

## Cilindros de guado AVENTICS serie MSC

Las mini guas de AVENTICS serie MSC tienen un diseo compacto, apenas necesitan espacio de instalacin y se pueden configurar de forma ptima para prcticamente cualquier tarea de manipulacin automatizada. {1}La versatilidad de sus posibilidades de configuracin convierten a la mini gua en un componente de manipulacin autnticamente universal.{1} El funcionamiento preciso y fiable acompaado de una configuracin y personalizacin para cada aplicacin: estas propiedades hacen que las mini placas deslizantes asuman el papel de actuador en una manipulacin eficiente. La serie MSC aporta absorcin de par elevada y mxima estabilidad. Adems, presenta unas caractersticas tcnicas que garantizan funciones ptimamente adaptadas y procesos de fcil mantenimiento. Rpido, seguro y conectado de forma eficiente con la Interfaz especial Easy-2-Combine, las mini placas deslizantes se pueden combinar con los otros componentes de un sistema de manipulacin sin placas de montaje adicionales.

- Par de torsin y absorcin de carga con estabilidad mxima
- construccin compacta
- Interfaz Easy-2-Combine



## Datos tcnicos

|                                |                                                              |
|--------------------------------|--------------------------------------------------------------|
| Sector                         | Industria                                                    |
| Advertencia                    | Producto de archivo: No utilizar para nuevas construcciones! |
| Ø del mbolo                   | 12 mm                                                        |
| Carrera                        | 30 mm                                                        |
| Principio activo               | de efecto doble                                              |
| Easy2Combine                   | compatible                                                   |
| mbolo doble                   | con mbolo doble                                             |
| Orificio                       | M5                                                           |
| Amortiguacin                  | hidrulica                                                   |
| Precisin de repeticin        | 0,02 mm                                                      |
| Presin de funcionamiento mn. | 1 bar                                                        |
| Presin de funcionamiento mx. | 10 bar                                                       |
| Temperatura ambiente mn.      | 0 C                                                         |
| Temperatura ambiente mx.      | 60 C                                                        |
| Fluido                         | Aire comprimido                                              |

|                                                                           |                                                                          |
|---------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Fuerza de émbolo durante retracción, teórica                              | 107 N                                                                    |
| Fuerza de émbolo durante extracción, teórica                              | 143 N                                                                    |
| Velocidad máx.                                                            | 0.8 m/s                                                                  |
| Longitud de amortiguación                                                 | 7 mm                                                                     |
| Energía de amortiguación                                                  | 1 J                                                                      |
| Contenido de aceite del aire comprimido min.                              | 0 mg/m <sup>3</sup>                                                      |
| Contenido de aceite del aire comprimido máx.                              | 1 mg/m <sup>3</sup>                                                      |
| Tamaño de partículas máx.                                                 | 5 µm                                                                     |
| Presión para determinar las fuerzas de émbolo con guía de bolas integrada | 6,3 bar<br>Con patín de bolas sobre raíles integrado de alto rendimiento |
| Peso                                                                      | 0.56 kg                                                                  |

## Material

|                              |                  |
|------------------------------|------------------|
| Material carcasa             | Aluminio         |
| Superficie Carcasa           | anodizado        |
| Material vástago             | Acero inoxidable |
| Material placa frontal       | Aluminio         |
| Superficie Placa frontal     | anodizado        |
| Material juntas              | Poliuretano      |
| Material mesa de guía        | Aluminio         |
| Superficie Mesa de guía      | anodizado        |
| Material riel de guía        | Acero, cromado   |
| Superficie Riel de guía      | templado         |
| Material anillos de centraje | Acero inoxidable |
| N° de material               | R412019199       |

## Información técnica

Precisión de repetición después de 100 carreras consecutivas: 0,02 mm

Versión de la base con conexiones de aire detrás y en el lateral

Las carreras intermedias pueden configurarse.

Volumen de entrega: incl. anillos de centraje

R1 = gama de ajuste de carrera para el avance

R2 = gama de ajuste de carrera para el retorno

El punto de condensación de presión se debe situar como mínimo 15 °C por debajo de la temperatura ambiental y del medio, y debe ser como máx. de 3 °C .

El contenido de aceite del aire comprimido debe permanecer constante durante toda la vida útil.

Utilice solo aceites permitidos por AVENTICS. Encontrará más información en el documento "Información técnica" (disponible en el <https://www.emerson.com/en-us/support>).

## Dimensiones



R\*: versión de la base con conexiones de aire solo detrás

S\*: versión de la base con conexiones de aire detrás y en el lateral

\*\* Ø 8 tiene otra superficie de referencia.

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| Ø del émbolo | Ø D1  | Ø D2    | H1 | H2   | H3   | H4-R | H4-S | H5   | H6-R | H6-S |
|--------------|-------|---------|----|------|------|------|------|------|------|------|
| 8            | M5    | M10x1   | 28 | 9.6  | 20.5 | -    | 7.5  | 19.5 | -    | 5.5  |
| 12           | M5    | M12x1   | 34 | 5.7  | 25   | 11.2 | 11.2 | 24.5 | 5.7  | 5.7  |
| 16           | M5    | M12x1   | 40 | 7.2  | 29   | 12.2 | 12.2 | 31   | 7.7  | 7.7  |
| 20           | G 1/8 | M16x1,5 | 50 | 11.2 | 37.5 | 17.3 | 17.3 | 38.2 | 11.7 | 12.2 |
| 25           | G 1/8 | M18x1,5 | 60 | 14.2 | 44   | 15.5 | 22.9 | 46.5 | 13.2 | 21.7 |

| Ø del émbolo | H7   | H8  | H9  | H10 | L3 máx. | L4  | L5 2) | L6  | L7 | R2   |
|--------------|------|-----|-----|-----|---------|-----|-------|-----|----|------|
| 8            | 18   | -   | -   | -   | 31      | 9.8 | -     | 1.9 | 6  | 4.1  |
| 12           | 8.3  | -   | -   | -   | 46.7    | 7.2 | 22.5  | 2   | 8  | 12   |
| 16           | 11.2 | -   | -   | -   | 44.9    | 6.5 | 17.7  | 2   | 10 | 10.4 |
| 20           | 11.7 | 5.5 | 4.2 | 1   | 48.9    | 8   | 30    | 2.1 | 10 | 14   |
| 25           | 16.2 | 6.9 | 5.2 | 1.5 | 67.7    | 9   | 31    | 2.1 | 12 | 16.2 |

| Ø del émbolo | W1   | W2-R | W2-S | W3-R | W3-S | W4   | W5   | W6  | W7  |
|--------------|------|------|------|------|------|------|------|-----|-----|
| 8            | 50.2 | -    | 19.3 | -    | 30.5 | 18   | W1/2 | -   | -   |
| 12           | 66   | 28.8 | 28.8 | 53   | 53   | 24.5 | W1/2 | -   | -   |
| 16           | 76   | 31   | 31   | 60.5 | 60.5 | 30   | W1/2 | -   | -   |
| 20           | 92   | 10   | 21   | 74   | 74   | 35   | W1/2 | 2   | 4   |
| 25           | 112  | 11   | 14   | 92   | 92   | 44   | W1/2 | 2.5 | 4.8 |

## Medidas en función de la carrera

| Ø del émbolo | S=10 EB | S=20 EB | S=30 EB | S=40 EB | S=50 EB | S=80 EB | S=100 EB | S=125 EB | S=150 EB | S=200 EB |
|--------------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| 8            | 12      | 2       | 2       | 2       | 2       | 2       | –        | –        | –        | –        |
| 12           | 22      | 12      | 2       | 2       | 2       | 2       | 2        | –        | –        | –        |
| 6            | 22      | 12      | 2       | 2       | 2       | 2       | 2        | 2        | 2        | –        |
| 20           | 22      | 12      | 2       | 2       | 2       | 2       | 2        | 2        | 2        | 2        |
| 25           | 22      | 12      | 2       | 2       | 2       | 2       | 2        | 2        | 2        | 2        |

| Ø del émbolo | S=10 L1-R | S=20 L1-R | S=30 L1-R | S=40 L1-R | S=50 L1-R | S=80 L1-R | S=100 L1-R | S=125 L1-R | S=150 L1-R | S=200 L1-R |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|
| 8            | –         | –         | –         | –         | –         | –         | –          | –          | –          | –          |
| 12           | 99.3      | 99.3      | 99.3      | 109.3     | 124.3     | 170.3     | 190.3      | –          | –          | –          |
| 6            | 101.8     | 101.8     | 101.8     | 111.8     | 126.8     | 172.8     | 192.8      | 281.3      | 306.3      | –          |
| 20           | 112.9     | 112.9     | 112.9     | 122.9     | 137.9     | 182.9     | 202.9      | 287.4      | 327.4      | 402.4      |
| 25           | 126.1     | 126.1     | 126.1     | 136.1     | 149.1     | 195.1     | 215.1      | 292.1      | 332.1      | 407.1      |

| Ø del émbolo | S=10 L1-S | S=20 L1-S | S=30 L1-S | S=40 L1-S | S=50 L1-S | S=80 L1-S | S=100 L1-S | S=125 L1-S | S=150 L1-S | S=200 L1-S |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|
| 8            | 80.7      | 80.7      | 90.7      | 100.7     | 120.7     | 170.7     | –          | –          | –          | –          |
| 12           | 116.2     | 116.2     | 116.2     | 126.2     | 141.2     | 187.2     | 207.2      | –          | –          | –          |
| 6            | 112.7     | 112.7     | 112.7     | 122.7     | 137.7     | 183.7     | 203.7      | 292.2      | 317.2      | –          |
| 20           | 137.8     | 137.8     | 137.8     | 147.8     | 162.8     | 207.8     | 227.8      | 312.3      | 352.3      | 427.3      |
| 25           | 149.8     | 149.8     | 149.8     | 159.8     | 172.8     | 218.8     | 238.8      | 315.8      | 355.8      | 430.8      |

| Ø del émbolo | S=10 L2 | S=20 L2 | S=30 L2 | S=40 L2 | S=50 L2 | S=80 L2 | S=100 L2 | S=125 L2 | S=150 L2 | S=200 L2 |
|--------------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| 8            | 73.5    | 73.5    | 83.5    | 93.5    | 113.5   | 163.5   | –        | –        | –        | –        |
| 12           | 88.8    | 88.8    | 88.8    | 98.8    | 113.8   | 159.8   | 179.8    | –        | –        | –        |
| 6            | 90.4    | 90.4    | 90.4    | 100.4   | 115.4   | 161.4   | 181.4    | 269.9    | 294.9    | –        |
| 20           | 100.5   | 100.5   | 100.5   | 110.5   | 125.5   | 170.5   | 190.5    | 275      | 315      | 390      |
| 25           | 111.5   | 111.5   | 111.5   | 121.5   | 134.5   | 180.5   | 200.5    | 277.5    | 317.5    | 392.5    |

| Ø del émbolo | S=10<br>R1 máx. | S=20<br>R1 máx. | S=30<br>R1 máx. | S=40<br>R1 máx. | S=50<br>R1 máx. | S=80<br>R1 máx. | S=100<br>R1 máx. | S=125<br>R1 máx. | S=150<br>R1 máx. | S=200<br>R1 máx. |
|--------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|
| 8            | 4.2             | 4.2             | 4.2             | 4.2             | 4.2             | 4.2             | –                | –                | –                | –                |
| 12           | 5.7             | 5.7             | 5.7             | 5.7             | 5.7             | 5.7             | 5.7              | –                | –                | –                |
| 6            | 8.7             | 8.7             | 8.7             | 8.7             | 8.7             | 8.7             | 8.7              | 8.7              | 8.7              | –                |
| 20           | 12.4            | 12.4            | 12.4            | 12.4            | 12.4            | 12.4            | 12.4             | 12.4             | 12.4             | 12.4             |
| 25           | 11.5            | 11.5            | 11.5            | 11.5            | 10.5            | 11.5            | 11.5             | 11.5             | 11.5             | 11.5             |

factor de corrección (a, d)



factor de corrección (a, d)  
horizontal



|       |                                    |
|-------|------------------------------------|
| stat. | $M_{B0} = F_G \cdot A + F \cdot D$ |
| dyn.  | $M_B = F_G \cdot A$                |



|       |                        |
|-------|------------------------|
| stat. | $M_{C0} = F_G \cdot B$ |
| dyn.  | $M_C = F_G \cdot B$    |



|       |                      |
|-------|----------------------|
| stat. | $M_{A0} = F \cdot B$ |
| dyn.  | $M_A = 0$            |

|       |                                                                                |
|-------|--------------------------------------------------------------------------------|
| dyn.  | $\frac{M_A}{M_1} + \frac{M_B}{M_2} + \frac{M_C}{M_3} \leq 1$                   |
| stat. | $\frac{M_{A0}}{M_{Z0}} + \frac{M_{B0}}{M_{Y0}} + \frac{M_{C0}}{M_{X0}} \leq 1$ |

$F = m \cdot a$   $FG = m \cdot g$   $a = 1250 \cdot V^2 / H$   
 $F$  = fuerza de retardo [N]  $F_G$  = fuerza de peso [N]  $m$  = masa de carga [kg]  $a$  = retardo [m/s<sup>2</sup>]  $g$  = aceleración de la gravedad 9,81 [m/s<sup>2</sup>]  $V$  = velocidad  $H$  = longitud de carrera de amortiguador [mm]

factor de corrección (a, d)  
vertical



|       |                              |
|-------|------------------------------|
| stat. | $M_{B0} = (F_G + F) \cdot D$ |
| dyn.  | $M_B = F_G \cdot D$          |



|       |                              |
|-------|------------------------------|
| stat. | $M_{A0} = (F_G + F) \cdot B$ |
| dyn.  | $M_A = F_G \cdot B$          |

|       |                                                        |
|-------|--------------------------------------------------------|
| dyn.  | $\frac{M_A}{M_1} + \frac{M_B}{M_2} \leq 1$             |
| stat. | $\frac{M_{A0}}{M_{Z0}} + \frac{M_{B0}}{M_{Y0}} \leq 1$ |

$F = m \cdot a$   $FG = m \cdot g$   $a = 1250 \cdot V^2 / H$   
 $F$  = fuerza de retardo [N]  $F_G$  = fuerza de peso [N]  $m$  = masa de carga [kg]  $a$   
= retardo [m/s<sup>2</sup>]  $g$  = aceleración de la gravedad 9,81 [m/s<sup>2</sup>]  $V$  = velocidad  $H$   
= longitud de carrera de amortiguador [mm]

## Dimensiones

### MSC-08



\* = anillos de centrado

\*\* Ø 8 tiene otra superficie de referencia.

| N° de material | Ø del émbolo | Carrera | N1 | N2 | N3 | L5 |
|----------------|--------------|---------|----|----|----|----|
| R412019204     | 8            | 10      | 4  | 2  | 2  | 11 |
| R412019205     | 8            | 20      | 4  | 2  | 2  | 11 |
| R412019206     | 8            | 30      | 4  | 2  | 2  | 11 |
| R412019207     | 8            | 40      | 6  | 2  | 2  | 11 |
| R412019208     | 8            | 50      | 8  | 3  | 3  | 11 |
| R412019209     | 8            | 80      | 12 | 3  | 5  | 11 |

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## Dimensiones MSC-12



\* = anillos de centrado

| N° de material | Ø del émbolo | Carrera | N1 | N2 | N3 |
|----------------|--------------|---------|----|----|----|
| R412019190     | 12           | 10      | 4  | 2  | 2  |
| R412019191     | 12           | 20      | 4  | 2  | 2  |
| R412019192     | 12           | 30      | 4  | 2  | 2  |
| R412019193     | 12           | 40      | 4  | 2  | 2  |
| R412019194     | 12           | 50      | 6  | 3  | 3  |
| R412019195     | 12           | 80      | 10 | 3  | 5  |
| R412019196     | 12           | 100     | 12 | 3  | 5  |

| N° de material | Ø del émbolo | Carrera | N1 | N2 | N3 |
|----------------|--------------|---------|----|----|----|
| R480643794     | 12           | 10      | 4  | 2  | 2  |
| R480643795     | 12           | 20      | 4  | 2  | 2  |
| R480643796     | 12           | 30      | 4  | 2  | 2  |
| R480643797     | 12           | 40      | 4  | 2  | 2  |
| R480643798     | 12           | 50      | 6  | 3  | 3  |
| R480643799     | 12           | 80      | 10 | 3  | 5  |
| R480643800     | 12           | 100     | 12 | 3  | 5  |

| N° de material | Ø del émbolo | Carrera | N1 | N2 | N3 |
|----------------|--------------|---------|----|----|----|
| R412019190     | 12           | 10      | 4  | 2  | 2  |
| R412019191     | 12           | 20      | 4  | 2  | 2  |
| R412019192     | 12           | 30      | 4  | 2  | 2  |
| R412019193     | 12           | 40      | 4  | 2  | 2  |
| R412019194     | 12           | 50      | 6  | 3  | 3  |
| R412019195     | 12           | 80      | 10 | 3  | 5  |
| R412019196     | 12           | 100     | 12 | 3  | 5  |

## Masa móvil máxima y mínima



V = velocidad [m/s]  
m = masa

## Plano de vista general



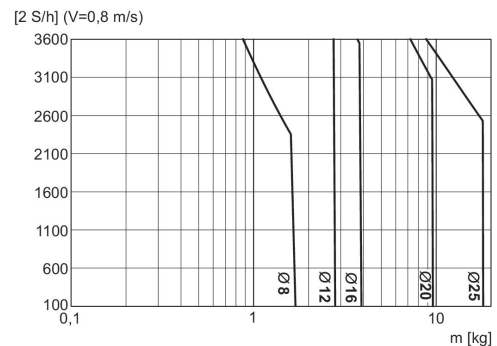
INDICACIÓN: Este plano de vista general sirve como orientación para saber en qué lugares pueden fijarse al cilindro los diferentes accesorios. Para ello se ha simplificado la representación. En consecuencia, no está permitido hacer deducciones concretas sobre datos de medidas.

## Factor de corrección velocidad necesaria de retracción y extracción, horizontal



\* en retracción  
 \*\* en extracción  
 $V = s/1000 \cdot t \cdot k_m$   
 $V$  = velocidad [m/s]  
 $S$  = carrera

## Masa móvil adicional máx., horizontal



$S$  = carrera [mm]  
 $2 \times S = 1$  ciclo  
 $V$  = velocidad [m/s]  
 $m$  = masa

## Masa móvil adicional máx., vertical



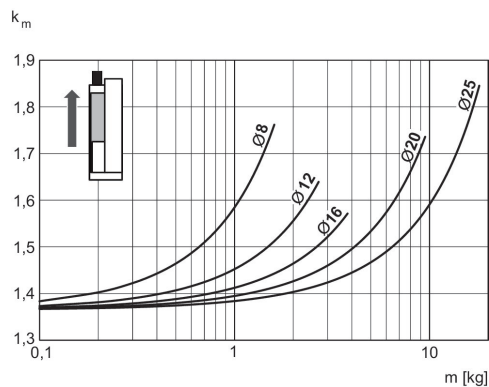
$S$  = carrera [mm]  
 $2 \times S = 1$  ciclo  
 $V$  = velocidad [m/s]  
 $m$  = masa

## Factor de corrección velocidad necesaria de extracción, vertical, hacia arriba



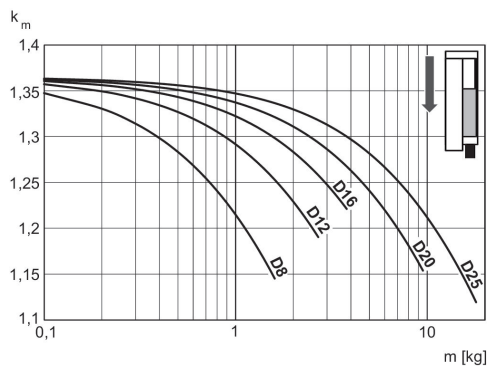
$V = s/1000 \cdot t \cdot k_m$   
 $V$  = velocidad [m/s]  
 $S$  = carrera [mm]  
 $t$  = tiempo [s] para una carrera  
 $m$  = masa

Factor de corrección velocidad  
necesaria de retracción, vertical,  
hacia arriba



$V = s/1000 \cdot t \cdot km$   
 $V$  = velocidad [m/s]  
 $S$  = carrera [mm]  
 $t$  = tiempo [s] para una carrera  
 $m$  = masa

Factor de corrección velocidad  
necesaria de retracción, vertical,  
hacia abajo



$V = s/1000 \cdot t \cdot km$   
 $V$  = velocidad [m/s]  
 $S$  = carrera [mm]  
 $t$  = tiempo [s] para una carrera  
 $m$  = masa

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## Dimensiones MSC-16



\* = anillos de centraje

| N° de material | Ø del émbolo | Carrera | E   | N1 | N2 | N3 |
|----------------|--------------|---------|-----|----|----|----|
| R412019175     | 16           | 125     | 200 | 12 | 4  | 5  |
| R480643808     | 16           | 125     | 200 | 12 | 4  | 5  |
| R412019188     | 16           | 125     | 200 | 12 | 4  | 5  |
| R480640200     | 16           | 125     | 200 | 12 | 4  | 5  |
| R412019176     | 16           | 150     | 240 | 12 | 4  | 5  |
| R480643809     | 16           | 150     | 240 | 12 | 4  | 5  |
| R412019189     | 16           | 150     | 240 | 12 | 4  | 5  |
| R480640201     | 16           | 150     | 240 | 12 | 4  | 5  |

Factor de corrección velocidad  
necesaria de extracción, vertical,  
hacia abajo



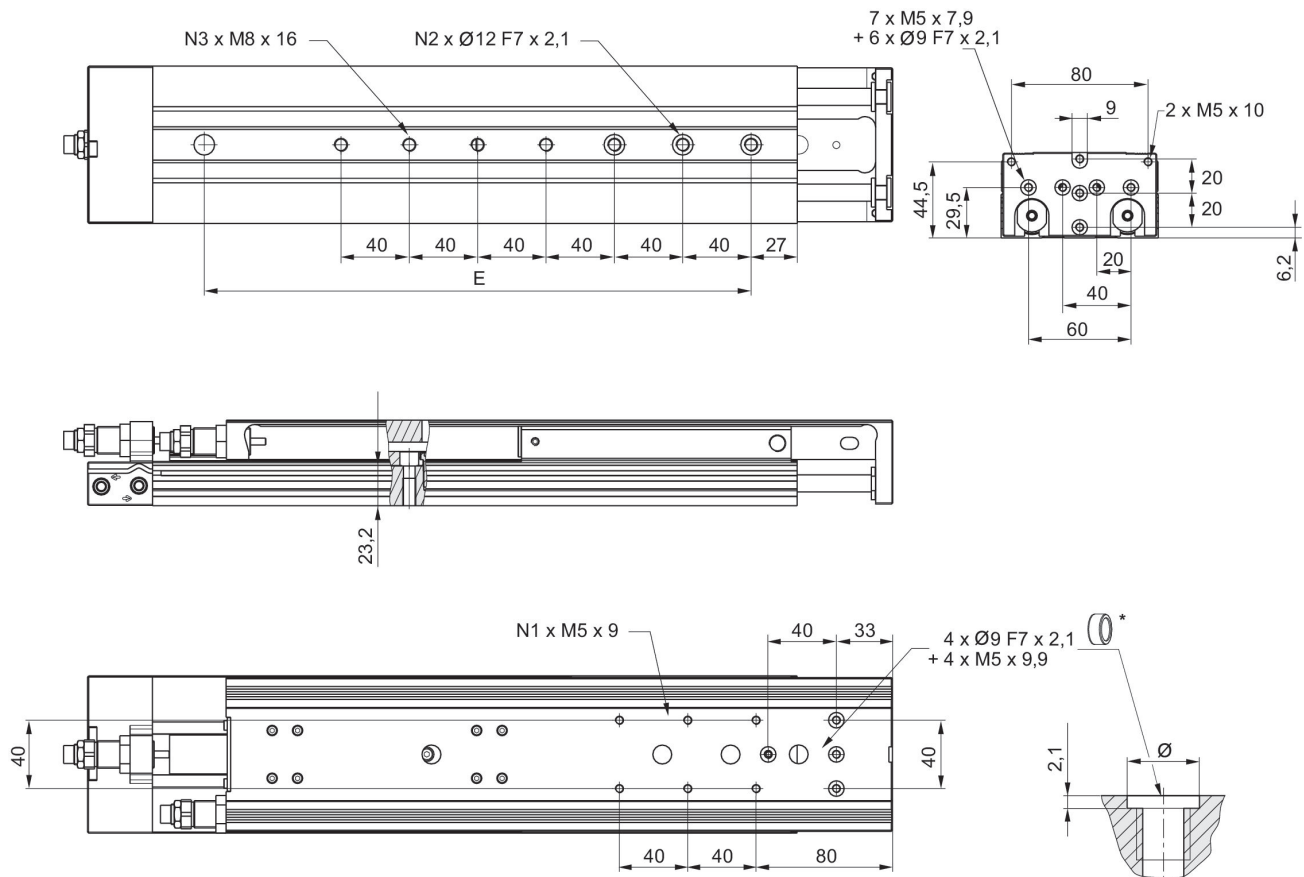
$V = s/1000 \cdot t \cdot k_m$   
 $V$  = velocidad [m/s]  
 $S$  = carrera [mm]  
 $t$  = tiempo [s] para una carrera  
 $m$  = masa

Velocidad de extracción máx.



$V = \sqrt{s \cdot k_v}$   
 $V$  = velocidad [m/s]  
 $S$  = carrera [mm]  
 $m$  = masa

## Dimensiones MSC-20



\* = anillos de centrado

| N° de material | Ø del émbolo | Carrera | E   | N1 | N2 | N3 |
|----------------|--------------|---------|-----|----|----|----|
| R412018917     | 20           | 125     | 200 | 6  | 4  | 5  |
| R480643817     | 20           | 125     | 200 | 6  | 4  | 5  |
| R412019005     | 20           | 125     | 200 | 6  | 4  | 5  |
| R480640205     | 20           | 125     | 200 | 6  | 4  | 5  |
| R412018918     | 20           | 150     | 240 | 6  | 4  | 5  |
| R480643818     | 20           | 150     | 240 | 6  | 4  | 5  |
| R412019006     | 20           | 150     | 240 | 6  | 4  | 5  |
| R480640206     | 20           | 150     | 240 | 6  | 4  | 5  |
| R412018919     | 20           | 200     | 320 | 6  | 4  | 7  |
| R480643819     | 20           | 200     | 320 | 6  | 4  | 7  |
| R412019007     | 20           | 200     | 320 | 6  | 4  | 7  |
| R480640207     | 20           | 200     | 320 | 6  | 4  | 7  |

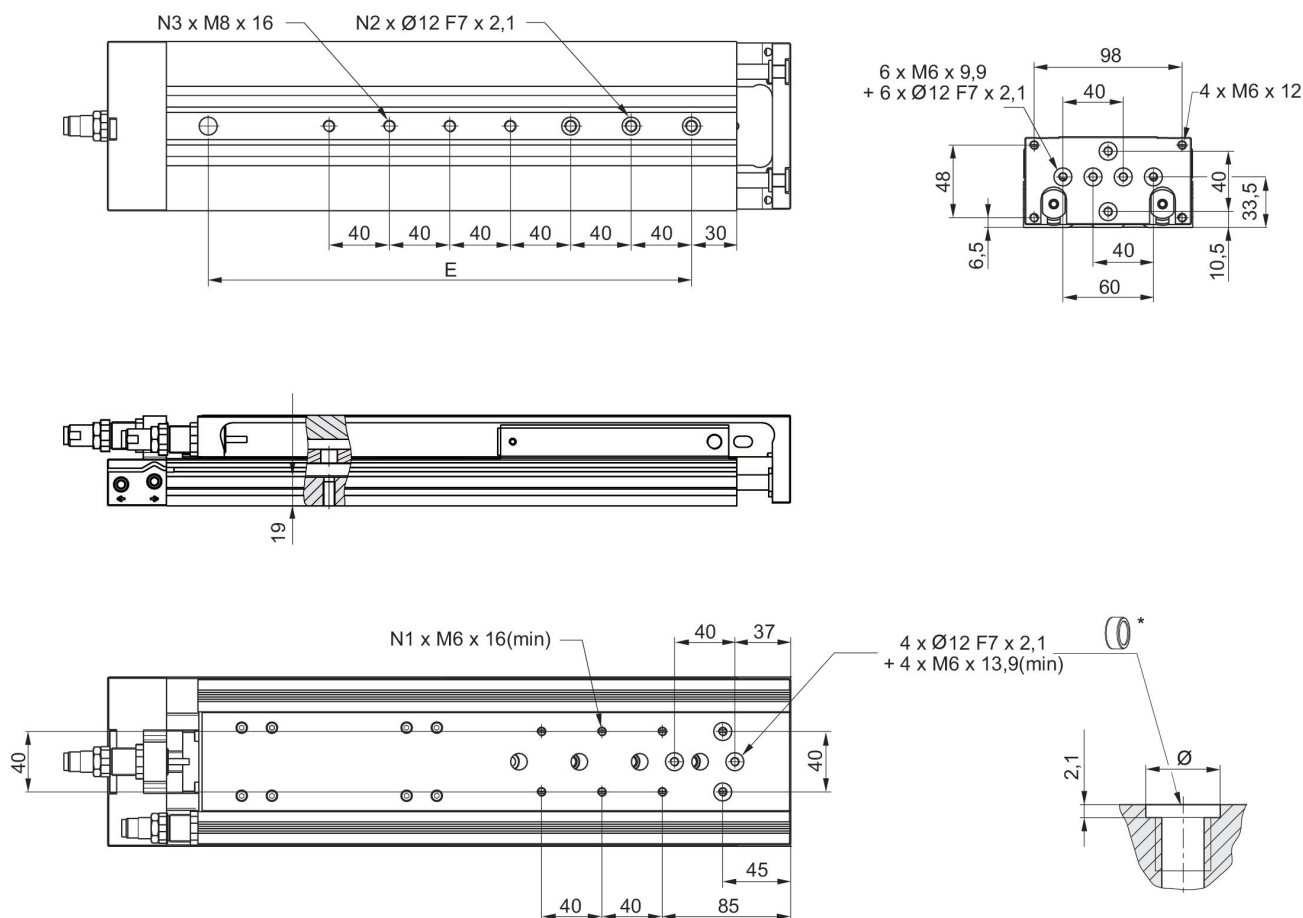
# Mini cuna, Serie MSC-HG-HM

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## Dimensiones MSC-25



\* = anillos de centrado

| N° de material | Ø del émbolo | Carrera | E   | N1 | N2 | N3 |
|----------------|--------------|---------|-----|----|----|----|
| R412019030     | 25           | 125     | 200 | 4  | 4  | 5  |
| R480643827     | 25           | 125     | 200 | 4  | 4  | 5  |
| R412019041     | 25           | 125     | 200 | 4  | 4  | 5  |
| R480640211     | 25           | 125     | 200 | 4  | 4  | 5  |
| R412019031     | 25           | 150     | 240 | 6  | 4  | 5  |
| R480643828     | 25           | 150     | 240 | 6  | 4  | 5  |
| R412019042     | 25           | 150     | 240 | 6  | 4  | 5  |
| R480640212     | 25           | 150     | 240 | 6  | 4  | 5  |
| R412019032     | 25           | 200     | 320 | 6  | 4  | 7  |
| R480643829     | 25           | 200     | 320 | 6  | 4  | 7  |
| R412019043     | 25           | 200     | 320 | 6  | 4  | 7  |
| R480640213     | 25           | 200     | 320 | 6  | 4  | 7  |

## Capacidad de carga



M = par de giro máx. admisible

## factor de corrección (a)

| N° de material    | Ø del émbolo | S   | a [mm] | d [mm] | Mx0 par<br>estático<br>M [Nm] | My0 par<br>estático<br>M [Nm] | Mz0 par<br>estático<br>M [Nm] | Mx par<br>dinámico<br>M [Nm] | My par<br>dinámico<br>M [Nm] | Mz par<br>dinámico<br>M [Nm] |
|-------------------|--------------|-----|--------|--------|-------------------------------|-------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------|
| R412019211        | 8            | 20  | 50     | 14     | 7                             | 7                             | 7                             | 1.1                          | 1.9                          | 1.9                          |
| R412019212        | 8            | 30  | 60     | 14     | 7                             | 7                             | 7                             | 1.1                          | 1.9                          | 1.9                          |
| R412019213        | 8            | 40  | 70     | 14     | 7                             | 7                             | 7                             | 1.1                          | 1.9                          | 1.9                          |
| R412019214        | 8            | 50  | 80     | 14     | 9                             | 13                            | 13                            | 1.3                          | 2.9                          | 2.9                          |
| R412019215        | 8            | 80  | 125    | 14     | 13                            | 25                            | 25                            | 1.3                          | 3.8                          | 3.8                          |
| <b>R412019199</b> | 12           | 30  | 64.5   | 16     | 20                            | 14                            | 14                            | 4.2                          | 4.4                          | 4.4                          |
| R412019200        | 12           | 40  | 74.5   | 16     | 20                            | 14                            | 14                            | 4.2                          | 4.4                          | 4.4                          |
| R412019201        | 12           | 50  | 84.5   | 16     | 23                            | 19                            | 19                            | 4.6                          | 5.6                          | 5.6                          |
| R412019202        | 12           | 80  | 125    | 16     | 33                            | 32                            | 32                            | 5.2                          | 8.2                          | 8.2                          |
| R412019203        | 12           | 100 | 145    | 16     | 33                            | 32                            | 32                            | 5.2                          | 8.2                          | 8.2                          |
| R412019183        | 16           | 30  | 65.5   | 15     | 35                            | 25                            | 25                            | 6.5                          | 6.6                          | 6.6                          |
| R412019184        | 16           | 40  | 75.5   | 15     | 35                            | 25                            | 25                            | 6.5                          | 6.6                          | 6.6                          |
| R412019185        | 16           | 50  | 85.5   | 15     | 38                            | 29                            | 29                            | 7                            | 7.6                          | 7.6                          |
| R412019186        | 16           | 80  | 126    | 15     | 74                            | 58                            | 58                            | 8.7                          | 12.8                         | 12.8                         |
| R412019187        | 16           | 100 | 146    | 15     | 74                            | 58                            | 58                            | 8.7                          | 12.8                         | 12.8                         |
| R412019188        | 16           | 125 | 198.5  | 15     | 88                            | 118                           | 118                           | 15.2                         | 31.2                         | 31.2                         |
| R412019189        | 16           | 150 | 223.5  | 15     | 88                            | 119                           | 119                           | 15.2                         | 31.2                         | 31.2                         |
| R412019000        | 20           | 30  | 70.5   | 20     | 87                            | 57                            | 57                            | 9.6                          | 12                           | 12                           |
| R412019001        | 20           | 40  | 80.5   | 20     | 87                            | 57                            | 57                            | 9.6                          | 12                           | 12                           |
| R412019002        | 20           | 50  | 90.5   | 20     | 93                            | 65                            | 65                            | 10                           | 13.3                         | 13.3                         |
| R412019003        | 20           | 80  | 130.5  | 20     | 116                           | 99                            | 99                            | 11.7                         | 19                           | 19                           |
| R412019004        | 20           | 100 | 150.5  | 20     | 116                           | 99                            | 99                            | 11.7                         | 19                           | 19                           |
| R412019006        | 20           | 150 | 233.5  | 20     | 126                           | 152                           | 152                           | 19                           | 45.4                         | 45.4                         |
| R412019007        | 20           | 200 | 296    | 20     | 126                           | 179                           | 179                           | 19                           | 53.4                         | 53.4                         |
| R412019036        | 25           | 30  | 77.5   | 24     | 100                           | 90                            | 90                            | 22.9                         | 19.5                         | 19.5                         |
| R412019037        | 25           | 40  | 87.5   | 24     | 100                           | 90                            | 90                            | 22.9                         | 19.5                         | 19.5                         |
| R412019038        | 25           | 50  | 96.5   | 24     | 100                           | 90                            | 90                            | 15.3                         | 13                           | 13                           |
| R412019039        | 25           | 80  | 137    | 24     | 110                           | 129                           | 129                           | 18.8                         | 20.8                         | 20.8                         |
| R412019040        | 25           | 100 | 157    | 24     | 110                           | 129                           | 129                           | 18.8                         | 20.8                         | 20.8                         |
| R412019041        | 25           | 125 | 201    | 24     | 145                           | 180                           | 180                           | 20.4                         | 44.1                         | 44.1                         |
| R412019042        | 25           | 150 | 236.5  | 24     | 145                           | 201                           | 201                           | 20.4                         | 49.2                         | 49.2                         |
| R412019043        | 25           | 200 | 299    | 24     | 145                           | 236                           | 236                           | 20.4                         | 57.8                         | 57.8                         |

## Peso de las piezas móviles [kg]

| Ø del émbolo | S=10  | S=20  | S=30  | S=40  | S=50  | S=80  | S=100 | S=125 | S=150 | S=200 |
|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 8            | 0.14  | 0.14  | 0.155 | 0.165 | 0.195 | 0.265 | –     | –     | –     | –     |
| 12           | 0.255 | 0.255 | 0.26  | 0.28  | 0.315 | 0.403 | 0.46  | –     | –     | –     |
| 16           | 0.375 | 0.375 | 0.375 | 0.4   | 0.45  | 0.615 | 0.65  | 0.725 | 0.765 | –     |
| 20           | 0.655 | 0.655 | 0.655 | 0.69  | 0.765 | 0.985 | 1.035 | 1.2   | 1.29  | 1.54  |
| 25           | 1     | 1     | 1     | 1.1   | 1.225 | 1.45  | 1.625 | 1.885 | 2.085 | 2.445 |