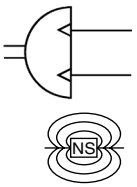
ROTATABLE CYLINDERS

Ø 12 - 20 mm - double acting
with 2 positions (90°-180°)

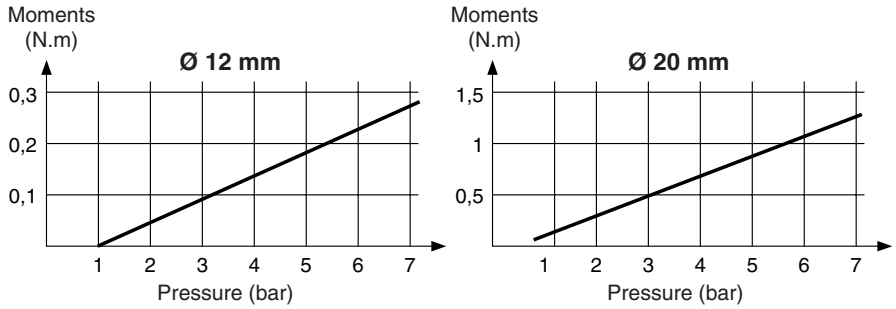


Series
429
Type
R

GENERAL

Detection	**Equipped for magnetic position detectors**
Fluid	Air or neutral gas, filtered, lubricated or not
Operating pressure	1 to 7 bar
Ambient temperature	+ 5°C, +60°C
Rotation	90° - 180° (±5°)
Cushioning	Non cushioned

DEVELOPED MOMENTS



For an optimum installation of a cylinder, we recommend a cylinder with the necessary moment equal to 70% of the developed moment.

MAXIMUM ALLOWABLE MOMENTUM

Maximum allowable momentum **Ø12 = 4 x 10-3J**
Ø20 = 1x10-2J

In case of heavy load and high speed rotation, momentum at stroke end may exceed the above limits and damage the rotatable cylinder. To limit momentum, reduce the rotation speed with flow regulators (as close to the cylinder as possible).

CONSTRUCTION

Body	Light alloy
Stop	Steel
Rod	Steel
Seals	NBR (nitrile)

SPECIFICATIONS (SINGLE ROD CYLINDER)

Ø (mm)	**rotation**	**catalogue number**	**reference**	**weight** (kg)
12	90°	**42900042**	R12 D 90-M	0,130
	180°	**42900043**	R12 D 180-M	0,130
20	90°	**42900046**	R20 D 90-M	0,250
	180°	**42900047**	R20 D 180-M	0,320

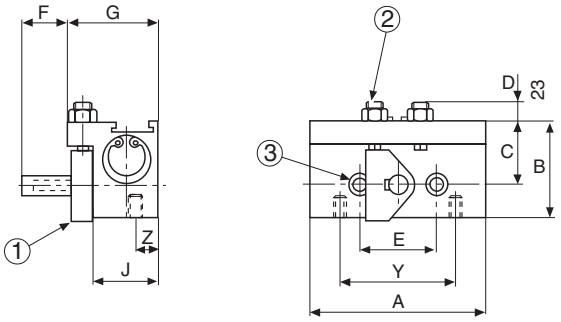
POSITION DETECTORS

Magnetic position detectors must be ordered separately:
"T"model, reed switch type / magneto-resistive type

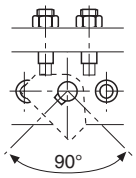
Sensor bracket for 429 rotative cylinders:
catalogue number: **P4945256760N001**

DIMENSIONS (mm)

Rotatable 180°



Rotatable 90°

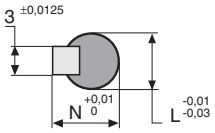


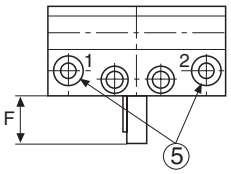
Ø (mm)	A 90°	A 180°	B	C	D	E	F
12	55	55	30	20	6	24	15
20	53	72	42	30	10	35	20

Ø (mm)	G	J	L	N	P	Y	Z
12	28	20	6	7,2	16,5	34	8
20	35	25,5	8	9,2	21	43	12

① : Stop boss
② : Rotation adjusting screw ± 5°
③ : Front mounting (see possible mountings below)
⑤ : Two Ø M5 supply ports
Port 1 : clockwise, rod side with pin
Port 2 : counterclockwise, rod side with pint

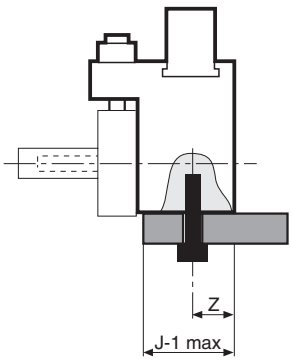
Rod end



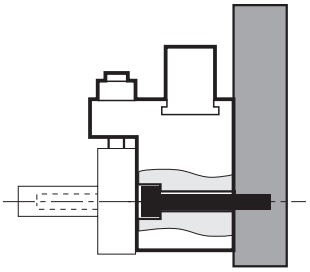


POSSIBILITIES MOUNTINGS

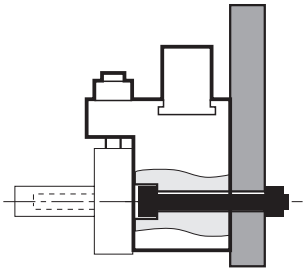
• Bottom mounting



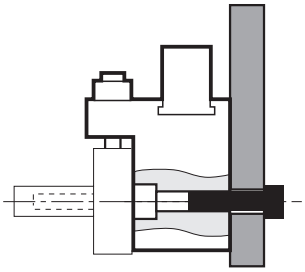
• Front mounting

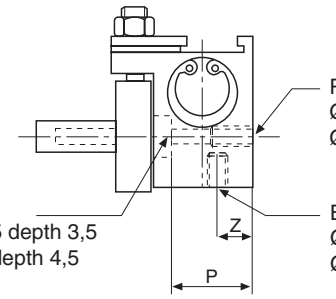


• Front mounting



• Rear mounting

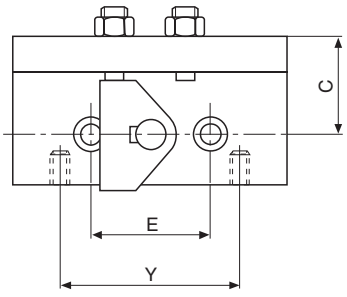




Front mounting
Ø 12 : 2 x Ø 3,3 counterbored Ø 6,5 depth 3,5
Ø 20 : 2 x Ø 4,2 counterbored Ø 8 depth 4,5

Rear side mounting
Ø 12 : 2 Ø M4 depth 8
Ø 20 : 2 Ø M5 prof. 10

Bottom mounting
Ø 12 : 2 Ø M4 depth 7
Ø 20 : 2 Ø M5 depth 8



ROTATABLE CYLINDERS

Ø 16 - 18 - 22 mm - double acting with 2, 3 and 4 positions

Series **429** Type **RS**

GENERAL

Detection — **Equipped for magnetic position detectors**

Fluid — Air or neutral gas, filtered, lubricated or not

Operating pressure — 2 to 7 bar

Ambient temperature — + 5°C, +60°C

Rotation

position number	rotation possibilities	total rotation
2	90°	90°
2	180°	180°
3	90° + 90°	180°
4	2α + β	180°

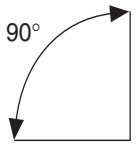
Adjustment of angular movement on extreme 2 positions (see below).

Cushioning

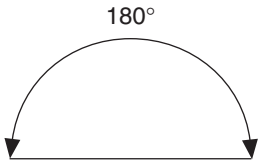
- 2 position models — Adjustable pneumatic cushioning
- 3 and 4 position models — No cushioning

ANGULAR MOVEMENT

2 position model

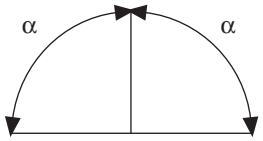


Adjustment range* : 70° — 95°



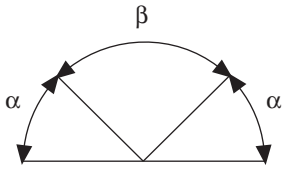
Adjustment range* : 160° — 185°

3 and 4 position model



α 90°

Adjustment range* : 120° — 185°



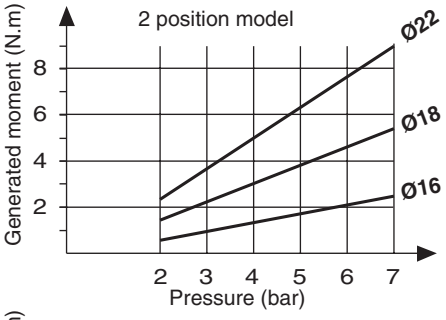
2 α + β

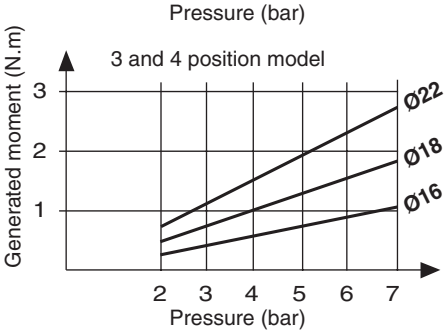
Adjustment range* : 120° — 185°

Any values α and β, 2 α + β having to be equal to 180°.

* Movement limits to be distributed to both ends.

MOMENTS DEVELOPED





For an optimum use, it is recommanded to define a rotatable cylinder whose moment is 70 % of the developed moment.

SPECIFICATIONS

position number	rotation angle	Ø (mm)	catalogue number	reference	connection Ø
2	90°	16	**42900052**	RS16 A2. 90 /M	M5
		18	**42900056**	RS18 A2. 90 /M	
		22	**42900060**	RS22 A2. 90 /M	
	180°	16	**42900053**	RS16 A2. 180 /M	M5
		18	**42900057**	RS18 A2. 180 /M	
		22	**42900061**	RS22 A2. 180 /M	
3	90° + 90°	16	**42900054**	RS16 NA3. 90+90 /M	M5
		18	**42900058**	RS18 NA3. 90+90 /M	
		22	**42900062**	RS22 NA3. 90+90 /M	
4	α + β + α	16	**42900055***	RS16 NA4. α + β /M*	M5
		18	**42900059***	RS18 NA4. α + β /M*	
		22	**42900063***	RS22 NA4. α + β /M*	

* Define angles α + β (2 α + β = 180°). Typical Codification Base code + α α β β β α α
Example: 429000634509045 or 429000633012030

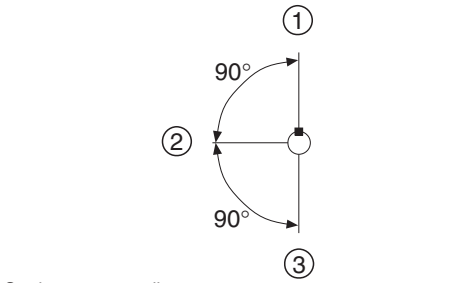
POSITION DETECTORS

Magnetic position detectors must be ordered separately:
"T"model, reed switch type / magneto-resistive type

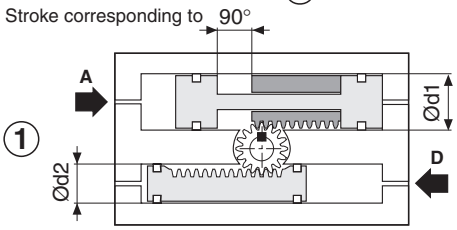
Sensor bracket for 429 rotative cylinders:
catalogue number: **P4945256760N001**

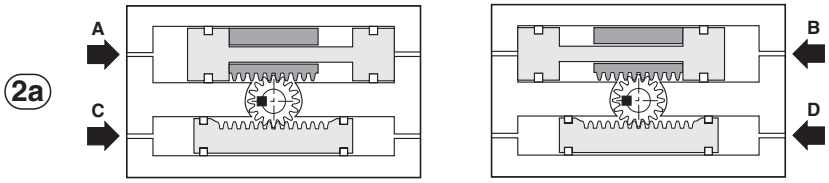
FUNCTIONING PRINCIPLE

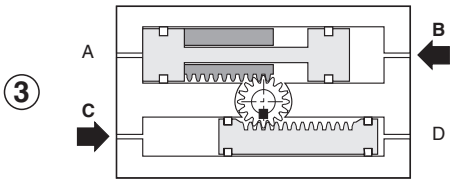
3 position model



Stroke corresponding to 90°





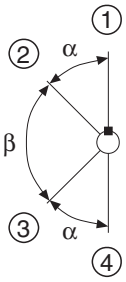


Two choices, to obtain position 2 (2a or 2b). From a given position, the rotatable cylinder may be placed on any other 2 positions.

Pneumatic command table

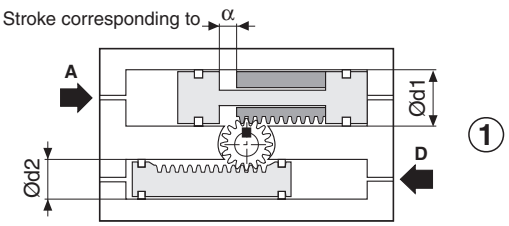
outlets	positions 1	2a	2b	3
A	—	—		
B			—	—
C		—		—
D	—		—	

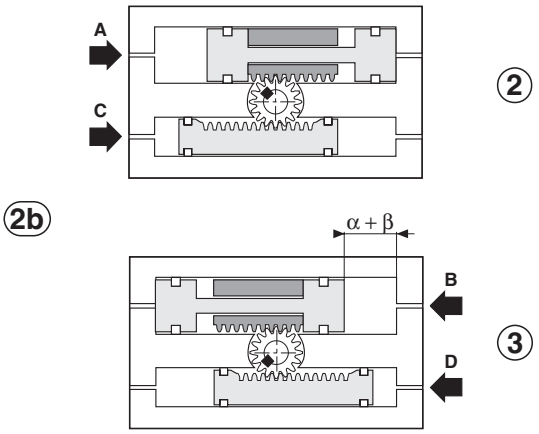
4 position model

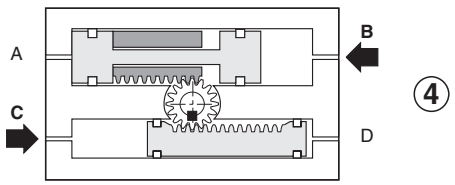


Ø d1 > Ø d2

Stroke corresponding to α







From a given position, the rotatable cylinder may be placed on any other 2 positions.

Pneumatic command table

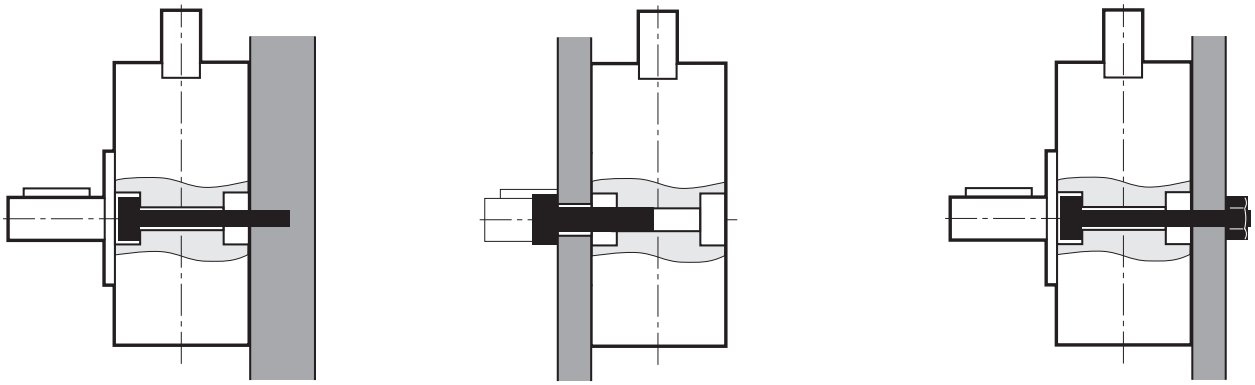
outlets	positions 1	2	3	4
A	—	—		
B			—	—
C		—		—
D	—		—	

model		Ø 16			Ø 18			Ø 22		
position number		2		3-4	2		3-4	2		3-4
Ø bores (mm)	Ø d1	24			26			30		
	Ø d2	16			18			22		
crossrod Ø	(mm)	Ø 10^{h7}			Ø 12^{h7}			Ø 15^{h7}		
moment developed	N.m	see chart			see chart			see chart		
rotation angle	(°)	90°	180°	180°	90°	180°	180°	90°	180°	180°
adjustable angle	(°)	70—95	160—185	120—185	70—95	160—185	120—185	70—95	160—185	120—185
pneumatic cushioning		yes	yes	no	yes	yes	no	yes	yes	no
cushioning angle	(°)	60	60	—	40	40	—	40	40	—
maximum momentum	J	$14x10^{-2}$	$14x10^{-2}$	$3,5x10^{-2}$	$28x10^{-2}$	$28x10^{-2}$	$7x10^{-2}$	$42x10^{-2}$	$42x10^{-2}$	$11x10^{-2}$

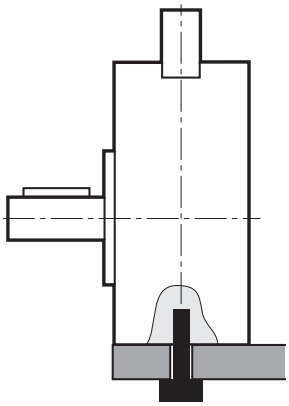
If the momentum generated by the application exceeds the above defined maximum values, rotation speed must be reduced with flow regulators (to be placed at closest to the cylinder) or with shock absorbers.

POSSIBLE MOUNTING OF ROTATABLE CYLINDERS

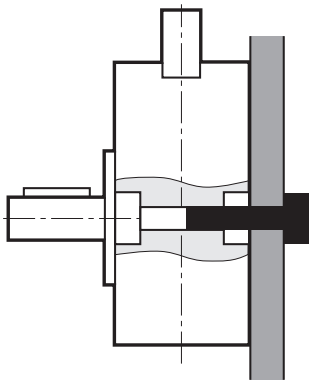
• Front mounting



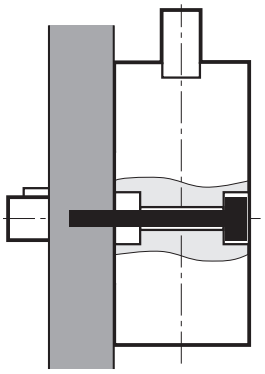
• Bottom mounting



• Rear mounting



• Rear mounting



DIMENSIONS (mm), WEIGHT (kg)

2 positions

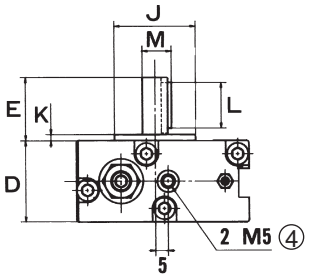
① : Front mounting :
2 - Ø S_1, counterbore Ø S_2,
depth S_3

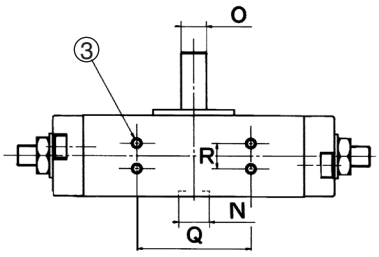
② : Rear mounting :
2 - Ø S_4

③ : Bottom mounting :
4 - Ø P_1, depth P_2,

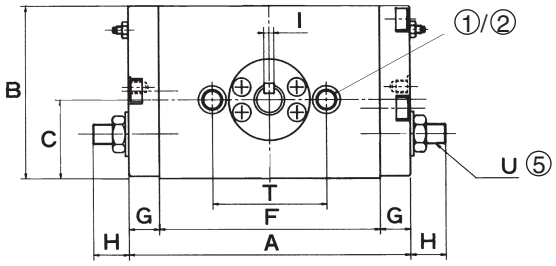
④ : 2 pneumatic supply
ports Ø M5

⑤ : 2 angle movement adjustment screws





⑥



	weight		
	Ø 16	Ø 18	Ø 22
90°	0,7	1,0	1,6
180°	0,8	1,2	1,8

3 or 4 positions

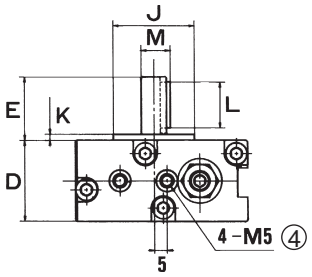
① : Front mounting :
2 - Ø S_1, counterbore Ø S_2,
depth S_3

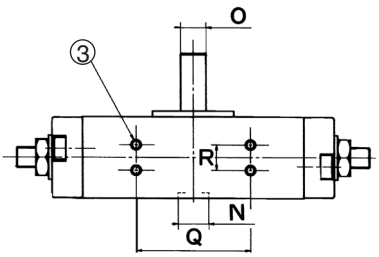
② : Rear mounting :
2 - Ø S_4

③ : Bottom monting :
4 - Ø P_1, depth P_2,

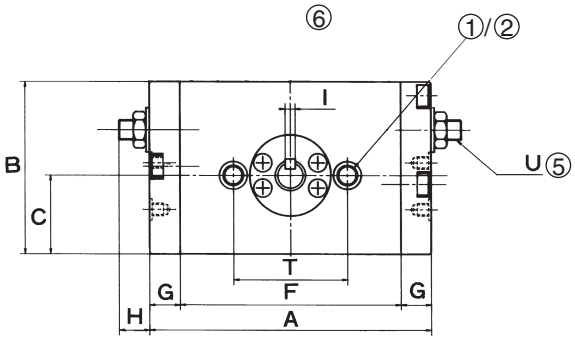
④ : 4 pneumatic supply
ports Ø M5

⑤ : 2 angle movement adjustment screws





⑥



	weight		
	Ø 16	Ø 18	Ø 22
180°	0,8	1,2	1,8

Ø (mm)	A			B	C	D	E	F			G	H			I
	2 positions		3-4 pos.					2 positions		3-4 pos.		2 positions		3-4 pos.	
	90°	180°	180°					90°	180°	180°		90°	180°	180°	
16	98	111	111	68	31	32	25	74	87	87	12	14	14	12	$4^{\ 0}_{-0,03}$
18	103	135	135	75	34,5	34	30	79	111	111	12	13	14	15	$4^{\ 0}_{-0,03}$
22	115	158	158	87,5	41	39	35	87	130	130	14	15	15	15	$5^{\ 0}_{-0,03}$

Ø (mm)	Ø J	K	L	M	Ø N $^{-0,05}_{0}$	Ø O	Ø P1	P2	Q	R	ØS1	ØS2	S3	ØS4	T	U
16	$32^{\ 0}_{-0,05}$	2,5	18	11,5	12 (❄2)	10^{h7}	M4x0,7	6	45	10	6,5	11	6,5	M8x1,25	45	M8x1,25
18	$37^{\ 0}_{-0,05}$	3	18	13,5	14 (❄1,8)	12^{h7}	M5x0,8	7	52	12	8,5	14	8,5	M10x1,50	52	M10x1,50
22	$44^{\ 0}_{-0,05}$	3	20	17	17 (❄2)	15^{h7}	M6x1	8	60	14	8,5	14	8,5	M10x1,50	60	M10x1,50

❄ : depth

CHOICE OF MODEL

Choose a model so that the necessary moment is 70 % of the developed moment.

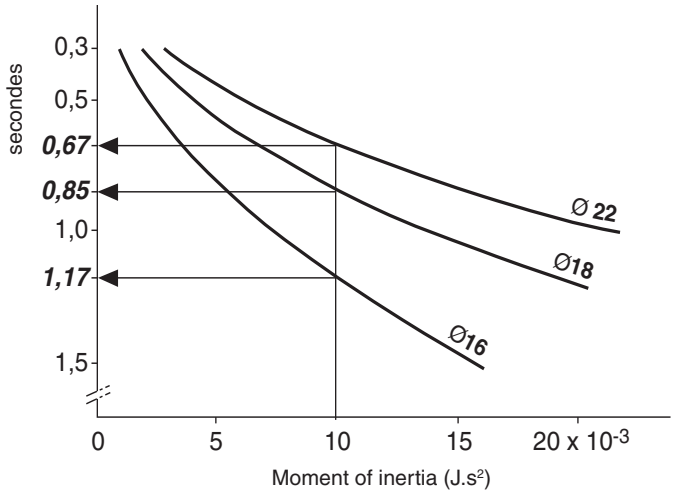
ROTATION TIME

HOW TO READ DIAGRAMS

Rotation time with respect to moment of inertia

Example : With a 10 x 10^{-3} J.s² moment, rotation time must be greater than :

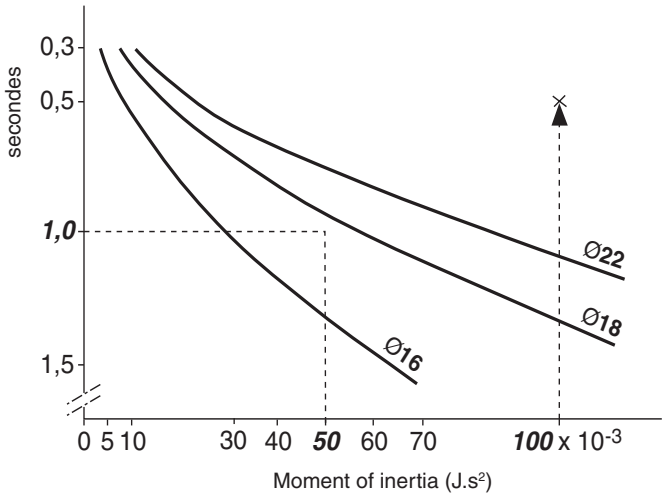
- 1.17 s for model Ø 16,
- 0.85 s for model Ø 18,
- 0.67 s for model Ø 22.



Maximum momentum

Example : With a momentum of 50 x 10^{-3} J.s² and a rotation time of 1 s/180°, model Ø 18 may be used with end stroke pneumatic cushioning, since the intersection point is below the maximum momentum.

Example : With a momentum of 100 x 10^{-3} J.s² and a rotation time of 0,5 s/180°, no model is satisfactory since the intersection point is above all maximum momentums.



CALCULATION OF MOMENTUM

Momentum is calculated according to the following equation :

$$E = 1/2\ I\ \omega^2$$

E = momentum, in Joules
I = moment of inertia, in kg.m²
ω = axis angular speed of rod at boss stop, in radians / second ($\omega = \theta / t$ rad/s)
θ = rotation angle in radians (180° = 3,14 rad)
t = rotation time, in seconds

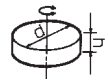
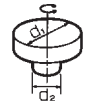
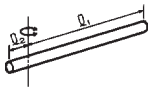
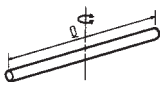
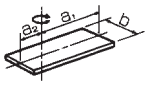
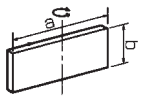
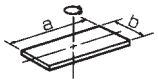
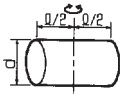
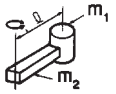
If the actual momentum is greater than the admissible maximum values, rotation speed must be reduced or shock absorbers must be installed.

LOAD ON AXIS

Avoid applying the load directly on the axis, by using a bearing or a stop.
If it cannot be avoided, it must be limited as follows.

type of cylinder	Ø cylinder (mm)	max. radial load (N)	max. axial load (N)
R	12	3	1,5
	20	5	2,5
RS	16	20	10
	18	40	20
	22	60	30

DEFINITION OF MOMENT OF INERTIA

	$I = \frac{m.d^2}{8}$
	$I = \frac{1}{8}(m_1.d_1^2+m_2.d_2^2)$
	$I = \frac{1}{3}(m_1.Q_1^2+m_2.Q_2^2)$
	$I = \frac{m.Q^2}{12}$
	$I = \frac{1}{12}\{m_1.(4a_1^2+b^2)+m_2.(4a_2^2+b^2)\}$
	$I = \frac{m.a^2}{12}$
	$I = \frac{m.(a^2+b^2)}{12}$
	$I = \frac{m}{12}.(\frac{d^2}{3}+\frac{Q^2}{4})$
	$I = \frac{m.d^2}{16}$
	$I = \{m_1.(Q^2+\frac{d^2}{2})+\frac{m^2.Q^2}{3}\}$