

# **AC-synchronous motors**

## **Series LSSMN-36.**

Rev. March 2003

**Minsk 2003**

The firm «Ruchservomotor» develops and makes direct drive systems on the base of step and synchronous motors. In addition to standard samples, introduced in the catalogue of production, we offer development of motors in according the requirements of the customer, including the different sizes, joint dimensions, dynamic, accuracy and capacity of the characteristic.

Next technical parameters are possible:

- *Length of movement up to 5m*
- *Peak effort (moment) up to 9400N (21000Nm)*
- *Position accuracy up to 0,1mm*
- *Max. speed up to 6 m/s*
- *Max. acceleration up to 13g.*

The Direct Drives Ruchservomotor JV are constructed on the basis of AC-synchronous motors with permanent magnets.

The primary part (forcer in linear motors or stator in rotary motors) contains a magnetic circuit and three-phase system of a winding, are connected in a star or in a triangle.

By means of a magnet system forms linearly - distributed or circle magnetic field. The position of a resultant is determined by currents phases of the inverter, and the amplitude of vector, so and effort, developed by a motor, is set by amplitudes of phase currents.

The secondary part (magnetic road in linear engines or rotor in rotary motors) contains permanent magnets with alternating polarity, which at the expense of interaction with a magnetic field of a primary part provide a thrust effort.

### Advantages of a direct drives "Ruchservomotor" JV

- High dynamics, rigidity, accuracy and reliability stipulated by absence of a mechanical transmission (of ballscrews transmissions, reduction gearboxes, gear belts).
- Low detent effort (torque) at the expense of an optimum licensed design of a magnet system, wide band of speed regulation.
- The high specific thrust characteristics in all speed range, compact design.
- High scale of protection.
- Capability of water cooling of a primary part ensuring absence of the temperature extension in precision machine tools.
- Capability of built fulfilment, including rotary motors with a hollow shaft ensuring optimum design integration

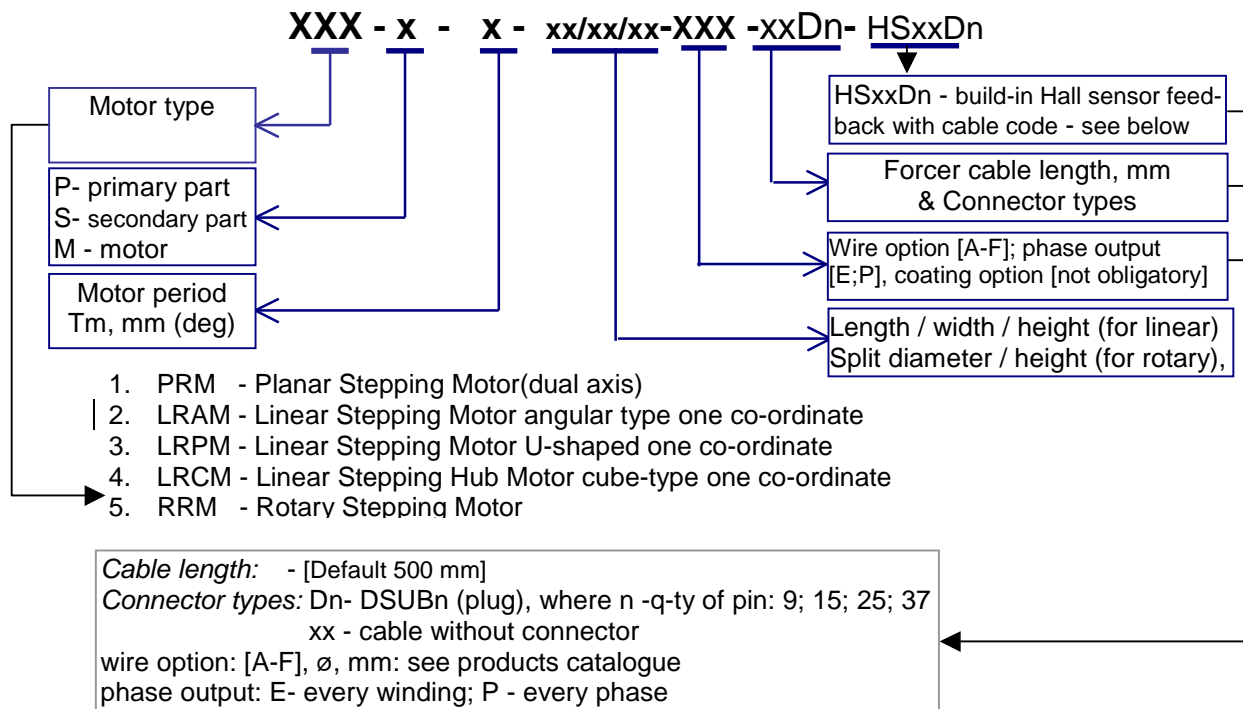
## Ordering Code of Ruchservomotor JV products

Each motor (module) basically consists from primary part (forcer with coil) and secondary part.

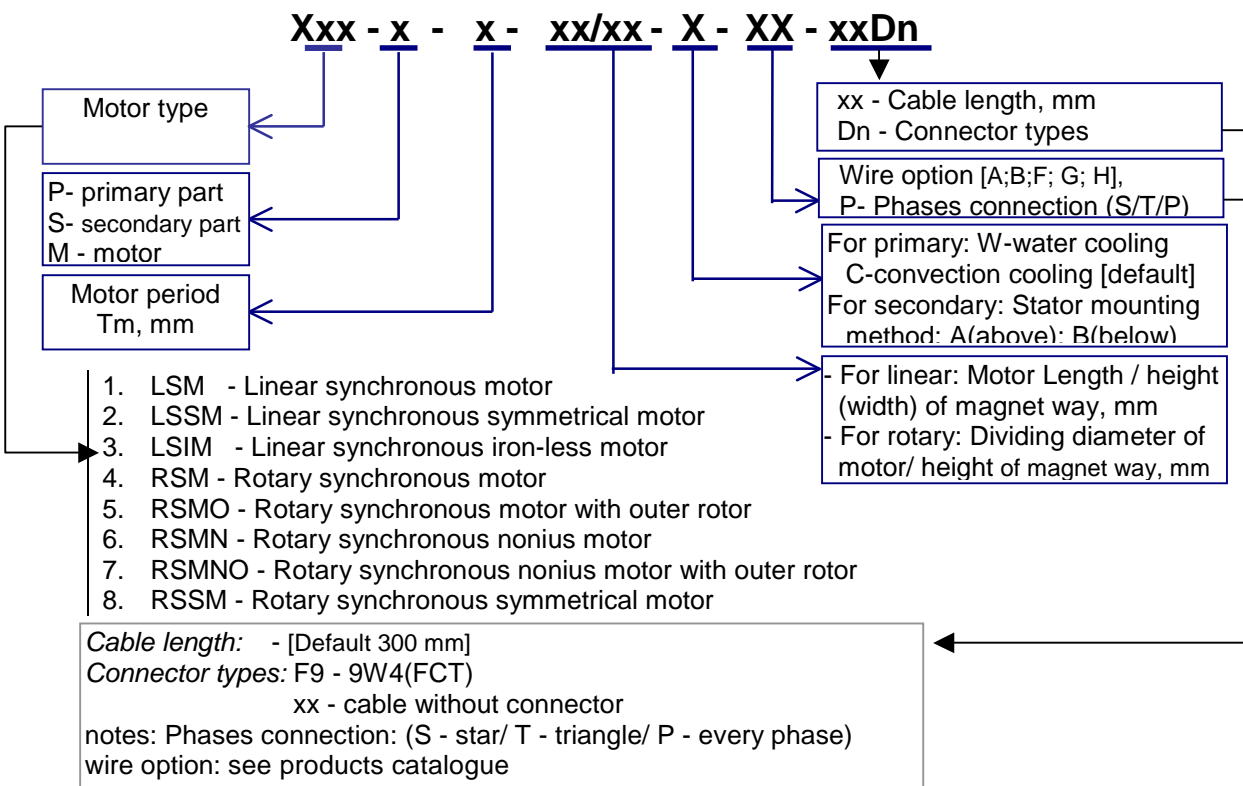
For select the proper linear stepping motor model using the next code.

Note: at order the rotary motors you don't need order the secondary part. It is actuated in the forcer ordering code

### Ordering code for Stepping motors (linear und rotary)



### Ordering code for Synchronous motors (linear and rotary)



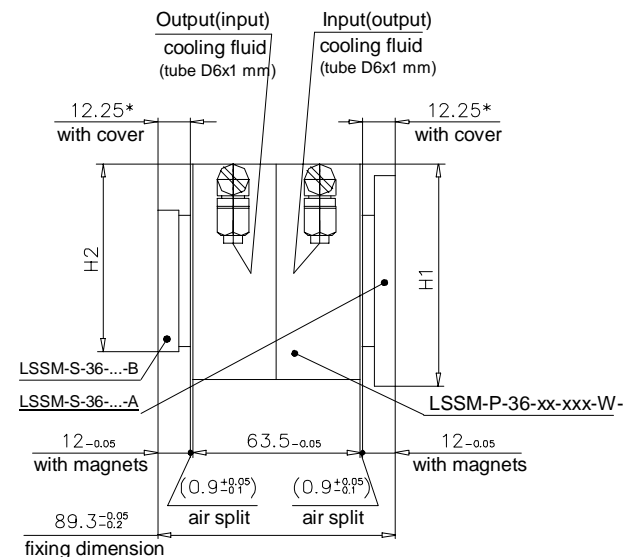
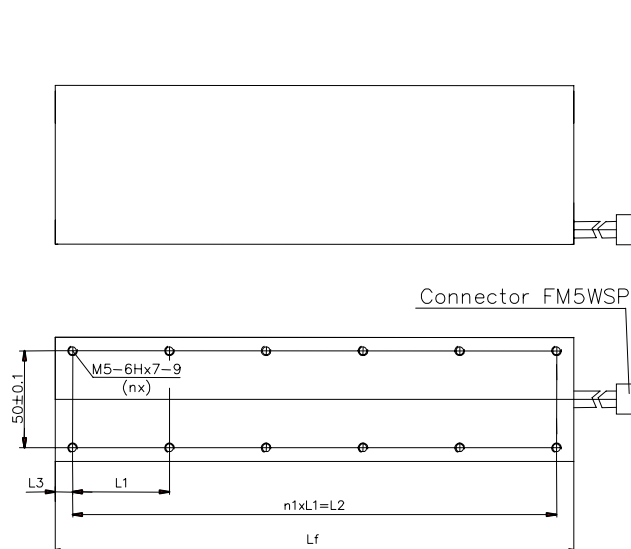
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# Linear Synchronous Motor series LSSMN-36

## Notes:

1. Motor has peak force at peak current  $I_p$  (2...3 sek)
2. Air split between rotor and stator - 0.65mm (with magnet protection by a stainless steel).
3. Max temperature of stator should be less than  $70^{\circ}\text{C}$ .
4. The forcer has build-in threshold sensor for temperature  $120^{\circ}\text{C}$ .
5. (S/T) - motor phase connection: Star / Triangle
6. Input pressure of liquid fluid - 1,1 bar
7. All data are subject to change without notice
8. All data tolerance  $\pm 10\%$ .

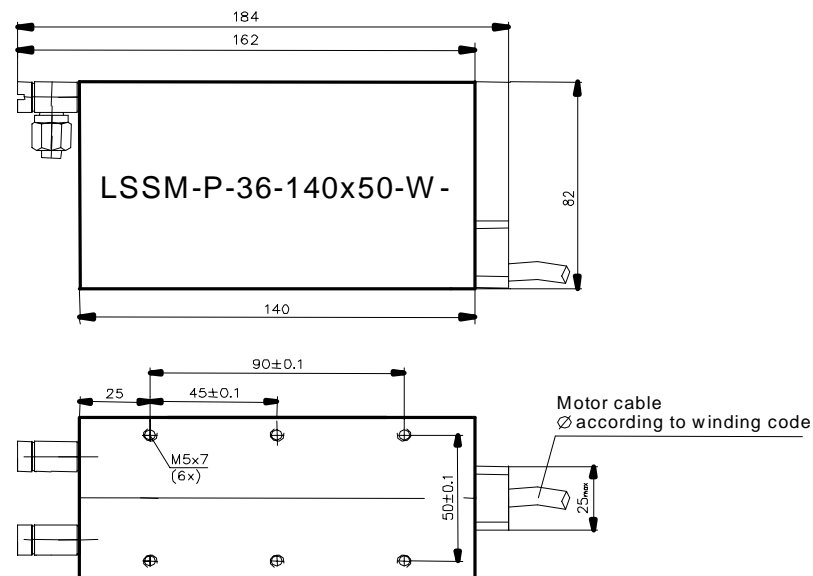
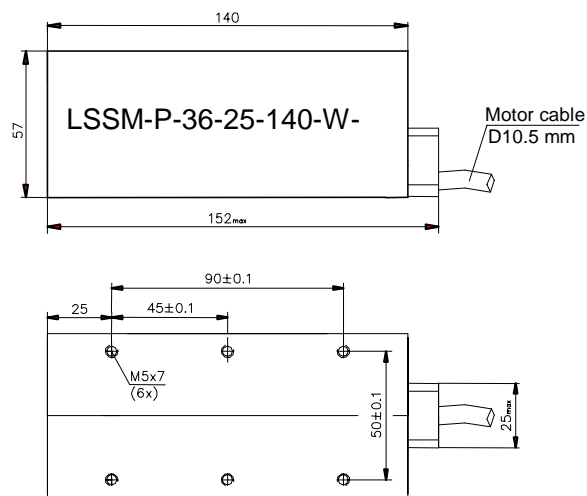
\* value «terminal-terminal»



## Overall and join dimensions

	Continuous force at convection cooling (coil at 120C). $F_a$ , N	Continuous force at water cooling (coil at 120C). $F_w$ , N	Peak force (coil at 20C) $F_p$ , N	Recommended supply voltage $U_s$ , VDC	Max. velocity at $F_a$ and $U_s$ (coil at 20C) [S/T], m/s	Max. velocity at $F_w$ and $U_s$ (coil at 20C) [S/T], m/s	Max. velocity at $F_p$ and $U_s$ (coil at 20C) [S/T], m/s	Forcer weight $m_r$ , kr	Forcer length, $L_f$ , mm	Forcer height $H_f$ , mm	Forcer width $B_r$ , mm	Stator width, mm		Stator height $H_s$ , mm
												H1	H2	
LSSMN- P- 36- 140*25-...	144	308	490	310	6,7 / 11,5	4,8 / 8,4	2,6 / 4,7	2,1	140	57	63,5	59,5	46,5	12,25
LSSMN- P- 36- 140*50-...	283	607	980		3,4 / 5,9	2,4 / 4,3	1,2 / 2,3	3,8	140	57		84,5	71,5	
LSSMN- P- 36- 210*25-...	216	462	735	310	4,5 / 7,8	3,2 / 5,6	1,6 / 3,1	3,1	210	57		59,5	46,5	
LSSMN- P- 36- 210*50-...	424	910	1471	600	4,4 / 7,6	3,1 / 5,5	1,6 / 3,0	5,6	210	82		84,5	71,5	
LSSMN- P- 36- 266*25-...	288	616	980	600	6,5 / 11,2	4,7 / 8,1	2,5 / 4,5	4,0	266	57		59,5	46,5	
LSSMN- P- 36- 266*50-...	566	1214	1961		3,8 / 6,6	2,7 / 4,8	1,4 / 2,6	6,8	266	82		84,5	71,5	
LSSMN- P- 36- 354*25-...	359	769	1225	600	6,0 / 10,3	4,3 / 7,5	2,3 / 4,2	5,0	354	57		59,5	46,5	
LSSMN- P- 36- 354*50-...	707	1517	2451		3,0 / 5,3	2,1 / 3,8	1,1 / 2,0	8,0	354	82		84,5	71,5	
LSSMN- P- 36- 392*50-...	848	1821	2941	600	2,1 / 3,8	1,5 / 2,7	0,7 / 1,4	9,2	392	82	84,5	71,5		

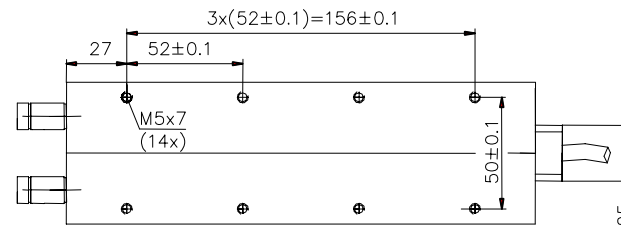
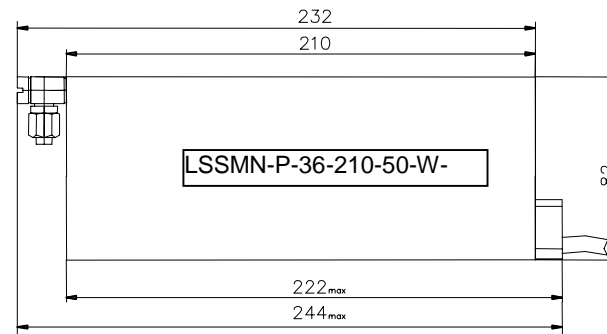
## Serie LSSMN - P - 36 – 140- ...



Overall and joint dimensions

Parameter	Symbol	Unit	LSSMN-P-36-140-...			
			25-...		50-...	
			FS	FT	FS	FT
Peak force (coil at 20°C)	Fp	N	490		980	
Continuous force (coil at 120°C), water cooling	Fw	N	308		607	
Continuous force (coil at 120°C), air cooling	Fa	N	144		283	
Detent force	Fd	N	5,9		11,8	
Attraction force of magnets	Fm	N	50		100	
Recommended supply voltage DC	Us	V	310		310	
Motor constant (coil at 20°C)	Ko	N/√W	21,7		34,0	
Peak power dissipation (coil at 20°C)	Pp	W	1580	1613	2544	2571
Continuous power dissipation (coil at 120°C), water cooling	Pw	W	336	363	503	525
Continuous power dissipation (coil at 120°C), air cooling	Pa	W	80	98	108	122
Coolant flow for temperature difference 5°C by power Pw	Cf	L/min	0,2	0,3	1,4	1,5
Maximum velocity at Fp and Us (Coil at 20°C)	Vp	m/s	2,6	4,7	1,2	2,3
Maximum velocity at Fw and Us (Coil at 20°C)	Vw	m/s	4,8	8,4	2,4	4,3
Maximum velocity at Fa and Us (Coil at 20°C)	Va	m/s	6,7	11,5	3,4	5,9
Peak current (RMS) at Fp and V=0	Ip	Arms	18,4	31,9	18,4	31,9
Continuous current at 120°C with water cooling at Fw and V=0	Iw	Arms	8,2	14,2	8,0	13,9
Continuous current at 120°C with air cooling at Fa and V=0	Ia	Arms	3,6	6,2	3,5	6,1
Efficiency at Mw and 540V DC (Coil at 20°C)	Ew	%	81,6	87,7	74,2	83,2
Back EMF constant (*) (peak phase-phase)	Ku	V/(m/s)	32,8	19,0	65,7	37,9
Electrical resistance at 20°C (*)	R	Ohm	2,29	0,76	3,74	1,25
Electrical inductance (*)	L	mH	22,0	7,3	44,0	14,7

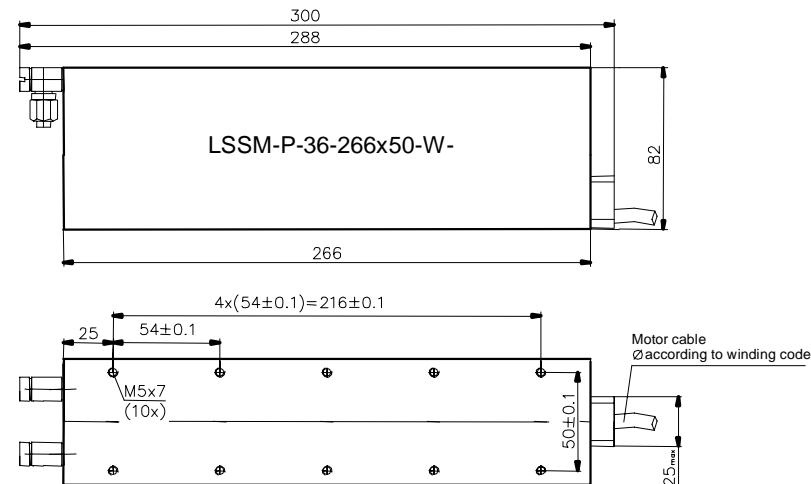
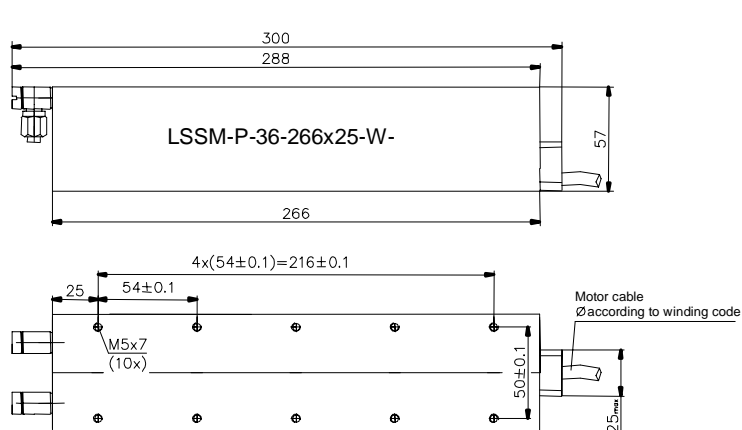
# Serie LSSMN - P - 36 – 210- ...



## Overall and join dimensions

Parameter	Symbol	Unit	LSSMN-P-36-210-...			
			25-...		50-...	
			FS	FT	FS	FT
Peak force (coil at 20°C)	Fp	N	735		1471	
Continuous force (coil at 120°C), water cooling	Fw	N	462		910	
Continuous force (coil at 120°C), air cooling	Fa	N	216		424	
Detent force	Fd	N	8,8		17,6	
Attraction force of magnets	Fm	N	75		150	
Recommended supply voltage DC	Us	V	310		600	
Motor constant (coil at 20°C)	Ko	N/√W	26,6		41,6	
Peak power dissipation (coil at 20°C)	Pp	W	2347	2380	3832	3884
Continuous power dissipation (coil at 120°C), water cooling	Pw	W	486	513	768	809
Continuous power dissipation (coil at 120°C), air cooling	Pa	W	108	125	170	197
Coolant flow for temperature difference 5°C by power Pw	Cf	L/min	1,4	1,5	2,2	2,3
Maximum velocity at Fp and Us (Coil at 20°C)	Vp	m/s	1,6	3,1	1,6	3,0
Maximum velocity at Fw and Us (Coil at 20°C)	Vw	m/s	3,2	5,6	3,1	5,5
Maximum velocity at Fa and Us (Coil at 20°C)	Va	m/s	4,5	7,8	4,4	7,6
Peak current (RMS) at Fp and V=0	Ip	Arms	18,4	31,9	18,4	31,9
Continuous current at 120°C with water cooling at Fw and V=0	Iw	Arms	8,2	14,2	8,0	13,9
Continuous current at 120°C with air cooling at Fa and V=0	Ia	Arms	3,6	6,2	3,5	6,1
Efficiency at Mw and 540V DC (Coil at 20°C)	Ew	%	75,0	83,5	78,8	86,2
Back EMF constant (*) (peak phase-phase)	Ku	V/(m/s)	49,3	28,4	98,6	56,9
Electrical resistance at 20°C (*)	R	Ohm	3,44	1,15	5,62	1,87
Electrical inductance (*)	L	mH	33,0	11,0	65,9	22,0

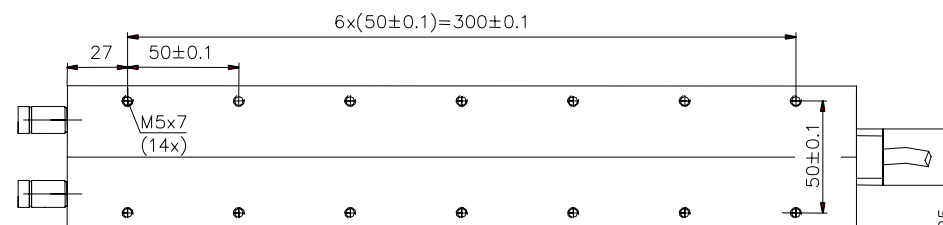
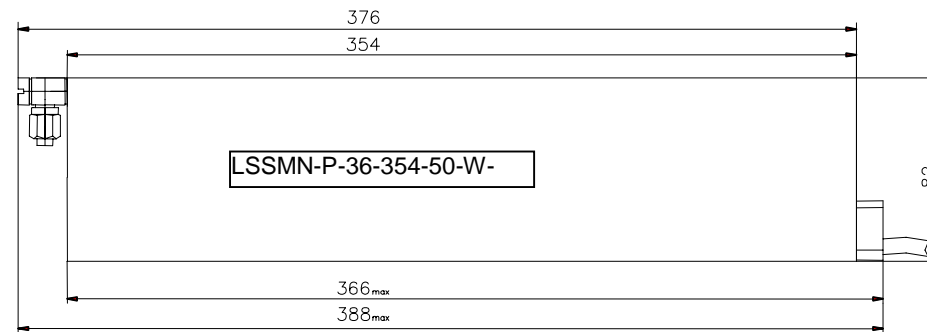
## Serie LSSMN - P - 36 – 266- ...



Overall and joint dimensions

Parameter	Symbol	Unit	LSSMN-P-36-266-...			
			25-...		50-...	
			FS	FT	FS	FT
Peak force (coil at 20°C)	Fp	N	980		1961	
Continuous force (coil at 120°C), water cooling	Fw	N	616		1214	
Continuous force (coil at 120°C), air cooling	Fa	N	288		566	
Detent force	Fd	N	11,8		23,5	
Attraction force of magnets	Fm	N	100		200	
Recommended supply voltage DC	Us	V	600		600	
Motor constant (coil at 20°C)	Ko	N/√W	30,7		48,0	
Peak power dissipation (coil at 20°C)	Pp	W	3157	3220	5096	5157
Continuous power dissipation (coil at 120°C), water cooling	Pw	W	670	721	1013	1062
Continuous power dissipation (coil at 120°C), air cooling	Pa	W	158	193	221	252
Coolant flow for temperature difference 5°C by power Pw	Cf	L/min	1,9	2,1	2,9	3,0
Maximum velocity at Fp and Us (Coil at 20°C)	Vp	m/s	2,5	4,5	1,4	2,6
Maximum velocity at Fw and Us (Coil at 20°C)	Vw	m/s	4,7	8,1	2,7	4,8
Maximum velocity at Fa and Us (Coil at 20°C)	Va	m/s	6,5	11,2	3,8	6,6
Peak current (RMS) at Fp and V=0	Ip	Arms	18,4	31,9	18,4	31,9
Continuous current at 120°C with water cooling at Fw and V=0	Iw	Arms	8,2	14,2	8,0	13,9
Continuous current at 120°C with air cooling at Fa and V=0	Ia	Arms	3,6	6,2	3,5	6,1
Efficiency at Mw and 540V DC (Coil at 20°C)	Ew	%	81,1	87,4	76,3	84,5
Back EMF constant (*) (peak phase-phase)	Ku	V/(m/s)	65,7	37,9	131,4	75,9
Electrical resistance at 20°C (*)	R	Ohm	4,59	1,53	7,49	2,50
Electrical inductance (*)	L	mH	44,0	14,7	87,9	29,3

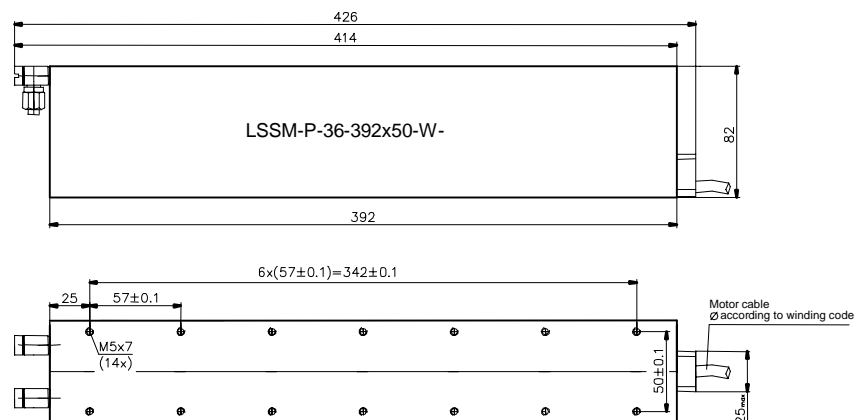
# Serie LSSMN - P - 36 – 354- ...



Overall and join dimensions

Parameter	Symbo	Unit	LSSMN-P-36-354-...			
			25-...		50-...	
			FS	FT	FS	FT
Peak force (coil at 20°C)	Fp	N	1225		2451	
Continuous force (coil at 120°C), water cooling	Fw	N	769		1517	
Continuous force (coil at 120°C), air cooling	Fa	N	359		707	
Detent force	Fd	N	14,7		29,4	
Attraction force of magnets	Fm	N	125		250	
Recommended supply voltage DC	Us	V	600		600	
Motor constant (coil at 20°C)	Ko	N/√W	34,3		53,7	
Peak power dissipation (coil at 20°C)	Pp	W	3937	4011	6349	6411
Continuous power dissipation (coil at 120°C), water cooling	Pw	W	831	890	1250	1298
Continuous power dissipation (coil at 120°C), air cooling	Pa	W	193	233	266	296
Coolant flow for temperature difference 5°C by power Pw	Cf	L/min	2,4	2,5	3,6	3,7
Maximum velocity at Fp and Us (Coil at 20°C)	Vp	m/s	2,3	4,2	1,1	2,0
Maximum velocity at Fw and Us (Coil at 20°C)	Vw	m/s	4,3	7,5	2,1	3,8
Maximum velocity at Fa and Us (Coil at 20°C)	Va	m/s	6,0	10,3	3,0	5,3
Peak current (RMS) at Fp and V=0	Ip	Arms	18,4	31,9	18,4	31,9
Continuos current at 120°C with water cooling at Fw and V=0	Iw	Arms	8,2	14,2	8,0	13,9
Continuos current at 120°C with air cooling at Fa and V=0	Ia	Arms	3,6	6,2	3,5	6,1
Efficiency at Mw and 540V DC (Coil at 20°C)	Ew	%	80,0	86,7	71,9	81,6
Back EMF constant (*) (peak phase-phase)	Ku	V/(m/s)	82,1	47,4	164,3	94,8
Electrical resistance at 20°C (*)	R	Ohm	5,73	1,91	9,36	3,12
Electrical inductance (*)	L	mH	54,9	18,3	109,9	36,6

# Serie LSSMN - P - 36 – 392-



## Overall and join dimensions

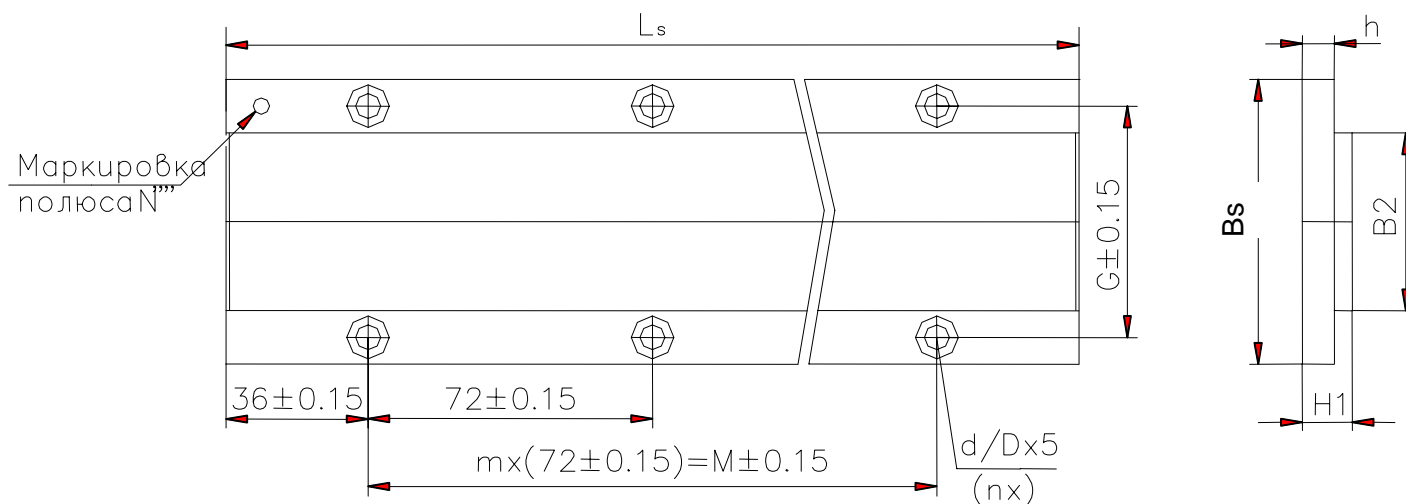
Parameter	Symbol	Unit	LSSMN-P-36-392...	
			50-...	
			FS	FT
Peak force (coil at 20°C)	Fp	N	2941	
Continuous force (coil at 120°C), water cooling	Fw	N	1821	
Continuous force (coil at 120°C), air cooling	Fa	N	848	
Detent force	Fd	N	35,3	
Attraction force of magnets	Fm	N	300	
Recommended supply voltage DC	Us	V	600	
Motor constant (coil at 20°C)	Ko	N/√W	58,8	
Peak power dissipation (coil at 20°C)	Pp	W	7589	7644
Continuous power dissipation (coil at 120°C), water cooling	Pw	W	1478	1520
Continuous power dissipation (coil at 120°C), air cooling	Pa	W	305	331
Coolant flow for temperature difference 5°C by power Pw	Cf	L/min	4,2	4,4
Maximum velocity at Fp and Us (Coil at 20°C)	Vp	m/s	0,7	1,4
Maximum velocity at Fw and Us (Coil at 20°C)	Vw	m/s	1,5	2,7
Maximum velocity at Fa and Us (Coil at 20°C)	Va	m/s	2,1	3,8
Peak current (RMS) at Fp and V=0	Ip	Arms	18,4	31,9
Continuous current at 120°C with water cooling at Fw and V=0	Iw	Arms	8,0	13,9
Continuous current at 120°C with air cooling at Fa and V=0	Ia	Arms	3,5	6,1
Efficiency at Mw and 540V DC (Coil at 20°C)	Ew	%	64,1	76,3
Back EMF constant (*) (peak phase-phase)	Ku	V/(m/s)	197,1	113,8
Electrical resistance at 20°C (*)	R	Ohm	11,23	3,74
Electrical inductance (*)	L	mH	131,9	44,0



Magnetic road for synchronous motors LSM, LSSM with protection of magnets, type A

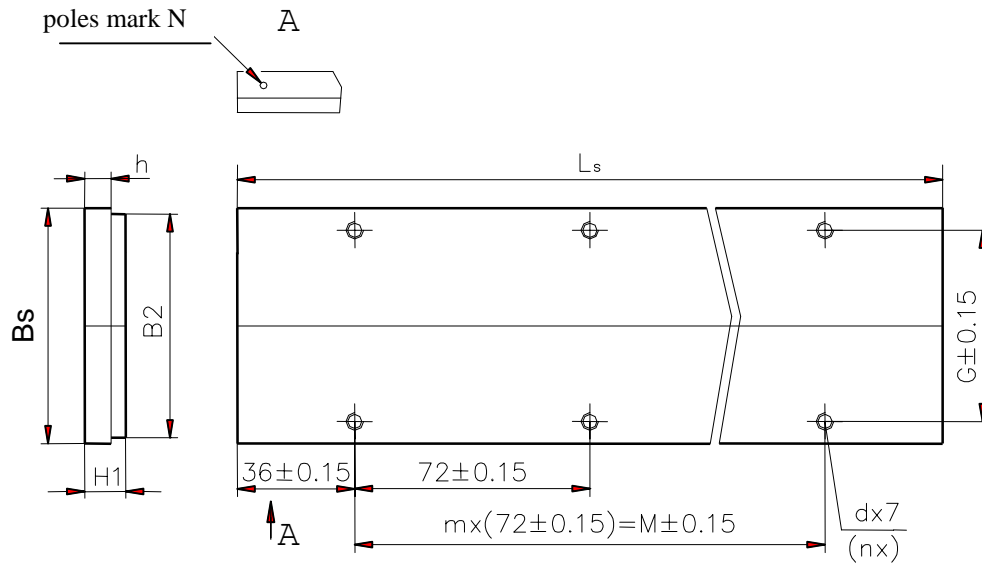
(mounting method - above)

LSM(LSSM) - S - 36 - x\*x-A



Name	B2,mm	G, mm	Bs,mm	H1,mm	h,mm	d,mm	D,mm	m	M,mm	n	Ls,m	weigh, kg
LSM-S-36-144x25-A	26	40	55	12.25	8	5.8	10	1	72	4	144	0.68
LSM-S-36-216x25-A								2	144	6	216	1.02
LSM-S-36-288x25-A								3	216	8	288	1.36
LSM-S-36-360x25-A								4	288	10	360	1.7
LSM-S-36-432x25-A								5	360	12	432	2.04
LSM-S-36-504x25-A								6	432	14	504	2.38
LSM-S-36-576x25-A								7	504	16	576	2.72
LSM-S-36-144x50-A	51	65	80	14.25	10	7	12	1	72	4	144	1.07
LSM-S-36-216x50-A								2	144	6	216	1.6
LSM-S-36-288x50-A								3	216	8	288	2.13
LSM-S-36-360x50-A								4	288	10	360	2.66
LSM-S-36-432x50-A								5	360	12	432	3.19
LSM-S-36-504x50-A								6	432	14	504	3.72
LSM-S-36-576x50-A								7	504	16	576	4.25
LSM-S-36-144x75-A	76	90	105	14.25	10	7	12	1	72	4	144	1.45
LSM-S-36-216x75-A								2	144	6	216	2.18
LSM-S-36-288x75-A								3	216	8	288	2.91
LSM-S-36-360x75-A								4	288	10	360	3.64
LSM-S-36-432x75-A								5	360	12	432	4.37
LSM-S-36-504x75-A								6	432	14	504	5.1
LSM-S-36-576x75-A								7	504	16	576	5.83
LSM-S-36-144x100-A	101	115	130	16.25	12	7	12	1	72	4	144	1.84
LSM-S-36-216x100-A								2	144	6	216	2.76
LSM-S-36-288x100-A								3	216	8	288	3.68
LSM-S-36-360x100-A								4	288	10	360	4.6
LSM-S-36-432x100-A								5	360	12	432	5.52
LSM-S-36-504x100-A								6	432	14	504	6.44
LSM-S-36-576x100-A								7	504	16	576	7.36
LSM-S-36-144x150-A	151	165	180	16.25	12	7	12	1	72	4	144	3.01
LSM-S-36-216x150-A								2	144	6	216	4.52
LSM-S-36-288x150-A								3	216	8	288	6.03
LSM-S-36-360x150-A								4	288	10	360	7.54
LSM-S-36-432x150-A								5	360	12	432	9.05
LSM-S-36-504x150-A								6	432	14	504	10.56
LSM-S-36-576x150-A								7	504	16	576	12.07

Magnetic road for synchronous motors LSM, LSSM with protection of magnets, type B  
 (mounting method - below)  
 LSM(LSSM) - S - 36 - x\*x-B



Name	B2.mm	G.mm	Bs.mm	H1.mm	h.mm	d.mm	m	M.mm	n	Ls.mm	mass. kg
LSM-S-36-144x25-B	26	17	29	12.25	8	M5-7H	1	72	4	144	0.42
LSM-S-36-216x25-B							2	144	6	216	0.64
LSM-S-36-288x25-B							3	216	8	288	0.85
LSM-S-36-360x25-B							4	288	10	360	1.07
LSM-S-36-432x25-B							5	360	12	432	1.28
LSM-S-36-504x25-B							6	432	14	504	1.5
LSM-S-36-576x25-B							7	504	16	576	1.71
LSM-S-36-144x50-B	51	32	54	14.25	10	M6-7H	1	72	4	144	0.8
LSM-S-36-216x50-B							2	144	6	216	1.21
LSM-S-36-288x50-B							3	216	8	288	1.62
LSM-S-36-360x50-B							4	288	10	360	2.03
LSM-S-36-432x50-B							5	360	12	432	2.43
LSM-S-36-504x50-B							6	432	14	504	2.84
LSM-S-36-576x50-B							7	504	16	576	3.25
LSM-S-36-144x75-B	76	55	79	16.25	12	M6-7H	1	72	4	144	1.2
LSM-S-36-216x75-B							2	144	6	216	1.8
LSM-S-36-288x75-B							3	216	8	288	2.4
LSM-S-36-360x75-B							4	288	10	360	3
LSM-S-36-432x75-B							5	360	12	432	3.6
LSM-S-36-504x75-B							6	432	14	504	4.2
LSM-S-36-576x75-B							7	504	16	576	4.8
LSM-S-36-144x100-B	101	75	104	18.25	14	M6-7H	1	72	4	144	1.58
LSM-S-36-216x100-B							2	144	6	216	2.37
LSM-S-36-288x100-B							3	216	8	288	3.16
LSM-S-36-360x100-B							4	288	10	360	3.95
LSM-S-36-432x100-B							5	360	12	432	4.74
LSM-S-36-504x100-B							6	432	14	504	5.53
LSM-S-36-576x100-B							7	504	16	576	6.32
LSM-S-36-144x150-B	151	120	154	20.25	16	M6-7H	1	72	4	144	2.7
LSM-S-36-216x150-B							2	144	6	216	4.05
LSM-S-36-288x150-B							3	216	8	288	5.4
LSM-S-36-360x150-B							4	288	10	360	6.75
LSM-S-36-432x150-B							5	360	12	432	8.1
LSM-S-36-504x150-B							6	432	14	504	9.45
LSM-S-36-576x150-B							7	504	16	576	10.79