








































































# CYLINDERS & ACTUATORS






















## Product Index




Products		Type	Illustration	Series	Page
Panel cylinders	Ø 6 to 16 mm	E		<a href="#">429</a>	<a href="#">1</a>
Short-stroke cylinders	Ø 8 to 100 mm			<a href="#">441</a>	<a href="#">3</a>
Round cylinders	Ø 8 to 25 mm - ISO 6432			<a href="#">435</a>	<a href="#">11</a>
	Ø 32 to 63 mm - ISO 6431			<a href="#">438</a>	<a href="#">15</a>
Compact cylinders	Ø 20 to 100 mm - ISO 21287			<a href="#">449</a>	<a href="#">20</a>
ISO 15552 cylinders	Ø 32 to 100 mm - profiled barrel			<a href="#">453</a>	<a href="#">27</a>
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	Ø 32 to 80 mm - ISO 6431			<a href="#">431</a>	<a href="#">77</a>
Rodless cylinders	Ø 32 to 125 mm - ISO 15552	E-F G-H		<a href="#">S</a>	<a href="#">83</a>
	Ø 6 to 80 mm	<a href="#">STN-STG</a> <a href="#">STB</a> <a href="#">STBN-STB-STBB</a>		445 446 448	<a href="#">91</a>
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	C-slot for series 441 cylinders	MR		<a href="#">494</a>	<a href="#">179</a>






















standards	single acting		double acting		model construction								Ø (mm)		standard stroke					type	illustration	Series	Page
	Rod in at rest 	Rod out at rest 	Non-cushioned 	Elastic cushioning 	Adjust. pneumatic cushioning 	Cylindrical	Food industry	Anti-corrosive	Tie rods	Profiled barrel	Through-rod 	Rotation-proof 	min.	max.	min.	max.							
Panel cylinders																							
					●								6	16	5	15		-	-	E		429	1
Short-stroke cylinders																							
										●			8	100	4	100	●	●		-		441	3 10
Round cylinders																							
ISO 6432					●								12	25	5	400 900	●	-		-		435	11
					●		●						8	25	5		●	-		-			
ISO 6431					●								12	25	5	400 900	●	-		-		438	15
					●								32	63	5	50 1000	●	-		-		438	15
Compact cylinders according to ISO 21287 standard																							
ISO 21287									●				ISO 21287									449	VIII 20 23
									●				20	100	5	400	●	●		-			
	Mountings								●				20	100						-		493	61
Cylinders according to ISO 15552 standard																							
ISO 15552					●	●			●				ISO 15552									453 454 450	VII
									●				32	100	25	1000	●	●				453	27 28
						●			●				32	100	25	1000	●	●		-		454	30 31
								●	●				32	250	25	1000	●	●				450	34 35
	Options and specialised versions:				... Low friction /.../ Tandem / 3 positions / ...								      						453 454 450	37 (39..59)			
					... "U" and "H" guiding units / ...																		
					... Static rod-locking device / ...																		
Mountings				... Dynamic rod-locking device / ...														453 454 450	61				
				... Oversize piston rod / Rod bellow...																			
Mountings								●				20	100						-		493	61	

<sup>(1)</sup> Magnetic position detectors, see page: **V**





























standards	single acting		double acting		model construction								Ø (mm)		standard stroke					type	illustration	Series	Page
	Rod in at rest 	Rod out at rest 	Non-cushioned 	Elastic cushioning 	Adjust. pneumatic cushioning 	Cylindrical	Food industry	Anti-corrosive	Tie rods	Profiled barrel	Through-rod 	Rotation-proof 	min.	max.	min.	max.	Equipped for position detection <sup>(1)</sup>	spare parts kit no.	ATEX				
<b>Cylinders according to CNOMO - AFNOR</b>																							
CNOMO AFNOR NF E 49001								Ø					25	200	5	2000	Ø		-	PCN		437	<b>69</b> <b>71</b>
<b>Anti-corrosive cylinders</b>																							
ISO 6432						●	●						12	25	5	400 900	●	-	-	-		435	<b>11</b>
ISO 6431						●	●						32	80	25	800 1000	●	-	-	-		431	<b>77</b>
ISO 15552							●	●					32	125	25	500	●			E-F G-H		S	<b>83</b>

<sup>(1)</sup> Magnetic position detectors, see page: **V**

standards	double acting			model			construction			Ø (mm)		standard stroke			type	illustration	Series	Page	
	Non-cushioned	Elastic cushioning	Adjust. pneumatic cushioning	Without	Ball bearings	Plain bearings	Cross rollers	Round cylinder	Profiled barrel	Rotation-proof	Rodless	Rotatable	min.						max.

Rodless cylinders																				
		●	●	●		●	●				●	6	80			●		Quick Selection Chart	91	
Rodless cylinders with magnetic couplings																				
				●							●	6	40	50	2000	●	STN		445	95
						●					●	6	40	50	1500	●	STG		445	101
Rodless band cylinders																				
				●							●	16	80	5	6000	●	STBN		448	120
						●					●	25	63	100	3800	●	STB		446	108
						●					●	16	80	5	5500	●	STB		448	125
							●				●	25	50	5	3750	●	STBB		448	135
																<a href="#">ILS</a> <a href="#">MR</a>	STB-STBN-STBB	Position detectors for cylinder series 448	881	147 149
Actuators with linear guides																				
					●	●			●			16	63	10	100	●	CGT		CGT	154
					●	●			●			16	32	10	160	●	P2L P2B		447	160 161
Rotatable cylinders (90°-180°)																				
											●	12	20	-	-	●	R (2 positions)		429	165
											●	16	22	-	-	●	RS (2, 3 and 4 positions)		429	167

(1) Magnetic position detectors, see page: **V**

model	adaptation on cylinder type					Rotatable cylinders R / RS	illustration	Series	Page
	reed-switch type - 2 wires	Magneto-resistive - 3 wires (MIR)	round cylinders	compact profiled barrel	tie-rods	profiled barrel			
			Series	Series	Series	C-slot for series 441 cylinders	Profiled barrel - dovetail grooves, with linear guides, types P2L, P2B		
			435 438	441 449 453 454	450 437 (PCN)				
<b>Position detectors - for T-slot grooves</b>									
									494 <b>173</b>
									494 <b>175</b>
				-		integrated	integrated	mounting kits	<a href="#">494</a> <b>177</b>
<b>Position detectors - for C-slot grooves</b>									
			-	-	-				494 <b>179</b>

## DEFINITION OF THE DIAMETER OF A CYLINDER

### • THE DYNAMIC EFFORT DEVELOPED BY A CYLINDER

$$F = \text{Pressure} \times \text{piston area} \times \text{efficiency}$$

The efficiency of a cylinder depends on the diameter of the cylinder, on the pressure and on its mechanical construction. The graph and chart page 6 show the dynamic effort developed by a cylinder at the piston rod, at various supply pressures.

Example: calculate a cylinder to lift a load of 130 daN with a pressure of 7 bar (gauge pressure).

$$\frac{\text{theoretical}}{\text{dynamic effort}} = \frac{\text{actual load}}{\text{load factor}} = \frac{130}{0,75} = 175 \text{ daN}$$

The graph below shows the cross over point between the dynamic effort and the supply pressure. The cylinder diameter required will be that where the curve passes this point or the cylinder giving a force immediately above that required.

In the example above: 175 daN is between Ø 50 and Ø 63. The cylinder recommended is the Ø 63 mm which will develop a force of 200 daN at 7 bar and the actual load factor is:

$$\frac{130 \text{ daN}}{200 \text{ daN}} \times 100 = 65 \%$$

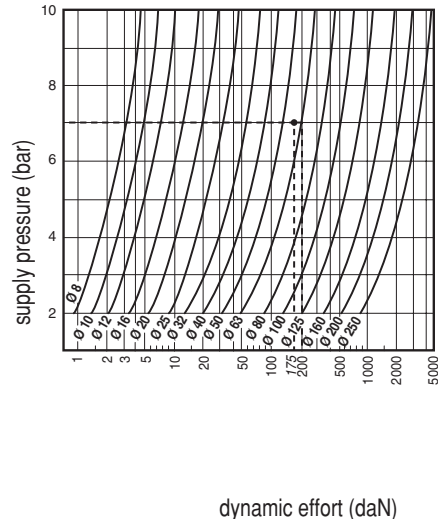
### • LOAD FACTOR

This is the relationship expressed as a percentage between the actual load being moved by the cylinder and the dynamic effort available at the end of the piston rod.

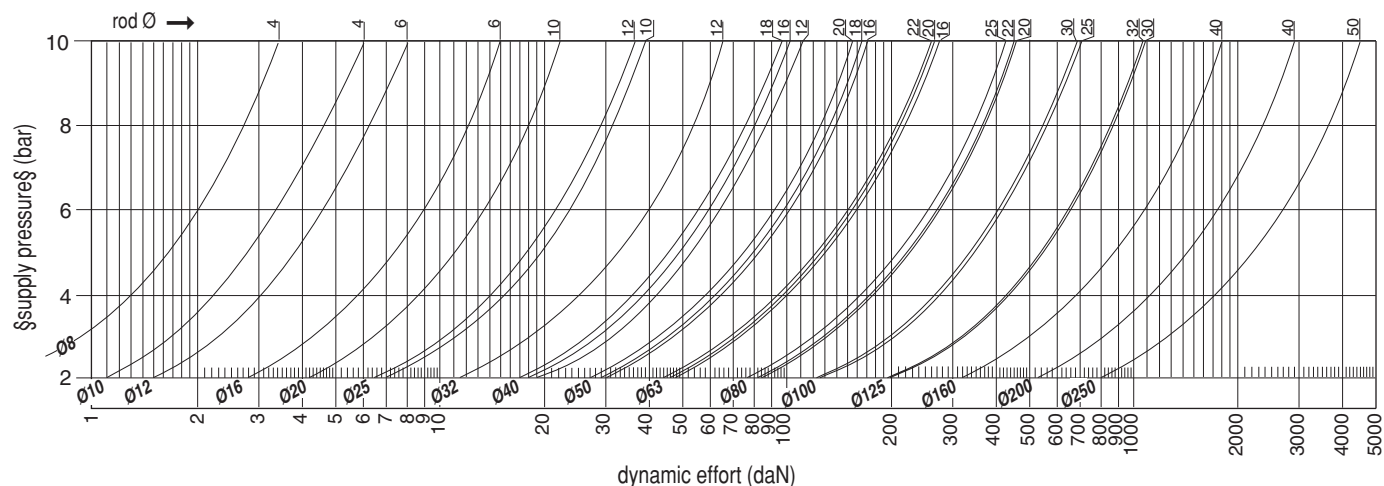
$$\text{load factor (\%)} = \frac{\text{actual load}}{\text{dynamic effort}} \times 100$$

For an optimum installation of a cylinder, we recommend a cylinder with a load factor inferior to or equal to 75%.

### EFFORTS DEVELOPED AT THE END OF THE ROD (ROD OUT)



## EFFORTS DEVELOPED AT THE END OF THE ROD (ROD RETURNED)



## EFFORTS DEVELOPED BY A CYLINDER (daN)

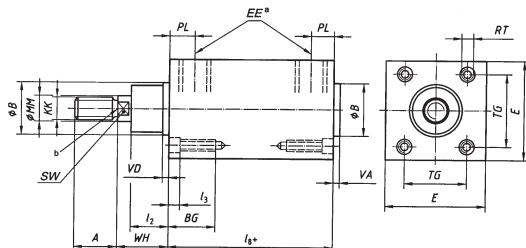
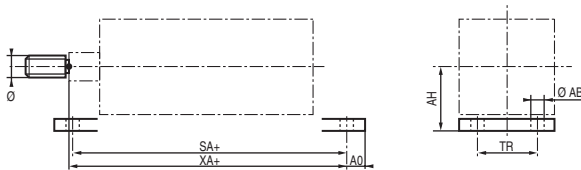
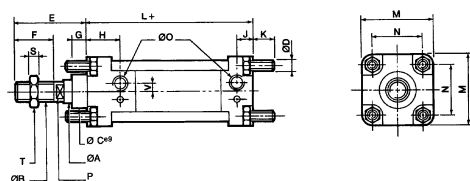
cylinder Ø (mm)	rod Ø (mm)	Series					piston cross-section area (cm <sup>2</sup> )		dynamic effort developed (daN) at various supply pressures (bar)									
		435 - 438	435 - 431 (Anti-corrosive)	449	453 - 454 - 453	437 (PCN)			2		4		6		8		10	
		●	○	●	○	●	●	○	●	○	●	○	●	○	●	○	●	○
8	4	x					0,5	0,4	1,0	0,5	1,5	1,5	2,5	2,0	3,5	2,5	4,5	3,5
10	4	x					0,8	0,6	1,5	1,0	2,5	2,5	4,0	3,5	5,5	4,5	7,5	6,0
12	6	x	x				1,1	0,8	2,0	1,5	4,0	3,0	6,0	4,5	8,5	6,0	10,5	8,0
16	6	x	x				2,0	1,7	3,5	3,0	7,5	6,0	10,0	9,0	15,0	12,0	19,0	15,0
20	10	x	x	x			3,1	2,3	5,5	4,0	12,0	9,0	16,0	13,5	23,0	18,0	30,0	22,0
25	10	x	x	x			4,1	4,1	7,0	7,0	15,0	15,0	24,0	24,0	31,0	31,0	39,0	39,0
25	12					x	4,9	3,8	8,5	6,5	18,0	14,0	27,0	22,0	38,0	29,0	48,0	36,0
32	12	x	x	x	x	x	8,0	6,9	13,0	11,5	30,0	25,0	46,0	40,0	62,0	52,0	77,0	66,0
40	12				x		11,5	11,5	19,0	19,0	42,0	42,0	64,0	64,0	87,0	87,0	111,5	111,5
40	16		x		x		12,6	10,6	21,0	18,0	46,0	39,0	70,0	59,0	95,0	80,0	122,0	102,5
40	18	x				x	10,0	10,0	17,0	17,0	36,5	36,5	56,0	56,0	75,5	75,5	97,0	97,0
50	16			x			17,6	17,6	30,0	30,0	64,0	64,0	100,5	100,5	134,0	134,0	170,5	170,5
50	18	x				x	19,6	17,0	33,0	29,0	70,0	62,0	110,0	97,0	150,0	130,0	190,0	165,0
50	20		x		x		16,5	16,5	27,0	27,0	58,0	58,0	92,0	92,0	124,0	124,0	155,0	155,0
63	16			x			29,1	29,1	47,5	47,5	101,5	101,5	159,5	159,5	218,5	218,5	273,5	273,5
63	20		x		x		31,2	28,1	53,0	46,0	110,0	98,0	170,0	154,0	230,0	211,0	290,0	264,0
63	22	x				x	27,4	27,4	44,0	44,0	97,0	97,0	150,0	150,0	200,0	200,0	260,0	260,0
80	20			x			47,2	47,2	82,0	82,0	172,5	172,5	266,0	266,0	365,5	365,5	457,0	457,0
80	22				x	x	50,3	46,5	88,0	81,0	185,0	170,0	285,0	262,0	385,0	360,0	480,0	450,0
80	25		x		x		45,4	45,4	77,0	77,0	163,0	163,0	255,0	255,0	341,0	341,0	427,0	427,0
100	25			x	x		78,5	73,6	135,0	126,5	290,0	272,0	440,0	412,5	600,0	562,5	750,0	703,0
100	30					x	71,5	71,5	123,0	123,0	264,0	264,0	401,0	401,0	546,5	546,5	683,0	683,0
125	30					x	115,7	115,7	198,0	198,0	433,0	433,0	658,5	658,5	870,0	870,0	1082,0	1082,0
125	32				x		123,0	115,0	210,0	196,5	460,0	430,0	700,0	654,5	925,0	865,0	1150,0	1075,0
160	40				x	x	201,0	188,0	350,0	320,0	750,0	700,0	1150,0	1100,0	1550,0	1500,0	1900,0	1800,0
200	40				x	x	314,0	302,0	550,0	530,0	1150,0	1100,0	1800,0	1700,0	2400,0	2300,0	3000,0	2900,0

● Efforts developed with rod out (bottom side)

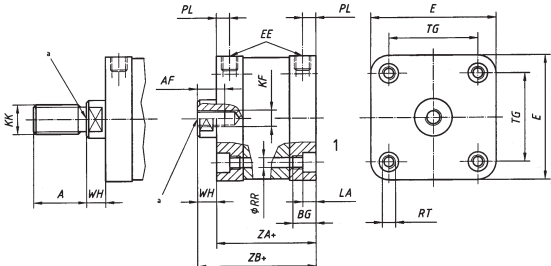
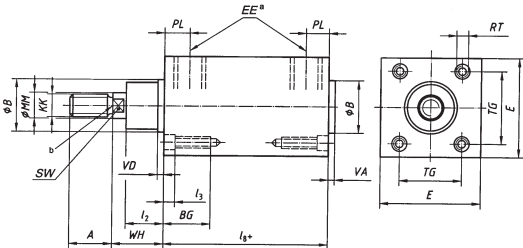
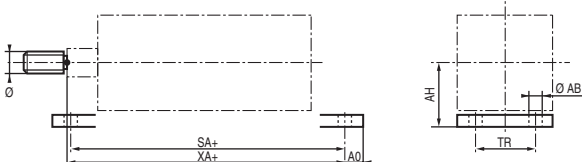
○ Efforts developed with rod returned (rod side)

Note: Cylinders with double crossbar develop identical efforts in both working directions. Their values are the ones defined here-above for efforts developed with rod returned.



standard of cylinders Ø 32 to 320 mm		INTERCHANGEABILITY	
		within the standard	between standards
<b>ISO 15552</b> (year: 2004)		<p>Full interchangeability between the manufacturers is achieved at every level:</p> <ul style="list-style-type: none"><li>• bare cylinder</li><li>• each mounting</li><li>• complete unit<sup>1</sup></li></ul>	<p>For full interchangeability with ISO 15552, ISO 6431 cylinder must be equipped with its mountings, and reciprocally.</p>
<p>This new international standard cancels and replaces ISO 6431. It defines the outer dimensions of a bare cylinder and equipped with its mountings.</p>  <p><b>Series 453-454-450:</b> in accordance with the international standards</p>			
<b>AFNOR NF ISO 15552</b> (june 2004) - DIN ISO 15552			
<p>These standards fully include the international standard ISO 15552. The NF ISO 15552 is completed with a definition of the rod diameters MM and cancels and replaces standard NFE 49003 parts 1 to 3.</p> <p><b>Series 453-454-450:</b> in accordance with the international standards</p>			
<b>ISO 6431 cylinders</b> (year: 1983)		<p>Interchangeability between manufacturers is achieved by replacing both the cylinder and its mountings.</p>	<p>A cylinder to AFNOR NFE 49003 - either bare or equipped with its mountings - is interchangeable with a cylinder to AFNOR NF ISO 15552 and vice versa.</p>
<p>This international standard defined a cylinder unit equipped with its mountings without specifying the bare cylinder alone. It is cancelled and replaced by above standard ISO 15552.</p>  <p><b>Series 453-454-450:</b> in accordance with the international standards</p>			
<b>AFNOR NFE 49003 - VDMA 24562 cylinders</b> (year: 1992)			
<p>These standards first define the outer dimensions of a bare cylinder and then its mountings; the cylinder with its mountings installed then corresponds to a cylinder unit according to above standard ISO 6431</p>		<p>Full interchangeability between the manufacturers is achieved at every level:</p> <ul style="list-style-type: none"><li>• bare cylinder</li><li>• each mounting</li><li>• complete unit<sup>1</sup></li></ul>	
<b>CNOMO 06.07.02/AFNOR NFE 49001 cylinders</b> (year: 1968)		<p>Full interchangeability between the manufacturers is achieved at every level:</p> <ul style="list-style-type: none"><li>• bare cylinder</li><li>• each mounting</li><li>• complete unit<sup>1</sup></li></ul>	<p>No interchangeability can be achieved between CNOMO/NFE 49001 cylinder (bare or equipped) and AFNOR NFE 49003 cylinder or ISO 6431 cylinder, and reciprocally.</p>
<p>The French standards define first all the external dimensions of a bare cylinder then the mountings.</p>  <p><b>Series 437 (PCN):</b> complies with the French standards.</p>			

Note: ISO 6432 and AFNOR NFE 49030 standards apply only to mini-cylinders Ø 8 to 25 mm.

standards of cylinders		INTERCHANGEABILITY	
		within the standard	between standards
<b>ISO 21287</b> Ø 20 to 100 mm  This new international standard defines the outer dimensions of a compact bare cylinder and equipped with its mountings. The center-to-center mounting distances of dia. 32 to 100 mm cylinders are identical to those of standard ISO 15552.   <p><b>Series 449 cylinders</b> complies with the international standard</p>		Full interchangeability between the manufacturers is achieved at every level: <ul style="list-style-type: none"> <li>• bare cylinder</li> <li>• each mounting</li> <li>• complete unit<sup>1</sup></li> </ul>	<div style="text-align: right;">             32 to 100 mm dia. cylinders can be equipped with all mountings to ISO 15552.           </div>
<b>ISO 15552</b> Ø 32 to 320 mm  This new international standard cancels and replaces ISO 6431. It defines the outer dimensions of a bare cylinder and equipped with its mountings.   <p><b>Series 453-454-450 cylinders</b> complies with the international standard</p>		Full interchangeability between the manufacturers is achieved at every level: <ul style="list-style-type: none"> <li>• bare cylinder</li> <li>• each mounting</li> <li>• complete unit<sup>1</sup></li> </ul>	
<b>ISO 15552</b>  These standards fully include the international standard ISO 15552. The NF ISO 15552 is completed with a definition of the rod diameters MM and cancels and replaces standard NFE 49003 parts 1 to 3.  <p><b>Series 453-450 cylinders</b> complies with the international standard</p>			
<b>ISO 6431</b> (1983)  This international standard defined a cylinder unit equipped with its mountings without specifying the bare cylinder alone. It is cancelled and replaced by above standard ISO 15552.   <p><b>Series 438 cylinders</b> complies with the international standards</p>		Interchangeability between manufacturers is achieved by replacing both the cylinder and its mountings.	