



VUES Brno a. s.
Mostecká 26
657 65 BRNO
Czech Republic

Tel: 00420 - 545551111
Fax: 00420 - 545551122
00420 - 545551444
E-Mail: mail@vues.cz
<http://www.vues.cz>

Synchronous linear motors of

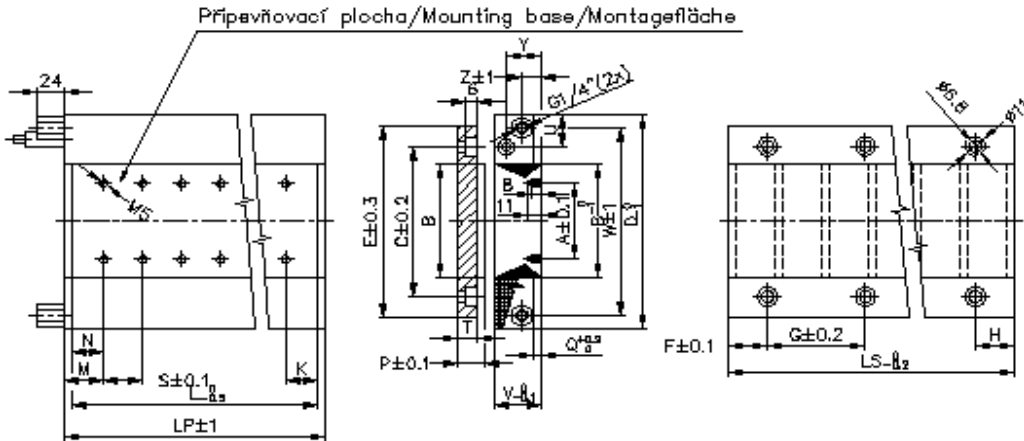
series L3SK

Flat linear motors for dynamic drives

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

◆ Řada L3SK ◆ Series L3SK ◆ Reihe L3SK ◆

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



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]	δ _m /δ _{st}	W [mm]	Z [mm]	U [mm]	Y [mm]	m [kg]
L3SK030P-1215	400	1x16	30	64	184,2	192	17,1	21	17,1	0,5	75	43,9	0,5/1,0	45	13	9	34	2,5
L3SK030P-2415	800				360	368	30	34	30									4,8
L3SK030P-3615	1200				535,8	544	42,9	47	42,9									7,3
L3SK050P-1215	650	1x36	50	84	184,2	192	17,1	21	17,1	0,5	75	43,9	0,5/1,0	65	13	9	34	3,6
L3SK050P-2415	1300				360	368	30	34	30									6,9
L3SK050P-3615	1950				535,8	544	42,9	47	42,9									10,4
L3SK050P-4815	2600				711,6	720	18,3	22,5	18,3									13,9
L3SK075P-1215	1000	2x32	75	109	184,2	192	17,1	21	17,1	0,5	75	43,9	0,5/1,0	90	13	9	34	5
L3SK075P-2415	2000				360	368	30	34	30									9,6
L3SK075P-3615	3000				535,8	544	42,9	47	42,9									14,4
L3SK075P-4815	4000				711,6	720	18,3	22,5	18,3									19,2
L3SK075P-6015	4900				887,4	896	31,2	35,5	31,2									23,9
L3SK100P-1215	1325	2x36	100	134	184,2	192	17,1	21	17,1	0,5	75	43,9	0,5/1,0	115	13	9	34	6,5
L3SK100P-2415	2650				360	368	30	34	30									12,5
L3SK100P-3615	3970				535,8	544	42,9	47	42,9									18,9
L3SK100P-4815	5300				711,6	720	18,3	22,5	18,3									25
L3SK100P-6015	6600				887,4	896	31,2	35,5	31,2									31,2
L3SK150P-1215	2000	4x32	150	184	184,2	192	17,1	21	17,1	0,5	75	45,9	0,5/1,0	165	15	9	34	9,5
L3SK150P-2415	3900				360	368	30	34	30									18
L3SK150P-3615	5800				535,8	544	42,9	47	42,9									27
L3SK150P-4815	7700				711,6	720	18,3	22,5	18,3									36
L3SK150P-6015	9600				887,4	896	31,2	35,5	31,2									45
L3SK200P-1215	2700	5x36	200	234	184,2	192	17,1	21	17,1	0,5	75	45,9	0,5/1,0	215	15	9	34	12
L3SK200P-2415	5250				360	368	30	34	30									23,5
L3SK200P-3615	7800				535,8	544	42,9	47	42,9									35
L3SK200P-4815	10350				711,6	720	18,3	22,5	18,3									47
L3SK200P-6015	12900				887,4	896	31,2	35,5	31,2									58
L3SK250P-1215	3170	6x38	250	284	184,2	192	17,1	21	17,1	0,5	75	45,9	0,5/1,0	265	15	9	34	15
L3SK250P-2415	6300				360	368	30	34	30									29
L3SK250P-3615	9450				535,8	544	42,9	47	42,9									43
L3SK250P-4815	12600				711,6	720	18,3	22,5	18,3									58
L3SK250P-6015	15750				887,4	896	31,2	35,5	31,2									72

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]
L3S030S-0416	30	45	60	32	-	32	64	14	8,5	4	0,34
L3S030S-0816					64		128			8	0,68
L3S030S-1616					3x64		256			16	1,36
L3S030S-3216					7x64		512			32	2,72
L3S030S-6416					15x64		1024			64	5,43

Typ / Type / Typ	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	H [mm]	Ls [mm]	P [mm]	T [mm]	2p	m [kg]
L3S050S-0416	50	65	80	32	-	32	64	14	8,5	4	0,47
L3S050S-0816					64		128			8	0,95
L3S050S-1616					3x64		256			16	1,89
L3S050S-3216					7x64		512			32	3,8
L3S050S-6416					15x64		1024			64	7,58
L3S075S-0416	75	90	105	32	-	32	64	14	8,5	4	0,64
L3S075S-0816					64		128			8	1,28
L3S075S-1616					3x64		256			16	2,56
L3S075S-3216					7x64		512			32	5,12
L3S075S-6416					15x64		1024			64	10,24
L3S100S-0416	100	115	130	32	-	32	64	14	8,5	4	0,8
L3S100S-0816					64		128			8	1,6
L3S100S-1616					3x64		256			16	3,2
L3S100S-3216					7x64		512			32	6,4
L3S100S-6416					15x64		1024			64	12,8
L3S150S-0416	150	165	180	32	-	32	64	14	8,5	4	1,31
L3S150S-0816					64		128			8	2,62
L3S150S-1616					3x64		256			16	5,25
L3S150S-3216					7x64		512			32	10,5
L3S150S-6416					15x64		1024			64	21
L3S200S-0416	200	215	230	32	-	32	64	14	8,5	4	1,7
L3S200S-0816					64		128			8	3,4
L3S200S-1616					3x64		256			16	6,81
L3S200S-3216					7x64		512			32	13,62
L3S200S-6416					15x64		1024			64	27,24
L3S250S-0416	250	270	285	32	-	32	64	14	8,5	4	2,11
L3S250S-0816					64		128			8	4,22
L3S250S-1616					3x64		256			16	8,45
L3S250S-3216					7x64		512			32	16,9

Typ
Type
Typ

L1S

L1K

L2S

L2SK

L3S

L3SK

LTSK

LNS

LA

Standardně používané kabely / Standard cables / Standard Kabel

Kabel / Cable / Kabel	30°C*	40°C*	60°C*
4 x 0,75 + 1x (2 x 0,25)	12 A	10,4 A	7,8 A
4 x 1,5 + 1x (2 x 0,5)	18 A	15,5 A	11,7 A
4 x 2,5 + 1x (2 x 0,5)	26 A	24 A	16,8 A
4 x 4 + 1x (2 x 0,5)	42 A	38,5 A	27,5 A

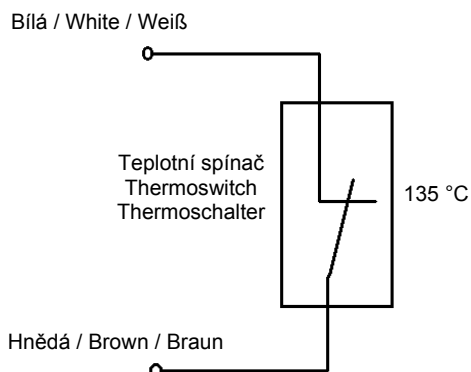
*) – Teplota okolí / Ambient temperature / Umgebungstemperatur

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 / Thermoswitch / Thermoschalter

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



Teplotní spínač / Thermoswitch / Thermoschalter

Provedení	Design	Kontaktausführung	Rozpínací / Breake contact / Öffner	
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

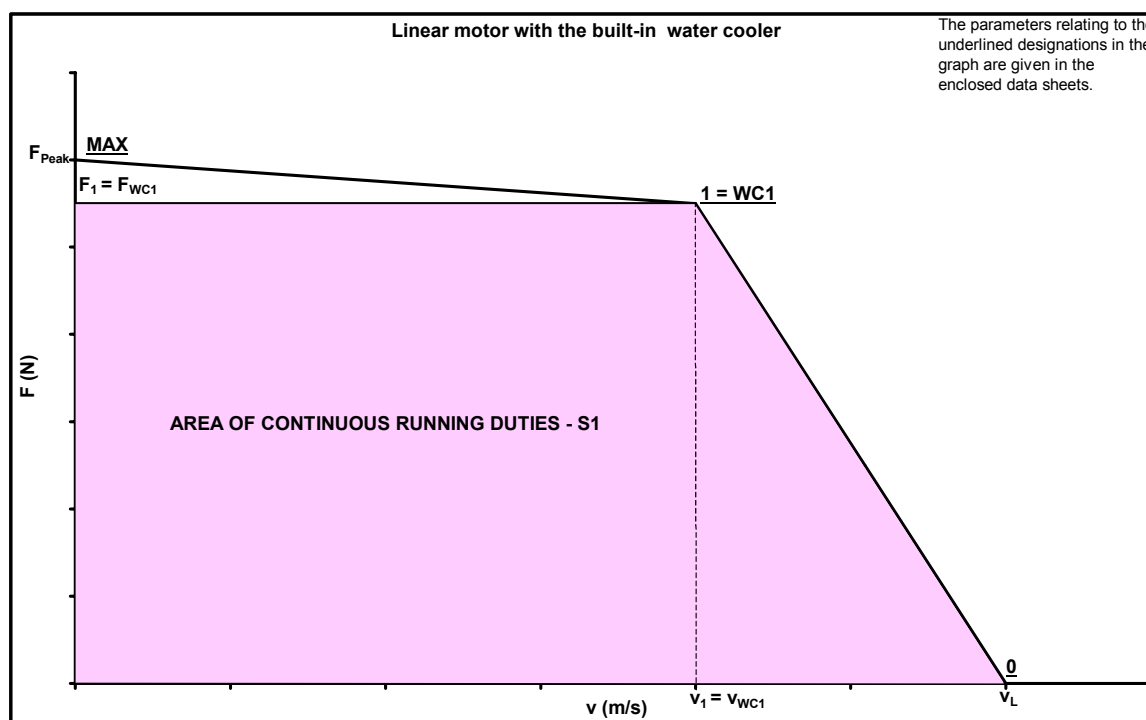
Technická data / Technical data / Technische Daten

L3SK030P – 250P , 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]
L3SK030P-1215-GH	400	10	300	6,8	10,0	312	320	300	6,8	10	320	900	14,1	50	4,45	22	5,7
L3SK030P-2415-GH	800	20	600	13,7	10,0	312	640	600	13,7	10	640	1750	28,2	50	2,22	11	5,7
L3SK030P-3615-GH	1200	30	900	20,5	10,0	312	960	900	20,5	10	960	2580	42,2	50	1,48	7	5,7
L3SK050P-1215-IH	650	10	500	6,8	6,3	187	435	500	6,8	6,3	435	1480	13,7	90	6	36	6,8
L3SK050P-2415-IH	1300	20	1000	13,7	6,3	187	870	1000	13,7	6,3	870	2880	27,5	90	3	18	6,8
L3SK050P-3615-IH	1950	30	1500	20,5	6,3	187	1305	1500	20,5	6,3	1305	4300	42,0	90	2	12	6,8
L3SK050P-4815-IH	2600	40	2000	27,4	6,3	187	1740	2000	27,4	6,3	1740	5700	56,0	90	1,5	9	6,8
L3SK075P-1215-LH	1000	10	750	6,8	4,2	125	590	750	6,8	4,2	590	2200	14,1	120	8	52	7,5
L3SK075P-2415-LH	2000	20	1500	13,7	4,2	125	1170	1500	13,7	4,2	1170	4320	28,2	120	4	26	7,5
L3SK075P-3615-LH	3000	30	2250	20,5	4,2	125	1730	2250	20,5	4,2	1730	6430	42,3	120	2,65	17	7,5
L3SK075P-4815-LH	4000	41	3000	27,4	4,2	125	2300	3000	27,4	4,2	2300	8540	56,4	120	2	13	7,5
L3SK075P-6015-LH	5000	51	3750	34,2	4,2	125	2950	3750	34,2	4,2	2950	10650	70,4	120	1,59	10	7,5
L3SK100P-1215-NH	1325	10	1000	6,8	3,2	94	720	1000	6,8	3,2	720	2950	14,0	150	9,9	69	8
L3SK100P-2415-NH	2650	20	2000	13,7	3,2	94	1440	2000	13,7	3,2	1440	5760	28,0	150	5	35	8
L3SK100P-3615-NH	3970	30	3000	20,5	3,2	94	2160	3000	20,5	3,2	2160	8570	41,9	150	3,3	23	8
L3SK100P-4815-NH	5300	40	4000	27,4	3,2	94	2880	4000	27,4	3,2	2880	11380	56,0	150	2,5	17	8
L3SK100P-6015-NH	6600	50	5000	34,2	3,2	94	3600	5000	34,2	3,2	3600	14200	69,7	150	2	14	8
L3SK150P-1215-RH	2000	9,3	1500	6,3	1,9	60	1025	1500	6,3	1,9	1025	4420	12,9	250	15,1	123	9,4
L3SK150P-2415-RH	3900	18,1	3000	12,6	1,9	60	2025	3000	12,6	1,9	2025	8640	25,2	250	7,5	62	9,4
L3SK150P-3615-RH	5800	27,0	4500	18,8	1,9	60	3050	4500	18,8	1,9	3050	12860	38,0	250	5,0	41	9,4
L3SK150P-4815-RH	7700	35,8	6000	25,1	1,9	60	4050	6000	25,1	1,9	4050	17000	49,8	250	3,8	31	9,4
L3SK150P-6015-RH	9600	44,7	7500	31,4	1,9	60	5000	7500	31,4	1,9	5000	21300	62,1	250	3,0	25	9,4
L3SK200P-1215-SH	2700	9,4	2000	6,3	1,4	44	1300	2000	6,3	1,4	1300	5900	13,1	300	19,3	164	9,8
L3SK200P-2415-SH	5250	18,3	4000	12,6	1,4	44	2600	4000	12,6	1,4	2600	11520	25,5	300	9,6	82	9,8
L3SK200P-3615-SH	7800	27,2	6000	18,8	1,4	44	3900	6000	18,8	1,4	3900	17150	37,8	300	6,4	25	9,8
L3SK200P-4815-SH	10350	36,1	8000	25,1	1,4	44	5200	8000	25,1	1,4	5200	22770	50,2	300	4,8	41	9,8
L3SK200P-6015-SH	12900	45,0	10000	31,4	1,4	44	6500	10000	31,4	1,4	6500	28400	62,0	300	3,9	33	9,8
L3SK250P-1215-QH	3170	8,8	2400	6,0	1,2	38	1600	2400	6,0	1,2	1600	7370	12,3	400	23,5	205	10
L3SK250P-2415-QH	6300	17,6	4800	12,1	1,2	38	3200	4800	12,1	1,2	3200	14400	24,4	400	11,8	102	10
L3SK250P-3615-QH	9450	26,4	7200	18,1	1,2	38	4800	7200	18,1	1,2	4800	21430	38,0	400	7,8	68	10
L3SK250P-4815-QH	12600	35,2	9600	24,1	1,2	38	6400	9600	24,1	1,2	6400	28450	48,9	400	5,9	51	10
L3SK250P-6015-QH	15750	44,0	12000	30,1	1,2	38	8000	12000	30,1	1,2	8000	35500	62,0	400	4,7	41	10

L3SK4

Load characteristic of the type L3SK



**Typ
Type
Typ**

L1S

L1SK

L2S

L2SK

L3S

L3SK

LTSK

LNS

LA

List of symbols

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 , I_1 and v_1 values determine the transition point of the motor.	τ_{el} [ms]	- electromagnetic time constant of the motor
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	U_{BUS} [V]	- DC voltage of intermediate circuit of the frequency inverter for which the motor is intended
F_A [N]	- attractive force between the primary and secondary parts of the motor	k_F [N/A]	- force constant
F_{wc1} [N]	- force being developed by the motor continuously at the cooling by a built-in water cooler	k_E [Vs/m]	- voltage constant
I_{peak} [A]	- current corresponding to the force F_{peak}	k_M [N/ \sqrt{W}]	- motor constant
I_1 [A]	- maximum short-time permissible current (r.m.s. value), corresponding to the force F_1	v_L [m/s]	- theoretical no-load velocity
I_{wc1} [A]	- current corresponding to the force F_{wc1}	ΔP_1 [W]	- motor losses corresponding to the force F_1 at the winding temperature of 130°C
I_{NC} [A]	- current corresponding to the force F_{NC}	$\Delta \Delta P_{wc1}$ [W]	- motor losses corresponding to the force F_{wc1} at the winding temperature of 130°C
		ΔP_{NC} [W]	- motor losses corresponding to the force F_{NC} at the winding temperature of 130°C
		m [kg]	- mass of the primary part of the motor
		m_{sec} [kg]	- mass of the secondary part of the motor
		f_1 [Hz]	- supply current frequency corresponding to the velocity v_1
		I_{ult} [A]	- ultimate current, exceeding of which may cause magnet demagnetization

Type key for linear motors

L 3 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

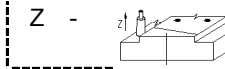
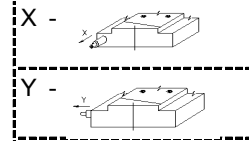
Pole pitch of secondary part

Serial number of the variant

Version

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

Electrical supply



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 L3S : | IC40 | i.e. natural cooling by means of motor surface |
| <input type="checkbox"/> | series L3SK : | IC3W7 | i.e. water cooling by means of integrated cooler |
| <input type="checkbox"/> | series L3S + cooler : | IC3W7 | i.e. water cooling by means of additional cooler |
| <input type="checkbox"/> | series L3SK + 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 ($B_r \approx 1,2 \text{ T}$). 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 very strong pressure on secondary part. As these forces are not detectable by human senses, they are often underestimated.

Typ
Type
Typ

L1S

L1SK

L2S

L2SK

L3S

L3SK

LTSK

LNS

LA

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

Magnetic field also influences sensitive electronic and magnetic devices as watches, mobile phones, floppy discs, magnetic cards, computers and also disturbs the colour stability on displays. The influence of magnetic field to 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 ÷ +35 °C and 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.