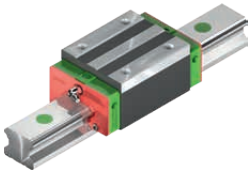
## 6. Linear modules HM-S

### 6.1 Properties of linear modules HM-S with ballscrew

The HIWIN linear axes with ballscrew are compact positioning modules that can be used flexibly. They are especially suitable for applications where high loads have to be moved with high precision.

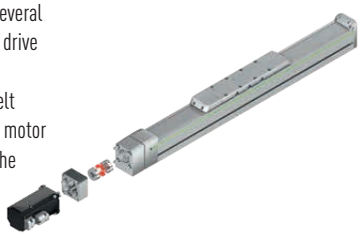
**Linear guideway**

High-quality HIWIN linear guideways safely transfer forces and torques from the carriage to the axis profile. Two blocks are used per carriage, which are guided on a high-precision profile rail. The SynchMotion™ technology with ball chain also ensures good synchronisation and smooth running in the HM060S, HM080S and HM120S sizes.



**Motor connection and belt drive**

The motor adapters are made up of several parts that offer an extremely flexible drive interface for attaching and modifying the drive installation. Optionally, a belt transmission can be used to turn the motor attachment through 180°, reducing the total length to a considerable extent.

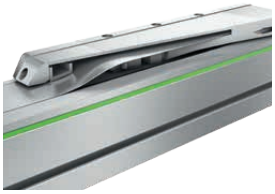


**Ballscrew**

The integrated HIWIN ballscrews ensure precise positioning thanks to their high pitch accuracy and rigidity. Different shaft pitches are available for each size in order to optimally meet the requirements for feed force and dynamics.

**Cover strip**

The steel cover strip prevents dirt and dust from entering the axis interior. In addition, the cover strip allows the axes to be used in areas with coarse, sharp-edged or hot foreign bodies. The magnetic strips integrated in the axis profile hold the belt securely in position and increase the sealing effect.

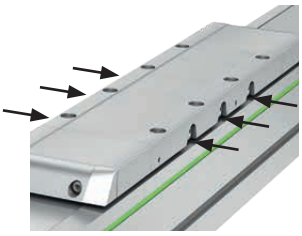


**Carriage**

HIWIN spindle axes are available with two different carriage lengths depending on the size and dimensions of the load to be transported. In order to ensure ideal, reproducible alignment of the adjacent structure, each threaded hole has an additional bore hole via which the load capacity can be fixed with centring sleeves. You will find the matching centring sleeves in the accessories on Page 231.

**Lubrication**

For convenient maintenance of the linear axis, a separate grease nipple is fitted to the left and right of the carriage for each lubrication point. This ensures optimum accessibility for relubrication, even under difficult installation conditions.



**Spindle support**

In applications with long travel distances and high velocity, the critical speed of the shaft is quickly reached, meaning an appropriate support is required to prevent the shaft from swinging up. In HIWIN spindle drive axes, up to three travelling shaft supports can be installed on each side of the carriage. This allows driving at full speed, even with large strokes.

### 6.2 Order code for linear modules HM-S

| HM | 060 | S | 010 | C | 0755 | L | 000 |
|---|---|---|---|---|---|---|---|

**HIWIN linear module**

**Size (profile width):**
040: 40 mm
060: 60 mm
080: 80 mm
120: 120 mm

**Drive type:**
S: Ballscrew

**Spindle pitch [mm]:**
005/010: HM040S
005/010/016: HM060S
005/010/020: HM080S
010/020/032: HM120S

**Cover strip:**
C: With steel cover strip
N: Without cover strip

**Stroke length [mm]**

**Carriage length:**
S: Short
L: Long

**Clearance between two carriages [mm]:**
(000: Only one carriage)

Continuation, order code for linear modules HM-S

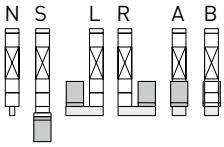
| A | N | N | R | B002 |
|---|---|---|---|---|

**Axis limit switch**[4]**:**
N: Without limit switch
A: 2 × normally closed, 100 mm cable, connector
B: 2 × normally open, 100 mm cable, connector
C: 2 × normally closed, 4 m open cable end
D: 2 × normally open, 5 m open cable end

**Spindle support:**
N: Without spindle support
1: One spindle support per side (HM060/080/120)
2: Two spindle supports per side (HM060/080/120)
3: Three spindle supports per side (HM060/080/120)
4: Four spindle supports per side (HM120)

**Motor flange type**[3]

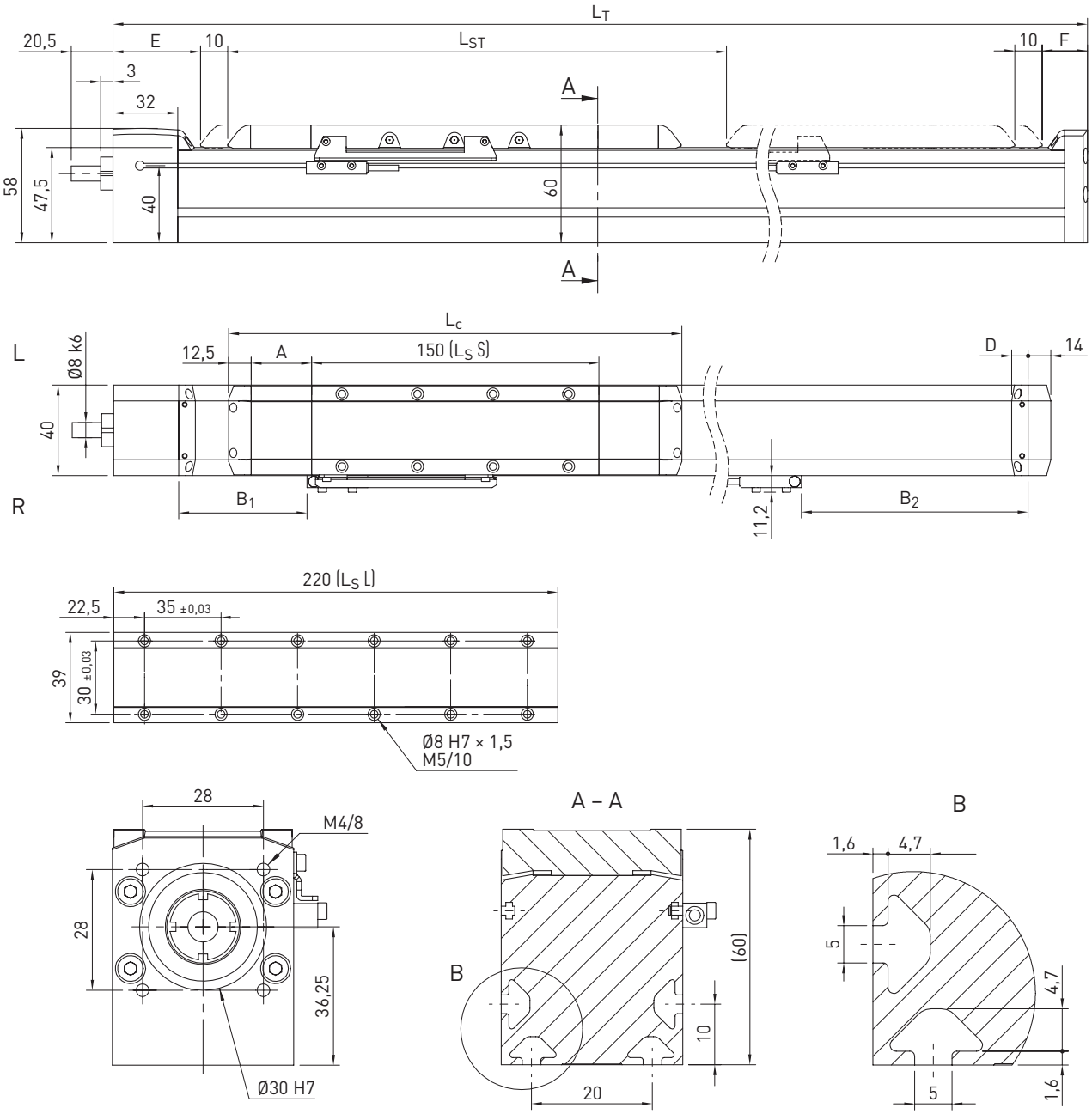
**Drive interface**[2]**:**
N: Without
S: Straight
L: Left
R: Right
A: Top
B: Bottom




**Distance measuring system option**[1]**:**
N: Without distance measuring system
A: HIWIN MAGIC, analogue, 1 $V_{SS}$ sin/cos, 5 m open cable end
D: HIWIN MAGIC, digital, TTL 5 V, 5 m open cable end

[1] More detailed information in chapter 21 from page 156 or in the "HIWIN MAGIC Distance Measuring Systems" assembly instructions".
[2] If no drive interface is selected, the order code ends after this digit.
[3] You can find all flange types in Table 22.15 from page 200. If no gearbox is selected, the order code ends after this digit.
[4] Additional reference switches on request.

### 6.3 Dimensions and specifications of HM040S




$L_S$ Carriage plate
L Left
R Right

Table 6.1 **HM040S dimensions**

| | Variant without cover | | Variant with cover | |
|---|---|---|---|---|
| **Type of carriage** | S | L | S | L |
| **Total carriage length $L_c$ [mm]** | 175 | 245 | 255 | 325 |
| **Cover strip deflection A [mm]** | – | – | 40 | 40 |
| **Switch distance $B_1$ [mm]** | 33.5 | 33.5 | 83.5 | 83.5 |
| **Switch distance $B_2$ [mm]** | 42.5 | 112.5 | 92.5 | 162.5 |
| **Terminal box D [mm]** | – | – | 10 | 10 |
| **End position at mechanical zero E [mm]** | 38 | | 48 | |
| **End position at mechanical zero F [mm]** | 20 | | 30 | |
| **Max. stroke length $L_{ST}$ [mm]** | 1,231 | 1,161 | 1,131 | 1,061 |
| **Total length $L_T$ [mm]** | $L_T = L_{ST} + 253$ | $L_T = L_{ST} + 323$ | $L_T = L_{ST} + 353$ | $L_T = L_{ST} + 423$ |

Table 6.2 **Load data**

| Type of carriage | S | L |
|---|---|---|
| $F_{ydynmax}$ [1] [N] | 1,438 | |
| $F_{zdynmax}$ [1] [N] | 1,438 | |
| $M_{xdynmax}$ [Nm] | 12 | |
| $M_{ydynmax}$ [Nm] | 80 | 130 |
| $M_{zdynmax}$ [Nm] | 80 | 130 |
| z [2] [mm] | 39.6 | |

[1] Force must only act free of torque
[2] Carriage upper edge – centre guide
See section 3.3.2 on page 17 (lifetime reference value)

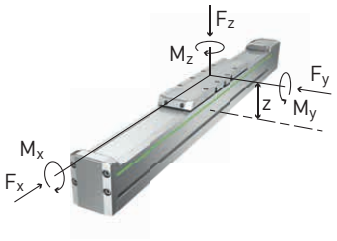



Table 6.3 **General technical data**

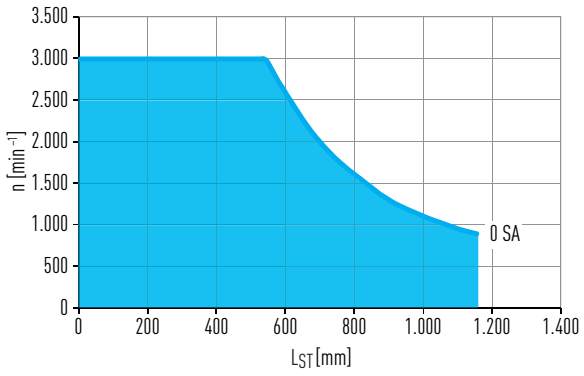
| | |
|---|---|
| Repeatability [mm] | ± 0.02 |
| Max. acceleration [m/s²] | 15 |
| Typical load capacity [kg] | 10 |
| Maximum total length [mm] | 1,484 |
| Area moment of inertia of profile cross section $I_x$ [mm⁴] | 111,032 |
| Area moment of inertia of profile cross section $I_y$ [mm⁴] | 116,769 |

Table 6.4 **Guide**

| | |
|---|---|
| Guide type | MGN15C |
| Static load rating $C_0$ [N] | 5,590 |
| Dynamic load rating $C_{dyn}$ [N] | 4,610 |

Table 6.5 **Drive**

| | Spindle lead | |
|---|---|---|
| | 5 mm | 10 mm |
| Spindle diameter [mm] | 12 | |
| Axial play [mm] | 0.02 | |
| Max. feed force $F_{x\_max}$ [N] | 1,271 | 792 |
| Max. speed [m/s] | 0.25 | 0.50 |
| Max. drive torque $M_{A\_max}$ [Nm] | 1.16 | 1.41 |
| Static load rating ballscrew $C_0$ [N] | 12,000 | 6,500 |
| Dynamic load rating ballscrew $C_{dyn}$ [N] | 6,900 | 4,300 |




SA Spindle support

Fig. 6.1 **Critical speed n over axis stroke length $L_{ST}$**

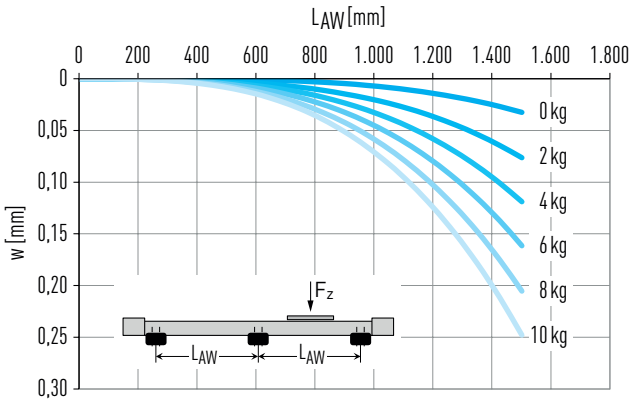


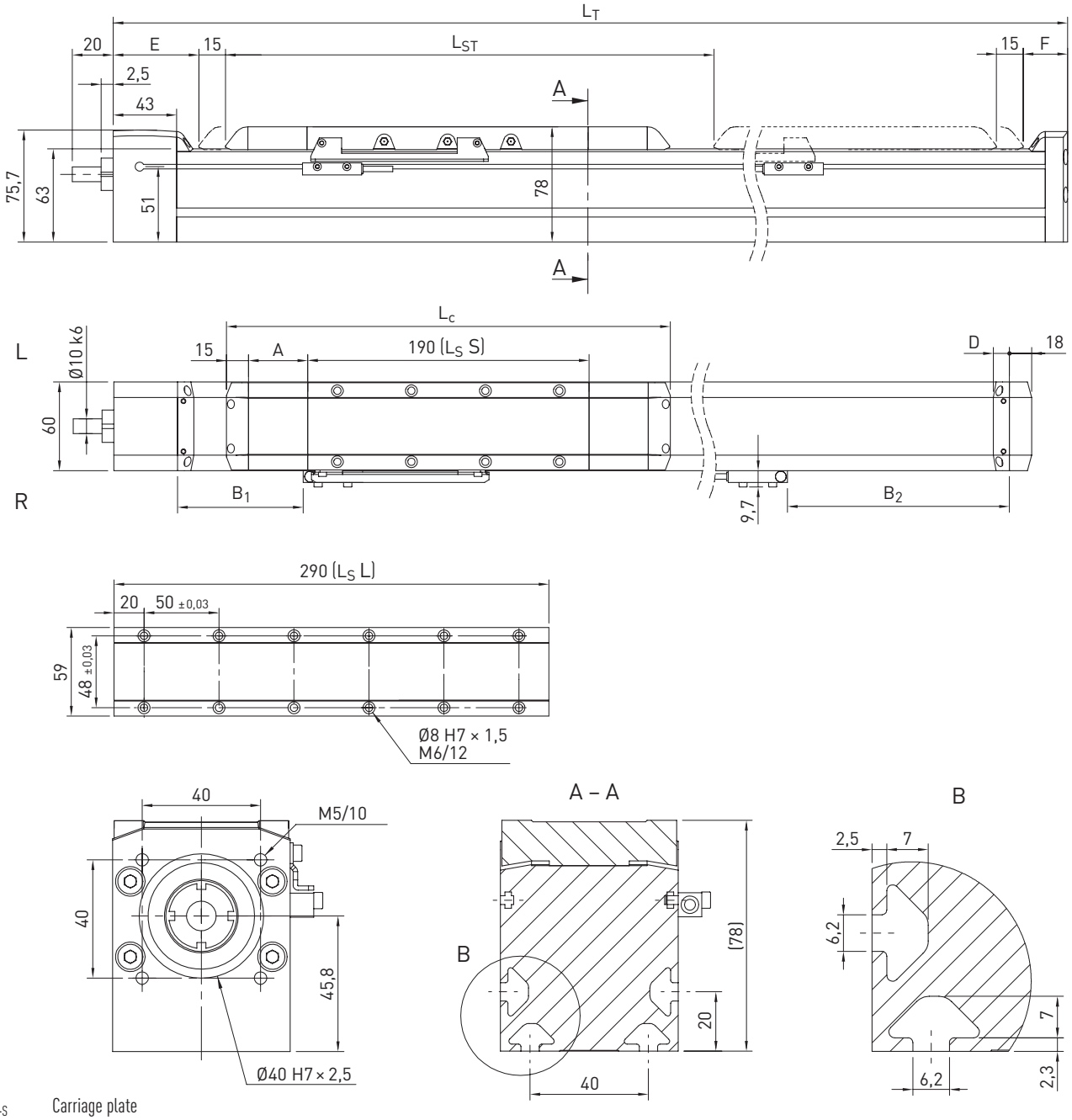

Fig. 6.2 **Deflection w over unsupported axis length $L_{AW}$ under load capacity $F_z$**

Table 6.6 **Mechanical properties**

| | Variant without cover | | | | Variant with cover | | | |
|---|---|---|---|---|---|---|---|---|
| Type of carriage | S | | L | | S | | L | |
| Spindle pitch [mm] | 5 | 10 | 5 | 10 | 5 | 10 | 5 | 10 |
| Mass of the carriage [kg] | 0.43 | 0.43 | 0.55 | 0.55 | 0.48 | 0.48 | 0.60 | 0.60 |
| Mass at 0-stroke [2] [kg] | 1.49 | 1.49 | 1.86 | 1.86 | 1.91 | 1.91 | 2.28 | 2.28 |
| Mass per 1 m stroke [kg/m] | 3.61 | | | | 3.63 | | | |
| $J_{rot.}$ [1] at 0-stroke [kgcm²] | 0.07 | 0.07 | 0.08 | 0.08 | 0.08 | 0.08 | 0.09 | 0.09 |
| $J_{rot.}$ [1] Per 1 m stroke [kgcm²/m] | 0.16 | | | | 0.16 | | | |
| Idle torque at 0-stroke [Nm] | 0.15 | | | | 0.20 | | | |

[1] Rotational moment of inertia
[2] The values apply to axes with one carriage. For axes with 2 carriages, add the following: Mass of carriage + mass per 1 m stroke x (Clearance between the carriages (in m) + carriage length $L_C$ (in m))

### 6.4 Dimensions and specifications of HM060S




$L_S$ Carriage plate
L Left
R Right

Table 6.7 **HM060S dimensions**

| | Variant without cover | | Variant with cover | |
|---|---|---|---|---|
| **Type of carriage** | S | L | S | L |
| **Total carriage length $L_c$ [mm]** | 220 | 320 | 300 | 400 |
| **Cover strip deflection A [mm]** | – | – | 40 | 40 |
| **Switch distance $B_1$ [mm]** | 35 | 35 | 86 | 86 |
| **Switch distance $B_2$ [mm]** | 98 | 198 | 149 | 249 |
| **Terminal box D [mm]** | – | – | 11 | 11 |
| **End position at mechanical zero E [mm]** | 50 | | 61 | |
| **End position at mechanical zero F [mm]** | 25 | | 36 | |
| **Max. stroke length $L_{ST}$ [mm]** | 2,961 | 2,861 | 2,859 | 2,759 |
| **Total length $L_T$ [mm]** | $L_T = L_{ST} + 325$ | $L_T = L_{ST} + 425$ | $L_T = L_{ST} + 427$ | $L_T = L_{ST} + 527$ |

Table 6.8 **Load data**

| Type of carriage | S | L |
|---|---|---|
| $F_{ydynmax}$ [1] [N] | 2,896 | |
| $F_{zdynmax}$ [1] [N] | 3,628 | |
| $M_{xdynmax}$ [Nm] | 28 | |
| $M_{ydynmax}$ [Nm] | 240 | 421 |
| $M_{zdynmax}$ [Nm] | 191 | 336 |
| z [2] [mm] | 57.4 | |

[1] Force must only act free of torque
[2] Carriage upper edge – centre guide
See section 3.3.2 on page 17 (lifetime reference value)

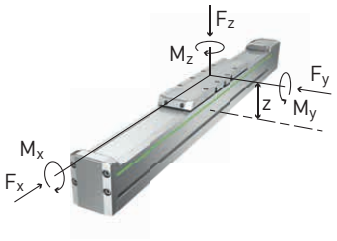



Table 6.9 **General technical data**

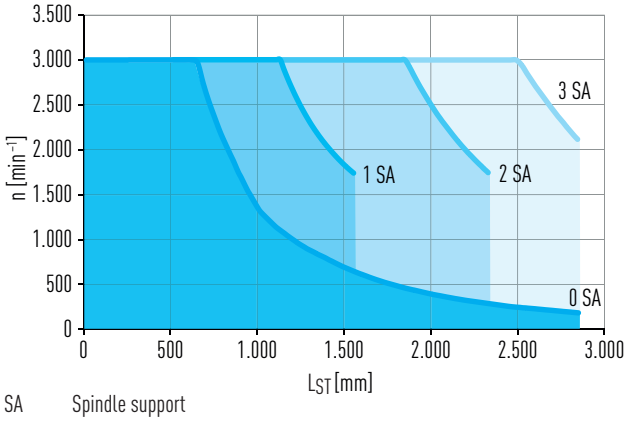
| | |
|---|---|
| Repeatability [mm] | ± 0.02 |
| Max. acceleration [m/s²] | 15 |
| Typical load capacity [kg] | 25 |
| Maximum total length [mm] | 3,286 |
| Area moment of inertia of profile cross section $I_x$ [mm⁴] | 431,907 |
| Area moment of inertia of profile cross section $I_y$ [mm⁴] | 539,706 |

Table 6.10 **Guide**

| | |
|---|---|
| Guide type | QEH15CA |
| Static load rating $C_0$ [N] | 15,280 |
| Dynamic load rating $C_{dyn}$ [N] | 12,530 |

Table 6.11 **Drive**

| | Spindle lead | | |
|---|---|---|---|
| | 5 mm | 10 mm | 16 mm |
| Spindle diameter [mm] | 15 | | |
| Axial play [mm] | 0.02 | | |
| Max. feed force $F_{x\_max}$ [N] | 2,541 | 1,989 | 1,915 |
| Max. speed [m/s] | 0.25 | 0.50 | 0.80 |
| Max. drive torque $M_{A\_max}$ [Nm] | 2.29 | 3.44 | 5.15 |
| Static load rating ballscrew $C_0$ [N] | 23,800 | 18,300 | 17,900 |
| Dynamic load rating ballscrew $C_{dyn}$ [N] | 13,800 | 10,800 | 10,400 |




SA Spindle support

Fig. 6.3 **Critical speed n over axis stroke length $L_{ST}$**

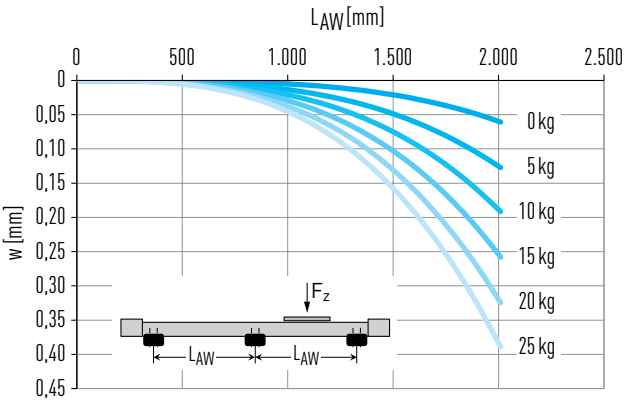


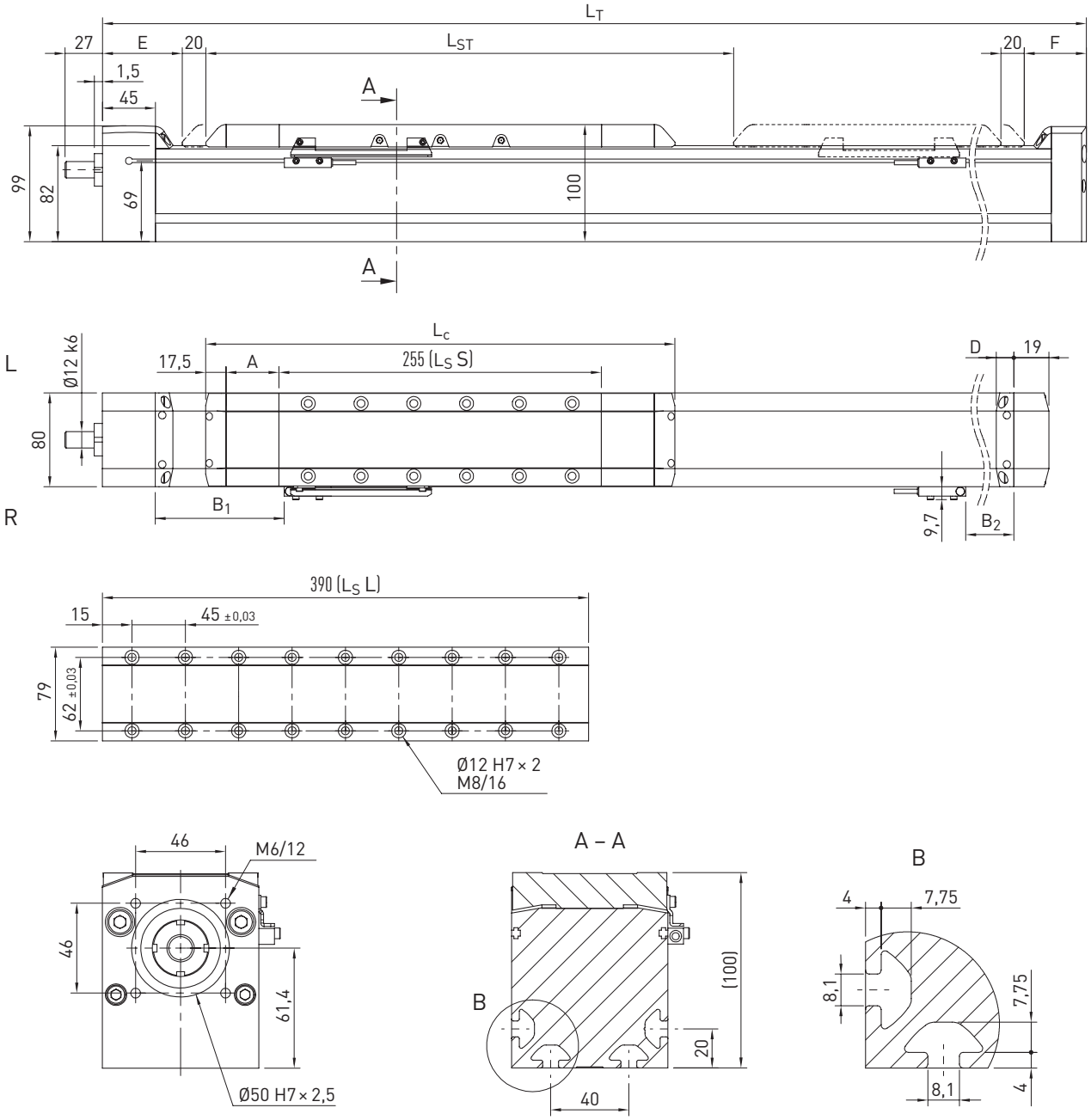

Fig. 6.4 **Deflection w over unsupported axis length $L_{AW}$ under load capacity $F_z$**

Table 6.12 **Mechanical properties**

| | Variant without cover | | | | | | Variant with cover | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of carriage | S | | | L | | | S | | | L | | |
| Spindle pitch [mm] | 5 | 10 | 16 | 5 | 10 | 16 | 5 | 10 | 16 | 5 | 10 | 16 |
| Mass of the carriage [kg] | 1.05 | 1.15 | 1.15 | 1.37 | 1.47 | 1.47 | 1.13 | 1.23 | 1.23 | 1.45 | 1.55 | 1.55 |
| Mass at 0-stroke [2] [kg] | 3.31 | 3.41 | 3.41 | 4.22 | 4.32 | 4.32 | 4.03 | 4.13 | 4.13 | 4.95 | 5.05 | 5.05 |
| Mass per 1 m stroke [kg/m] | 5.88 | | | | | | 5.93 | | | | | |
| $J_{rot.}$ [1] at 0-stroke [kgcm²] | 0.19 | | | 0.23 | | | 0.23 | | | 0.27 | | |
| $J_{rot.}$ [1] Per 1 m stroke [kgcm²/m] | 0.39 | | | | | | 0.39 | | | | | |
| Idle torque at 0-stroke [Nm] | 0.27 | | | | | | 0.28 | | | | | |

[1] Rotational moment of inertia
[2] The values apply to axes with one carriage. For axes with 2 carriages, add the following: Mass of carriage + mass per 1 m stroke x (Clearance between the carriages (in m) + carriage length $L_C$ (in m))

### 6.5 Dimensions and specifications of HM080S




$L_S$ Carriage plate
L Left
R Right

Table 6.13 **HM080S dimensions**

| | Variant without cover | | Variant with cover | |
|---|---|---|---|---|
| **Type of carriage** | S | L | S | L |
| **Total carriage length $L_c$ [mm]** | 290 | 425 | 380 | 515 |
| **Cover strip deflection A [mm]** | – | – | 45 | 45 |
| **Switch distance $B_1$ [mm]** | 40 | 40 | 100 | 100 |
| **Switch distance $B_2$ [mm]** | 175 | 310 | 235 | 370 |
| **Terminal box D [mm]** | – | – | 15 | 15 |
| **End position at mechanical zero E [mm]** | 53 | | 68 | |
| **End position at mechanical zero F [mm]** | 27 | | 42 | |
| **Max. stroke length $L_{ST}$ [mm]** | 4,090 | 3,955 | 3,970 | 3,835 |
| **Total length $L_T$ [mm]** | $L_T = L_{ST} + 410$ | $L_T = L_{ST} + 545$ | $L_T = L_{ST} + 530$ | $L_T = L_{ST} + 665$ |

Table 6.14 **Load data**

| Type of carriage | S | L |
|---|---|---|
| $F_{ydynmax}$ [1] [N] | 4,000 | |
| $F_{zdynmax}$ [1] [N] | 8,686 | |
| $M_{xdynmax}$ [Nm] | 67 | |
| $M_{ydynmax}$ [Nm] | 766 | 1,352 |
| $M_{zdynmax}$ [Nm] | 353 | 623 |
| z [2] [mm] | 68.5 | |

[1] Force must only act free of torque
[2] Carriage upper edge – centre guide
See section 3.3.2 on page 17 (lifetime reference value)

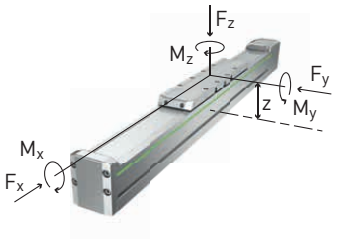



Table 6.15 **General technical data**

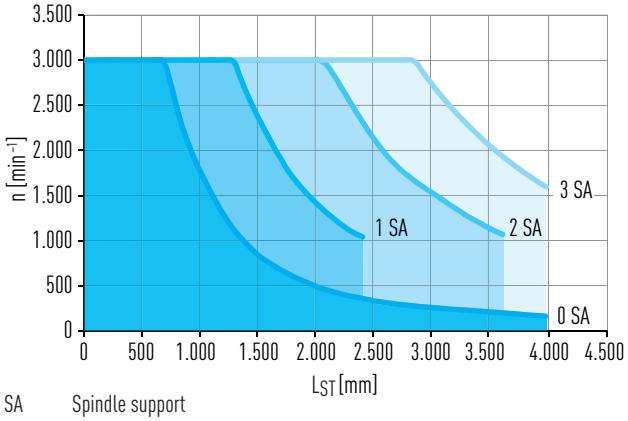
| | |
|---|---|
| Repeatability [mm] | ± 0.02 |
| Max. acceleration [m/s²] | 15 |
| Typical load capacity [kg] | 60 |
| Maximum total length [mm] | 4,500 |
| Area moment of inertia of profile cross section $I_x$ [mm⁴] | 1,293,796 |
| Area moment of inertia of profile cross section $I_y$ [mm⁴] | 1,759,898 |

Table 6.16 **Guide**

| | |
|---|---|
| Guide type | QHH20CA |
| Static load rating $C_0$ [N] | 33,860 |
| Dynamic load rating $C_{dyn}$ [N] | 30,000 |

Table 6.17 **Drive**

| | Spindle lead | | |
|---|---|---|---|
| | 5 mm | 10 mm | 20 mm |
| Spindle diameter [mm] | 20 | | |
| Axial play [mm] | 0.02 | | |
| Max. feed force $F_{x\_max}$ [N] | 3,186 | 3,149 | 1,620 |
| Max. speed [m/s] | 0.25 | 0.50 | 1.00 |
| Max. drive torque $M_{A\_max}$ [Nm] | 2.89 | 5.36 | 5.51 |
| Static load rating ballscrew $C_0$ [N] | 33,800 | 33,600 | 16,000 |
| Dynamic load rating ballscrew $C_{dyn}$ [N] | 17,300 | 17,100 | 8,800 |




SA Spindle support

Fig. 6.5 **Critical speed n over axis stroke length $L_{ST}$**

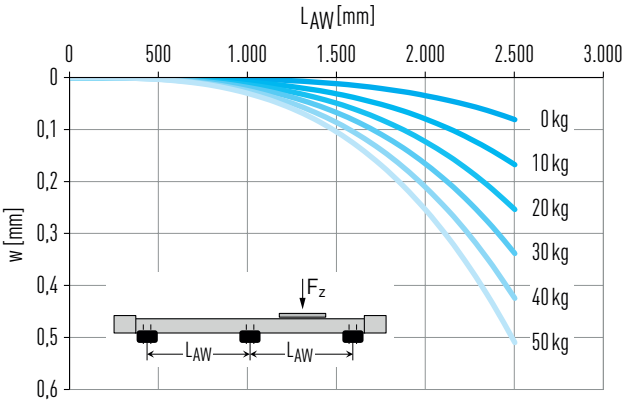


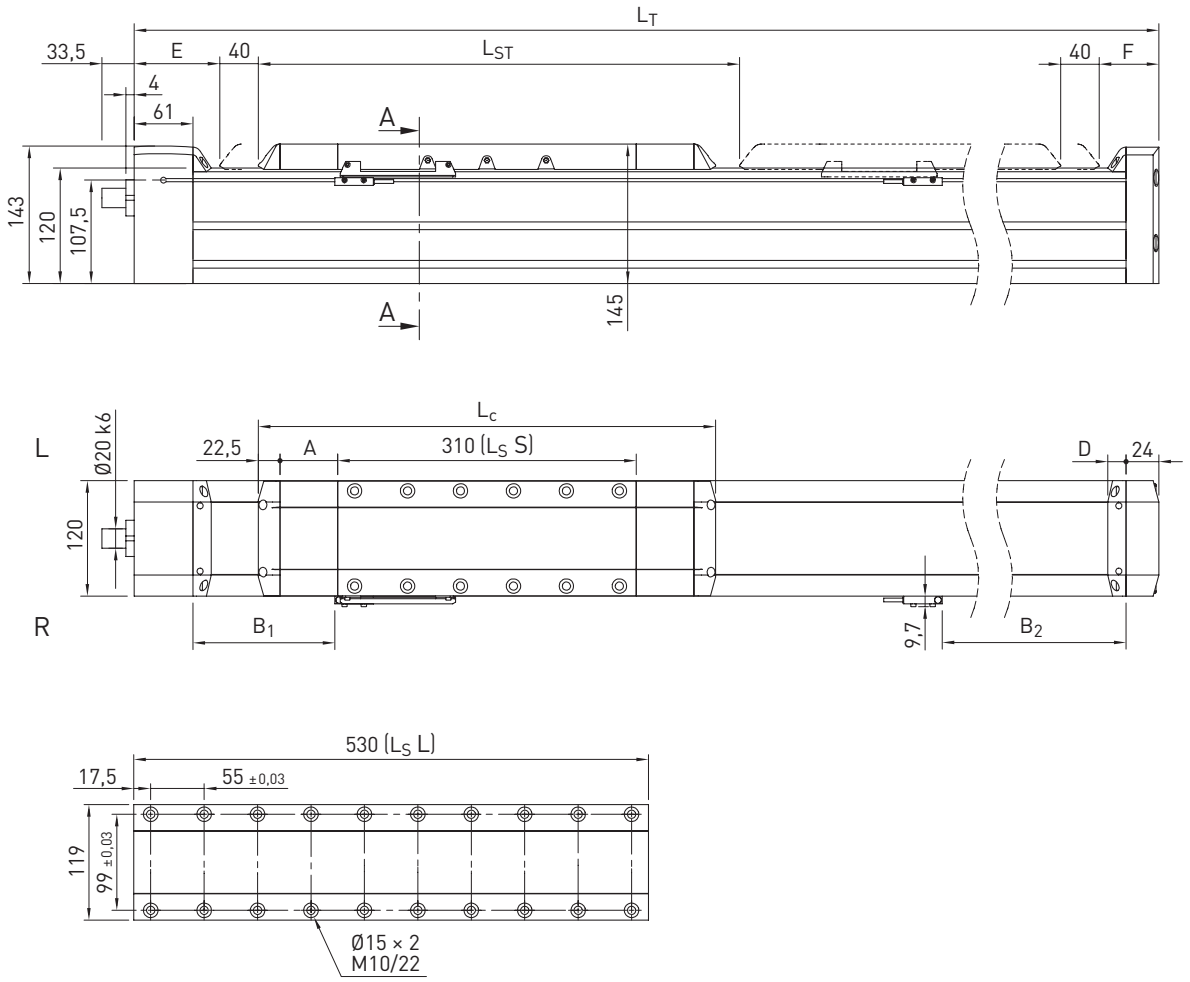

Fig. 6.6 **Deflection w over unsupported axis length $L_{AW}$ under load capacity $F_z$**

Table 6.18 **Mechanical properties**

| | Variant without cover | | | | | | Variant with cover | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of carriage | S | | | L | | | S | | | L | | |
| Spindle pitch [mm] | 5 | 10 | 20 | 5 | 10 | 20 | 5 | 10 | 20 | 5 | 10 | 20 |
| Mass of the carriage [kg] | 1.91 | 2.11 | 2.21 | 2.73 | 2.93 | 3.03 | 2.07 | 2.27 | 2.37 | 2.88 | 3.08 | 3.18 |
| Mass at 0-stroke [2] [kg] | 6.94 | 7.14 | 7.24 | 9.19 | 9.39 | 9.49 | 8.46 | 8.66 | 8.76 | 10.72 | 10.92 | 11.02 |
| Mass per 1 m stroke [kg/m] | 10.67 | | | | | | 10.72 | | | | | |
| $J_{rot.}$ [1] at 0-stroke [kgcm²] | 0.82 | | | 0.99 | | | 0.97 | | | 1.14 | | |
| $J_{rot.}$ [1] Per 1 m stroke [kgcm²/m] | 1.23 | | | | | | 1.23 | | | | | |
| Idle torque at 0-stroke [Nm] | 0.35 | | | | | | 0.52 | | | | | |

[1] Rotational moment of inertia
[2] The values apply to axes with one carriage. For axes with 2 carriages, add the following: Mass of carriage + mass per 1 m stroke x (clearance between the carriages (in m) + carriage length $L_C$ (in m))

### 6.6 Dimensions and specifications of HM120S




$L_S$ Carriage plate
L Left
R Right

Table 6.19 **HM120S dimensions**

| | Variant without cover | | Variant with cover | |
|---|---|---|---|---|
| **Type of carriage** | S | L | S | L |
| **Total carriage length $L_c$ [mm]** | 355 | 575 | 475 | 695 |
| **Cover strip deflection A [mm]** | – | – | 60 | 60 |
| **Switch distance $B_1$ [mm]** | 68.5 | 68.5 | 147.5 | 147.5 |
| **Switch distance $B_2$ [mm]** | 253.5 | 473.5 | 332.5 | 552.5 |
| **Terminal box D [mm]** | – | – | 19 | 19 |
| **End position at mechanical zero E [mm]** | 70 | | 89 | |
| **End position at mechanical zero F [mm]** | 33 | | 52 | |
| **Max. stroke length $L_{ST}$ [mm]** | 4,936 | 4,716 | 4,778 | 4,558 |
| **Total length $L_T$ [mm]** | $L_T = L_{ST} + 538$ | $L_T = L_{ST} + 758$ | $L_T = L_{ST} + 696$ | $L_T = L_{ST} + 916$ |

Table 6.20 **Load data**

| Type of carriage | S | L |
|---|---|---|
| $F_{ydynmax}$ [1] [N] | 15,327 | |
| $F_{zdynmax}$ [1] [N] | 15,327 | |
| $M_{xdynmax}$ [Nm] | 139 | |
| $M_{ydynmax}$ [Nm] | 1,625 | 3,311 |
| $M_{zdynmax}$ [Nm] | 1,625 | 3,311 |
| z [2] [mm] | 99.1 | |

[1] Force must only act free of torque
[2] Carriage upper edge – centre guide
See section 3.3.2 on page 17 (lifetime reference value)

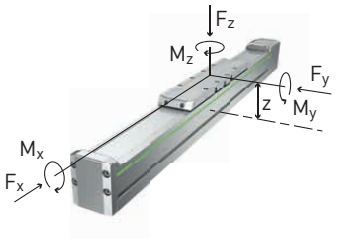



Table 6.21 **General technical data**

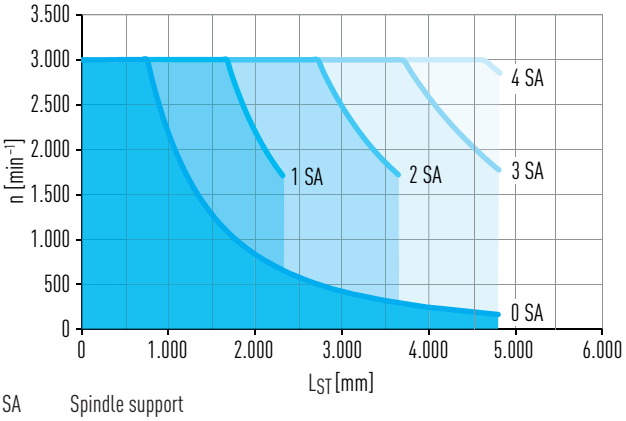
| | |
|---|---|
| Repeatability [mm] | ± 0.02 |
| Max. acceleration [m/s²] | 15 |
| Typical load capacity [kg] | 120 |
| Maximum total length [mm] | 5,473 |
| Area moment of inertia of profile cross section $I_x$ [mm⁴] | 6,235,456 |
| Area moment of inertia of profile cross section $I_y$ [mm⁴] | 8,646,933 |

Table 6.22 **Guide**

| | |
|---|---|
| Guide type | QHW30CC |
| Static load rating $C_0$ [N] | 66,340 |
| Dynamic load rating $C_{dyn}$ [N] | 58,260 |

Table 6.23 **Drive**

| | Spindle lead | | |
|---|---|---|---|
| | 10 mm | 20 mm | 32 mm |
| Spindle diameter [mm] | 32 | | |
| Axial play [mm] | 0.02 | | |
| Max. feed force $F_{x\_max}$ [N] | 6,592 | 4,069 | 2,744 |
| Max. speed [m/s] | 0.5 | 1.0 | 1.6 |
| Max. drive torque $M_{A\_max}$ [Nm] | 11.34 | 13.80 | 14.82 |
| Static load rating ballscrew $C_0$ [N] | 88,000 | 50,600 | 32,800 |
| Dynamic load rating ballscrew $C_{dyn}$ [N] | 35,800 | 22,100 | 14,900 |




SA Spindle support

Fig. 6.7 **Critical speed n over axis stroke length $L_{ST}$**

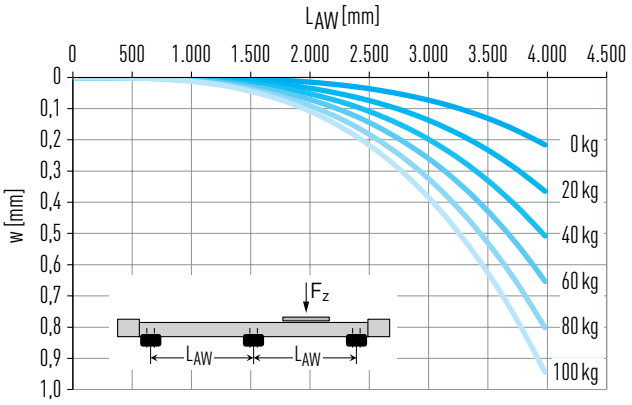



Fig. 6.8 **Deflection w over unsupported axis length $L_{AW}$ under load capacity $F_z$**

Table 6.24 **Mechanical properties**

| | Variant without cover | | | | | | Variant with cover | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of carriage | S | | | L | | | S | | | L | | |
| Spindle pitch [mm] | 10 | 20 | 32 | 10 | 20 | 32 | 10 | 20 | 32 | 10 | 20 | 32 |
| Mass of the carriage [kg] | 6.18 | 6.08 | 6.08 | 8.61 | 8.51 | 8.51 | 6.70 | 6.60 | 6.60 | 9.13 | 9.03 | 9.03 |
| Mass at 0-stroke [2] [kg] | 20.85 | 20.75 | 20.75 | 28.57 | 28.47 | 28.47 | 25.32 | 25.22 | 25.22 | 33.05 | 32.95 | 32.95 |
| Mass per 1 m stroke [kg/m] | 24.01 | | | | | | 24.10 | | | | | |
| $J_{rot.}$ [1] at 0-stroke [kgcm²] | 5.77 | | | 7.55 | | | 7.05 | | | 8.83 | | |
| $J_{rot.}$ [1] Per 1 m stroke [kgcm²/m] | 8.08 | | | | | | 8.08 | | | | | |
| Idle torque at 0-stroke [Nm] | 0.85 | | | | | | 0.90 | | | | | |

[1] Rotational moment of inertia
[2] The values apply to axes with one carriage. For axes with 2 carriages, add the following: Mass of carriage + mass per 1 m stroke x (Clearance between the carriages (in m) + carriage length $L_C$ (in m))