single acting

- Ø 2 3/4 ... 12 inch (Ø 78 ... 330 mm)
- Frictionless operation
- No maintenance or lubrication
- Ideal for short stroke, high-force applications
- High isolation level for vibrating machines
- Very easy to install – no alignment problems



Technical features

Medium:

Compressed air lubricated or unlubricated, Nitrogen, water (with glycol)

Operation:

Single acting

Operating pressure:

5,5 bar (79 psi) recommended dynamic pressure
8 bar (116 psi) maximum

Nominal diameters:

2 3/4, 4 1/2, 6, 8, 9 1/4, 12 inches

Strokes:

From 20 ... 320 mm max., depending on diameters and number of convolutions

Operating temperature:

for PM/31000 (Standard)
-30 ... +50°C (-22 ... +122°F)
-40 ... +70°C* (-40 ... +158°F)*
IR for TPM/31000
-20 ... +70°C (-4 ... 158°F)
-25 ... +90°C* (-13 ... 194°F)*
ECO for EPM/31000
+50 ... +115°C (+122 ... 239°F)
-20 ... +130°C* (-4 ... +266°F)*
* The number represent the maximum permissible operating temperature. It is sutibel to operated with restriction at this temperature, the air bellow may have a reduced life time!

Materials:

End plates: Aluminium
Ø 2 3/4 ... 6 inch, steel chromated Ø 8, 9 1/4, 12 inch
Central ring: aluminium or steel chromated
Bellow: PM/31000: fabric reinforced NR/BR, SBR-compound rubber
TPM/31000: IR
EPM/31000: ECO

Technical data

Model	PM/31021	PM/31022	PM/31023	PM/31041	PM/31042	PM/31043	PM/31061	PM/31062
Cylinder Ø [inch]	2 3/4"	2 3/4"	2 3/4"	4 1/2"	4 1/2"	4 1/2"	6"	6"
Air Port	G 1/4	G 1/4	G 1/4	G 3/8	G 3/8	G 3/8	G 1/2	G 1/2
Nominal Ø (inch) x convolutions	2 3/4" x 1	2 3/4" x 2	2 3/4" x 3	4 1/2" * 1	4 1/2" * 2	4 1/2" * 3	6" x 1	6" x 2
Stroke [mm]	20	45	60	40	85	100	55	115
Installation height min [mm]	50	65	80	50	65	100	55	80
Recomended max working height [mm]	65	105	130	80	135	180	100	170
Installation height max [mm]	70	110	140	90	150	200	110	190
Retracting force to reach min height [N]	200	310	300	200	240	140	200	220
Force at 6 bar [N] depending from the stroke	See graph on page 5 & 6							
Model	PM/31063	PM/31081	PM/31082	PM/31091	PM/31092	PM/31121	PM/31122	PM/31123
Cylinder Ø [inch]	6"	8"	8"	9 1/4"	9 1/4"	12"	12"	12"
Air Port	G 1/2	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4
Nominal Ø (inch) x convolutions	6" x 3	8 x 1	8 x 2	9 1/4 x 1	9 1/4 * 2	12" x 1	12" x 2	12" x 3
Stroke [mm]	190	95	185	105	230	129	230	320
Installation height min [mm]	100	55	80	55	80	51	75	110
Recomended max working height [mm]	255	140	250	150	295	151	265	395
Installation height max [mm]	285	150	265	160	310	180	305	430
Retracting force to reach min height [N]	250	60	110	150	170	300	300	400
Force at 6 bar [N] depending from the stroke	See graph on page 5 & 6							

Alternative air bellows

Symbol	Model	Material	Description	Dimension see page
	PM/31000	Standard	Ø 2 3/4 ... 12 inches (78 ... 310 mm)	3 and 4
	TPM/31000	IR	Ø 2 3/4 ... 12 inches (78 ... 310 mm)	3 and 4
	EPM/31000	ECO	Ø 2 3/4 ... 12 inches (125 ... 310 mm)	3 and 4

Options selector

★PM/31★★★			
Air bellow materials	Substitute	Number of convolutions	Substitute
NR/BR, SBR - Material	None	1	1
High temperature (IR)	T	2	2
Extreme temperature (ECO)	E	3	3
		Nominal diameters (inches)	Substitute
		2 3/4	02
		4 1/2	04
		6	06
		8	08
		9 1/4	09
		12	12

Note: Please fill in only the numbers of digits required, e.g. PM/31023



Important instructions:

Thrust:

The thrust depends on the height of the bellow. When height increases - the thrust decreases.

- Before installing the air bellow, check it carefully for any damage it may have suffered from transport or improper storage.

- Do not inflate the air bellow until it has been secured properly.

Clearance:

There must be enough clearance around the air bellow.

- The full surface of the metal parts is to be used to bear the forces.

- Air bellows must be equipped with lateral guides.

- Deflate the air bellows fully before removing.

- Ensure that the bellows is not constantly in contact with hydraulic oil, lubricants, solvents, metal cuttings and welding sparks.

- Should the air bellow be subjected to special media in an application, ask Norgren for further information, specifying the medium, temperature and concentration

Stops:

To avoid damage when the bellow is compressed or extended mechanical stops at both end positions have to be used.