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Synchronous linear motors of

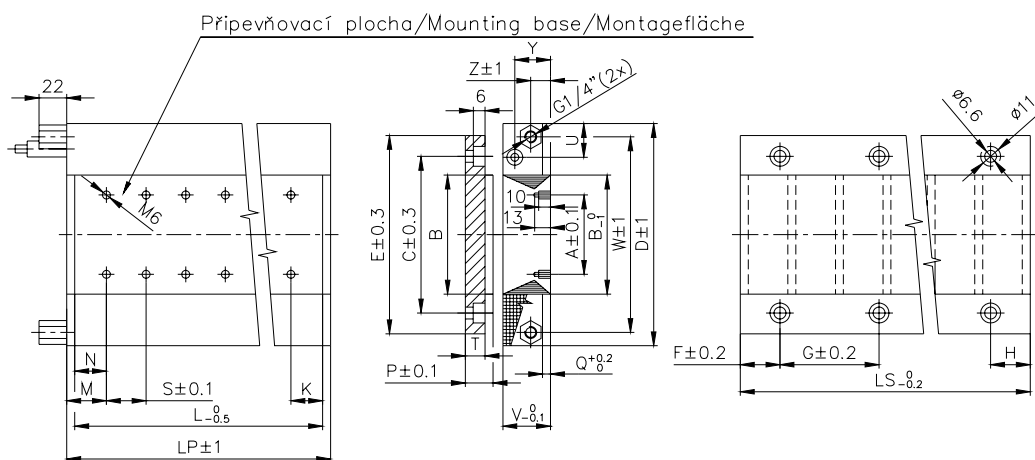
series L2SK

Flat linear motors for dynamic drives

| | |
|-------------------|--------------------------|
| Thrust forces | 30 ÷ 12 000 N |
| Thrust speed | 0 ÷ 20 m s ⁻¹ |
| Water cooling | IC3W7 |
| Temperature class | F |
| Enclosure | IP 55 |

- Typ
Type
Typ
- L1S
- L1SK
- L2S
- L2SK**
- L3S
- L3SK
- LTSK
- LNS
- LA

◆ Řada L2SK ◆ Series L2SK ◆ Reihe L2SK ◆



Primární díly / Primary parts / Primärteile

| Typ / Type / Typ | F _{peak} [N] | A [mm] | B [mm] | D [mm] | L [mm] | L _p [mm] | K [mm] | M [mm] | N [mm] | Q [mm] | S [mm] | V [mm] | d _m /d _{el} [mm] | W [mm] | Z [mm] | U [mm] | Y [mm] | m [kg] |
|------------------|-----------------------|--------|--------|--------|--------|---------------------|--------|--------|--------|--------|--------|--------|--------------------------------------|--------|--------|--------|--------|--------|
| L2SK040P-1215 | 530 | 20 | 40 | 74 | 190 | 211 | 20 | 24 | 20 | 0,5 | 50 | 38 | 0,5/1 | 57 | 10 | 8,5 | 28 | 2,8 |
| L2SK040P-2415 | 1030 | | | | 371,2 | 392 | 35,6 | 39,6 | 35,6 | | | | | | | | | 5,5 |
| L2SK040P-3615 | 1650 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 8,5 |
| L2SK060P-1215 | 800 | 30 | 60 | 94 | 190 | 211 | 20 | 24 | 20 | 0,5 | 50 | 38 | 0,5/1 | 77 | 10 | 8,5 | 28 | 4,1 |
| L2SK060P-2415 | 1560 | | | | 371,2 | 392 | 35,6 | 39,6 | 35,6 | | | | | | | | | 8,2 |
| L2SK060P-3615 | 2480 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 12,3 |
| L2SK080P-1215 | 1060 | 40 | 80 | 114 | 190 | 211 | 20 | 24 | 20 | 0,5 | 50 | 38 | 0,5/1 | 97 | 10 | 8,5 | 28 | 5,3 |
| L2SK080P-2415 | 2080 | | | | 371,2 | 392 | 35,6 | 39,6 | 35,6 | | | | | | | | | 10,5 |
| L2SK080P-3615 | 3100 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 16,1 |
| L2SK100P-1215 | 1330 | 50 | 100 | 134 | 190 | 211 | 20 | 24 | 20 | 0,5 | 50 | 38 | 0,5/1 | 117 | 10 | 8,5 | 28 | 7 |
| L2SK100P-2415 | 2600 | | | | 371,2 | 392 | 35,6 | 39,6 | 35,6 | | | | | | | | | 13,6 |
| L2SK100P-3615 | 3870 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 20,2 |
| L2SK120P-2415 | 3120 | 60 | 120 | 154 | 371,2 | 392 | 35,6 | 39,6 | 35,6 | 0,5 | 50 | 38 | 0,5/1 | 137 | 10 | 8,5 | 28 | 16,3 |
| L2SK120P-3615 | 4640 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 24,2 |
| L2SK120P-4815 | 6160 | | | | 733,6 | 755 | 16,8 | 20,8 | 16,8 | | | | | | | | | 32,2 |
| L2SK140P-2415 | 3640 | 70 | 140 | 174 | 371,2 | 392 | 35,6 | 39,6 | 35,6 | 0,5 | 50 | 38 | 0,5/1 | 157 | 10 | 8,5 | 28 | 19 |
| L2SK140P-3615 | 5420 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 28,3 |
| L2SK140P-4815 | 7200 | | | | 733,6 | 755 | 16,8 | 20,8 | 16,8 | | | | | | | | | 37 |
| L2SK160P-2415 | 4160 | 80 | 160 | 194 | 371,2 | 392 | 35,6 | 39,6 | 35,6 | 0,5 | 50 | 38 | 0,5/1 | 177 | 10 | 8,5 | 28 | 21 |
| L2SK160P-3615 | 6190 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 31,2 |
| L2SK160P-4815 | 8220 | | | | 733,6 | 755 | 16,8 | 20,8 | 16,8 | | | | | | | | | 41,5 |
| L2SK180P-2415 | 4680 | 90 | 180 | 214 | 371,2 | 392 | 35,6 | 39,6 | 35,6 | 0,5 | 50 | 38 | 0,5/1 | 197 | 10 | 8,5 | 28 | 23,6 |
| L2SK180P-3615 | 6960 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 35,2 |
| L2SK180P-4815 | 9250 | | | | 733,6 | 755 | 16,8 | 20,8 | 16,8 | | | | | | | | | 46,7 |
| L2SK200P-2415 | 5200 | 100 | 200 | 234 | 371,2 | 392 | 35,6 | 39,6 | 35,6 | 0,5 | 50 | 38 | 0,5/1 | 217 | 10 | 8,5 | 28 | 26,5 |
| L2SK200P-3615 | 7750 | | | | 552,4 | 574 | 26,2 | 30,2 | 26,2 | | | | | | | | | 39,4 |
| L2SK200P-4815 | 10300 | | | | 733,6 | 755 | 16,8 | 20,8 | 16,8 | | | | | | | | | 52,4 |

Sekundární díly / Secondary parts / Sekundärteile

| Typ / Type / Typ | B [mm] | C [mm] | E [mm] | F [mm] | G [mm] | H [mm] | Ls [mm] | P [mm] | T [mm] | 2p | m [kg] |
|------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|----|--------|
| L2S040S-1216 | 40 | 58 | 74 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 1,43 |
| L2S040S-1616 | | | | | | | 264 | | | 16 | 1,95 |
| L2S040S-2016 | | | | | | | 330 | | | 20 | 2,41 |
| L2S060S-1216 | 60 | 78 | 94 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 1,81 |
| L2S060S-1616 | | | | | | | 264 | | | 16 | 2,47 |
| L2S060S-2016 | | | | | | | 330 | | | 20 | 3,05 |

Typ
Type
Typ

L1S

L1SK

L2S

L2SK

L3S

L3SK

LTSK

LNS

LA

| | | | | | | | | | | | |
|--------------|-----|-----|-----|----|----|----|-----|----|-----|----|------|
| L2S080S-1216 | 80 | 98 | 114 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 2,2 |
| L2S080S-1616 | | | | | | | 264 | | | 16 | 3 |
| L2S080S-2016 | | | | | | | 330 | | | 20 | 3,7 |
| L2S100S-1216 | 100 | 118 | 134 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 2,63 |
| L2S100S-1616 | | | | | | | 264 | | | 16 | 3,57 |
| L2S100S-2016 | | | | | | | 330 | | | 20 | 4,43 |
| L2S120S-1216 | 120 | 138 | 154 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 3,06 |
| L2S120S-1616 | | | | | | | 264 | | | 16 | 4,13 |
| L2S120S-2016 | | | | | | | 330 | | | 20 | 5,16 |
| L2S140S-1216 | 140 | 158 | 174 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 3,52 |
| L2S140S-1616 | | | | | | | 264 | | | 16 | 5,02 |
| L2S140S-2016 | | | | | | | 330 | | | 20 | 6,28 |
| L2S160S-1216 | 160 | 178 | 194 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 4 |
| L2S160S-1616 | | | | | | | 264 | | | 16 | 5,92 |
| L2S160S-2016 | | | | | | | 330 | | | 20 | 7,4 |
| L2S180S-1216 | 180 | 198 | 214 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 4,5 |
| L2S180S-1616 | | | | | | | 264 | | | 16 | 6,7 |
| L2S180S-2016 | | | | | | | 330 | | | 20 | 8,3 |
| L2S200S-1216 | 200 | 218 | 234 | 33 | 66 | 33 | 198 | 14 | 8,5 | 12 | 5 |
| L2S200S-1616 | | | | | | | 264 | | | 16 | 7,4 |
| L2S200S-2016 | | | | | | | 330 | | | 20 | 9,25 |

Standardně používané kabely / Usually used cables
Standard benutzte Kabel

| Kabel / Cable / Kabel | 30°C* | 40°C* | 50°C* |
|--------------------------|-------|--------|--------|
| 4 x 0,75 + 1x (2 x 0,25) | 12 A | 10,4 A | 8,5 A |
| 4 x 1,5 + 1x (2 x 0,5) | 18 A | 15,5 A | 12,5 A |
| 4 x 2,5 + 1x (2 x 0,5) | 26 A | 24 A | 22,5 A |
| 4 x 4 + 1x (2 x 0,5) | 42 A | 38,5 A | 36,5 A |

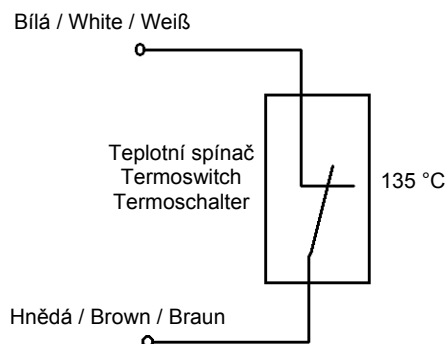
*) – Teplota okolí / Ambient temperature / Umgebungstemperatur

Zapojení / Connection / Schaltung

| Měníč / Converter Verstärker | Kabel / Cable Kabel |
|------------------------------|-----------------------|
| U | 1 |
| V | 2 |
| W | 3 |
| PE | YG* |
| TS | Bílá / White / Weiß |
| TS | Hnědá / Brown / Braun |

TS – Teplotní spínač / Termoswitch / Termoschalter

YG* – Žlutozelená / Yellow-green / Gelb-grün



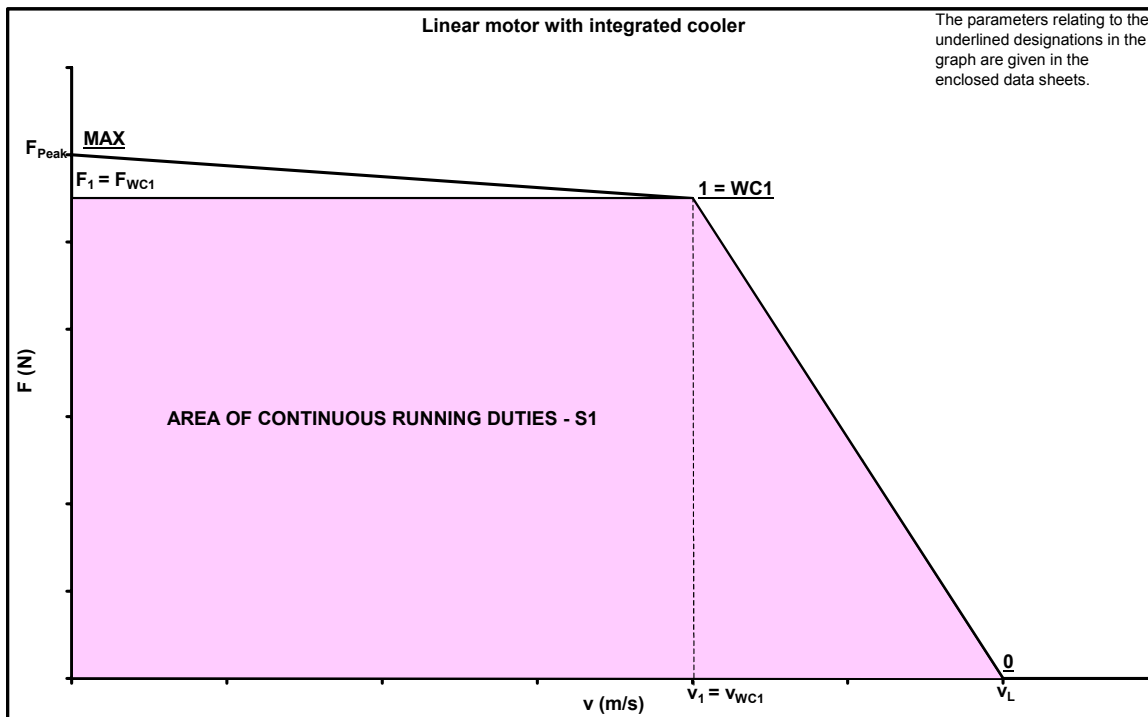
Teplotní spínač / Termoswitch / Termoschalter

| Provedení | Design | Kontaktausführung | Rozpínací / Brake contact / Öffned | |
|----------------------|------------------------|-------------------|------------------------------------|---------------------|
| Jmenovité napětí | Nominal voltage | Nennspannung | 250 V _{AC} | 500 V _{AC} |
| Jmenovitý proud | Nominal current | Nennstrom | | |
| | | cosφ = 1,0 | 2,5 A | 0,75 A |
| | | cosφ = 0,6 | 1,6 A | 0,5 A |
| Max. rozpínací proud | Max. switching current | Schaltstrom max. | 7,5 A | 2,5 A |

Technická data / Technical data / Technische Daten
L2SK040P – 200P , U_{DC} = 560 V

| Typ / Type / Typ | F _{peak} [N] | I _{peak} [A] | F ₁ [N] | I ₁ [A] | v ₁ [ms ⁻¹] | f ₁ [Hz] | ΔP ₁ [W] | F _{wc1} [N] | I _{wc1} [A] | v _{wc1} [ms ⁻¹] | ΔP _{wc1} [W] | F _A [N] | I _{ULT} [A] | k _F [NA ⁻¹] | R _{U-V} [Ω] | L _{U-V} [mH] | τ _{el} [ms] |
|------------------|--------------------------|--------------------------|-----------------------|-----------------------|---------------------------------------|------------------------|------------------------|-------------------------|-------------------------|---|--------------------------|-----------------------|-------------------------|---------------------------------------|-------------------------|--------------------------|-------------------------|
| L2SK040P-1215-GH | 530 | 12 | 390 | 7,8 | 9,2 | 273 | 584 | 390 | 7,8 | 9,2 | 584 | 1220 | 16 | 50 | 4,52 | 23 | 5,8 |
| L2SK040P-2415-GH | 1030 | 23 | 755 | 15,1 | 9,0 | 273 | 1094 | 755 | 15,1 | 9,0 | 1094 | 2390 | 32 | 50 | 2,26 | 11,5 | 5,8 |
| L2SK040P-3615-GH | 1650 | 37 | 1210 | 24,2 | 9,0 | 273 | 1864 | 1210 | 24,2 | 9,0 | 1864 | 3550 | 51 | 50 | 1,5 | 7,6 | 5,8 |
| L2SK060P-1215-IH | 800 | 12 | 585 | 7,8 | 6,2 | 182 | 756 | 585 | 7,8 | 6,2 | 756 | 1830 | 16 | 90 | 5,85 | 34 | 6,6 |
| L2SK060P-2415-IH | 1560 | 23 | 1140 | 15,2 | 6,0 | 182 | 1438 | 1140 | 15,2 | 6,0 | 1438 | 3580 | 32 | 90 | 2,93 | 17 | 6,6 |
| L2SK060P-3615-IH | 2480 | 37 | 1820 | 24,2 | 6,0 | 182 | 2440 | 1820 | 24,2 | 6,0 | 2440 | 5330 | 51 | 90 | 1,95 | 11,3 | 6,6 |
| L2SK080P-1215-JH | 1060 | 12 | 780 | 7,8 | 4,6 | 152 | 928 | 780 | 7,8 | 4,6 | 928 | 2440 | 16 | 100 | 7,19 | 45 | 7,2 |
| L2SK080P-2415-JH | 2080 | 23 | 1525 | 15,2 | 5,0 | 152 | 1777 | 1525 | 15,2 | 5,0 | 1777 | 4780 | 32 | 100 | 3,6 | 22 | 7,2 |
| L2SK080P-3615-JH | 3100 | 34 | 2275 | 22,7 | 5,0 | 152 | 2625 | 2275 | 22,7 | 5,0 | 2625 | 7120 | 48 | 100 | 2,39 | 15 | 7,2 |
| L2SK100P-1215-NH | 1330 | 12 | 975 | 7,8 | 3,7 | 121 | 1103 | 975 | 7,8 | 3,7 | 1103 | 3060 | 16 | 150 | 8,53 | 32 | 7,5 |
| L2SK100P-2415-NH | 2600 | 23 | 1910 | 15,3 | 4,0 | 121 | 2112 | 1910 | 15,3 | 4,0 | 2112 | 5980 | 32 | 150 | 4,26 | 16 | 7,5 |
| L2SK100P-3615-NH | 3870 | 34 | 2840 | 22,7 | 4,0 | 121 | 3113 | 2840 | 22,7 | 4,0 | 3113 | 8900 | 48 | 150 | 2,84 | 10,7 | 7,5 |
| L2SK120P-2415-NH | 3120 | 23 | 2290 | 15,2 | 3,1 | 91 | 2441 | 2290 | 15,2 | 3,1 | 2441 | 7170 | 32 | 150 | 4,93 | 19,2 | 7,7 |
| L2SK120P-3615-NH | 4640 | 34 | 3400 | 22,6 | 3,0 | 91 | 3592 | 3400 | 22,6 | 3,0 | 3592 | 10670 | 48 | 150 | 3,29 | 12,8 | 7,7 |
| L2SK120P-4815-NH | 6160 | 46 | 4520 | 30,1 | 3,0 | 91 | 4765 | 4520 | 30,1 | 3,0 | 4765 | 14180 | 63 | 150 | 2,47 | 9,6 | 7,7 |
| L2SK140P-2415-PH | 3640 | 23 | 2670 | 15,2 | 2,6 | 79 | 2768 | 2670 | 15,2 | 2,6 | 2768 | 9330 | 32 | 200 | 5,6 | 39 | 7,9 |
| L2SK140P-3615-PH | 5420 | 34 | 3975 | 22,7 | 2,6 | 79 | 4096 | 3975 | 22,7 | 2,6 | 4096 | 12450 | 48 | 200 | 3,74 | 26 | 7,9 |
| L2SK140P-4815-PH | 7200 | 46 | 5280 | 30,1 | 2,6 | 79 | 5412 | 5280 | 30,1 | 2,6 | 5412 | 16540 | 63 | 200 | 2,8 | 19 | 7,9 |
| L2SK160P-2415-PH | 4160 | 23 | 3050 | 15,2 | 2,3058 | 70 | 3097 | 3050 | 15,2 | 2,3 | 3097 | 9560 | 32 | 200 | 6,27 | 44 | 8,1 |
| L2SK160P-3615-PH | 6190 | 34 | 4540 | 22,7 | 2,3058 | 70 | 4575 | 4540 | 22,7 | 2,3 | 4575 | 14230 | 48 | 200 | 4,18 | 29 | 8,1 |
| L2SK160P-4815-PH | 8220 | 46 | 6030 | 30,1 | 2,3058 | 70 | 6063 | 6030 | 30,1 | 2,3 | 6063 | 18890 | 63 | 200 | 3,14 | 22 | 8,1 |
| L2SK180P-2415-RH | 4680 | 23 | 3430 | 15,226 | 2,0498 | 61 | 3427 | 3430 | 15,2 | 2,0 | 3427 | 10760 | 32,085 | 250 | 6,94 | 50 | 8,2 |
| L2SK180P-3615-RH | 6960 | 34 | 5105 | 22,661 | 2,0498 | 61 | 5064 | 5105 | 22,7 | 2,0 | 5064 | 16020 | 47,716 | 250 | 4,63 | 33 | 8,2 |
| L2SK180P-4815-RH | 9250 | 46 | 6785 | 30,118 | 2,0498 | 61 | 6705 | 6785 | 30,1 | 2,0 | 6705 | 21270 | 63,416 | 250 | 3,47 | 25 | 8,2 |
| L2SK200P-2415-RH | 5200 | 23 | 3815 | 15,237 | 1,845 | 55 | 3763 | 3815 | 15,2 | 1,8 | 3763 | 11960 | 32,077 | 250 | 7,61 | 55 | 8,3 |
| L2SK200P-3615-RH | 7750 | 34 | 5685 | 22,706 | 1,845 | 55 | 5568 | 5685 | 22,7 | 1,8 | 5568 | 17800 | 47,807 | 250 | 5,07 | 37 | 8,3 |
| L2SK200P-4815-RH | 10300 | 46 | 7555 | 30,175 | 1,845 | 55 | 7370 | 7555 | 30,2 | 1,8 | 7370 | 23600 | 63,537 | 250 | 3,8 | 28 | 8,3 |

Power characteristic for the type L2SK



The parameters relating to the underlined designations in the graph are given in the enclosed data sheets.

Typ
Type
Typ

L1S

L1SK

L2S

L2SK

L3S

L3SK

LTSK

LNS

LA

| | | | |
|--|---|-------------------------|---|
| F_{peak} [N] | - highest force developed by the motor (it is used as starting force) | R_{U-V} [Ω] | - resistance of the motor winding at 20°C |
| F_1 [N] | - max. force by current I_1 and speed v_1 | L_{U-V} [mH] | - inductance of the winding |
| v_1 [m/s] | - speed of the motor by current I_1 and force F_1 | τ_{el} [ms] | - electromagnetic time constant of the motor |
| F_1, I_1 and v_1 values determine the transition point of the motor. | | U_{BUS} [V] | - DC voltage of intermediate circuit of the frequency converter for which the motor is produced |
| F_{NC} [N] | - force being developed by the motor continuously at the air cooling by the motor surface and additional cooling area represented by an aluminium plate with the thickness of 10 mm and the cooling surface area three times as large as mechanical interface of the primary part. This additional cooling plate serves for simulating heat removal into the structure of the driven equipment during the tests | k_F [N/A] | - force constant of the motor |
| | | k_E [Vs/m] | - voltage constant of the motor |
| F_A [N] | - attractive force between the primary and secondary parts of the motor | k_M [N/ \sqrt{W}] | - constant of the motor |
| F_{wc} [N] | - force being developed by the motor continuously at the water cooling | v_L [m/s] | - theoretic no-load velocity |
| F_{wc1} [N] | - force being developed by the motor continuously at the cooling by a built-in water cooler | ΔP_1 [W] | - motor losses corresponding to the force F_1 at the winding temperature of 130°C |
| | | ΔP_{wc} [W] | - motor losses corresponding to the force F_{wc} at the winding temperature of 130°C |
| F_{wc2} [N] | - force being developed by the motor continuously at the cooling by a built-in and additional water coolers | ΔP_{wc1} [W] | - motor losses corresponding to the force F_{wc1} at the winding temperature of 130°C |
| | | ΔP_{wc2} [W] | - motor losses corresponding to the force F_{wc2} at the winding temperature of 130°C |
| I_{peak} [A] | - current corresponding to the force F_{peak} | ΔP_{NC} [W] | - motor losses corresponding to the force F_{NC} at the winding temperature of 130°C |
| I_1 [A] | - maximum short-time permissible current (r.m.s. value) which is given by the intersection of current limitation of the servomotor and of limitation by the rated voltage of the converter | m [kg] | - mass of the primary part of the motor |
| | | m_{sec} [kg] | - mass of the secondary part of the motor |
| I_{wc} [A] | - current corresponding to the force F_{wc} | f_1 [Hz] | - supply current frequency corresponding to the velocity v_1 |
| I_{wc1} [A] | - current corresponding to the force F_{wc1} | I_{ult} [A] | - supply current the exceeding of which brings about demagnetization of magnets |
| I_{wc2} [A] | - current corresponding to the force F_{wc2} | | |
| I_{NC} [A] | - current corresponding to the force F_{NC} | | |

Type key for linear motors

L 2 S K 050 P - 24 15 - F L - X 0 - 000

Linear

Number of the series

(1 , 2 , 3 , 4)

Type of the motor

| | |
|-------------|---|
| Synchronous | S |
| Induction | A |
| Reluctance | R |

Integrated cooler

Active width

Part of the motor

| | |
|-------------------|---|
| Primary | P |
| Secondary | S |
| Additional cooler | K |

Number of slots in primary part

Number of poles in secondary part

Slot pitch of primary part

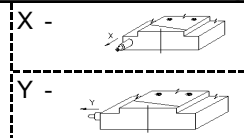
Pole pitch of secondary part

Serial number of the variant

Version

| | |
|---|---|
| 0 | - Standard |
| 1 | - Dimensional deviations |
| 2 | - Electrical deviations |
| 3 | - Dimensional and electrical deviations |

Electrical supply



| | |
|---|---------------------------------|
| Z | - z↑ |
| 0 | - For secondary part and cooler |
| S | - Connector |

Type of the winding

| | |
|---|-----------------------------------|
| N | - Winding for $U_{DC}=140 V_{DC}$ |
| L | - Winding for $U_{DC}=330 V_{DC}$ |
| H | - Winding for $U_{DC}=560 V_{DC}$ |
| 0 | - For secondary part and cooler |

Force constant

| | | | |
|--------|---------|---------|-----------------------------------|
| B - 9 | H - 60 | O - 180 | 0 - For secondary part and cooler |
| C - 15 | K - 70 | P - 200 | |
| D - 25 | I - 90 | R - 250 | |
| E - 30 | J - 100 | S - 300 | |
| F - 45 | L - 120 | U - 350 | |
| G - 50 | N - 150 | Q - 400 | |

General technical and operating conditions of the motors

Cooling of linear motors

Primary parts:

- | | | |
|--|-------|--|
| <input type="checkbox"/> series L2S : | IC40 | i.e. natural cooling by means of motor surface |
| <input type="checkbox"/> series L2SK : | IC3W7 | i.e. water cooling by means of integrated cooler |
| <input type="checkbox"/> series L2S + cooler : | IC3W7 | i.e. water cooling by means of additional cooler |
| <input type="checkbox"/> series L2SK + cooler: | IC3W7 | i.e. water cooling by means of both types of coolers |
| <input type="checkbox"/> Secondary parts: | | are not cooled |

Operating conditions

Linear motors are designed for being used in the environment protected against weather influences defined in the ČSN EN 60721-3-3 standard:

- ambient temperature +5 °C to +40 °C;
- relative air humidity 5 % to 95 %;
- altitude above sea level up to 1000 m;
- For water cooling, it is necessary to use treated water without mechanical impurities. The recommended water hardness is max. 0,7 mmol/l. If necessary, water softeners are to be used. The recommended cooling water acidity is 6,5 pH to 7,5 pH. The inlet water temperature is +5 °C to +25 °C. The maximum quantity of cooling water is 5 l/min at the pressure drop of 2 hPa. The cooling system is tested at the maximum pressure of 1 MPa.

Other technical data

- Degree of protection of the motor:
A high degree of protection IP 55 against contact with live parts is reached by embedding the whole winding and the primary motor circuit into protective sealing compound. As the motors are usually delivered as built-in ones, protection against contact with moving parts cannot be ensured.
- Thermal insulation class "F" according to ČSN EN 60034; Part 1 standard, allows the maximum temperature rise of the winding up to 105 K.
- The winding of the standard motor design is three-phase one, either **Y** -connected, without neutral point led out, or **Δ** - connected.
- Thermal protection:
The winding of the standard motor design is protected by a thermal sensor (break contact) being located in end windings and reacting at the temperature of 135 °C. On customer request also PTC, KTY-84 or resistance thermometers can be used as thermal sensors.
- Connection of the motor to the frequency inverter:
The winding outlet is made as a standard by flexible cable enabling also supply of the moving primary part. On request the motor winding can be led out to a connector determined by the customer.
- Surface protection:
The standard machines are painted black. On request of the customer also a paint for food industry or another colour can be used.

Safety rules

The secondary parts of synchronous linear motors are fitted with very strong permanent magnets ($B_r \approx 1,2$ T). The coercive force of the magnets is stable, independent of machine operating conditions and results in a continuous attractive force acting between the primary and secondary parts (see the attractive force values in data sheets of the particular motors), as well as between the secondary part and any magnetic part in the close vicinity. If these parts are not fixed, they could get move suddenly, unexpectedly and very fast. Their movement ends by a very strong pressure on secondary part. As these forces are not detectable by human senses,

Typ
Type
Typ

L1S

L1SK

L2SK

L2SK

L3S

L3SK

LTSK

LNS

LA

| |
|--------------------|
| Typ Type Typ |
| L1S |
| L1SK |
| L2S |
| L2SK |
| L3S |
| L3SK |
| LTSK |
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they are often underestimated. Magnetic field also influences sensitive electronic and magnetic devices as watches, mobile phones, floppy discs, magnetic cards, computers and disturbs the colour stability on displays. The influence of magnetic field on healthy human body is harmless. Magnetic field may also influence pacemakers, audio aids and other electronic orthopaedic aids, which may be very dangerous for persons wearing them.

Main precautions :

- Assembly and maintenance must be carried out by at least two trained operators.
- Assembly or maintenance must be always carried out in gloves.
- Warning plates

ATTENTION: STRONG MAGNETS IN LINEAR DRIVES OF THIS MACHINE !
STRONG MAGNETIC FIELD !
HIGH MAGNETIC ATTRACTIVE FORCES !

must be located on visible places.

- Unfixed magnetic objects, as tools, jigs and parts ready for mounting must not be placed near secondary parts of the linear motor.
- Persons with pacemakers cannot be allowed to work close to the linear drives of this kind.
- For the case of an accident that could occur when working with linear motor at least two solid wedges made of non-magnetic material, and a hammer (approx. 1 kg) must be always at hand. These are the necessary tools for releasing fingers, hand or foot pushed between two magnetic parts.
- Special non-magnetic assembly facilities should be used, if necessary.

Rules for transport and storage:

- Products must be transported and stored in a special non-magnetic packing securing the safe distance (approx. 25 mm) from secondary parts.
- In the course of transporting the machines or their parts with built-in primary and secondary parts their mutual moving must be prevented.
- Store rooms must be protected against weather influence, with the temperature in the range of $-5 \div +35 \text{ }^\circ\text{C}$ and at the humidity below 95 %. The rooms must be kept dry and clean.
- The stored magnetic parts must be designated with a warning plate

ATTENTION ! STRONG MAGNETS !

Notice: The original package secures the demanded safe distance from magnets and warning plates are attached to each part.

Assembly rules:

- The assembly must be always done by two workers at least.
- Any spontaneous movement of the secondary part or primary part of the linear motor along its assembled track must be prevented.
- Secondary parts should be mounted as the very last operation. The package should be removed just before the assembly.
- Before starting the assembly work on the equipment where the secondary parts have been already installed these parts must be provided with a fixed non-magnetic cover securing the safe distance approx. 25 mm from magnets.

Specifications are subject to change without notice.