

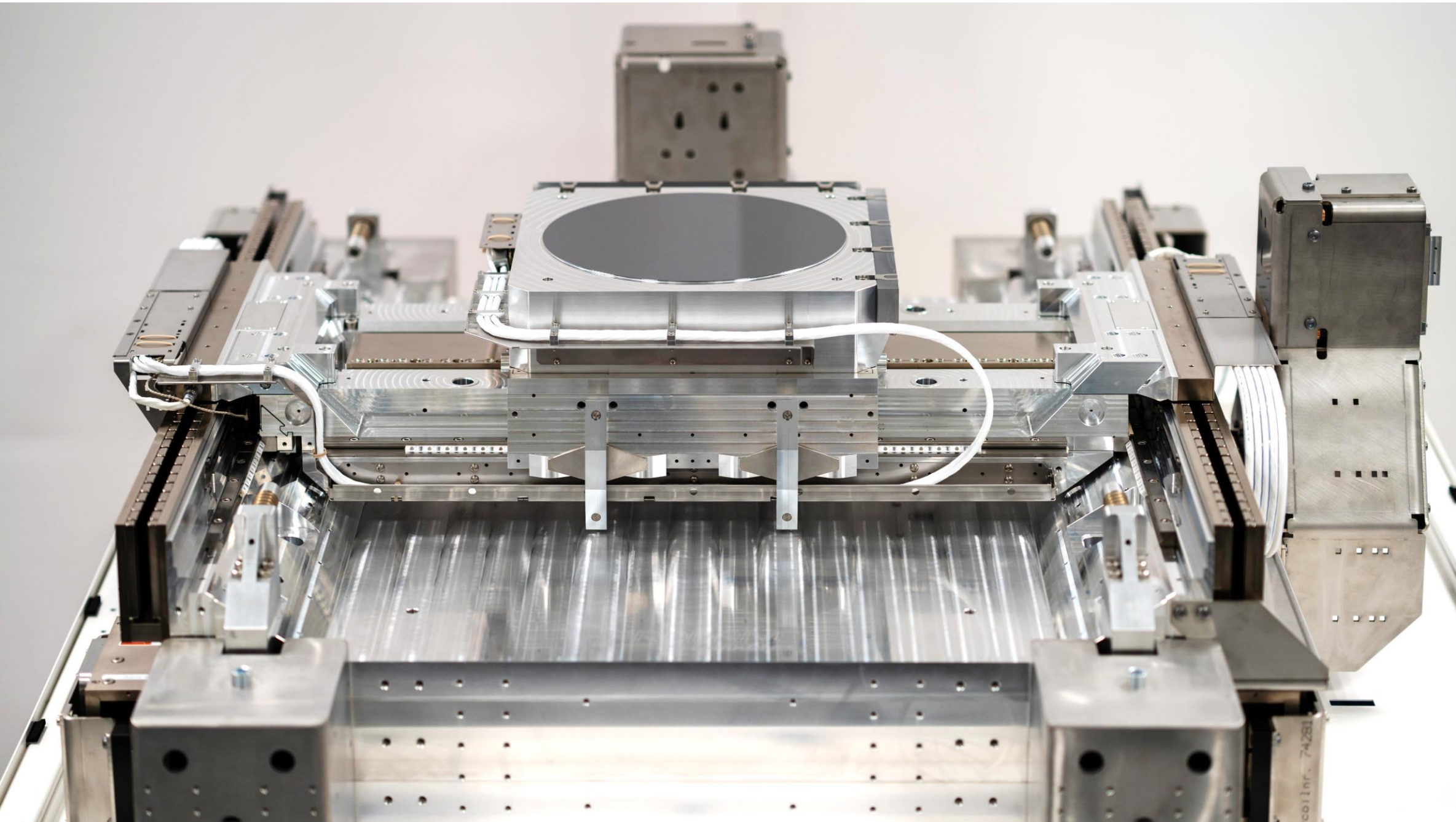
LINEAR MOTOR CATALOG

CHIRON

Iron Core Motors

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Linear motors integrated in a motion stage

Knowledge

Engineering excellence is the driving force behind linear motor innovation in both design and manufacturing. Prodrive has a highly skilled group of (electro-)mechanical engineers capable of customizing linear motor technology towards your needs.

Quality

Quality is in the DNA of Prodrive Technologies. With a long history in electronics manufacturing, Prodrive continues in the area of linear motor manufacturing with the same philosophy and processes, setting a new standard within the linear motor market.

Automation

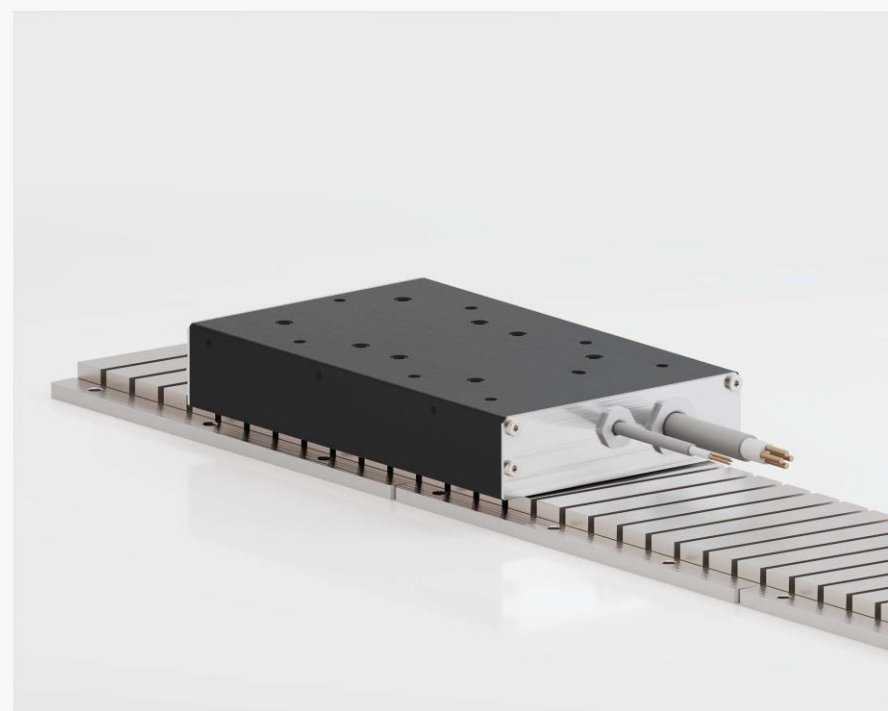
Design for manufacturing is key to reduce cost and guarantee quality. Winding, assembly, vacuum potting and magnet gluing are highly automated processes which guarantees a constant quality at minimum cost.

Time to market

Due to the agility of Prodrive Technologies' large development department, customization can be performed in a very short time, providing a short time to market for challenging mechatronic applications.



Prodrive Technologies HQ Campus, The Netherlands



Chiron

The Chiron line offers iron core linear motors which are optimized for high force and high efficiency. Find the optimal fit for your application due to the many different available form factors.



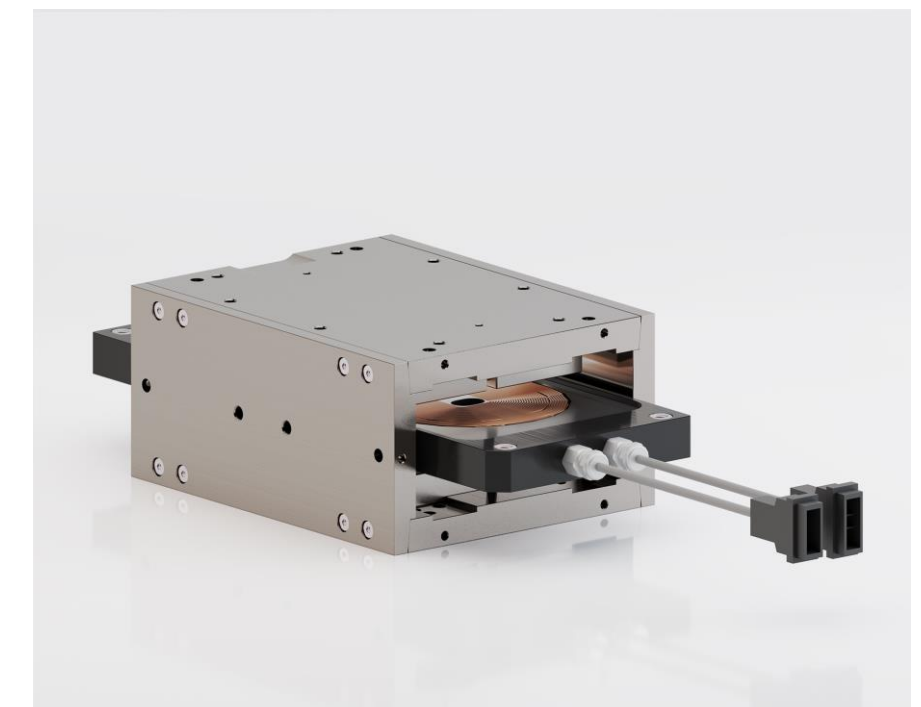
Phoenix

The Phoenix line offers ironless linear motors, for applications requiring an extremely low force ripple for excellent servo performance without attraction forces. Available in a large range of sizes.



Gryphon

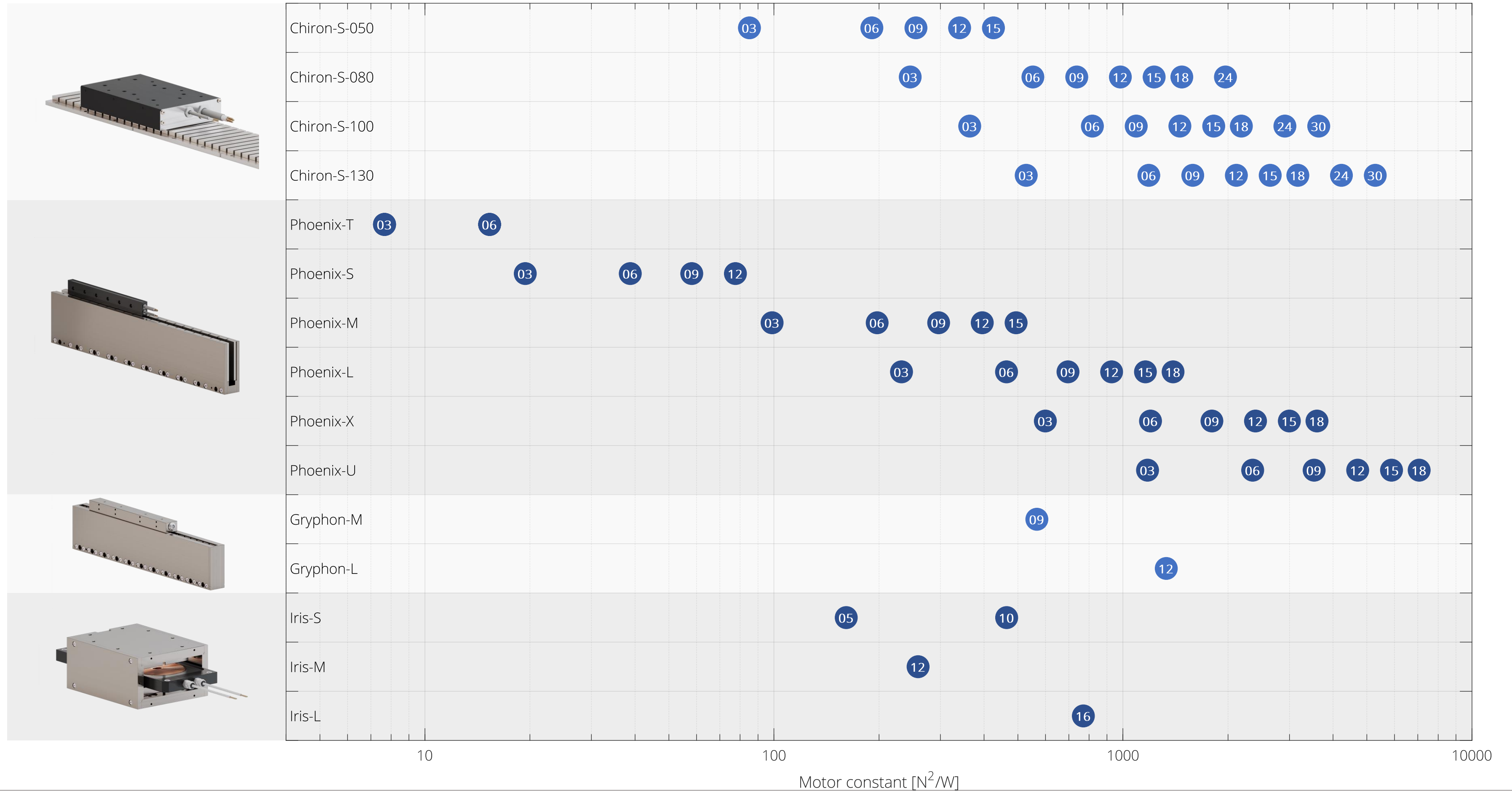
The Gryphon line offers a cost-effective solution for vacuum-compatible ironless linear motors. These motors also contain features providing magnetic shielding.



Iris

For short stroke applications requiring a relatively large displacement in three directions, the Iris line provides a high force density with zero attraction forces in a rectangular form factor.

OVERVIEW



WINDING CONFIGURATIONS

The phases of all three-phase linear motors are star-connected.

The Chiron, Phoenix and Gryphon line can be selected with different winding configurations to create an optimal fit for your application.

Winding configuration A

The windings are configured such that independent of the number of coils, the force constant remains equal, and the maximum velocity remains unchanged. The maximum current increases with the number of coils.

Winding configuration B

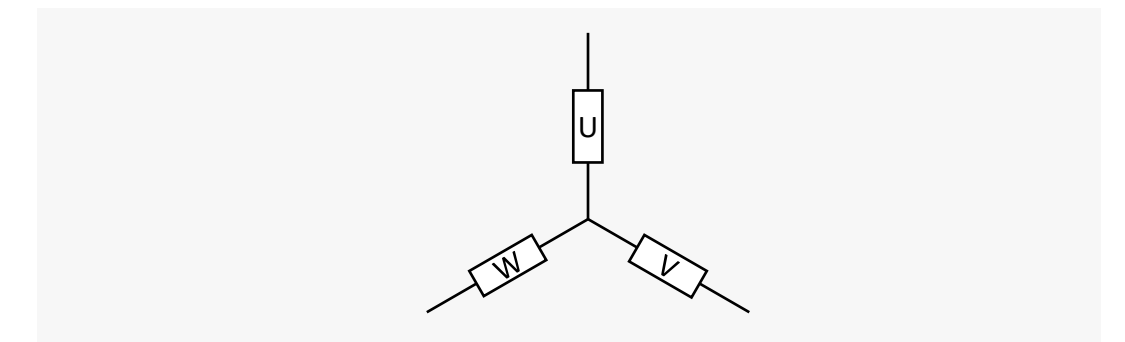
The windings are configured like winding configuration A, but this winding configuration can reach higher velocities at the expense of a lower force constant.

Winding configuration C

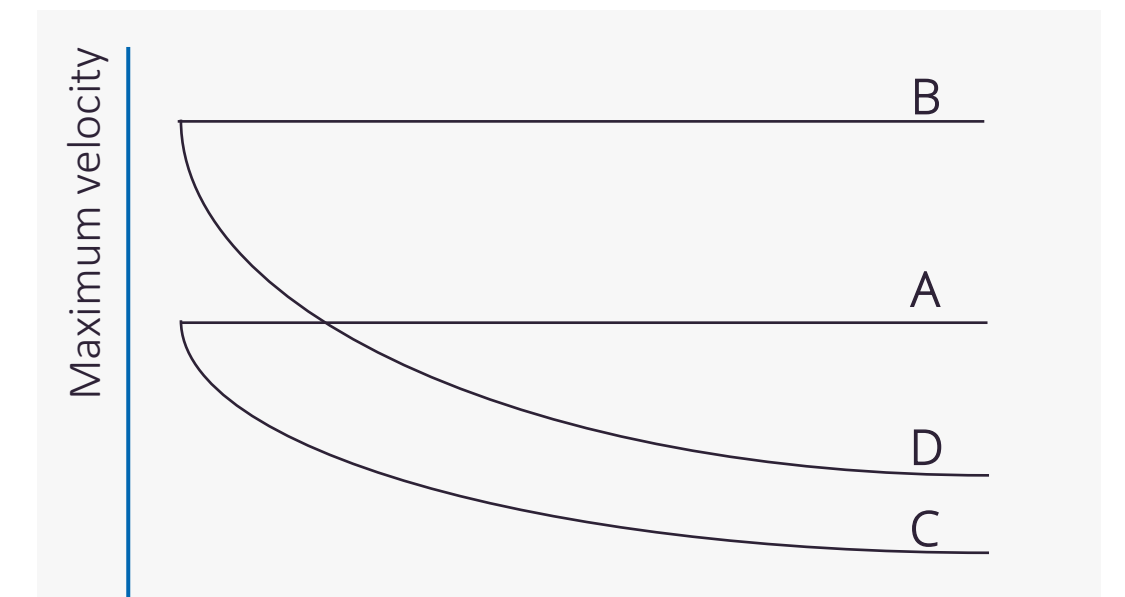
The windings are configured such that the current remains constant with increasing number of coils at the expense of reducing the maximum velocity. For the Chiron, Phoenix and Gryphon line, this configuration allows moving magnet applications with partial coil unit overlap.

Winding configuration D

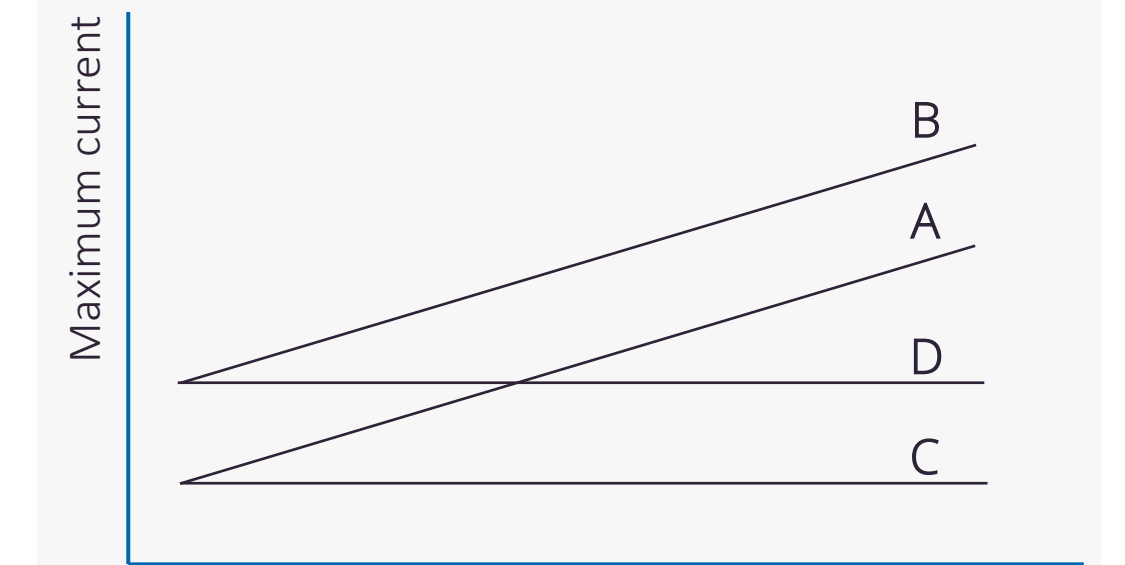
The windings are configured such that the current remains constant with increasing number of coils at the expense of reducing the maximum velocity. This configuration has a higher maximum velocity compared to winding configuration C. For the Phoenix line, this configuration allows moving magnet applications with partial coil unit overlap.



Phase connection chart



Number of coils

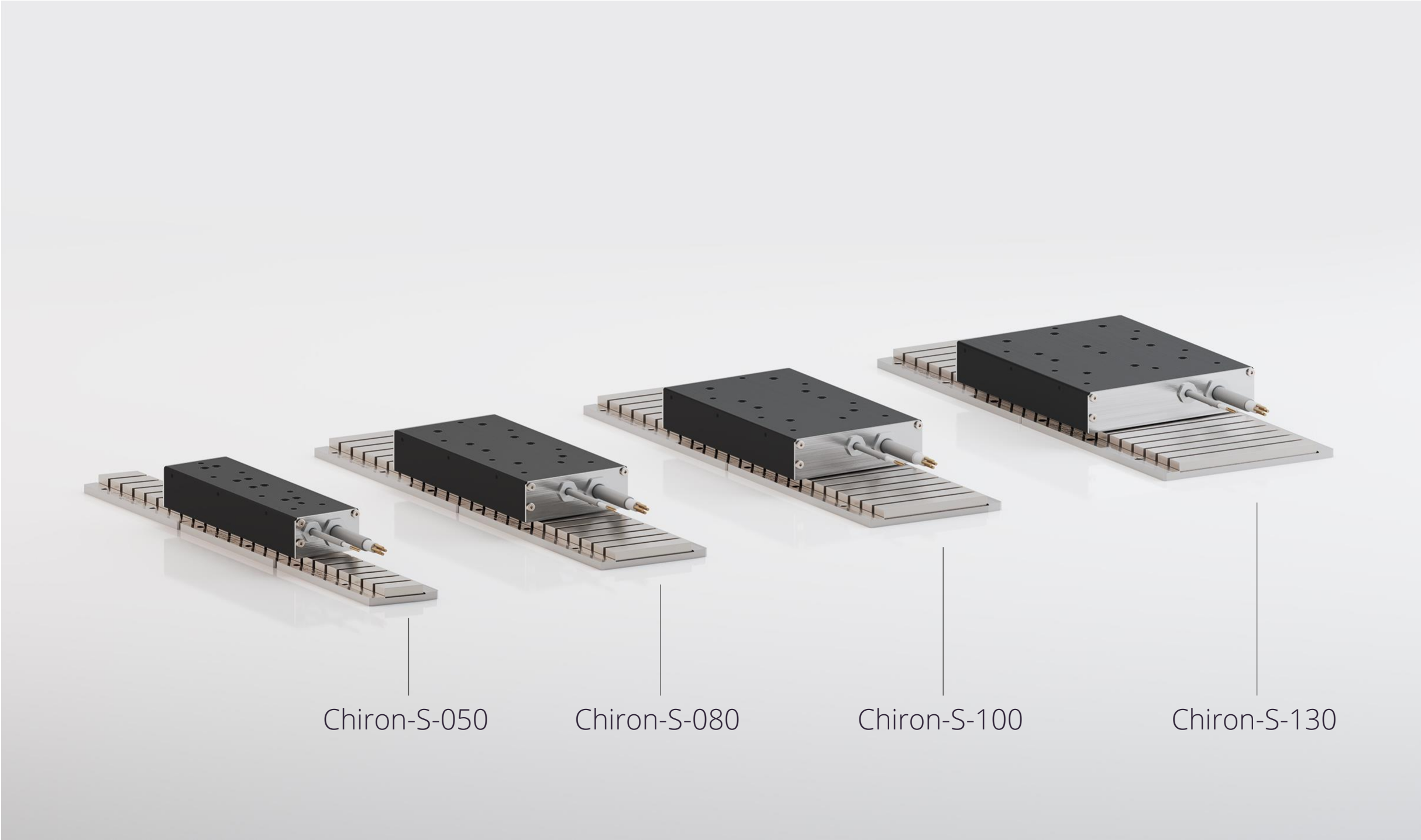


Number of coils

Winding configurations chart

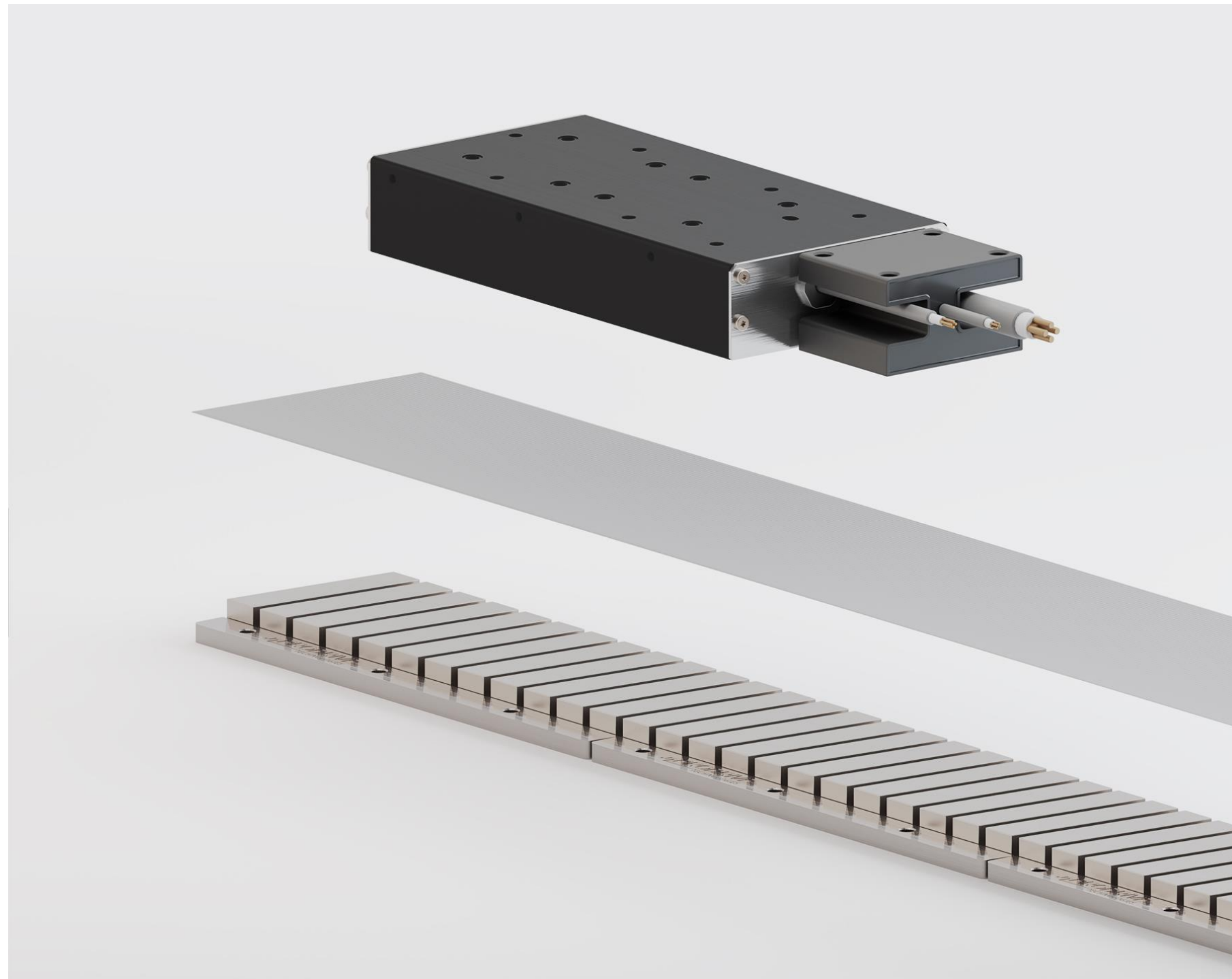
CHIRON LINE

The Chiron line offers iron core linear motors which are optimized for high force and high efficiency. Find the optimal fit for your application due to the many different available form factors.



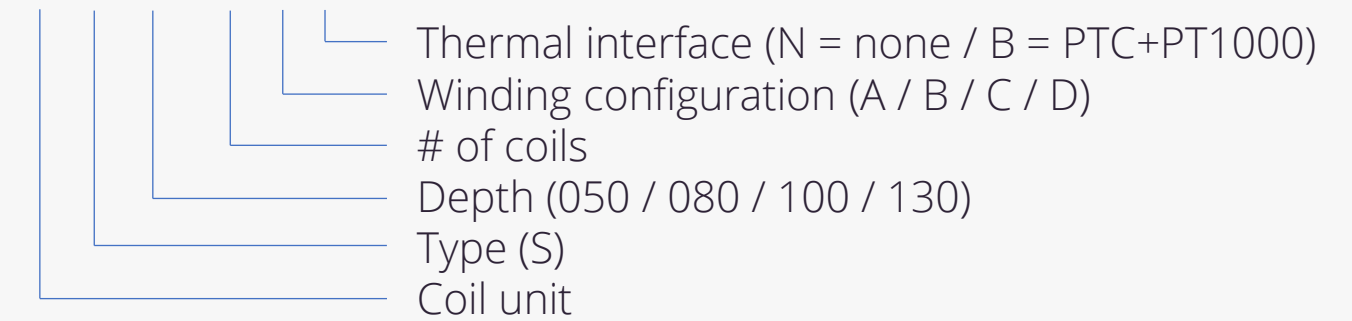
Chiron line linear motors in different sizes

CHIRON FEATURES



Chiron magnet plates (Chiron-MP-080-12), coil unit (Chiron-CU-S-080-06-A-B), commutation sensor (Chiron-CS-A) and magnet plate cover

Chiron-CU-S-080-12-A-N



Chiron-MP-080-16



Chiron-CS-A



- Modularity in width and depth for optimal mechanical integration
- Multiple winding configurations for optimal current/velocity matching
- Coil units have an optional temperature protection (PTC) and sensor (PT1000)
- Magnet plates can be butted together
- Magnets are skewed to minimize force ripples and detent forces
- IP rating of coil units is IP69K
- Optional stainless-steel cover plate for protection of the magnet plates
- Optional commutation sensor, analog Hall (sin/cos) or digital Hall

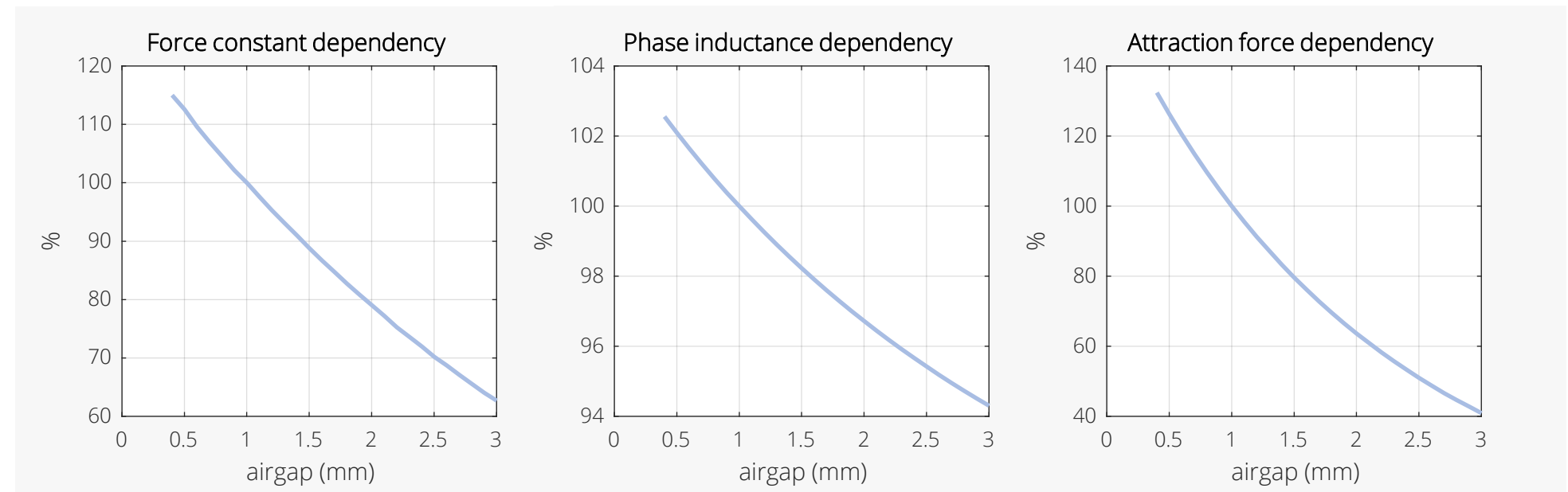
CHIRON-S-050 PERFORMANCE SPECIFICATIONS

Parameter		Symbol	Unit	T _{coil} (°C)	CU-S-050-03	CU-S-050-06		CU-S-050-09		CU-S-050-12			CU-S-050-15	
Winding configuration		-	-	-	C	B	C	B	C	A	B	C	B	C
Electromechanical	Peak force ($\alpha_T = 5^\circ\text{C/s}$ increase)	F_p	N	20	100	205		300		410			500	
	Continuous force, interface at 20°C	F_c	N	100	65	135		200		270			330	
	Attraction force ($l = 0$)	F_{att}	N	-	345	600		855		1110			1365	
	Motor constant	S	N ² /W	20	85	180		255		350			425	
	Force constant ($l = l_c$)	$K_{f,c}$	N/A _{rms}	-	26	26	55	26	79	54	26	105	26	132
	Force constant ($l = l_p$)	$K_{f,p}$	N/A _{rms}	-	23	23	49	23	69	48	23	92	23	116
	Maximum velocity ($F = 0$)	v_m	m/s	-	31	31	15	31	10	15	31	7.8	31	6.2
	Maximum velocity ($F = F_p$)	v_i	m/s	20	18	18	8.8	18	5.8	8.9	18	4.2	18	3.3
Electrical	Maximum dc bus voltage	V_{dc}	V	-	690	690		690		690			690	
	Phase resistance	$R_{ph,20}$	Ohm	20	2.9	1.5	5.8	1.0	8.7	2.9	0.7	12	0.6	15
	Phase inductance	L_{ph}	mH	20	14	7.0	28	4.7	42	14	3.5	56	2.8	70
	Peak line emf constant	$K_{e,ll,p}$	Vs/m	-	22	22	47	22	67	46	22	89	22	111
	Maximum rms current	I_p	A _{rms}	20	4.3	8.7	4.3	13	4.3	8.7	17	4.3	22	4.3
	Continuous rms current, interface at 20°C	I_c	A _{rms}	100	2.5	5.0	2.5	7.6	2.5	5.0	10.1	2.5	13	2.5
Thermal	Continuous dissipation, interface at 20°C	$P_{d,c}$	W	100	73	145		218		291			364	
	Thermal resistance, coils to interface	$R_{th,i}$	K/W	-	1.1	0.55		0.37		0.28			0.22	
	Thermal resistance, coils to conv. surface	$R_{th,c}$	K/W	-	0.9	0.43		0.29		0.22			0.17	
	Thermal time constant, interface at 20°C	τ_{th}	s	-	67	67		67		67			67	

Notes

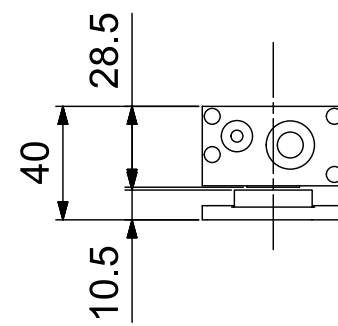
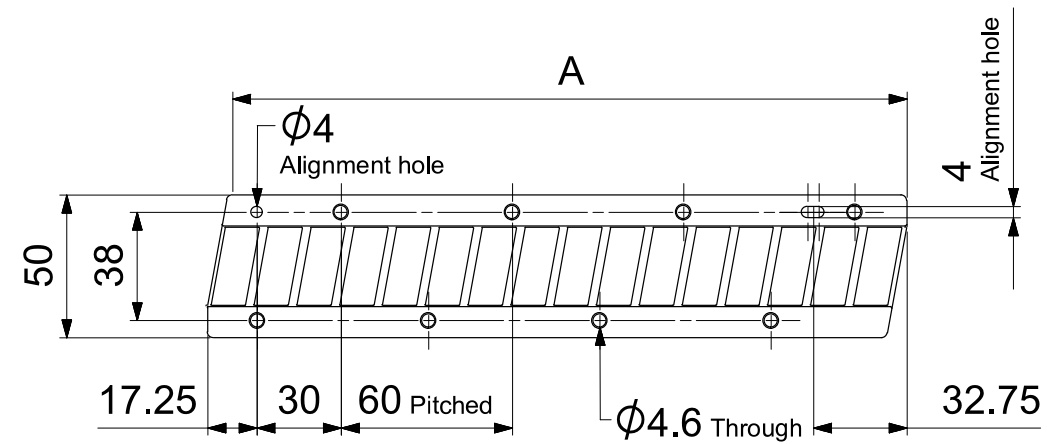
- Specifications are based upon a magnet temperature of 20°C
- Specifications consider complete overlap of the coil unit with a magnet plate
- Specifications consider sinusoidal q-axis commutation
- Velocity specifications are based on the maximum bus voltage
- Specifications are based upon an airgap of 1 mm
- See 'definitions' section at the end of the catalog for more details

Product marking / approvals

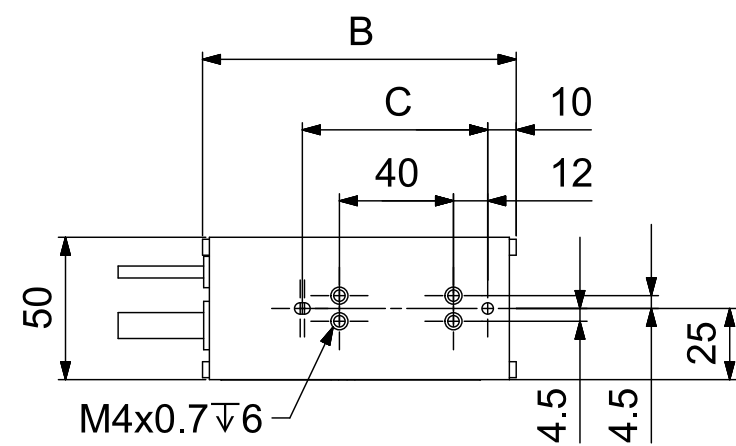


Airgap dependency

CHIRON-S-050 MECHANICAL SPECIFICATIONS

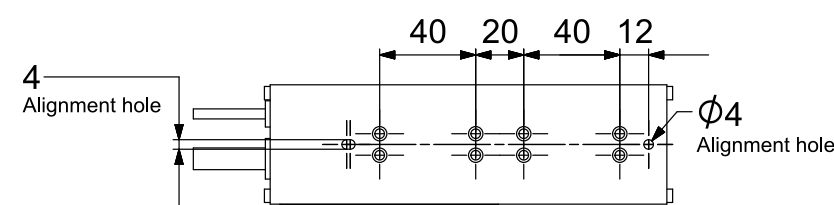


		Parameter	Symbol	Unit	MP-050-08	MP-050-16	MP-050-28
Magnet Plates	Number of poles	N_p	-		8	16	28
	Pole pitch (N-N)	$2\tau_p$	mm		30	30	30
	Width	A	mm		120	240	420
	Mass	M_{mp}	kg		0.4	0.7	1.2

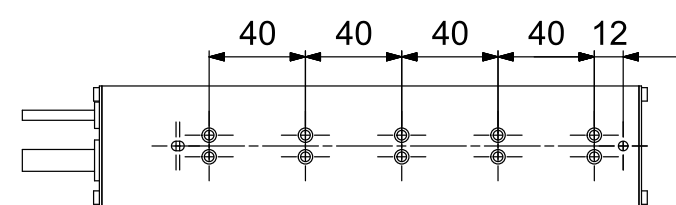


Chiron-CU-S-050-03

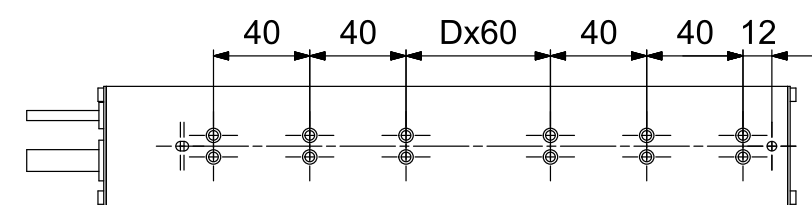
		Parameter	Symbol	Unit	CU-S-050-03	CU-S-050-06	CU-S-050-09	CU-S-050-12	CU-S-050-15
Coil Units	Number of coils	N_{coil}	-		3	6	9	12	15
	Coil pitch	τ_{coil}	mm		20	20	20	20	20
	Width	B	mm		110	170	230	290	350
	Center pin distance	C	mm		65	125	185	245	305
	Number of 60 mm pitches	D	mm		0	0	0	1	2
	Mass (ex. cable)	M_{Cu}	kg		0.5	0.8	1.2	1.5	1.8
	Standard cable length	L_{cable}	m		1	1	1	1	1



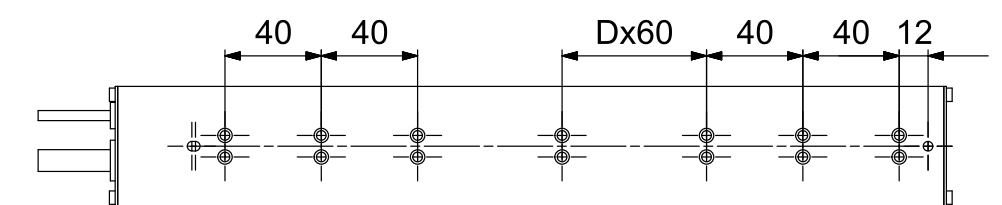
Chiron-CU-S-050-06



Chiron-CU-S-050-09



Chiron-CU-S-050-12



Chiron-CU-S-050-15

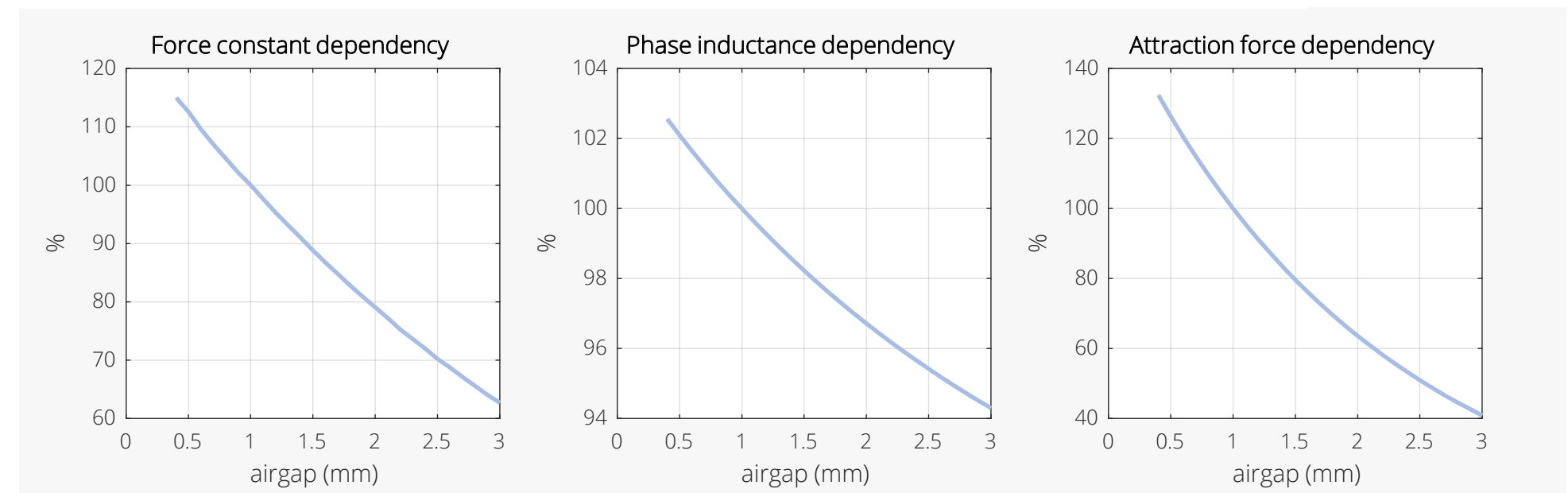
CHIRON-S-080 PERFORMANCE SPECIFICATIONS

Parameter		Symbol	Unit	T _{coil} (°C)	CU-S-080-03	CU-S-080-06	CU-S-080-09	CU-S-080-12			CU-S-080-15		CU-S-080-18				CU-S-080-24					
Winding configuration		-	-	-	C	B	C	B	C	A	B	C	B	C	A	B	C	D	A	B	C	D
Electromechanical	Peak force ($\alpha_T = 5^\circ\text{C/s}$ increase)	F _p	N	20	250	510	740	1000			1230		1480				1970					
	Continuous force, interface at 20°C	F _c	N	100	165	335	490	665			820		985				1310					
	Attraction force (I = 0)	F _{att}	N	-	830	1440	2050	2660			3270		3880				5100					
	Motor constant	S	N ² /W	20	250	520	740	1010			1230		1470				1960					
	Force constant (I = I _c)	K _{f,c}	N/A _{rms}	-	61	61	128	61	182	124	61	242	61	303	121	61	364	182	121	61	485	242
	Force constant (I = I _p)	K _{f,p}	N/A _{rms}	-	56	56	119	56	169	116	56	225	56	282	113	56	338	169	113	56	450	225
	Maximum velocity (F = 0)	v _m	m/s	-	14	14	6.4	14	4.6	6.7	14	3.4	14	2.7	6.8	14	2.3	4.6	6.8	14	1.7	3.4
	Maximum velocity (F = F _p)	v _i	m/s	20	8.2	8.2	3.8	8.2	2.4	3.8	8.2	1.7	8.2	1.2	3.9	8.2	0.9	2.4	3.9	8.2	0.5	1.7
Electrical	Maximum dc bus voltage	V _{dc}	V	-	690	690	690	690			690		690				690					
	Phase resistance	R _{ph,20}	Ohm	20	5.2	2.6	10	1.7	16	5.2	1.3	21	1.0	26	3.5	0.9	31	7.8	2.6	0.7	42	10
	Phase inductance	L _{ph}	mH	20	29	15	58	9.7	87	29	7.3	116	5.8	145	19	4.8	174	44	15	3.6	232	58
	Peak line emf constant	K _{e,ll,p}	Vs/m	-	51	51	107	51	152	104	51	202	51	253	101	51	303	152	101	51	404	202
	Maximum rms current	I _p	A _{rms}	20	4.4	8.8	4.4	13	4.4	8.8	18	4.4	22	4.4	13	26	4.4	8.8	18	35	4.4	8.8
	Continuous rms current, interface at 20°C	I _c	A _{rms}	100	2.7	5.4	2.7	8.1	2.7	5.4	10.8	2.7	14	2.7	8.1	16	2.7	5.4	10.8	22	2.7	5.4
Thermal	Continuous dissipation, interface at 20°C	P _{d,c}	W	100	150	300	450	600			750		900				1200					
	Thermal resistance, coils to interface	R _{th,i}	K/W	-	0.53	0.27	0.18	0.13			0.11		0.09				0.067					
	Thermal resistance, coils to conv. surface	R _{th,c}	K/W	-	0.43	0.22	0.14	0.11			0.09		0.07				0.054					
	Thermal time constant, interface at 20°C	τ _{th}	s	-	61	61	61	61			61		61				61					

Notes

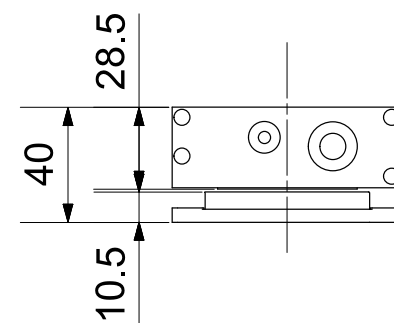
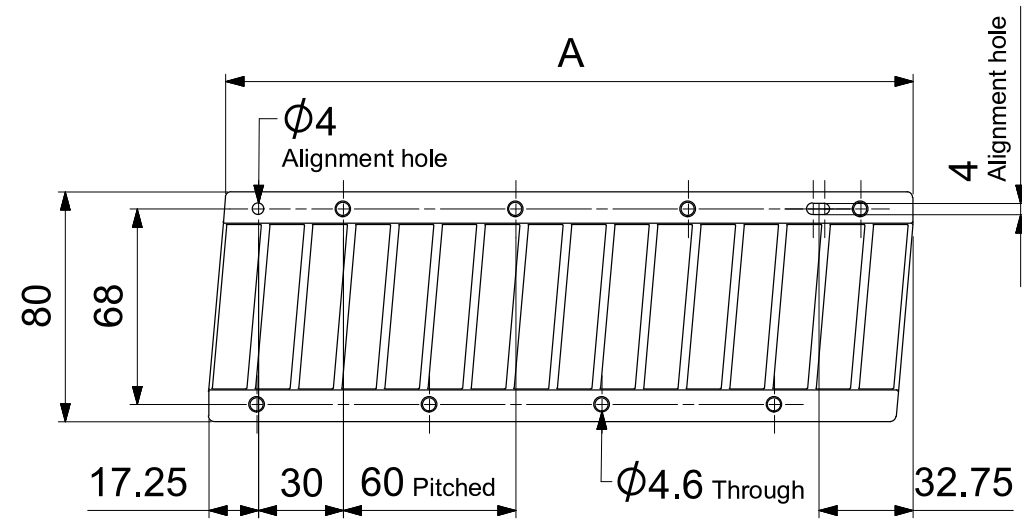
- Specifications are based upon a magnet temperature of 20°C
- Specifications consider complete overlap of the coil unit with a magnet plate
- Specifications consider sinusoidal q-axis commutation
- Velocity specifications are based on the maximum bus voltage
- Specifications are based upon an airgap of 1 mm
- See 'definitions' section at the end of the catalog for more details

Product marking / approvals

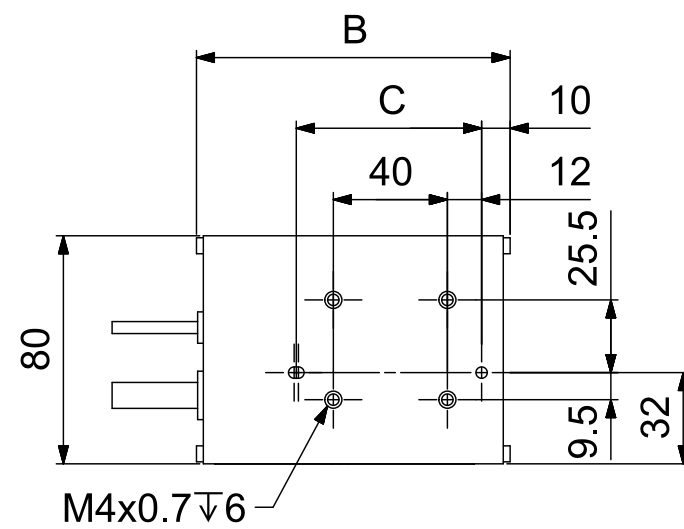


Airgap dependency

CHIRON-S-080 MECHANICAL SPECIFICATIONS

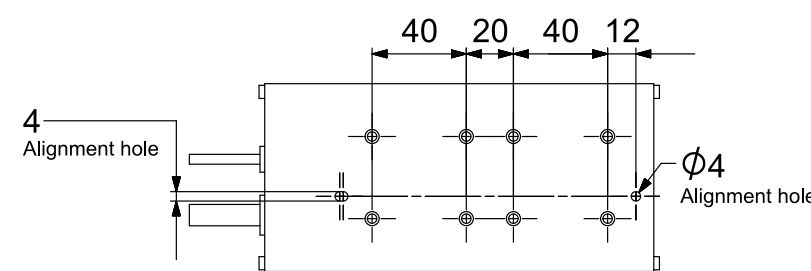


Magnet Plates	Parameter	Symbol	Unit	MP-080-12	MP-080-16	MP-080-28	MP-080-36
	Number of poles	N_p	-	12	16	28	36
	Pole pitch (N-N)	$2\tau_p$	mm	30	30	30	30
	Width	A	mm	180	240	420	540
Mass	M_{mp}	kg	0.9	1.2	2.1	2.7	

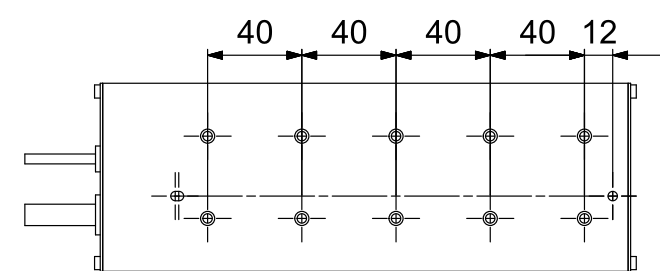


Chiron-CU-S-080-03

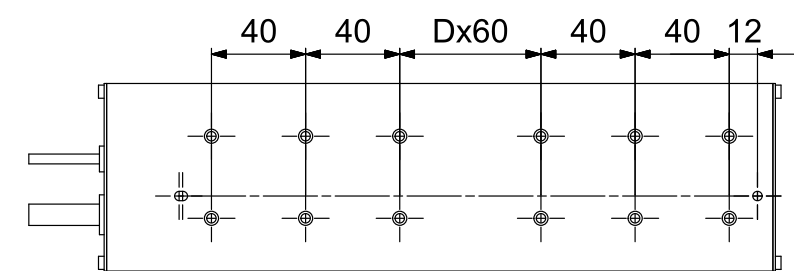
Coil Units	Parameter	Symbol	Unit	CU-S-080-03	CU-S-080-06	CU-S-080-09	CU-S-080-12	CU-S-080-15	CU-S-080-18	CU-S-080-24
	Number of coils	N_{coil}	-	3	6	9	12	15	18	24
	Coil pitch	τ_{coil}	mm	20	20	20	20	20	20	20
	Width	B	mm	110	170	230	290	350	410	530
	Center pin distance	C	mm	65	125	185	245	305	365	485
	Number of 60 mm pitches	D	mm	0	0	0	1	2	3	5
	Mass (ex. cable)	M_{cu}	kg	0.9	1.5	2.2	2.8	3.4	4.1	5.3
	Standard cable length	L_{cable}	m	1	1	1	1	1	1	1



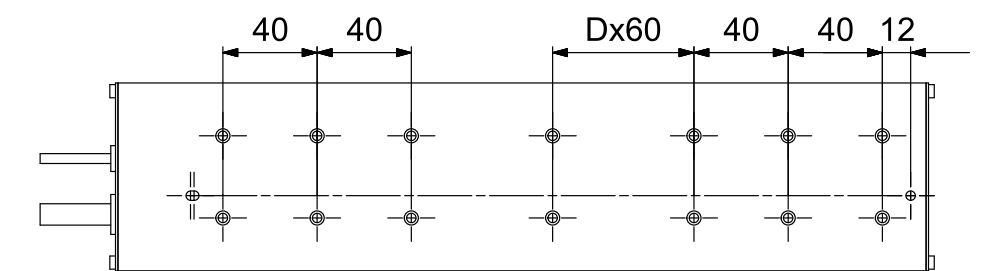
Chiron-CU-S-080-06



Chiron-CU-S-080-09



Chiron-CU-S-080-12



Chiron-CU-S-080-15/18/24

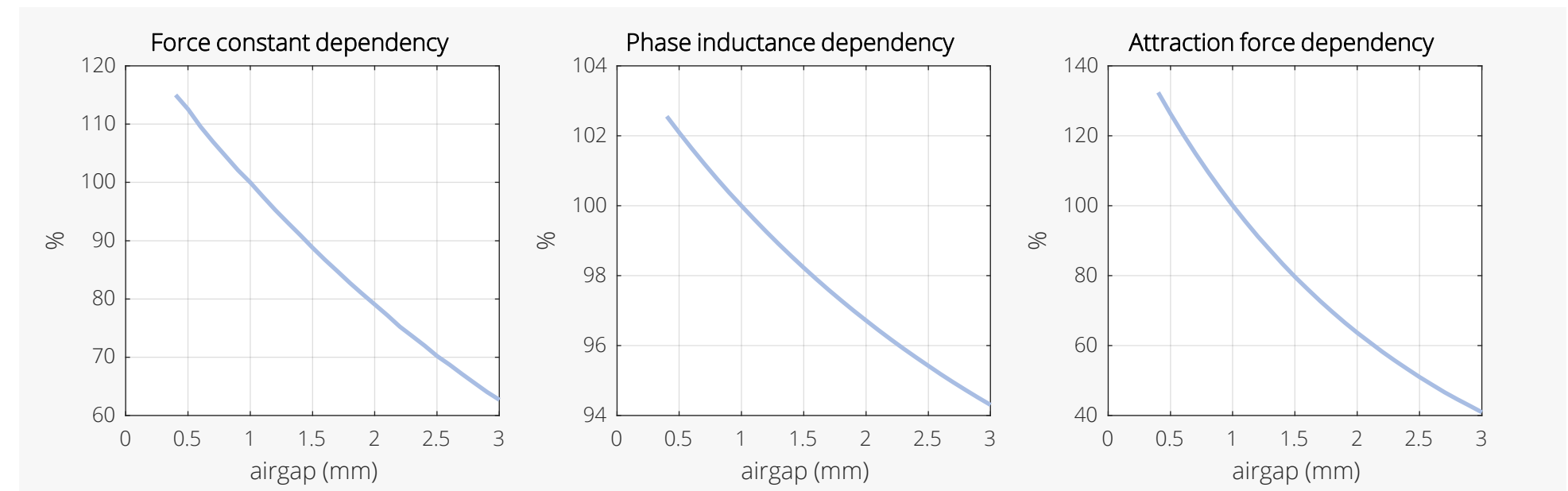
CHIRON-S-100 PERFORMANCE SPECIFICATIONS

Parameter		Symbol	Unit	T _{coil} (°C)	CU-S-100-03	CU-S-100-06	CU-S-100-09	CU-S-100-12			CU-S-100-15		CU-S-100-18				CU-S-100-24				CU-S-100-30					
Winding configuration		-	-	-	C	B	C	B	C	A	B	C	B	C	A	B	C	D	A	B	C	D	A	B	C	D
Electromechanical	Peak force ($\alpha_T = 5^\circ\text{C/s}$ increase)	F _p	N	20	340	710	1030	1400			1720		2070				2760				3450	3300	3450			
	Continuous force, interface at 20°C	F _c	N	100	230	470	690	940			1160		1390				1850				2310					
	Attraction force (I = 0)	F _{att}	N	-	1160	2020	2890	3750			4620		5480				7210				8940					
	Motor constant	S	N ² /W	20	360	770	1090	1490			1820		2180				2910				3640					
	Force constant (I = I _d)	K _{fc}	N/A _{rms}	-	84	84	177	84	252	172	84	336	84	420	168	84	503	252	168	84	671	336	168	84	839	420
	Force constant (I = I _p)	K _{fp}	N/A _{rms}	-	78	78	165	78	235	161	78	314	78	392	157	78	470	235	157	78	627	314	157	78	784	392
	Maximum velocity (F = 0)	v _m	m/s	-	10	10	5	10	3	5	10	2.5	10	2.0	4.9	10	1.6	3.3	4.9	10	1.2	2.5	4.9	10	1.0	2.0
	Maximum velocity (F = F _p)	v _i	m/s	20	5.9	5.9	2.7	5.9	1.7	2.7	5.9	1.1	5.9	0.8	2.7	5.9	0.5	1.7	2.7	5.9	0.2	1.1	2.7	5.9	0.0	0.8
Electrical	Maximum dc bus voltage	V _{dc}	V	-	690	690	690	690			690		690				690				690					
	Phase resistance	R _{ph,20}	Ohm	20	6.7	3.4	13	2.2	20	6.7	1.7	27	1.3	34	4.5	1.1	40	10	3.4	0.8	54	13	2.7	0.7	67	17
	Phase inductance	L _{ph}	mH	20	39	20	78	13	117	39	9.8	156	7.8	195	26	6.5	234	59	20	4.9	312	78	16	3.9	390	98
	Peak line emf constant	K _{e,llp}	Vs/m	-	70	70	148	70	209	143	70	279	70	349	140	70	419	209	140	70	558	279	140	70	698	349
	Maximum rms current	I _p	A _{rms}	20	4.4	8.8	4.4	13	4.4	8.8	18	4.4	22	4.4	13	26	4.4	8.8	18	35	4.4	8.8	22	44	4.2	8.8
	Continuous rms current, interface at 20°C	I _c	A _{rms}	100	2.8	5.5	2.8	8.3	2.8	5.5	11	2.8	14	2.8	8.3	17	2.8	5.5	11	22	2.8	5.5	14	28	2.8	5.5
Thermal	Continuous dissipation, interface at 20°C	P _{d,c}	W	100	200	400	600	800			1000		1200				1600				2000					
	Thermal resistance, coils to interface	R _{th,i}	K/W	-	0.40	0.20	0.13	0.10			0.080		0.067				0.050				0.040					
	Thermal resistance, coils to conv. surface	R _{th,c}	K/W	-	0.33	0.17	0.11	0.08			0.067		0.056				0.042				0.033					
	Thermal time constant, interface at 20°C	τ _{th}	s	-	59	59	59	59			59		59				59				59					

Notes

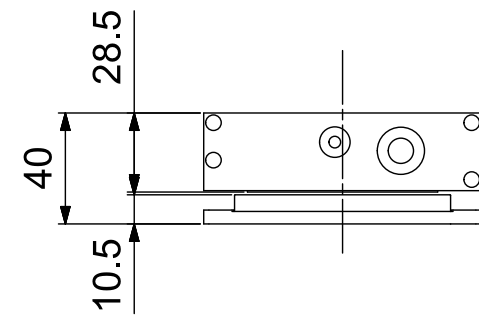
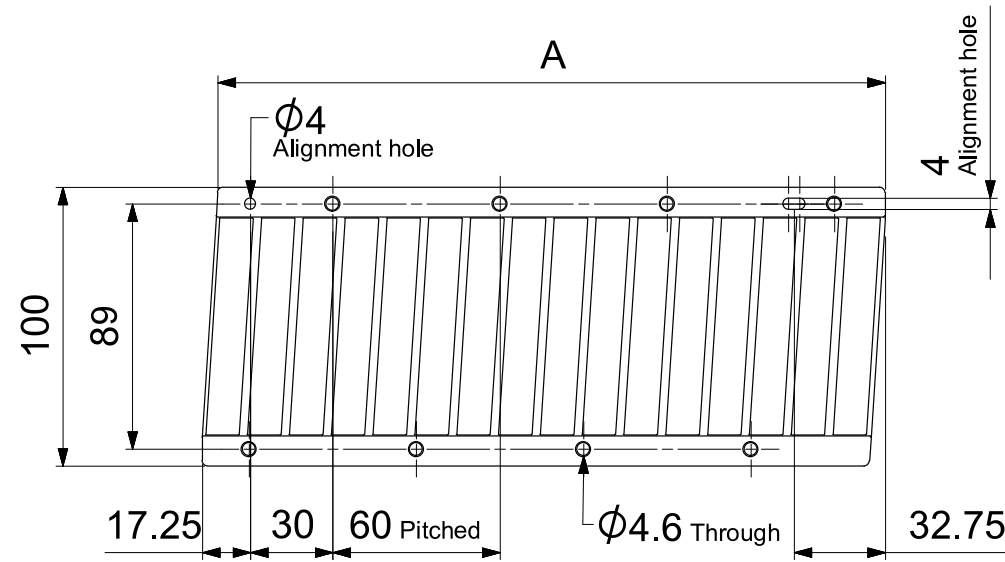
- Specifications are based upon a magnet temperature of 20°C
- Specifications consider complete overlap of the coil unit with a magnet plate
- Specifications consider sinusoidal q-axis commutation
- Velocity specifications are based on the maximum bus voltage
- Specifications are based upon an airgap of 1 mm
- See 'definitions' section at the end of the catalog for more details

Product marking / approvals

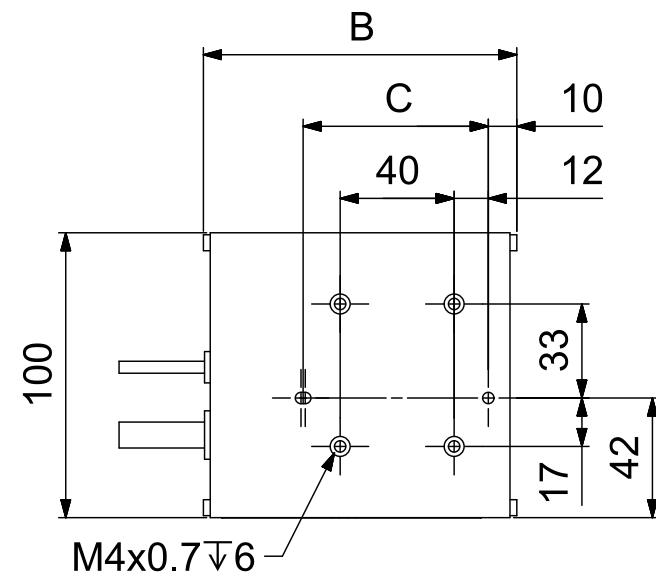


Airgap dependency

CHIRON-S-100 MECHANICAL SPECIFICATIONS

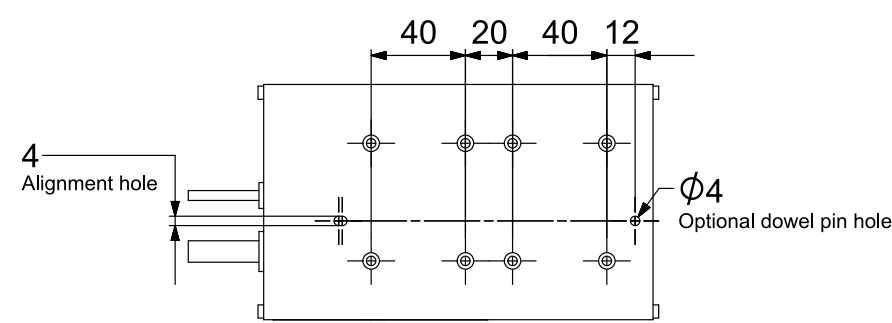


	Parameter	Symbol	Unit	MP-100-12	MP-100-16	MP-100-28	MP-100-36
Magnet Plates	Number of poles	N_p	-	12	16	28	36
	Pole pitch (N-N)	$2\tau_p$	mm	30	30	30	30
	Width	A	mm	180	240	420	540
	Mass	M_{mp}	kg	1.2	1.5	2.7	3.5

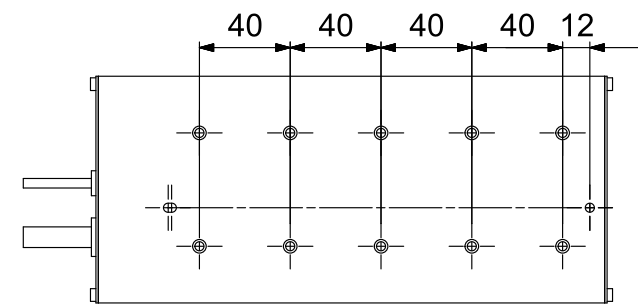


Chiron-CU-S-100-03

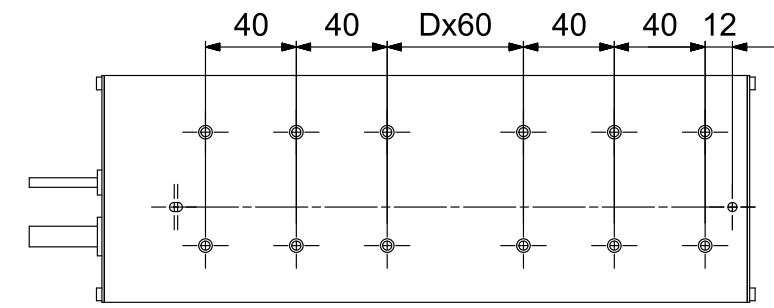
	Parameter	Symbol	Unit	CU-S-100-03	CU-S-100-06	CU-S-100-09	CU-S-100-12	CU-S-100-15	CU-S-100-18	CU-S-100-24	CU-S-100-30
Coil Units	Number of coils	N_{coil}	-	3	6	9	12	15	18	24	30
	Coil pitch	τ_{coil}	mm	20	20	20	20	20	20	20	20
	Width	B	mm	110	170	230	290	350	410	530	650
	Center pin distance	C	mm	65	125	185	245	305	365	485	605
	Number of 60 mm pitches	D	mm	0	0	0	1	2	3	5	7
	Mass (ex. cable)	M_{cu}	kg	1.2	2.0	2.8	3.7	4.5	5.4	7.0	8.7
	Standard cable length	L_{cable}	m	1	1	1	1	1	1	1	1



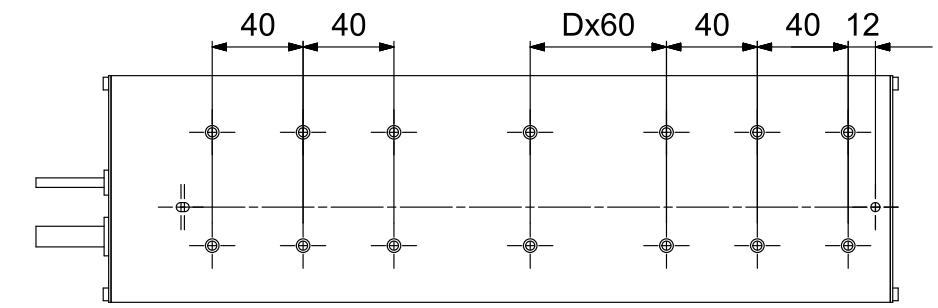
Chiron-CU-S-100-06



Chiron-CU-S-100-09



Chiron-CU-S-100-12



Chiron-CU-S-100-15/18/24/30

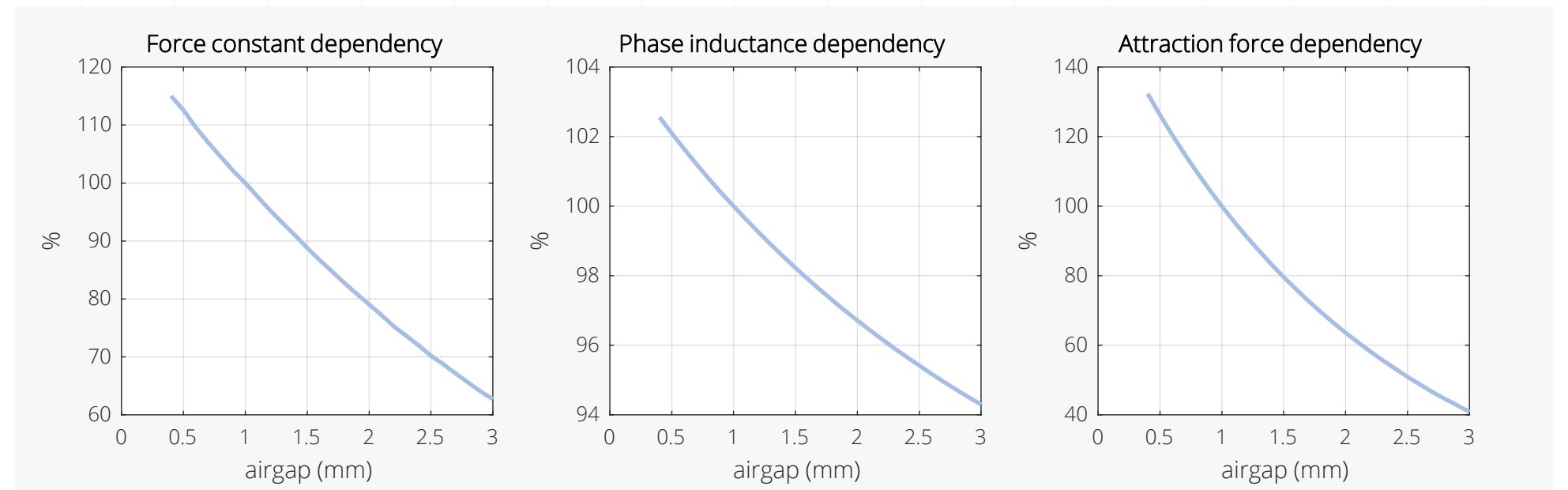
CHIRON-S-130 PERFORMANCE SPECIFICATIONS

Parameter		Symbol	Unit	T _{coil} (°C)	CU-S-130-03	CU-S-130-06	CU-S-130-09	CU-S-130-12			CU-S-130-15		CU-S-130-18				CU-S-130-24				CU-S-130-30					
Winding configuration		-	-	-	C	B	C	B	C	A	B	C	B	C	A	B	C	D	A	B	C	D	A	B	C	D
Electromechanical	Peak force (α _T = 5°C/s increase)	F _p	N	20	500	1000	1450	2000			2450		2950				3900	3450	3900	4900						
	Continuous force, interface at 20°C	F _c	N	100	320	660	970	1310			1610		1930				2580									
	Attraction force (I = 0)	F _{att}	N	-	1640	2860	4090	5310			6540		7760				10210									
	Motor constant	S	N ² /W	20	550	1100	1600	2150			2650		3150				4200									
	Force constant (I = I _c)	K _{f,c}	N/A _{rms}	-	118	118	247	118	353	241	118	470	118	588	235	118	705	353	235	118	940	470	235	118	1175	588
	Force constant (I = I _p)	K _{f,p}	N/A _{rms}	-	111	111	234	111	333	228	111	444	111	555	222	111	665	333	222	111	887	444	222	111	1109	555
	Maximum velocity (F = 0)	v _m	m/s	-	7.1	7.1	3.3	7.1	2.4	3.4	7.1	1.8	7.1	1.4	3.5	7.1	1.2	2.4	3.5	7.1	0.9	1.8	3.5	7.1	0.7	1.4
	Maximum velocity (F = F _p)	v _i	m/s	20	4.1	4.1	1.8	4.1	1.0	1.8	4.1	0.6	4.1	0.4	1.8	4.1	0.2	1.0	1.8	4.1	0.0	0.6	1.8	4.1	0.0	0.4
Electrical	Maximum dc bus voltage	V _{dc}	V	-	690	690	690	690			690		690				690									
	Phase resistance	R _{ph,20}	Ohm	20	9.0	4.5	18	3.0	27	9.0	2.3	36	1.8	45	6.0	1.5	54	14	4.5	1.1	72	18	3.6	0.9	90	23
	Phase inductance	L _{ph}	mH	20	55	28	110	18.3	165	55	13.8	220	11	275	37	9.2	330	83	28	6.9	440	110	22	5.5	550	138
	Peak line emf constant	K _{e,ll,p}	Vs/m	-	97	97	207	97	292	200	97	390	97	487	195	97	585	292	195	97	780	390	195	97	975	487
	Maximum rms current	I _p	A _{rms}	20	4.4	8.8	4.4	13	4.4	8.8	18	4.4	22	4.4	13	26	4.4	8.8	18	35	3.9	8.8	22	44	3.1	8.8
	Continuous rms current, interface at 20°C	I _c	A _{rms}	100	2.7	5.5	2.7	8.2	2.7	5.5	11	2.7	14	2.7	8.2	16	2.7	5.5	11	22	2.7	5.5	14	27	2.4	5.5
Thermal	Continuous dissipation, interface at 20°C	P _{d,c}	W	100	267	533	800	1067			1333		1600				2133									
	Thermal resistance, coils to interface	R _{th,i}	K/W	-	0.30	0.15	0.10	0.08			0.060		0.050				0.038									
	Thermal resistance, coils to conv. surface	R _{th,c}	K/W	-	0.23	0.12	0.08	0.06			0.047		0.039				0.029									
	Thermal time constant, interface at 20°C	τ _{th}	s	-	58	58	58	58			58		58				58									

Notes

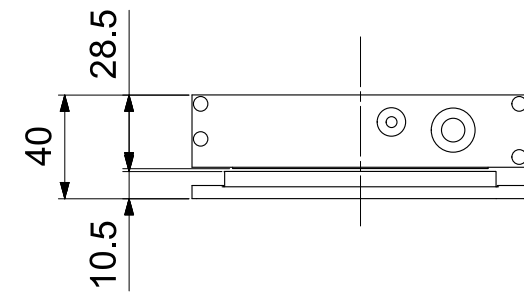
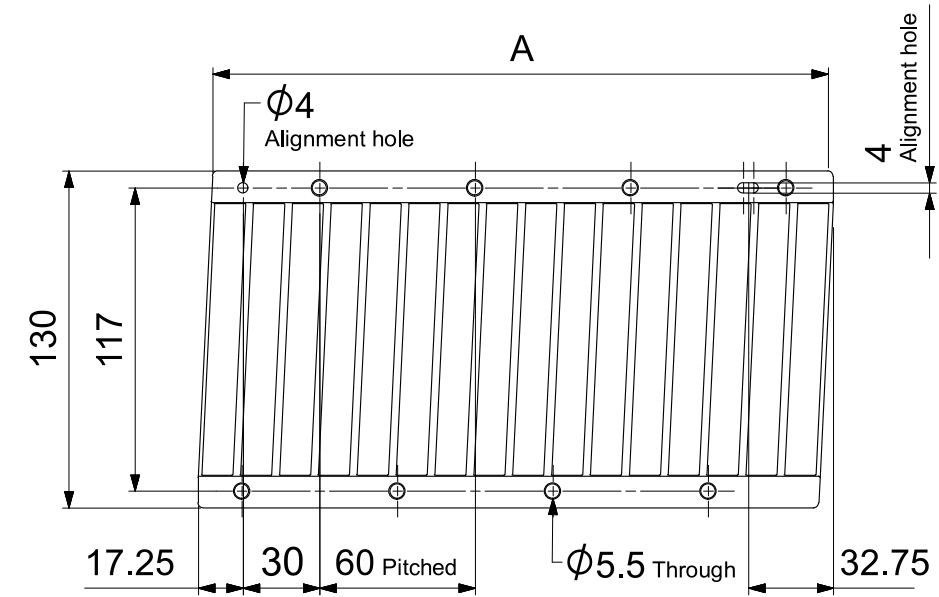
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- See 'definitions' section at the end of the catalog for more details

Product marking / approvals

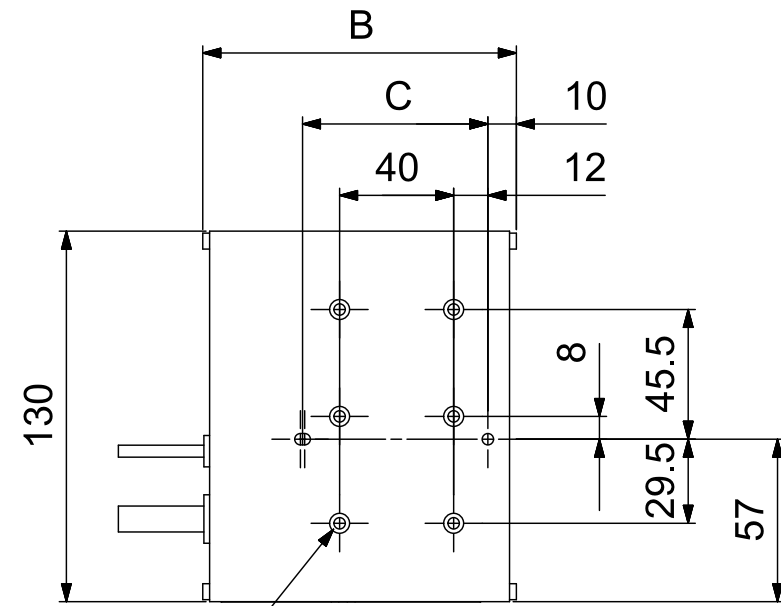


Airgap dependency

CHIRON-S-130 MECHANICAL SPECIFICATIONS

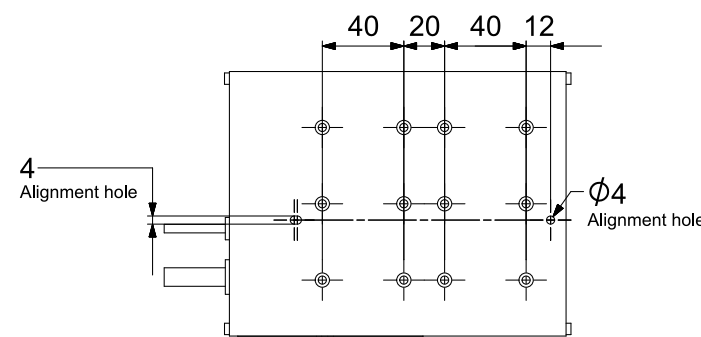


	Parameter	Symbol	Unit	MP-130-12	MP-130-16	MP-130-28	MP-130-36
Magnet Plates	Number of poles	N_p	-	12	16	28	36
	Pole pitch (N-N)	$2\tau_p$	mm	30	30	30	30
	Width	A	mm	180	240	420	540
	Mass	M_{mp}	kg	1.5	2.0	3.6	4.6

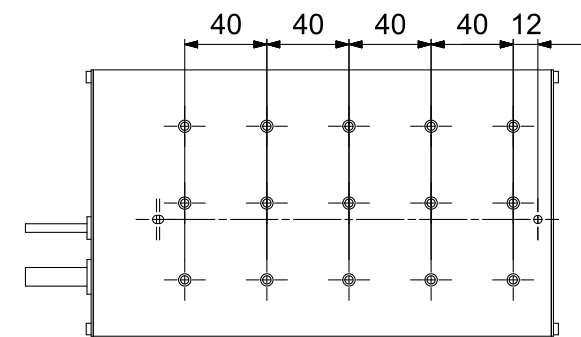


	Parameter	Symbol	Unit	CU-S-130-03	CU-S-130-06	CU-S-130-09	CU-S-130-12	CU-S-130-15	CU-S-130-18	CU-S-130-24	CU-S-130-30
Coil Units	Number of coils	N_{coil}	-	3	6	9	12	15	18	24	30
	Coil pitch	τ_{coil}	mm	20	20	20	20	20	20	20	20
	Width	B	mm	110	170	230	290	350	410	530	650
	Center pin distance	C	mm	65	125	185	245	305	365	485	605
	Number of 60 mm pitches	D	mm	0	0	0	1	2	3	5	7
	Mass (ex. cable)	M_{cu}	kg	1.5	2.7	3.8	5.0	6.1	7.3	9.6	11.9
	Standard cable length	L_{cable}	m	1	1	1	1	1	1	1	1

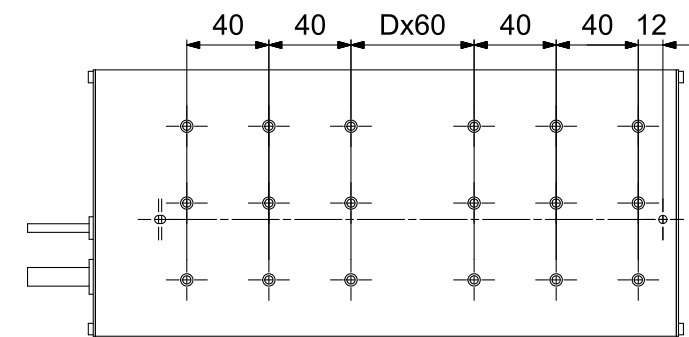
Chiron-CU-S-130-03



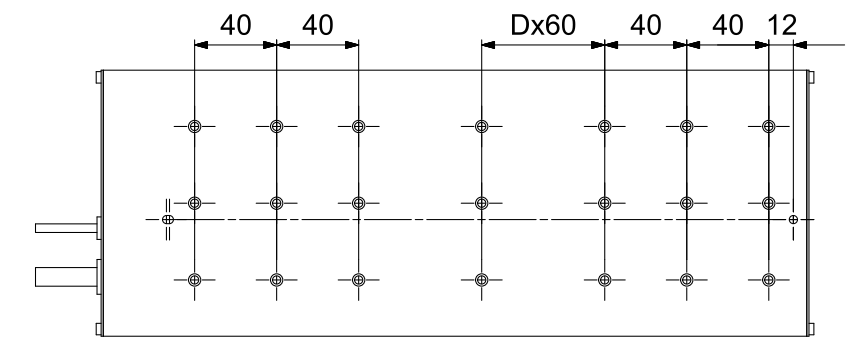
Chiron-CU-S-130-06



Chiron-CU-S-130-09

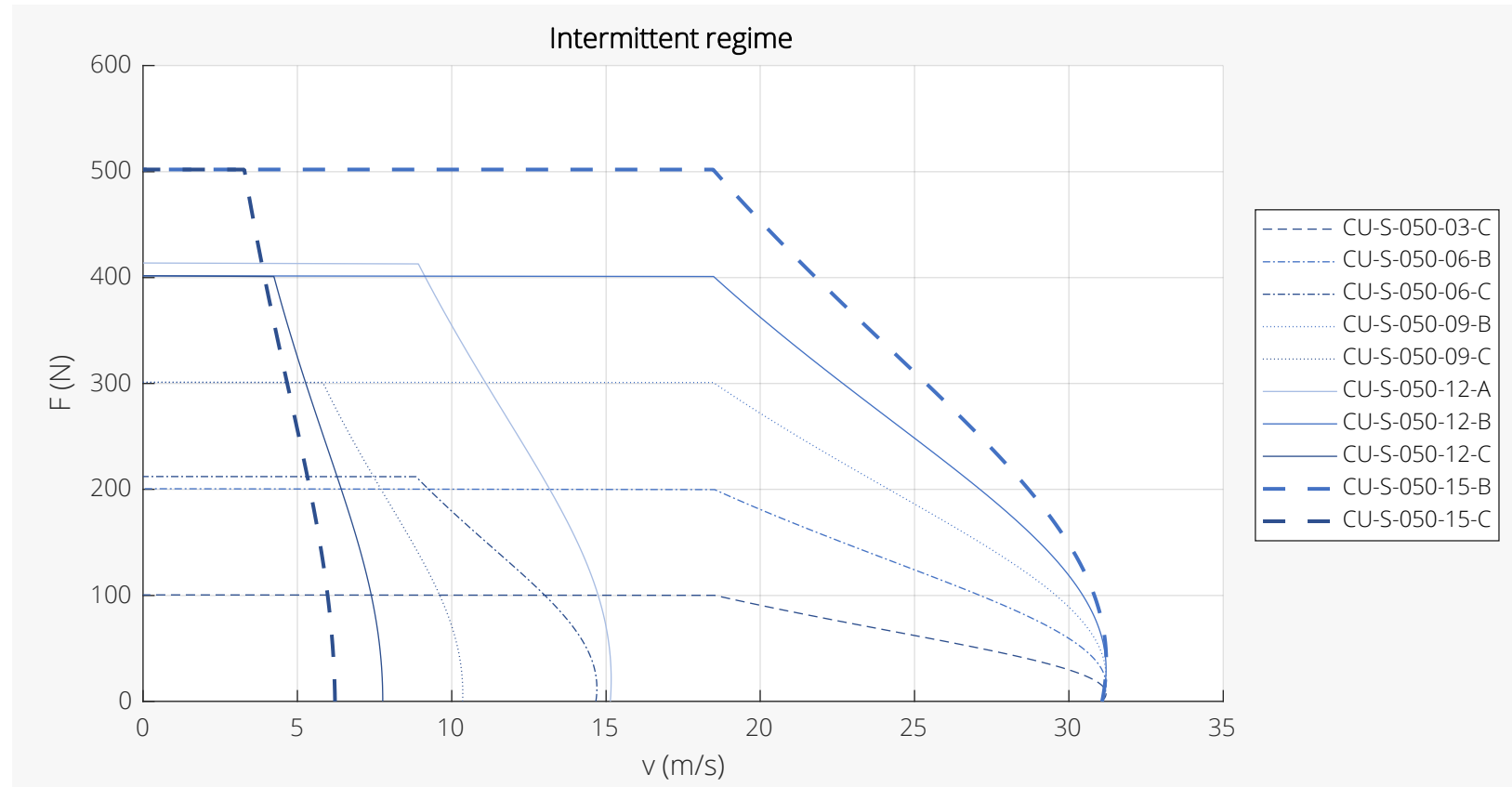


Chiron-CU-S-130-12

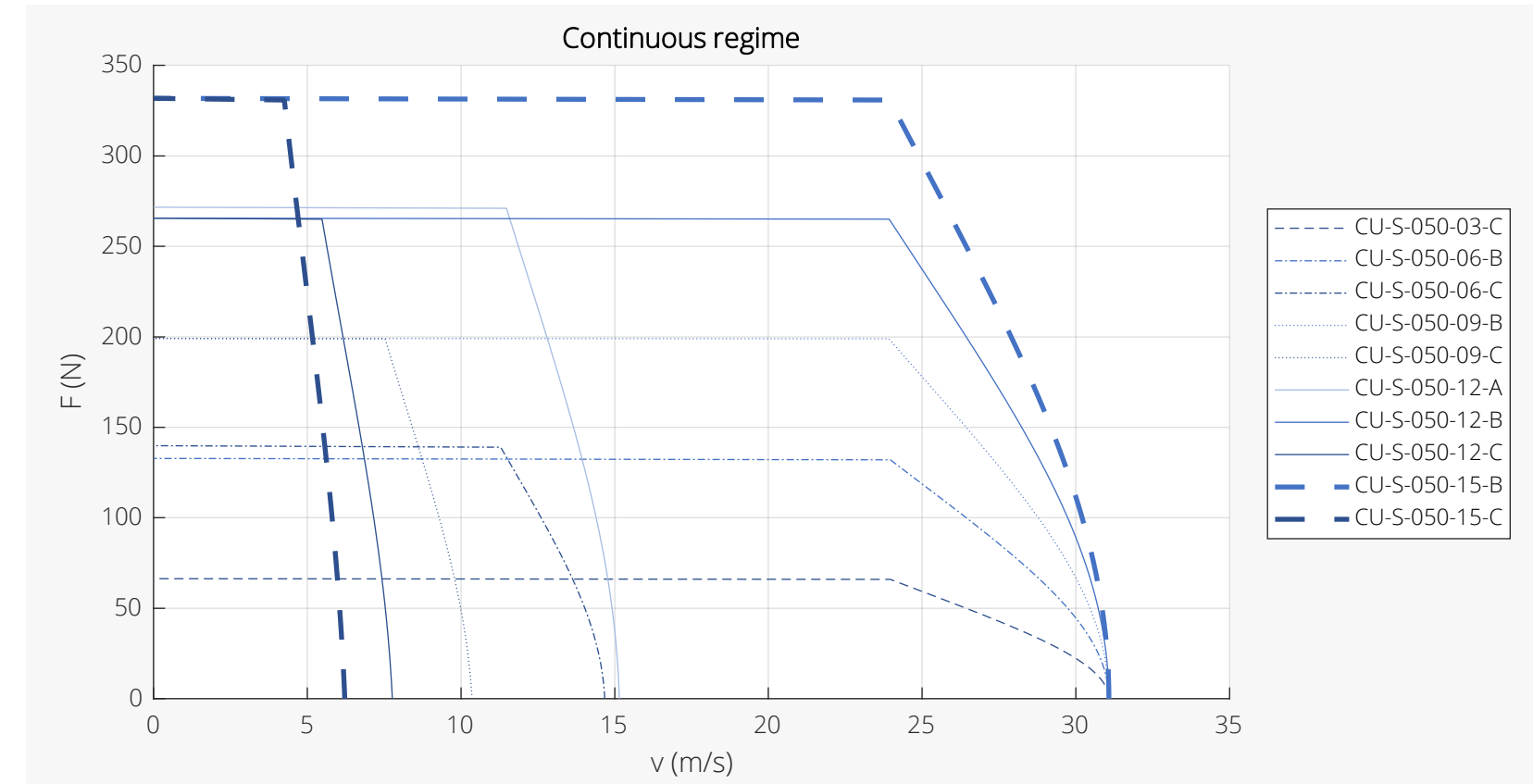


Chiron-CU-S-130-15/18/24/30

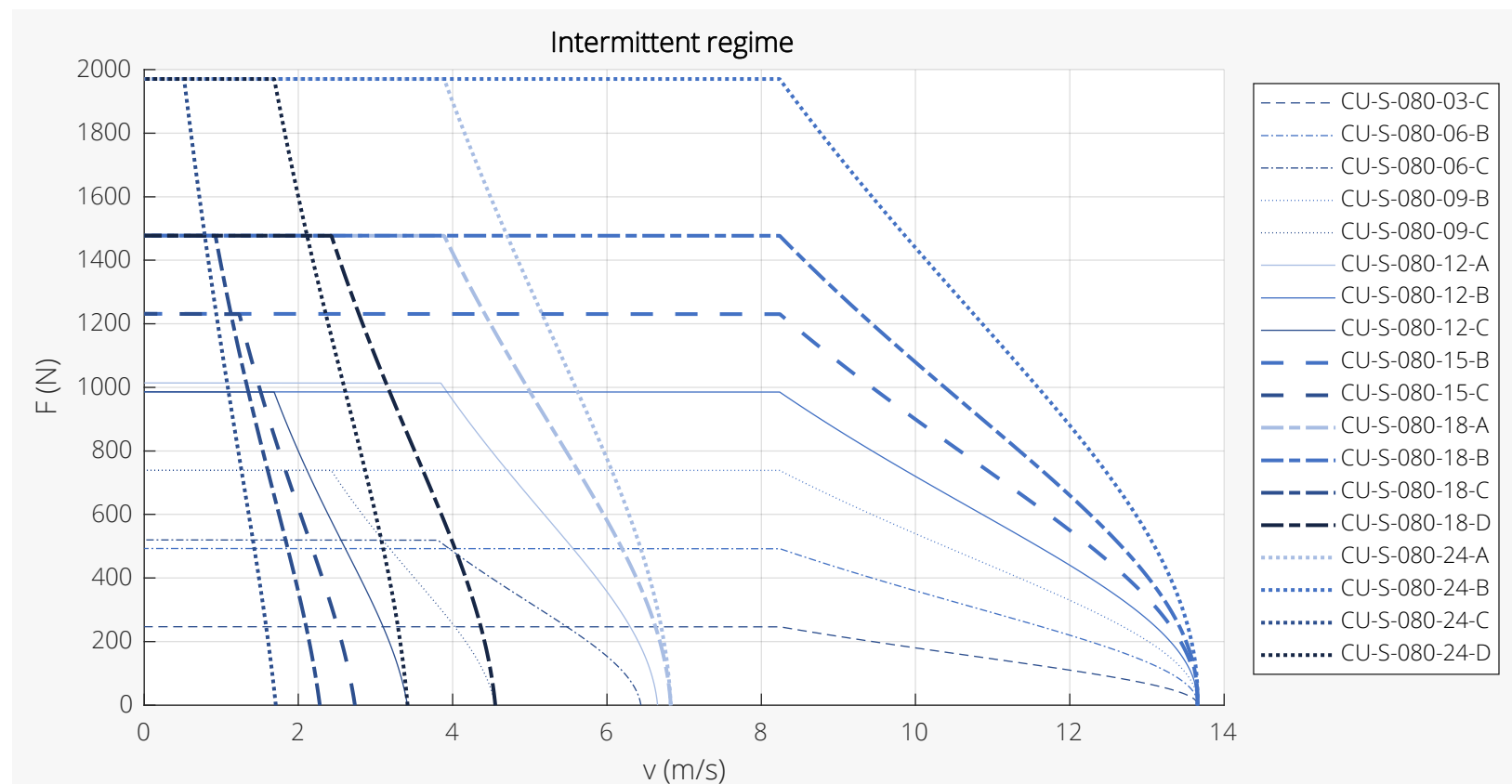
CHIRON-S-050/080 FORCE-VELOCITY DIAGRAMS



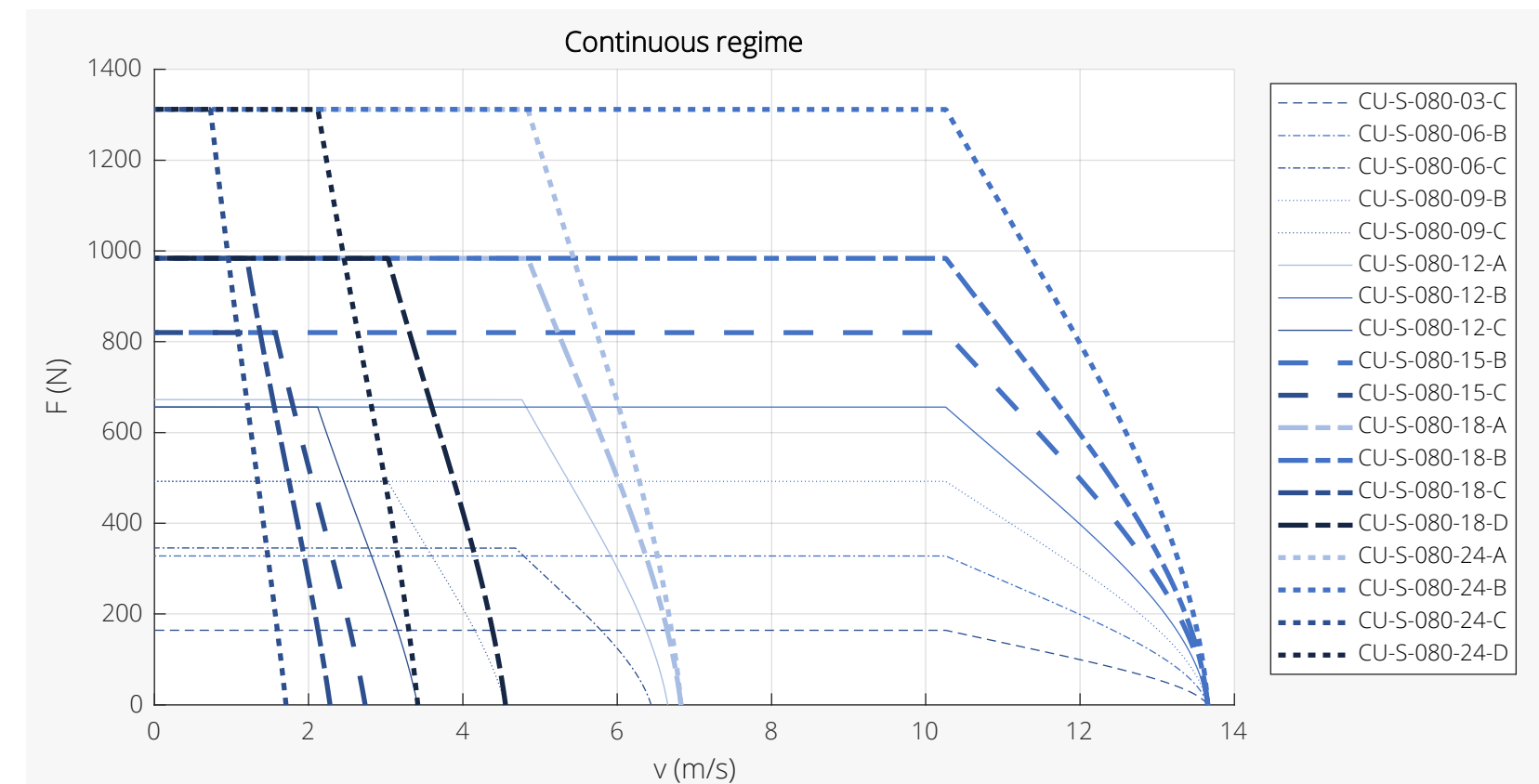
Force-Velocity Diagrams Size S-050 Intermittent Regime



Force-Velocity Diagrams Size S-050 Continuous Regime

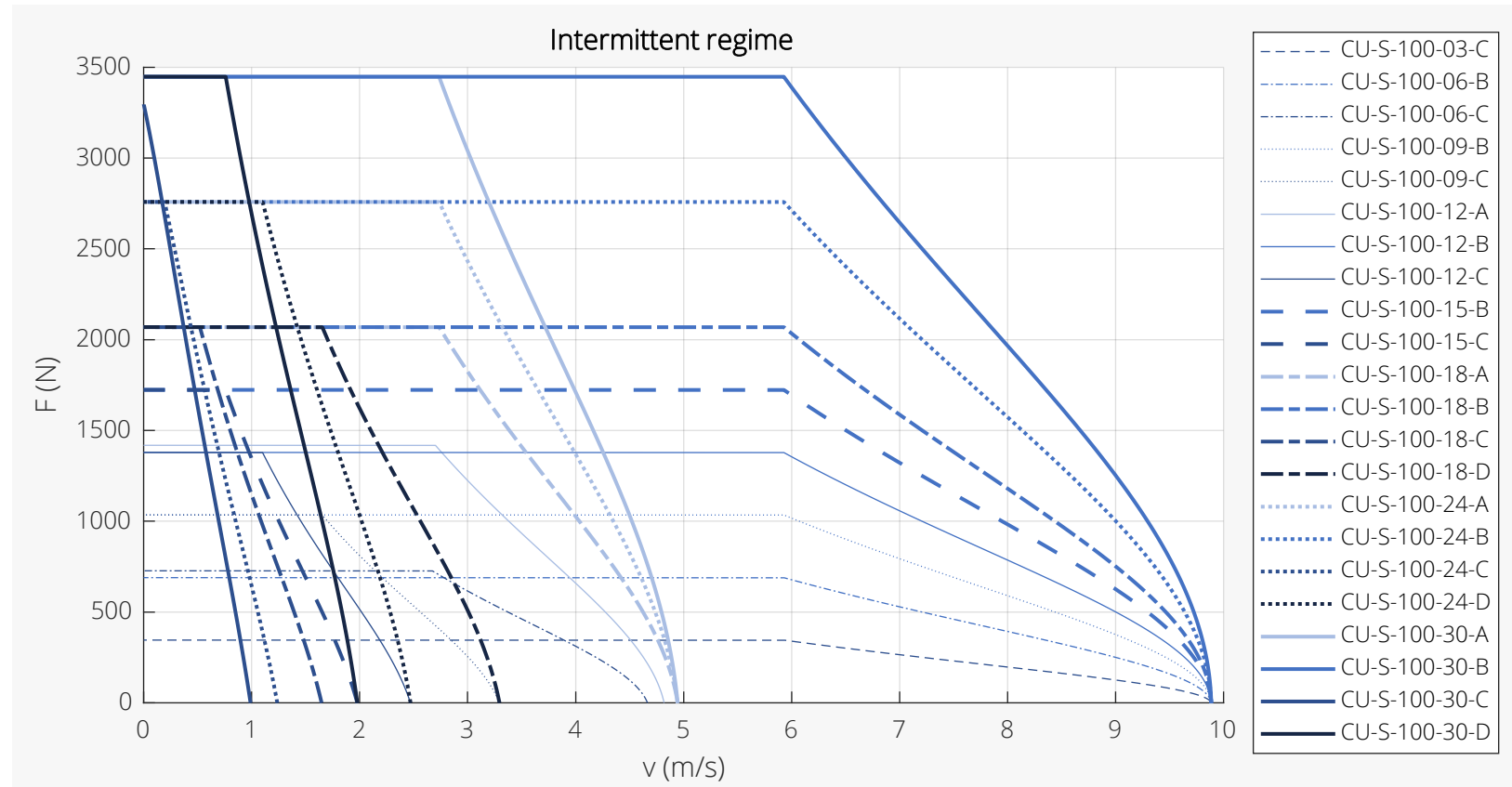


Force-Velocity Diagrams Size S-080 Intermittent Regime

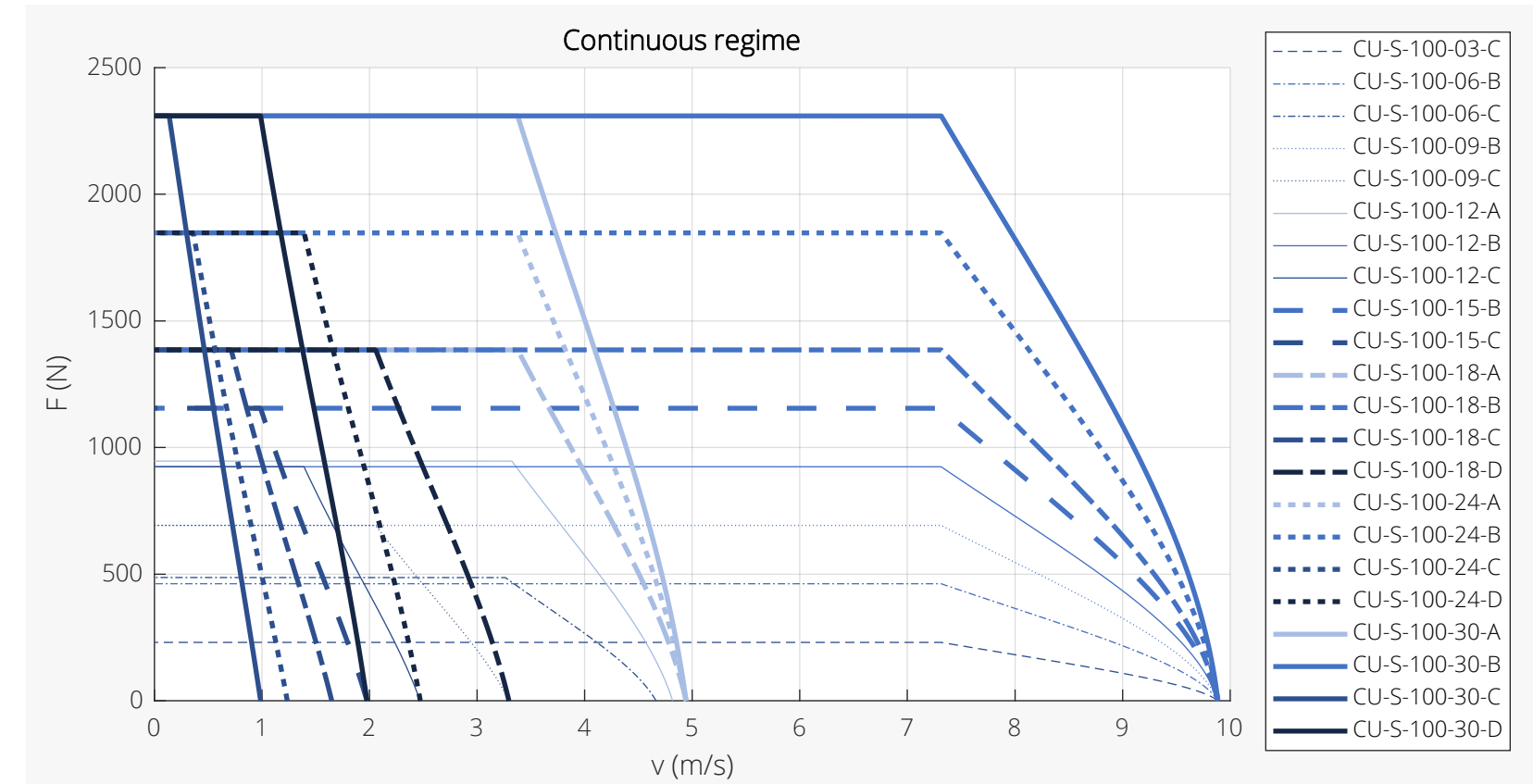


Force-Velocity Diagrams Size S-080 Continuous Regime

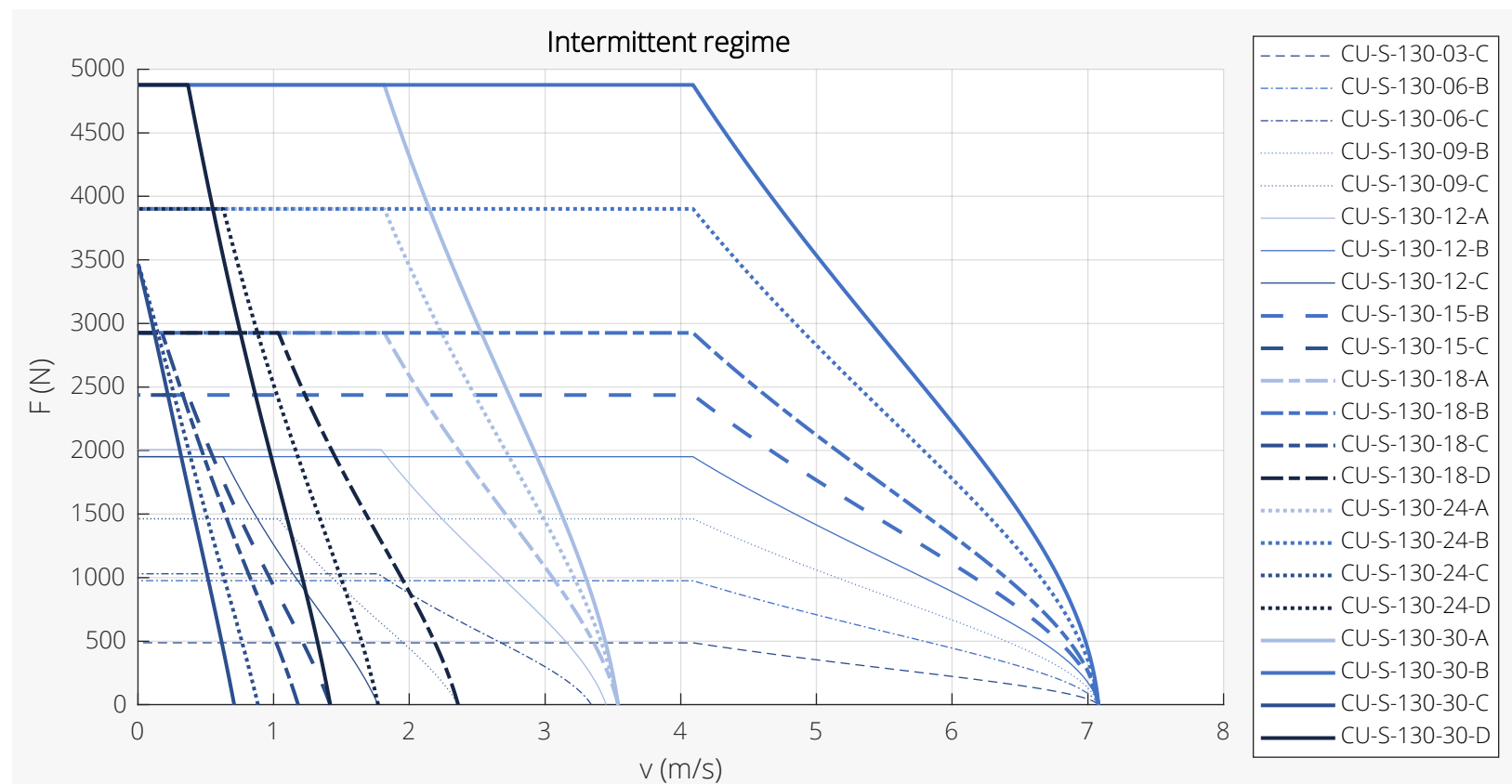
CHIRON-S-100/130 FORCE-VELOCITY DIAGRAMS



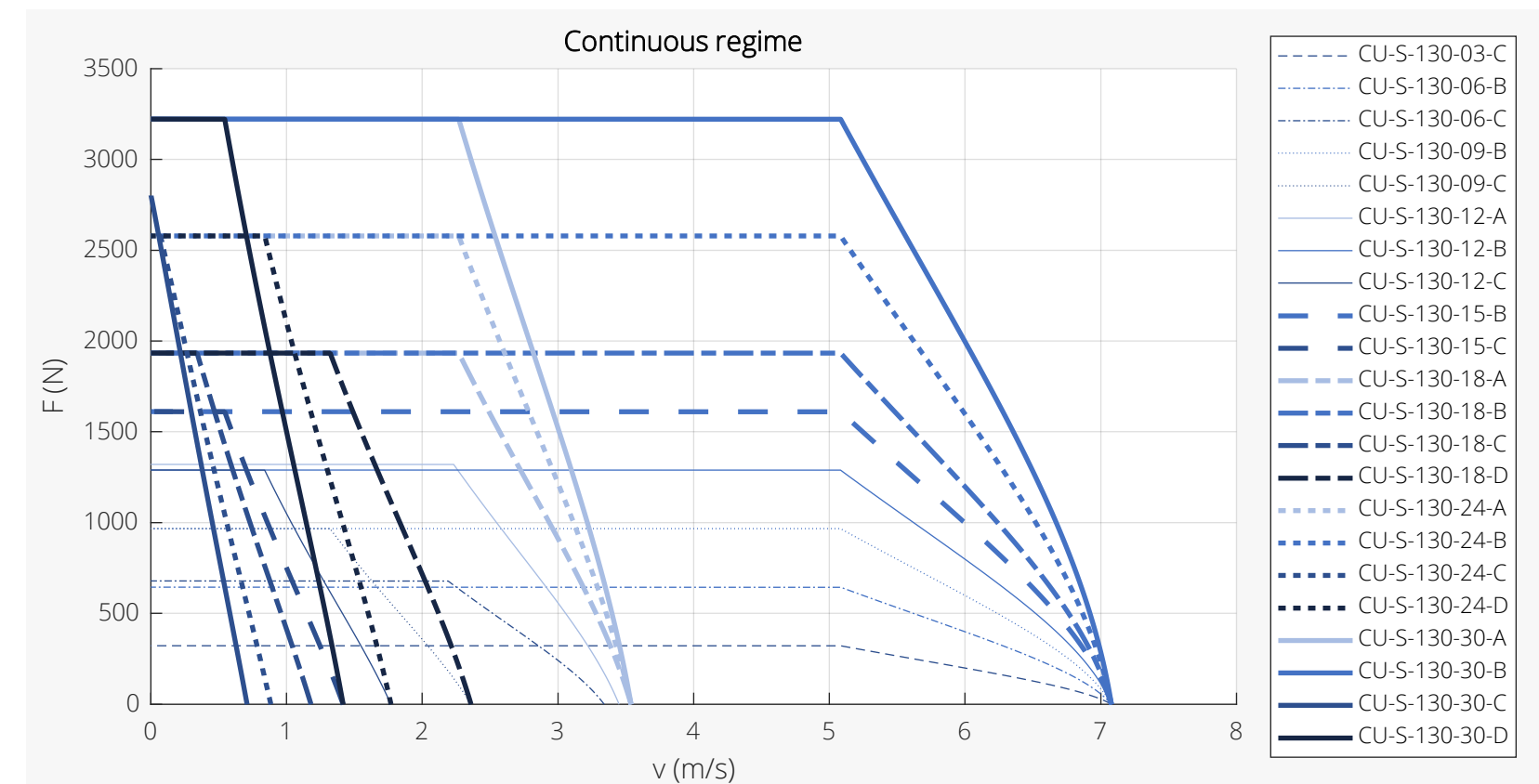
Force-Velocity Diagrams Size S-100 Intermittent Regime



Force-Velocity Diagrams Size S-100 Continuous Regime



Force-Velocity Diagrams Size S-130 Intermittent Regime



Force-Velocity Diagrams Size S-130 Continuous Regime



Chiron commutations sensor (Chiron-CS-D)

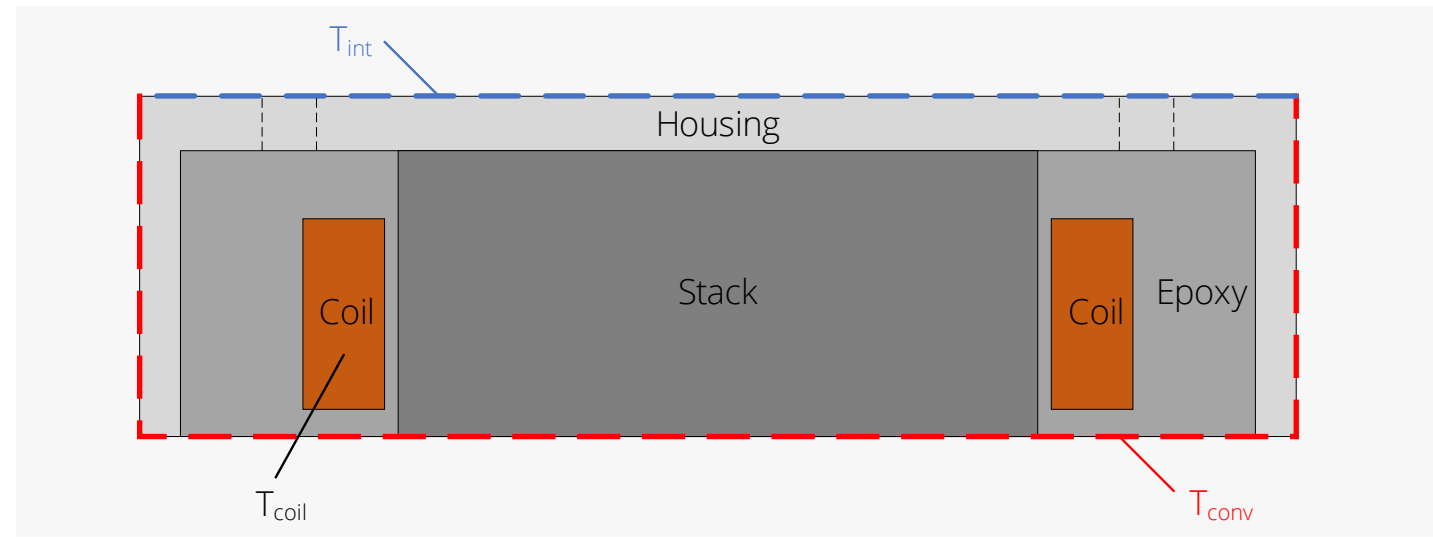
- For correct operation of a linear motor, the commutation angle (the electrical angle between the coil unit and the magnet yoke) should be known. This commutation angle is needed to determine the phase angle of the three phase currents.
- The commutation angle can be derived from the relative displacement, for example using a position sensor. However, the Chiron commutation sensor can directly measure the commutation angle without the need of a position sensor. The Chiron commutation sensor can be added to your motion system which provides a cost-effective alternative to measure the commutation angle.
- The Chiron commutation sensor is available in two types. The digital type (Chiron-CS-D) contains three digital Hall sensors, each shifted by 120 electrical degrees, from which the commutation angle can be derived. The analog type (Chiron-CS-A) contains two analog Hall sensors, each shifted by 90 electrical degrees, providing sin/cos signals for a more accurate measurement of the commutation angle. Both commutation sensor types can be used for the complete range of sizes.
- The digital commutation sensor allows a supply voltage range between 4.5 Vdc and 28 Vdc. The supply voltage of the analog commutation sensor should be 5 Vdc.

DEFINITIONS

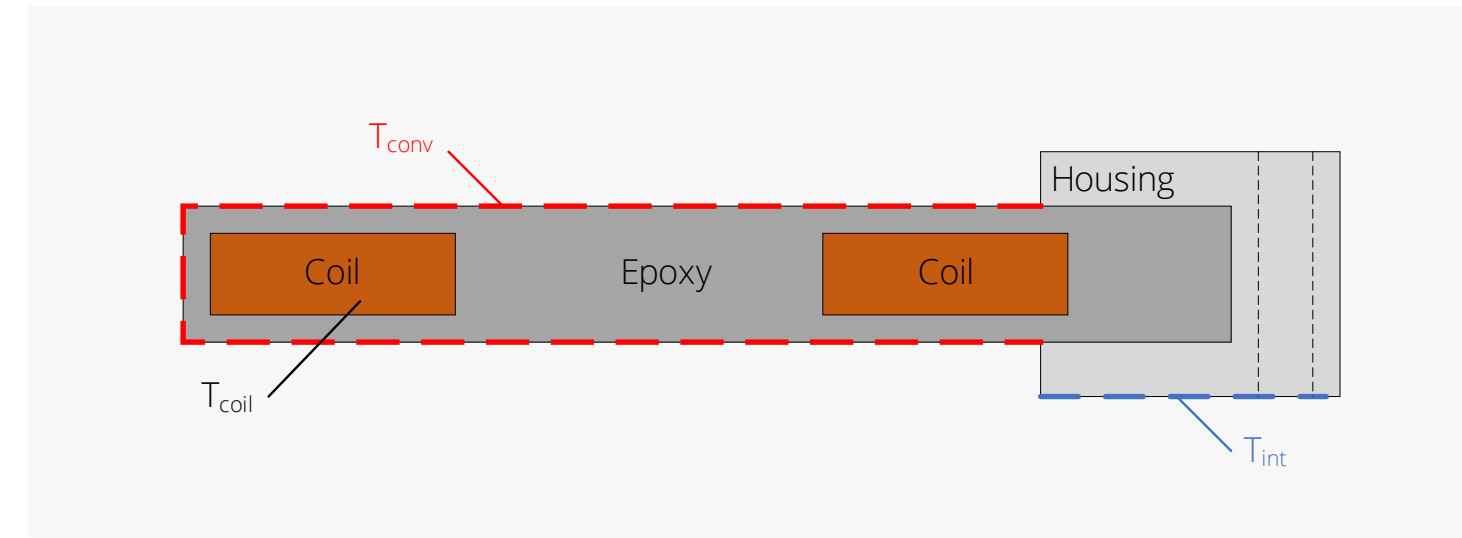
Parameter	Symbol / Equation	Unit	Remarks
Coil temperature	T_{coil}	$^{\circ}C$	Average temperature over the complete coil volume
Interface temperature	T_{int}	$^{\circ}C$	Average temperature over the complete interface surface
Convective surface temperature	T_{conv}	$^{\circ}C$	Average temperature over the complete convective surface
Thermal resistance	$R_{th,i}$	K/W	From average coil temperature to average interface temperature
Thermal resistance	$R_{th,c}$	K/W	From average coil temperature to average convective surface temperature
Thermal time constant	τ_{th}	s	The time to reach 63.7% of the steady state temperature considering $T_{int} = 20^{\circ}C$

The actual continuous force is strongly dependent on the cooling conditions available in the application. Depending on the situation (vacuum environment, natural convection, forced convection or other), the thermal resistances of the coil unit ($R_{th,i}$ and $R_{th,c}$) should be combined with the thermal resistances of the cooling interfaces to determine the overall thermal resistance (R_{th}). This overall thermal resistance provides the maximum dissipated power and continuous force.

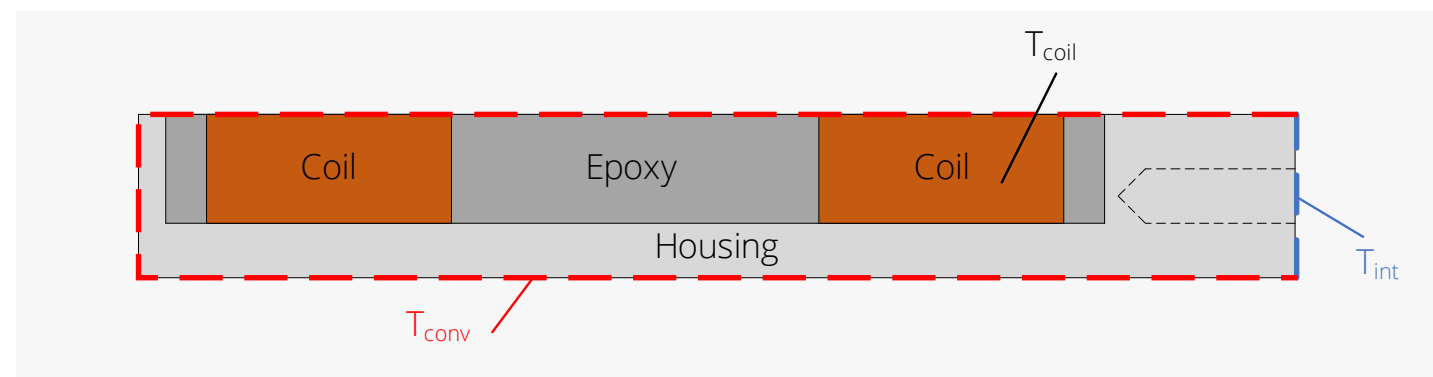
Please contact us for any support to calculate your specific application.



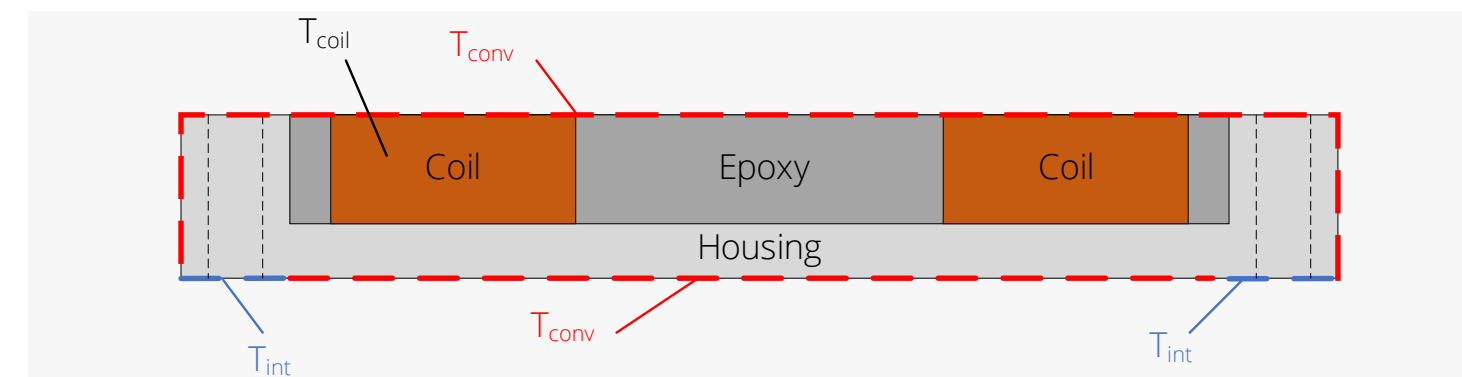
Chiron temperature definitions



Phoenix / Gryphon temperature definitions



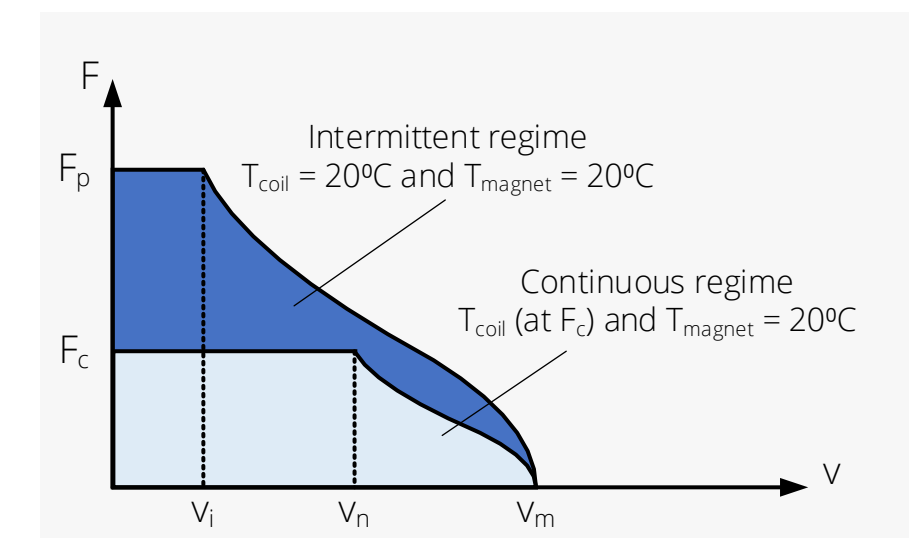
Iris-S temperature definitions



Iris-M/L temperature definitions

DEFINITIONS

Description	Equation	Unit	Remarks
Phase resistance at T_{coil}	$R_{ph} = R_{ph,20}(1+0.0039(T_{coil}-20))$	Ohm	
Force constant at no load	$K_{f,0} = \sqrt{3/2} K_{e,ll,p}$	N/A _{rms}	For Phoenix and Gryphon: $K_{f,0} = K_f$.
Continuous dissipation	$P_{d,c} = (T_{coil} - T_{int})/R_{th,i}$	W	Only copper losses are considered. This catalog considers $T_{int} = 20^\circ\text{C}$ and only heat dissipation towards the interface.
Peak dissipation	$P_{d,p} = C_{th} \alpha_T$	W	α_T is mentioned at the peak force specification. C_{th} is the heat capacitance of the coils only and not specified separately in the catalog.
Continuous rms current	$I_c = \min\left(\sqrt{\frac{P_{d,c}}{3R_{ph}}}, \frac{V_{dc}}{\sqrt{6}R_{ph}}\right)$	A _{rms}	Limited either by continuous dissipation or dc voltage and resistance or connector ratings (if applicable).
Peak rms current	$I_p = \min\left(\sqrt{\frac{P_{d,p}}{3R_{ph,20}}}, \frac{V_{dc}}{\sqrt{6}R_{ph,20}}\right)$	A _{rms}	Limited either by peak dissipation or dc voltage and resistance or connector ratings (if applicable).
Continuous force	$F_c = K_{f,c} I_c$	N	For Phoenix and Gryphon: $K_{f,c} = K_f$.
Peak force	$F_p = K_{f,p} I_p$	N	For Phoenix and Gryphon: $K_{f,p} = K_f$.
Steepness	$S = \frac{K_{f,0}^2}{3R_{ph,20}}$	N ² /W	For Phoenix and Gryphon: $K_{f,0} = K_f$.
Maximum velocity ($F = 0$)	$v_m = \frac{V_{dc}}{K_{e,ll,p}}$	m/s	Iron losses are not considered.
Maximum velocity ($F = F_p$)	$v_i = \left(\tau_p \sqrt{6\tau_p^2 K_{f,p}^2 V_{dc}^2 + 54\pi^2 (L_{ph}^2 I_p^2 V_{dc}^2 - 6L_{ph}^2 R_{ph,20}^2 I_p^4)} - 6\tau_p^2 K_{f,p} R_{ph,20} I_p\right) (2\tau_p^2 K_{f,p}^2 + 18\pi^2 L_{ph}^2 I_p^2)^{-1}$	m/s	For Phoenix and Gryphon: $K_{f,p} = K_f$. Iron losses are not considered.
Maximum velocity ($F = F_c$)	$v_n = \left(\tau_p \sqrt{6\tau_p^2 K_{f,c}^2 V_{dc}^2 + 54\pi^2 (L_{ph}^2 I_c^2 V_{dc}^2 - 6L_{ph}^2 R_{ph,100}^2 I_c^4)} - 6\tau_p^2 K_{f,c} R_{ph,100} I_c\right) (2\tau_p^2 K_{f,c}^2 + 18\pi^2 L_{ph}^2 I_c^2)^{-1}$	m/s	For Phoenix and Gryphon: $K_{f,c} = K_f$. Iron losses are not considered.



Force-velocity curves

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