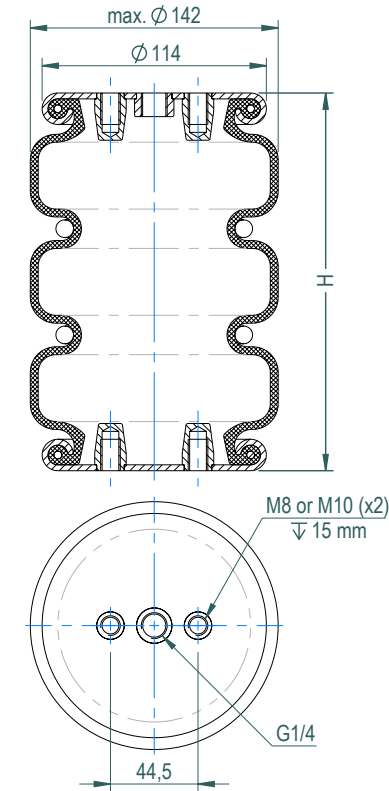


F SERIES  
Crimped Design

# M-13

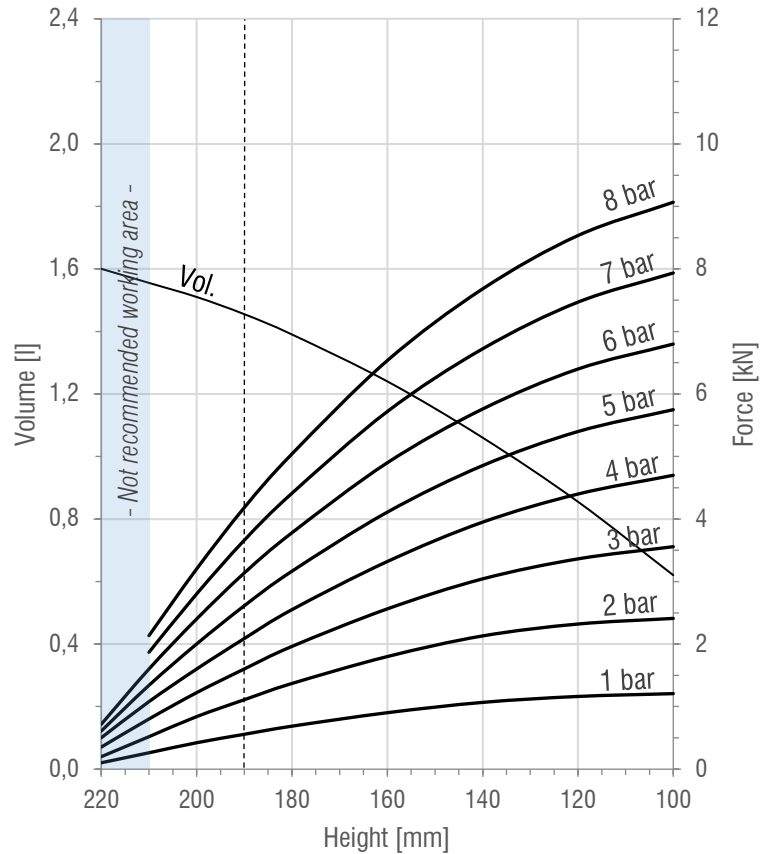
TRIPLE  
CONVOLUTION

## DRAWING



M8&M10=25 Nm G1/4=25 Nm

## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	126
Max. diameter [mm]	142
Required space diameter [mm]	160
Min. height [mm]	100
Static height [mm]	180
Design height [mm]	190
Max. usable height [mm]	210
Max. stroke [mm]	110
Force to compress to $H_{min}$ at 0 bar [N]	295
Weight [kg]	1,7

### REFERENCES

M-13_B	Rubber bellow only
M-13_C_G1/4	With crimped plates & G1/4 air inlet
M-13_R_SH	With socket head bead rings
M-13_R_TR	With threaded bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

Special guides are required when used as isolators due to lateral instability.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	1,6	2,1	2,6	3,1	3,7	1,5
Spring rate [N/mm]	50	63	77	90	105	
Natural frequency [Hz]	2,78	2,74	2,71	2,68	2,68	
Isolation rate at 10 Hz	91,6%	91,9%	92,1%	92,2%	92,3%	

Values at recommended design height H: 190 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]		3	4	5	6	7	Vol. [l]
Height H [mm]	100	3,6	4,7	5,8	6,8	7,9	0,6
	120	3,4	4,4	5,4	6,4	7,5	0,9
	140	3,0	4,0	4,9	5,8	6,7	1,1
	160	2,6	3,3	4,1	4,9	5,7	1,2
	180	2,0	2,6	3,2	3,8	4,4	1,4
200	1,2	1,6	2,0	2,4	2,8	1,5	

Force values [kN]

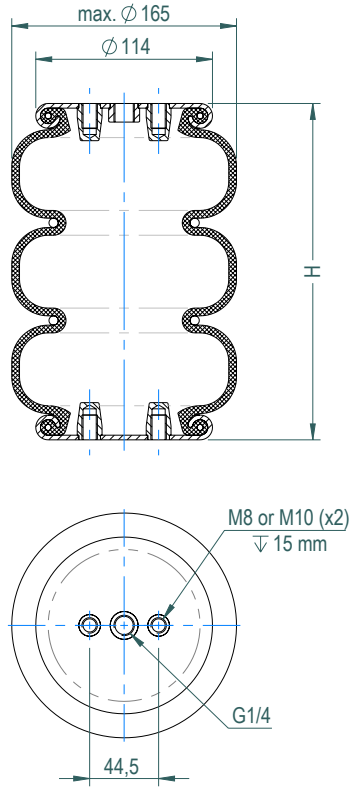
All Volume [l] values at 7 bar

F SERIES  
Crimped Design

# M-73-E

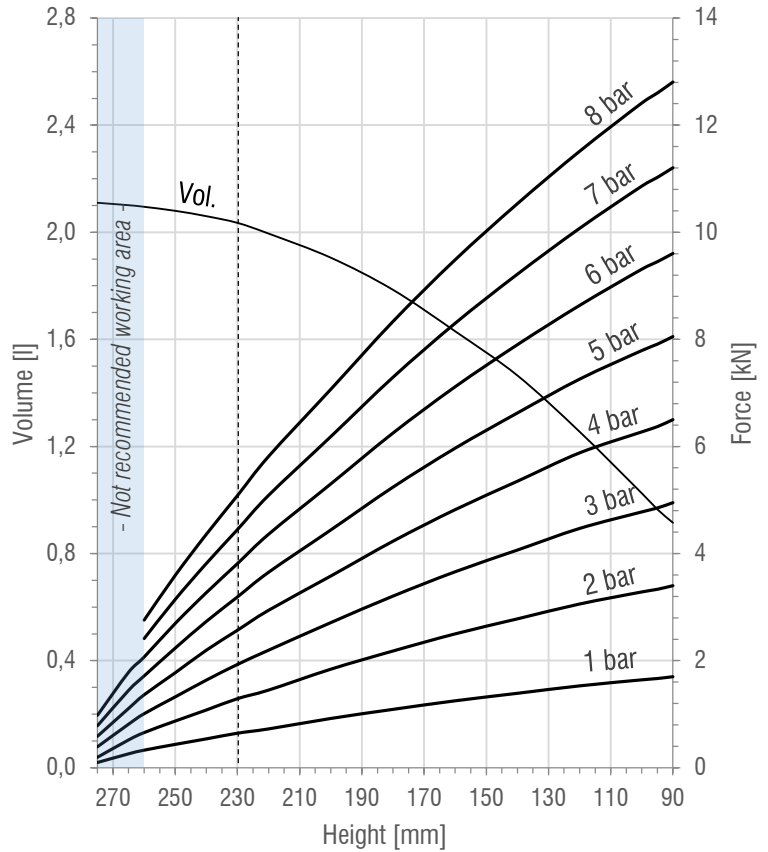
TRIPLE  
CONVOLUTION

## DRAWING



**M8&M10=25 Nm G1/4=25 Nm**

## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	146
Max. diameter [mm]	165
Required space diameter [mm]	180
Min. height [mm]	90
Static height [mm]	220
Design height [mm]	230
Max. usable height [mm]	260
Max. stroke [mm]	170
Force to compress to $H_{min}$ at 0 bar [N]	215
Weight [kg]	1,82

### REFERENCES

M-73-E_B	Rubber bellow only
M-73-E_C_G1/4	With crimped plates & G1/4 air inlet
M-73-E_R_SH	With socket head bead rings
M-73-E_R_TR	With threaded bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

Special guides are required when used as isolators due to lateral instability.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	1,9	2,6	3,2	3,8	4,4	2,0
Spring rate [N/mm]	34	45	55	65	75	
Natural frequency [Hz]	2,09	2,09	2,07	2,06	2,06	
Isolation rate at 10 Hz	95,4%	95,5%	95,5%	95,6%	95,6%	

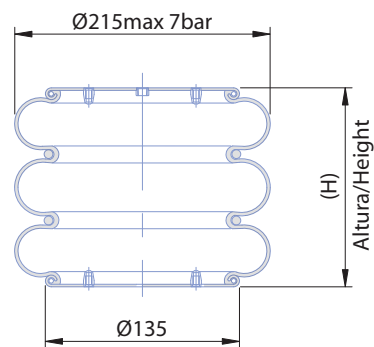
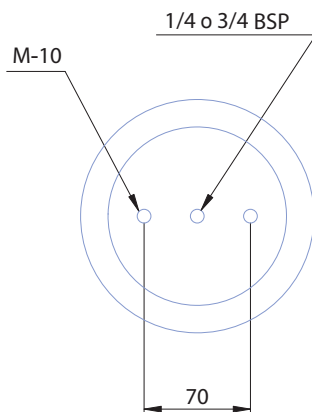
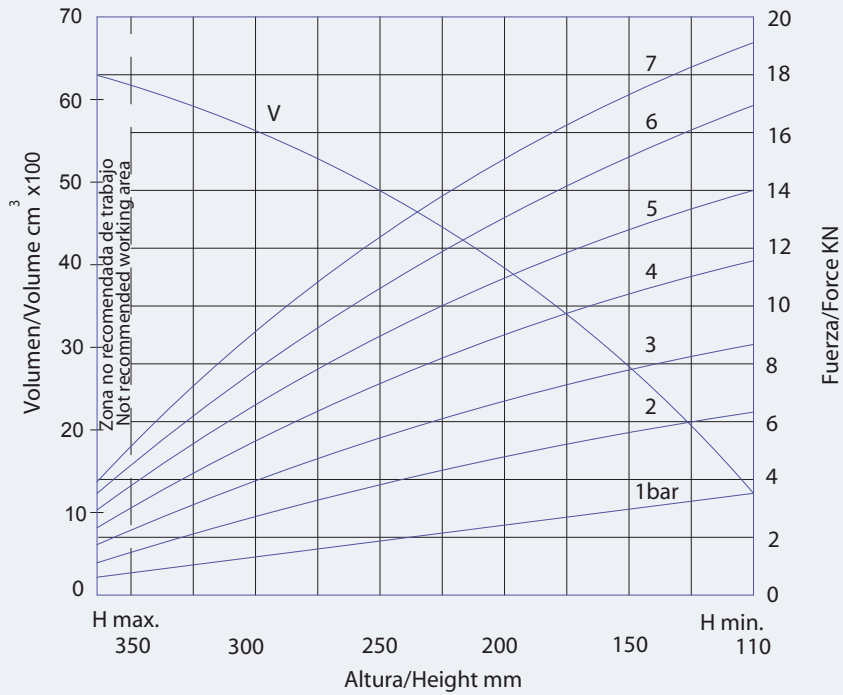
Values at recommended design height H: 230 mm -----

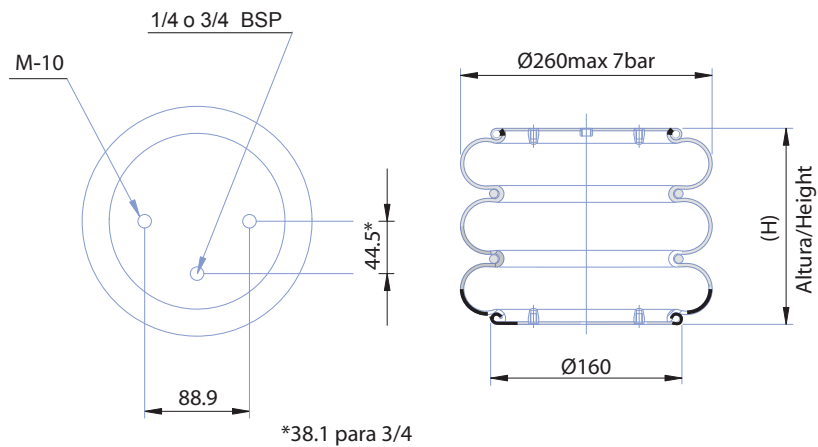
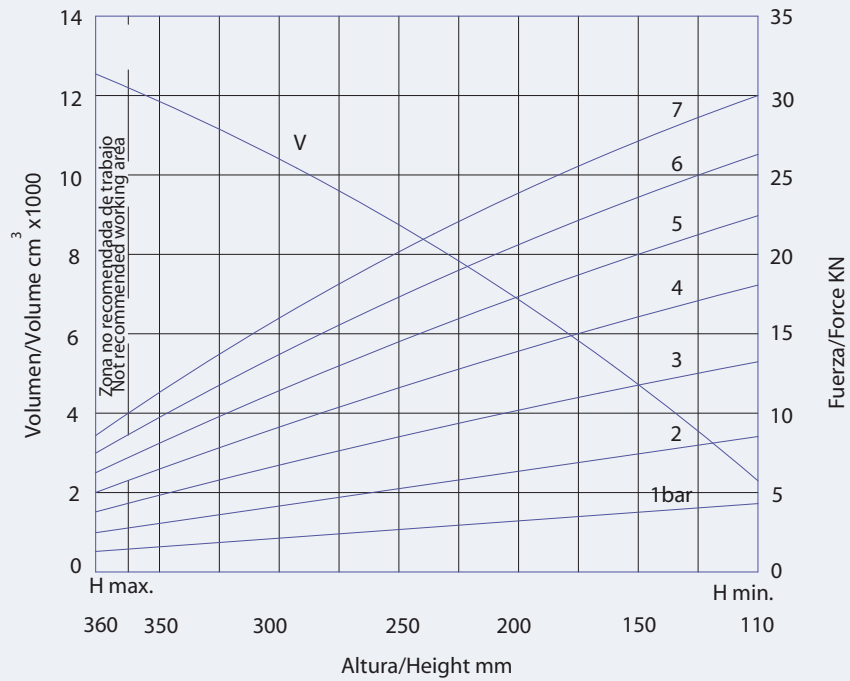
### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]	
Height H [mm]	100	4,8	6,3	7,8	9,3	10,9	1,0
	120	4,5	5,9	7,3	8,6	10,1	1,3
	140	4,1	5,4	6,6	7,9	9,2	1,5
	160	3,7	4,8	6,0	7,1	8,3	1,6
	180	3,2	4,2	5,2	6,3	7,3	1,8
	200	2,7	3,6	4,4	5,3	6,2	1,9
	220	2,2	2,9	3,7	4,4	5,1	2,0
	240	1,6	2,2	2,7	3,3	3,8	2,1
	260	1,0	1,4	1,7	2,1	2,4	2,1

Force values [kN]

All Volume [l] values at 7 bar



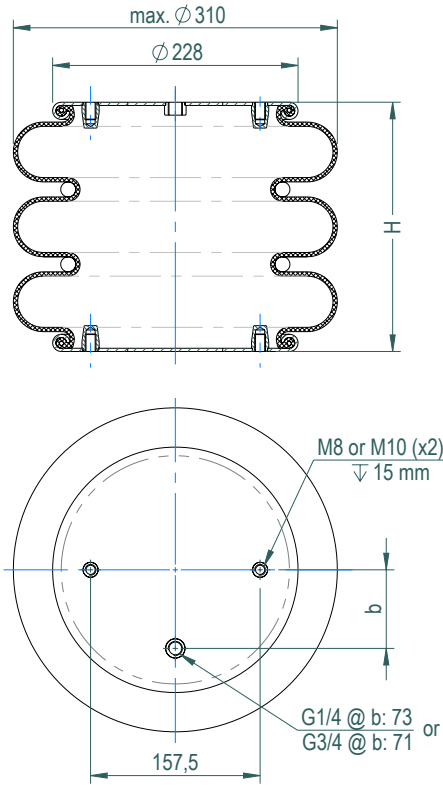


F SERIES  
Crimped Design

# M-93

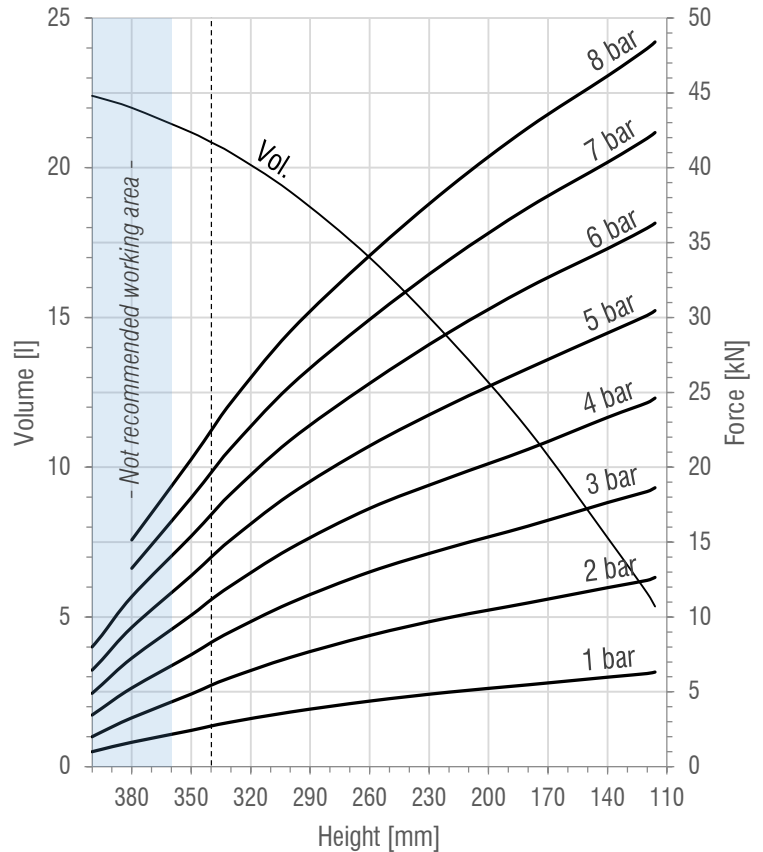
TRIPLE  
CONVOLUTION

## DRAWING



**M8&M10=25 Nm G1/4=25 Nm G3/4=50 Nm**

## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	300
Max. diameter [mm]	310
Required space diameter [mm]	330
Min. height [mm]	110
Static height [mm]	200
Design height [mm]	340
Max. usable height [mm]	360
Max. stroke [mm]	250
Force to compress to $H_{min}$ at 0 bar [N]	100
Weight [kg]	6,8

### REFERENCES

M-93_B	Rubber bellow only
M-93_C_G1/4	With crimped plates & G1/4 air inlet
M-93_C_G3/4	With crimped plates & G3/4 air inlet
M-93_R_SH	With socket head bead rings
M-93_R_TR	With threaded bead rings
M-93_R_CS	With countersunk bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	8,30	11,15	13,99	16,83	19,63	20,85
Spring rate [N/mm]	102	130	158	186	216	
Natural frequency [Hz]	1,75	1,71	1,68	1,66	1,66	
Isolation rate at 10 Hz	96,8%	97,0%	97,1%	97,2%	97,2%	

Values at recommended design height H: 340 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]		3	4	5	6	7	Vol. [l]
Height H [mm]	120	18,4	24,3	30,1	36,0	42,0	5,8
	140	17,6	23,3	29,0	34,6	40,4	7,7
	180	16,1	21,2	26,6	32,0	37,3	11,3
	220	14,6	19,3	24,1	29,0	33,8	14,3
	260	13,0	17,2	21,4	25,6	29,9	17,0
	300	10,9	14,6	18,2	21,8	25,4	19,2
	340	8,3	11,2	14,0	16,8	19,6	20,9
380	5,3	7,3	9,3	11,4	13,3	22,0	

Force values [kN]

All Volume [l] values at 7 bar

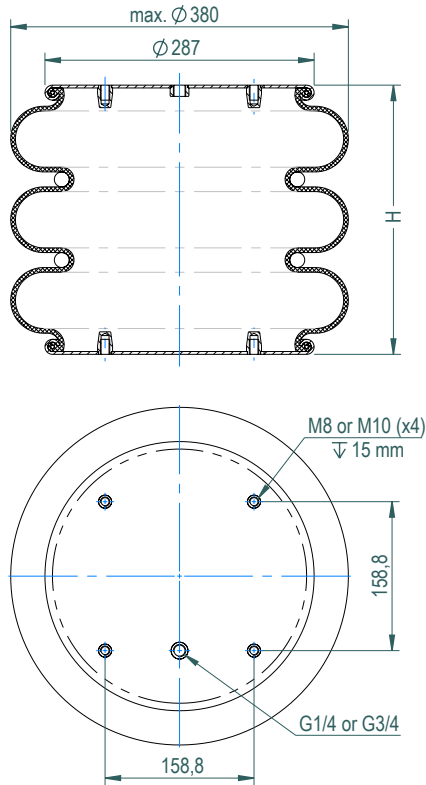
**!** Special guides are required when used as isolators due to lateral instability.

F SERIES  
Crimped Design

# M-103

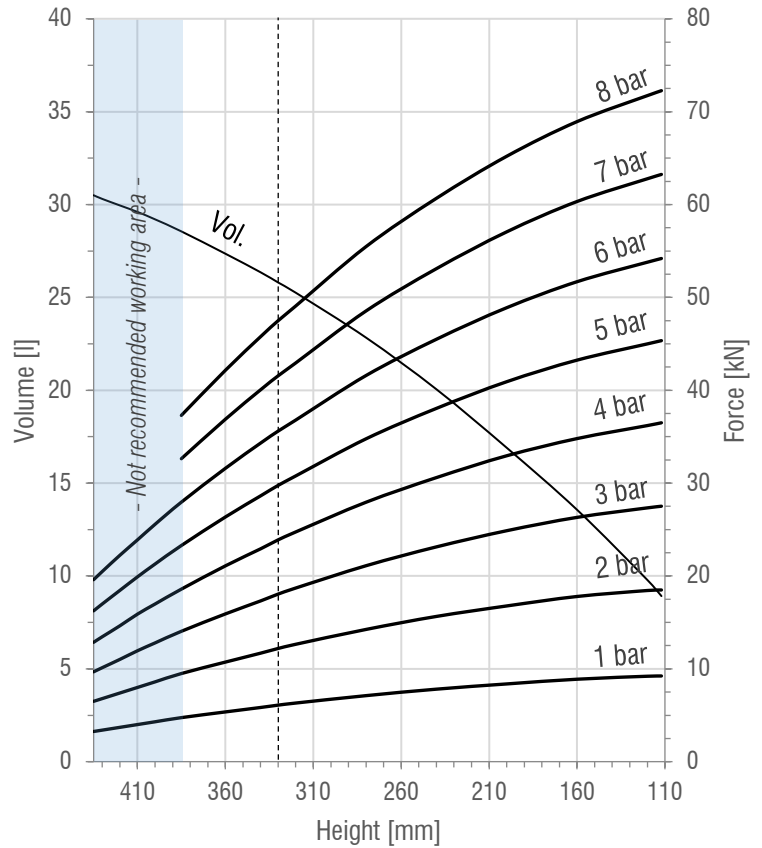
TRIPLE  
CONVOLUTION

## DRAWING



**M8&M10=25 Nm G1/4=25 Nm G3/4=50 Nm**

## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	368
Max. diameter [mm]	380
Required space diameter [mm]	405
Min. height [mm]	114
Static height [mm]	260
Design height [mm]	330
Max. usable height [mm]	385
Max. stroke [mm]	271
Force to compress to $H_{min}$ at 0 bar [N]	140
Weight [kg]	10,1

### REFERENCES

M-103_B	Rubber bellow only
M-103_C_G1/4	With crimped plates & G1/4 air inlet
M-103_C_G3/4	With crimped plates & G3/4 air inlet
M-103_R_SH	With socket head bead rings
M-103_R_TR	With threaded bead rings
M-103_R_CS	With countersunk bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	18,1	23,9	29,8	35,6	41,5	25,8
Spring rate [N/mm]	140	179	213	246	285	
Natural frequency [Hz]	1,39	1,37	1,34	1,32	1,31	
Isolation rate at 10 Hz	98,0%	98,1%	98,2%	98,2%	98,3%	

Values at recommended design height H: 330 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]	
Height H [mm]	120	27,3	36,2	45,0	53,8	62,8	9,8
	160	26,3	34,8	43,3	51,7	60,3	13,6
	200	24,9	33,0	40,9	48,9	57,1	16,9
	240	23,1	30,6	38,1	45,5	53,1	20,1
	280	21,1	28,0	34,8	41,6	48,5	22,8
	320	18,7	24,8	30,8	36,8	42,9	25,3
360	15,9	21,1	26,4	31,6	36,9	27,4	

Force values [kN]

All Volume [l] values at 7 bar

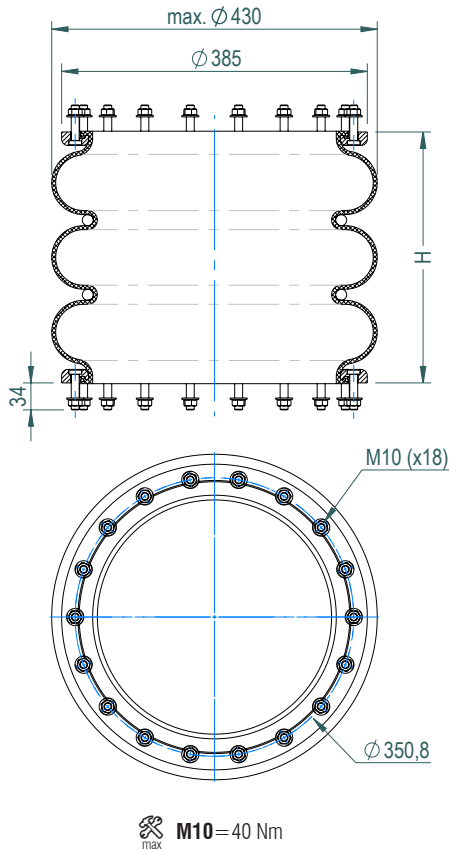
**!** Special guides are required when used as isolators due to lateral instability.

F SERIES  
Socket Head Bead Ring Design

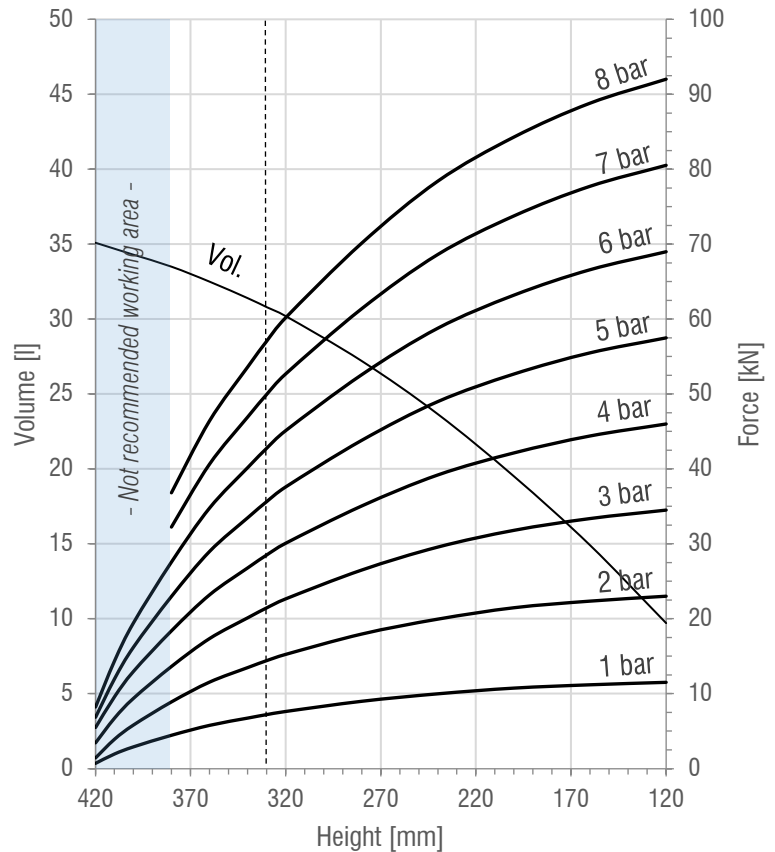
# M-113

TRIPLE  
CONVOLUTION

## DRAWING



## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	385
Max. diameter [mm]	430
Required space diameter [mm]	480
Min. height [mm]	120
Static height [mm]	315
Design height [mm]	330
Max. usable height [mm]	380
Max. stroke [mm]	260
Force to compress to $H_{min}$ at 0 bar [N]	325
Weight [kg]	16,0

### REFERENCES

M-113_B	Rubber bellow only
M-113_R_SH	With socket head bead rings
M-113_R_TR	With threaded bead rings
M-113_R_CS	With countersunk bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

Special guides are required when used as isolators due to lateral instability.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	21,5	28,5	35,6	42,8	49,9	30,8
Spring rate [N/mm]	203	261	321	381	442	
Natural frequency [Hz]	1,54	1,51	1,50	1,49	1,49	
Isolation rate at 10 Hz	97,6%	97,7%	97,7%	97,7%	97,7%	

Values at recommended design height H: 330 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]	
Height H [mm]	120	34,5	46,0	57,5	69,0	80,5	9,7
	160	33,4	44,4	55,5	66,6	77,7	14,9
	200	31,8	42,1	52,7	63,2	73,7	19,5
	240	29,6	39,2	49,0	58,8	68,6	23,7
	280	26,5	35,1	43,8	52,6	61,4	27,2
	320	22,7	30,1	37,6	45,1	52,7	30,2
	360	17,4	23,2	29,0	34,8	40,6	32,5
	380	13,7	18,4	23,0	27,6	32,2	33,5

Force values [kN]

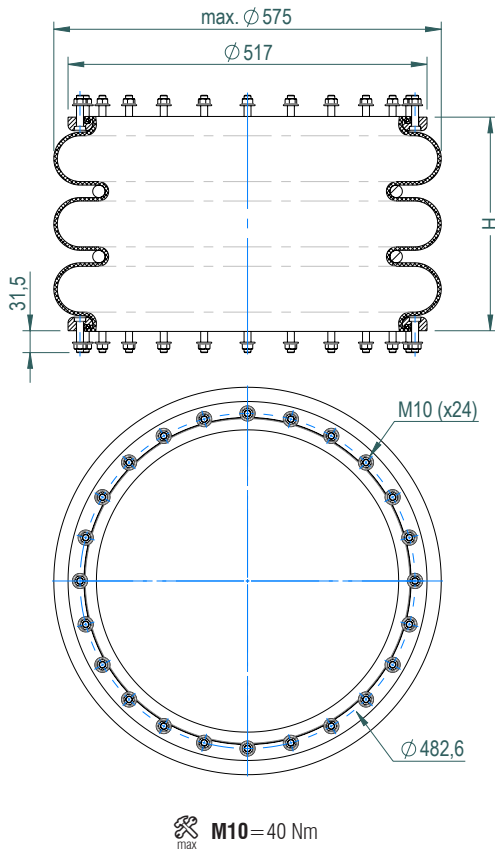
All Volume [l] values at 7 bar

F SERIES  
Socket Head Bead Ring Design

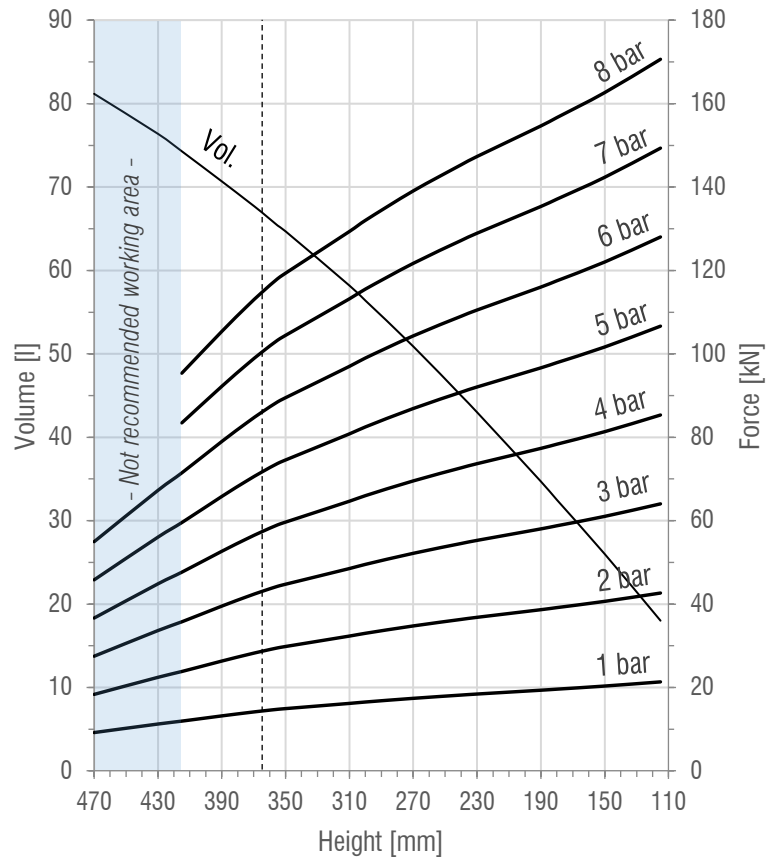
## M-118-3

TRIPLE  
CONVOLUTION

### DRAWING



### FORCE-HEIGHT CHART



### TECHNICAL DATA

#### PRODUCT CHARACTERISTICS

Static diameter [mm]	558
Max. diameter [mm]	575
Required space diameter [mm]	625
Min. height [mm]	115
Static height [mm]	305
Design height [mm]	365
Max. usable height [mm]	415
Max. stroke [mm]	300
Force to compress to $H_{min}$ at 0 bar [N]	500
Weight [kg]	25,8

#### REFERENCES

M-118-3_B	Rubber bellow only
M-118-3_R_SH	With socket head bead rings
M-118-3_R_TR	With threaded bead rings
M-118-3_R_CS	With countersunk bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

Special guides are required when used as isolators due to lateral instability.

#### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	43,0	57,3	71,7	86,0	100,3	67,0
Spring rate [N/mm]	314	403	493	582	671	
Natural frequency [Hz]	1,35	1,33	1,31	1,30	1,29	
Isolation rate at 10 Hz	98,1%	98,2%	98,3%	98,3%	98,3%	

Values at recommended design height H: 365 mm -----

#### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]		3	4	5	6	7	Vol. [l]
Height H [mm]	150	61,0	81,3	101,7	122,0	142,3	26,0
	190	58,0	77,3	96,7	116,0	135,3	34,7
	230	55,3	73,7	92,1	110,5	128,9	43,0
	270	52,2	69,5	86,9	104,3	121,7	50,9
	310	48,5	64,7	80,8	97,0	113,2	58,2
	350	44,8	59,7	74,6	89,5	104,4	64,7
390	39,5	52,7	65,8	79,0	92,2	70,7	

Force values [kN]

All Volume [l] values at 7 bar

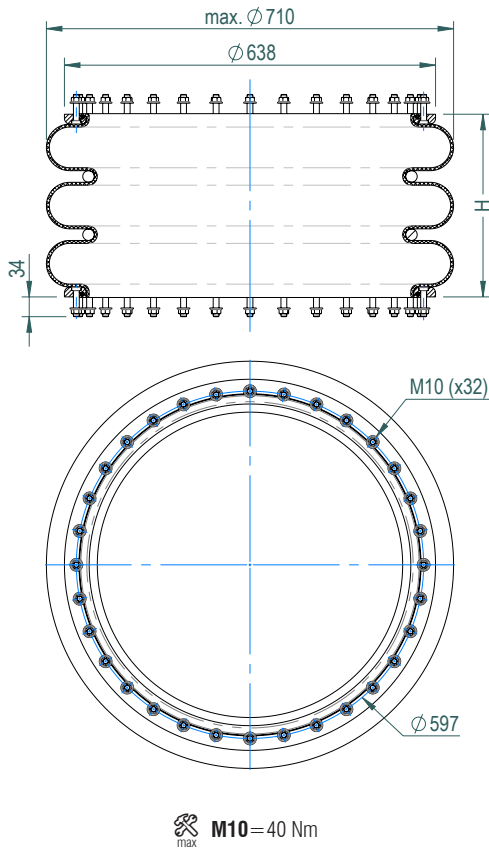


F SERIES  
Socket Head Bead Ring Design

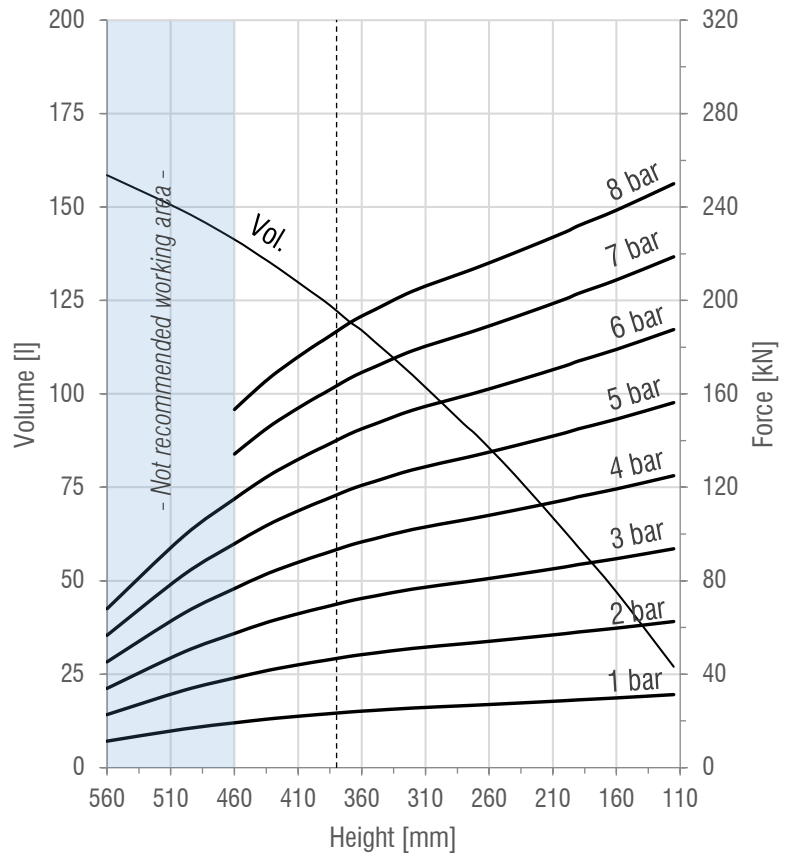
# M-130-3

TRIPLE  
CONVOLUTION

## DRAWING



## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	700
Max. diameter [mm]	710
Required space diameter [mm]	760
Min. height [mm]	115
Static height [mm]	300
Design height [mm]	380
Max. usable height [mm]	460
Max. stroke [mm]	345
Force to compress to $H_{min}$ at 0 bar [N]	800
Weight [kg]	34,7

### REFERENCES

M-130-3_B	Rubber bellow only
M-130-3_R_SH	With socket head bead rings
M-130-3_R_TR	With threaded bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	70,0	93,3	116,7	140,0	163,3	122,3
Spring rate [N/mm]	432	551	670	789	908	
Natural frequency [Hz]	1,24	1,21	1,20	1,19	1,18	
Isolation rate at 10 Hz	98,4%	98,5%	98,5%	98,6%	98,6%	

Values at recommended design height  $H$ : 380 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]	
Height $H$ [mm]	160	89,5	119,3	149,2	179,0	208,8	47,0
	200	86,0	114,7	143,3	172,0	200,7	63,0
	240	82,7	110,2	137,8	165,3	192,9	78,4
	280	79,5	106,0	132,5	159,0	185,5	92,0
	320	76,5	102,0	127,5	153,0	178,5	105,0
	360	72,5	96,7	120,8	145,0	169,2	117,0
	400	67,4	89,8	112,3	134,7	157,2	127,4
	440	61,3	81,7	102,1	122,5	142,9	136,9

Force values [kN]

All Volume [l] values at 7 bar

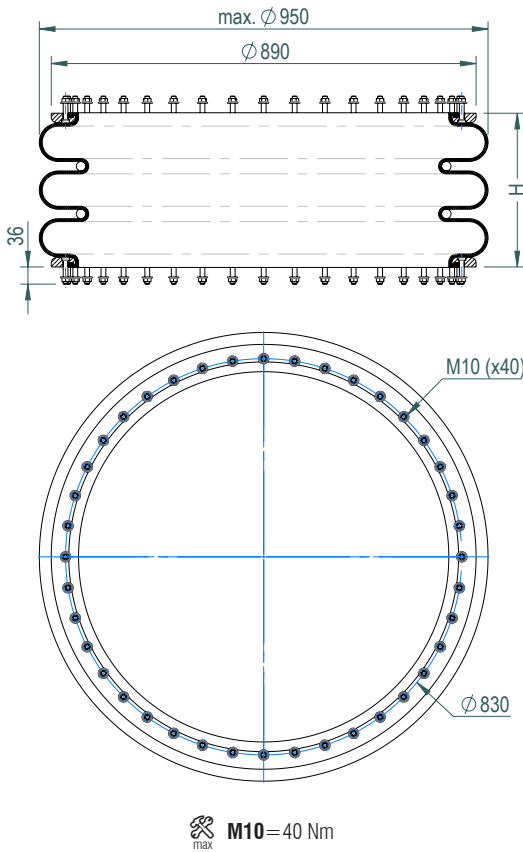
Special guides are required when used as isolators due to lateral instability.

F SERIES  
Socket Head Bead Ring Design

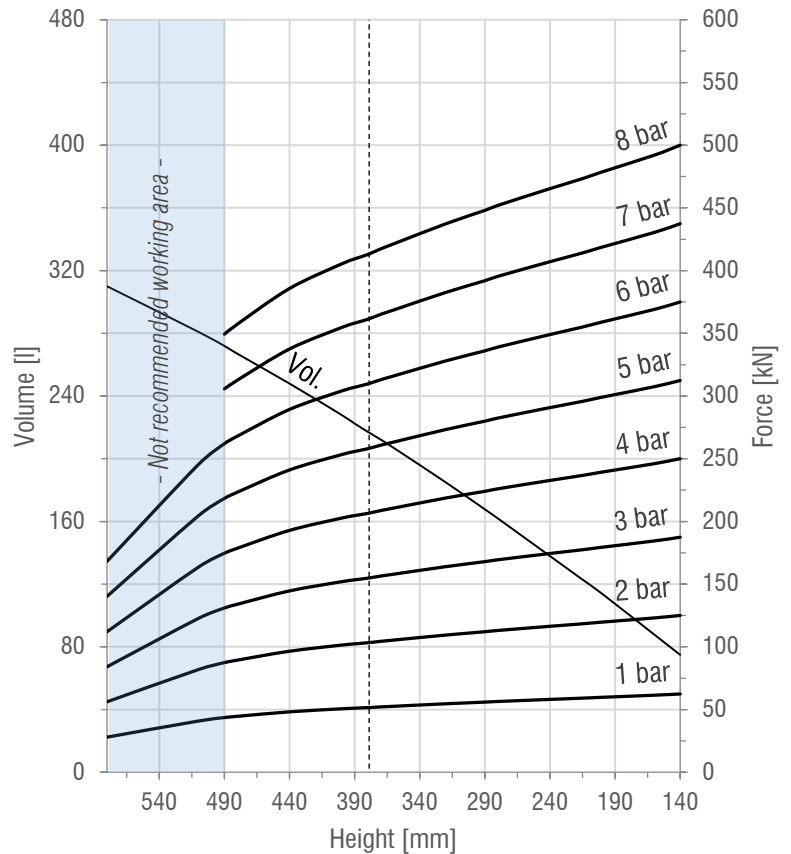
# M-140-3

TRIPLE  
CONVOLUTION

## DRAWING



## FORCE-HEIGHT CHART



## TECHNICAL DATA

### PRODUCT CHARACTERISTICS

Static diameter [mm]	940
Max. diameter [mm]	950
Required space diameter [mm]	1.000
Min. height [mm]	140
Static height [mm]	320
Design height [mm]	380
Max. usable height [mm]	490
Max. stroke [mm]	350
Force to compress to $H_{min}$ at 0 bar [N]	1.300
Weight [kg]	63,8

### REFERENCES

M-140-3_B	Rubber bellow only
M-140-3_R_SH	With socket head bead rings
M-140-3_R_TR	With threaded bead rings

Designs available with stainless steel and high temperature rubber compounds. Additional designs on request.

### DYNAMIC CHARACTERISTICS FOR USE AS ISOLATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]
Load [kN]	154,8	206,4	258,0	309,6	361,2	217,3
Spring rate [N/mm]	821	1.038	1.255	1.473	1.690	
Natural frequency [Hz]	1,15	1,12	1,10	1,09	1,08	
Isolation rate at 10 Hz	98,7%	98,7%	98,8%	98,8%	98,8%	

Values at recommended design height H: 380 mm -----

### STATIC CHARACTERISTICS FOR USE AS ACTUATOR

Pressure [bar]	3	4	5	6	7	Vol. [l]	
Height H [mm]	160	184,5	246,0	307,5	369,0	430,5	88,0
	200	179,5	239,3	299,2	359,0	418,8	114,0
	240	174,5	232,7	290,8	349,0	407,2	138,0
	280	169,5	226,0	282,5	339,0	395,5	162,0
	320	164,0	218,7	273,3	328,0	382,7	185,0
	360	158,0	210,7	263,3	316,0	368,7	207,0
	400	152,0	202,7	253,3	304,0	354,7	228,0
	440	144,7	192,9	241,1	289,3	337,5	248,0
	480	134,0	178,7	223,3	268,0	312,7	267,0

Force values [kN]

All Volume [l] values at 7 bar

⚠ Special guides are required when used as isolators due to lateral instability.