SEW EURODRIVE

Addendum to the Manual

AC Motors

Inverter Assignments and Characteristic Curves
DRL80S, DRL180S, DRL200L

Edition 01/2010

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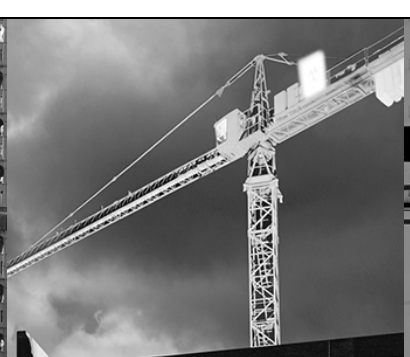


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1 Introduction

1.1 Contents of this publication

This manual is an addendum to the "AC Motors - Inverter Assignments and Characteristic Curves" manual, publication number 16858417 and its predecessor, publication number 16807626.

Due to the sales release of the DRL80S, DRL180S and DRL200L motors, the following information is published in the document at hand:

- Technical data of motors and brakemotors

- Motor/inverter assignment **DRL - MOVIDRIVE®**
- Dynamic and thermal limit characteristic curves DRL - MOVIDRIVE®

- Motor/inverter assignment **DRL - MOVIAXIS®**; **PWM = 8 kHz**; $V_{DC\ link}$ = 565 V and $V_{DC\ link}$ = 750 V
- Dynamic and thermal limit characteristic curves DRL-MOVIAXIS®; PWM = 8 kHz; $V_{DC\ link}$ = 565 V und $V_{DC\ link}$ = 750 V

- Motor/inverter assignment **DRL - MOVIAXIS®**; **PWM = 4 kHz**; $V_{DC\ link}$ = 565 V and $V_{DC\ link}$ = 750 V
- Dynamic and thermal limit characteristic curves DRL - MOVIAXIS®; PWM = 4 kHz; $V_{DC\ link}$ = 565 V und $V_{DC\ link}$ = 750 V

1.2 Copyright

2 Technical Data of DRL Motors

2.1 Key to the data tables

The following table lists the short symbols used in the "Technical Data" tables.

n_N	Rated speed
M_N	Rated torque
I_N	Rated current
J_{Mot}	Mass moment of inertia of the motor
M_{pk} Dyn1	Maximum limit torque (dynamics package 1)
M_{pk} Dyn2	Maximum limit torque (dynamics package 2)
m	Mass of the motor
BE..	Brake used
m_B	Mass of the brakemotor
J_{MOT_BE}	Mass moment of inertia of the brakemotor
M_B Dyn1	Braking torque (dynamics package 1)
M_B Dyn2	Braking torque (dynamics package 2)

2.2 Technical data of DRL asynchronous servomotors

Servomotors – System voltage: 400 V

n_N	Motor type	M_N [Nm]	IN [A]	M_{pk} Dyn1 [Nm]	M_{pk} Dyn2 [Nm]	m [kg]	J_{Mot} [10^{-4} kgm^2]
1200	**DRL80S**	6.5	2.15	10	25	11.5	14.9
	DRL180S	120	34.5	210	380	122	900
	DRL200L	200	58.5	475	680	260	2360
1700	**DRL80S**	6.5	2.96	10	25	11.5	14.9
	DRL180S	120	47.5	210	380	122	900
	DRL200L	200	80.6	475	680	260	2360
2100	**DRL80S**	6.2	3.59	10	25	11.5	14.9
	DRL180S	110	55.3	210	380	122	900
	DRL200L	195	99	475	680	260	2360
3000	**DRL80S**	6	4.82	10	25	11.5	14.9
	DRL180S	100	70.1	210	380	122	900
	DRL200L	165	118	475	680	260	2360

Servo brakemotors – System voltage: 400 V

n_N	Motor type	M_N [Nm]	IN [A]	BE..	M_B Dyn1 [Nm]	M_B Dyn2 [Nm]	m_B [kg][1)]	J_{Mot_BE} [10^{-4} kgm^2]
1200	**DRL80S**	6.5	2.15	BE2	10	20	15.2	19.4
	DRL180S	120	34.5	BE30	200	300	162	1030
	DRL200L	200	58.5	BE32	400	600	315	2590
1700	**DRL80S**	6.5	2.96	BE2	10	20	15.2	19.4
	DRL180S	120	47.5	BE30	200	300	162	1030
	DRL200L	200	80.6	BE32	400	600	315	2590
2100	**DRL80S**	6.2	3.59	BE2	10	20	15.2	19.4
	DRL180S	110	55.3	BE30	200	300	162	1030
	DRL200L	195	99	BE32	400	600	315	2590
3000	**DRL80S**	6	4.82	BE2	10	20	15.2	19.4
	DRL180S	100	70.1	BE30	200	300	162	1030
	DRL200L	165	118	BE32	400	600	315	2590

1) Applies to foot-mounted motor with brake (DRL...BE../FI..)

3 Combination Overviews, Characteristic Curves DRL - MOVIDRIVE®

3.1 Combination overviews DRL - MOVIDRIVE®

1. Rated speed n_N = 1200 1/min, dynamics package 1

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (size 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm	10		10								
	n_{base}	1/min	914		914								
DRL180S4	M_{max}	Nm											125
	n_{base}	1/min											1125
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 - 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DRL80S4	M_{max}	Nm										
	n_{base}	1/min										
DRL180S4	M_{max}	Nm	170	210								
	n_{base}	1/min	1063	1067								
DRL280L4	M_{max}	Nm		239	317	388	475					
	n_{base}	1/min		1128	1066	1000	925					

2. Rated speed n_N = 1200 1/min, dynamics package 2

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm	13	15.7	20.4	25	19.7	25					
	n_{base}	1/min	738	613	386	181	416	181					
DRL180S4	M_{max}	Nm											125
	n_{base}	1/min											1125
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 - 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DRL80S4	M_{max}	Nm										
	n_{base}	1/min										
DRL180S4	M_{max}	Nm	170	248	326	380						
	n_{base}	1/min	1063	940	821	739						
DRL280L4	M_{max}	Nm		239	317	388	475	561	680			
	n_{base}	1/min		1128	1066	1000	925	847	753			

3. Rated speed n_N = 1700 1/min, dynamics package 1

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm	9.1	10			10						
	n_{base}	1/min	1429	1447			1500						
DRL180S4	M_{max}	Nm											
	n_{base}	1/min											
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1320-503 (sizes 3 - 6):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)									
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320
DRL80S4	M_{max}	Nm										
	n_{base}	1/min										
DRL180S4	M_{max}	Nm	121	179	210	210						
	n_{base}	1/min	1586	1485	1498	1529						
DRL280L4	M_{max}	Nm			221	273	336	399	475			
	n_{base}	1/min			1621	1566	1496	1424	1332			

4. Rated speed n_N = 1700 1/min, dynamics package 2

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm	9.1	11.1	14.6	18.9	14.1	19.5	25				
	n_{base}	1/min	1429	1318	1130	896	1154	861	591				
DRL180S4	M_{max}	Nm											
	n_{base}	1/min											
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1600-503 (size 3 - 7):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320	1600
DRL80S4	M_{max}	Nm											
	n_{base}	1/min											
DRL180S4	M_{max}	Nm	121	179	235	288	352	380					
	n_{base}	1/min	1586	1485	1371	1270	1142	1089					
DRL280L4	M_{max}	Nm			221	273	336	399	495	650	680		
	n_{base}	1/min			1621	1566	1496	1424	1304	1128	1097		

5. Rated speed n_N = 2100 1/min, dynamics package 1

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max} Nm			10	10	10	10					
	n_{base} 1/min			1957	2033	1927	2033					
DRL180S4	M_{max} Nm											
	n_{base} 1/min											
DRL280L4	M_{max} Nm											
	n_{base} 1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B1600-503 (size 3 - 7):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
		0150	0220	0300	0370	0450	0550	0750	0900	1100	1320	1600
DRL80S4	M_{max} Nm											
	n_{base} 1/min											
DRL180S4	M_{max} Nm		140	185	210	210						
	n_{base} 1/min		1981	1880	1902	1964						
DRL280L4	M_{max} Nm				217	269	320	399	475			
	n_{base} 1/min				2019	1957	1886	1777	1671			

6. Rated speed n_N = 2100 1/min, dynamics package 2

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
		0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max} Nm			11.5	15.1	11.2	15.6	19.9	25			
	n_{base} 1/min			1728	1517	1752	1488	1230	949			
DRL180S4	M_{max} Nm											
	n_{base} 1/min											
DRL280L4	M_{max} Nm											
	n_{base} 1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B2000-503 (size 3 - 7):

Motor		MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)											
		0150	0220	0300	0370	0450	0550	0750	0900	1100	1320	1600	2000
DRL80S4	M_{max} Nm												
	n_{base} 1/min												
DRL180S4	M_{max} Nm		140	185	227	278	329	380					
	n_{base} 1/min		1981	1880	1785	1661	1538	1423					
DRL280L4	M_{max} Nm				217	269	320	399	524	618	680		
	n_{base} 1/min				2019	1957	1886	1777	1593	1468	1386		

7. Rated speed n_N = 3000 1/min, dynamics package 1

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm				10	7.8	10	10				
	n_{base}	1/min				2794	2830	2841	3064				
DRL180S4	M_{max}	Nm											
	n_{base}	1/min											
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B2500-503 (size 3 - 7):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)											
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320	1600	2000	2500
DRL80S4	M_{max}	Nm													
	n_{base}	1/min													
DRL180S4	M_{max}	Nm			132	163	200	210							
	n_{base}	1/min			2777	2693	2584	2720							
DRL280L4	M_{max}	Nm						224	281	372	439	475			
	n_{base}	1/min						2835	2738	2570	2437	2375			

8. Rated speed n_N = 3000 1/min, dynamics package 2

Assignment of MOVIDRIVE® MDX61B0005-5A3 ... MDX61B0110-503 (sizes 0 - 2):

Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)										
			0005	0008	0011	0014	0015	0022	0030	0040	0055	0075	0110
DRL80S4	M_{max}	Nm				10.7	7.8	11	14.2	19.5	25		
	n_{base}	1/min				2630	2830	2607	2378	2003	1634		
DRL180S4	M_{max}	Nm											
	n_{base}	1/min											
DRL280L4	M_{max}	Nm											
	n_{base}	1/min											

Assignment of MOVIDRIVE® MDX61B0150-503 ... MDX61B2500-503 (sizes 3 - 7):

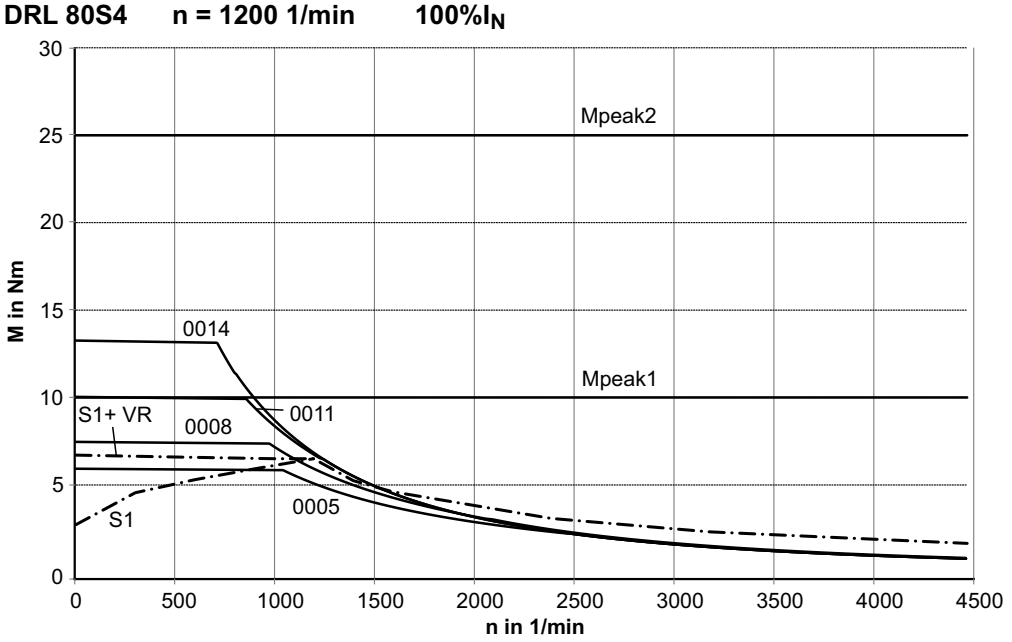
Motor			MOVIDRIVE® MDX61B...-5_3 (AC 400/500 V units) in CFC operating modes (P700)											
			0150	0220	0300	0370	0450	0550	0750	0900	1100	1320	1600	2000	2500
DRL80S4	M_{max}	Nm													
	n_{base}	1/min													
DRL180S4	M_{max}	Nm			132	163	200	210	238	296	380				
	n_{base}	1/min			2777	2693	2584	2720	2469	2285	2025				
DRL280L4	M_{max}	Nm						224	281	372	439	551	662	680	
	n_{base}	1/min						2835	2738	2570	2437	2218	2015	1984	

3.2 Characteristic curves DRL - MOVIDRIVE®

Key to the dynamic and thermal characteristic curves

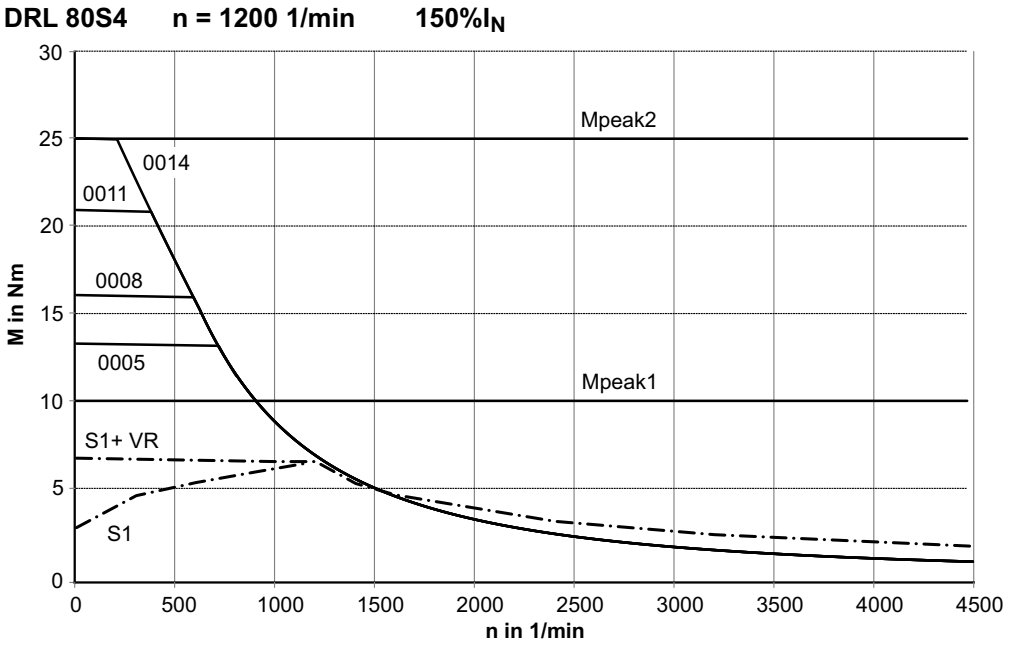
S1	S1 characteristic curve (thermal limit characteristic curve)
S1+VR	S1 characteristic curve with forced cooling fan (thermal limit characteristic curve)
M_{peak1}	Maximum limit torque of dynamics package 1
M_{peak2}	Maximum limit torque of dynamics package 2
0005	0.5 kW inverter output
0008	0.75 kW inverter output
0011	1.1 kW inverter output
0014	1.4 kW inverter output
0015	1.5 kW inverter output
0022	2.2 kW inverter output
0030	3 kW inverter output
0040	4 kW inverter output
0055	5.5 kW inverter output
0075	7.5 kW inverter output
0110	11 kW inverter output
0150	15 kW inverter output
0220	22 kW inverter output
0300	30 kW inverter output
0370	37 kW inverter output
0450	45 kW inverter output
0550	55 kW inverter output
0750	75 kW inverter output
0900	90 kW inverter output
1100	110 kW inverter output
1320	132 kW inverter output
1600	160 kW inverter output
2000	200 kW inverter output
2500	250 kW inverter output

DRL80S4, n_N = 1200 min^{-1}, 100% I_N



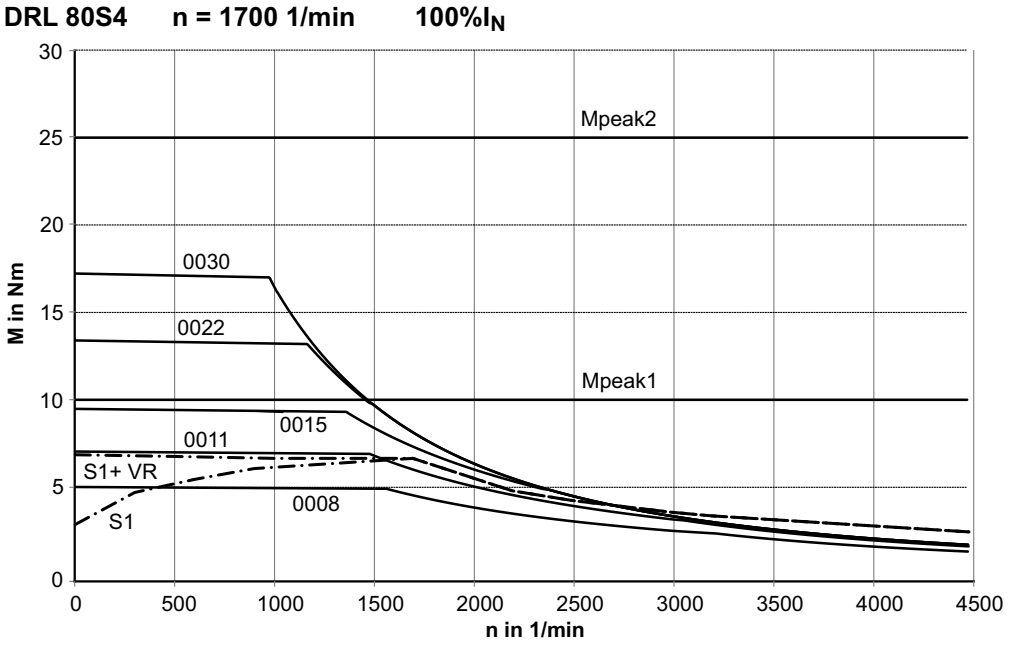
67113axx

DRL80S4, n_N = 1200 min^{-1}, 150% I_N



67114axx

DRL80S4, n_N = 1700 min^{-1}, 100% I_N



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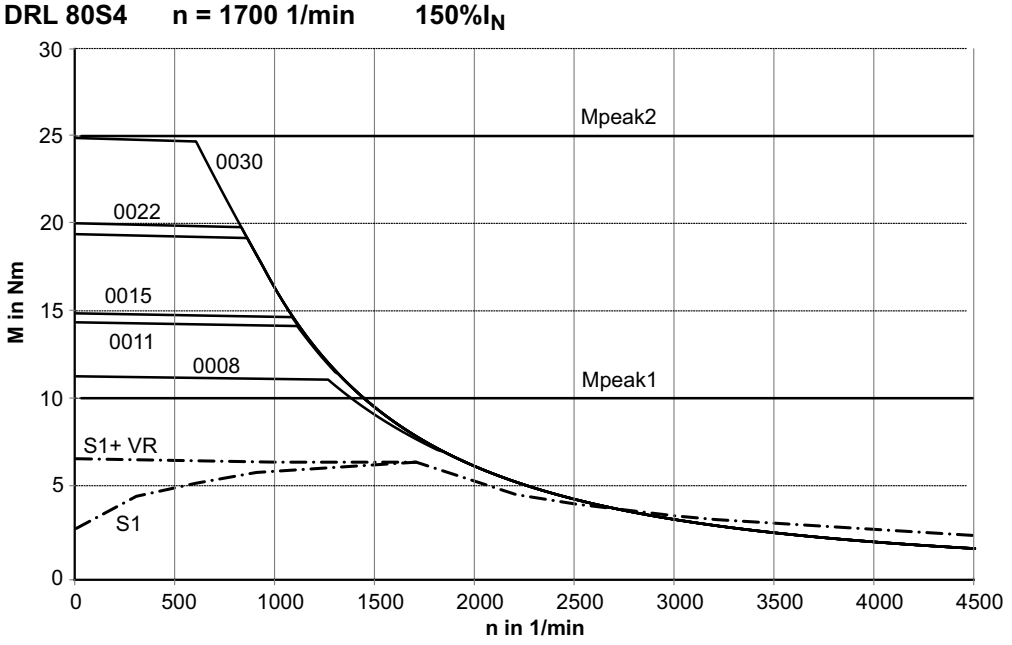

67116axx

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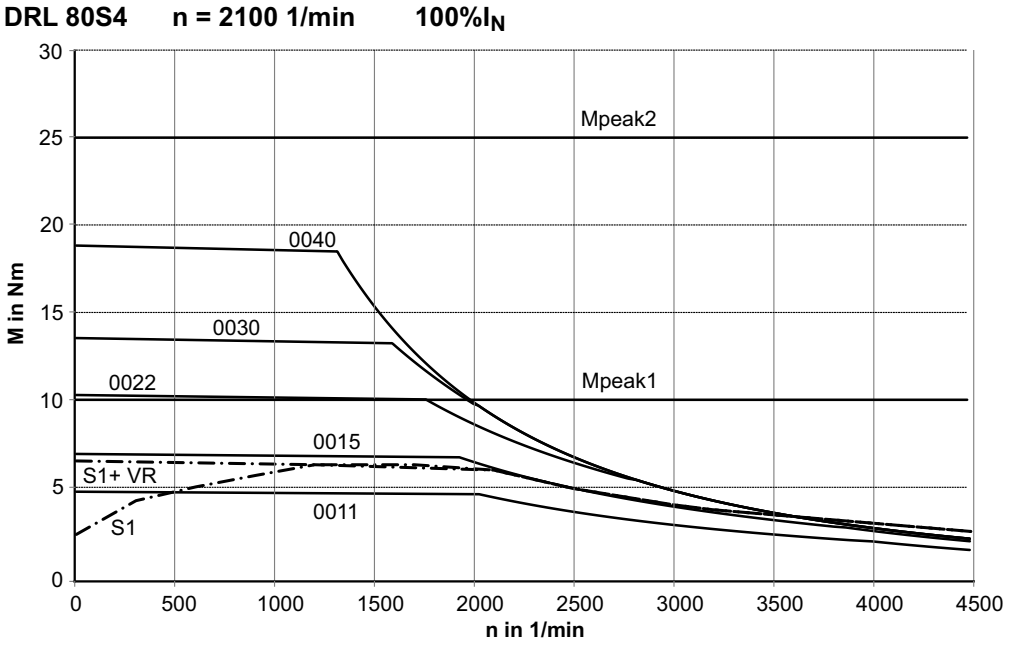
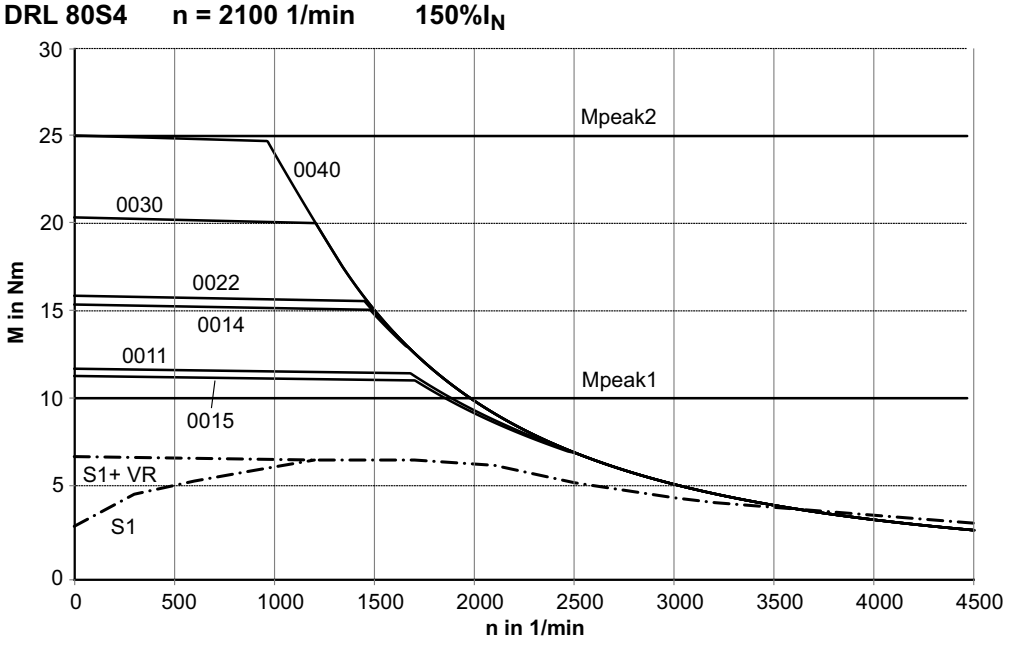


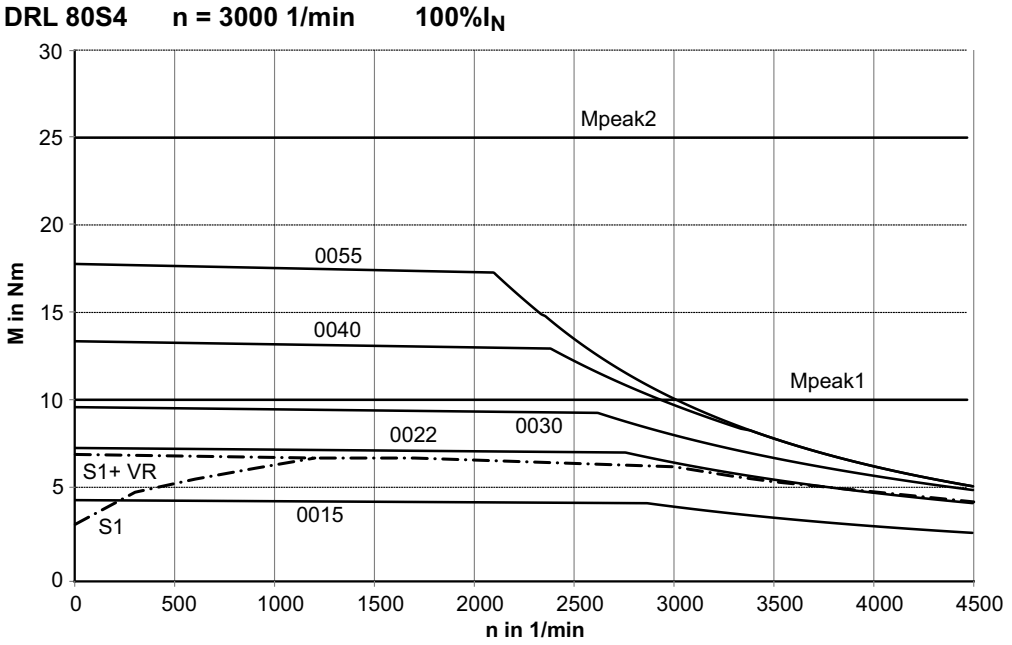
67117axx

DRL80S4, n_N = 2100 min^{-1}, 150% I_N



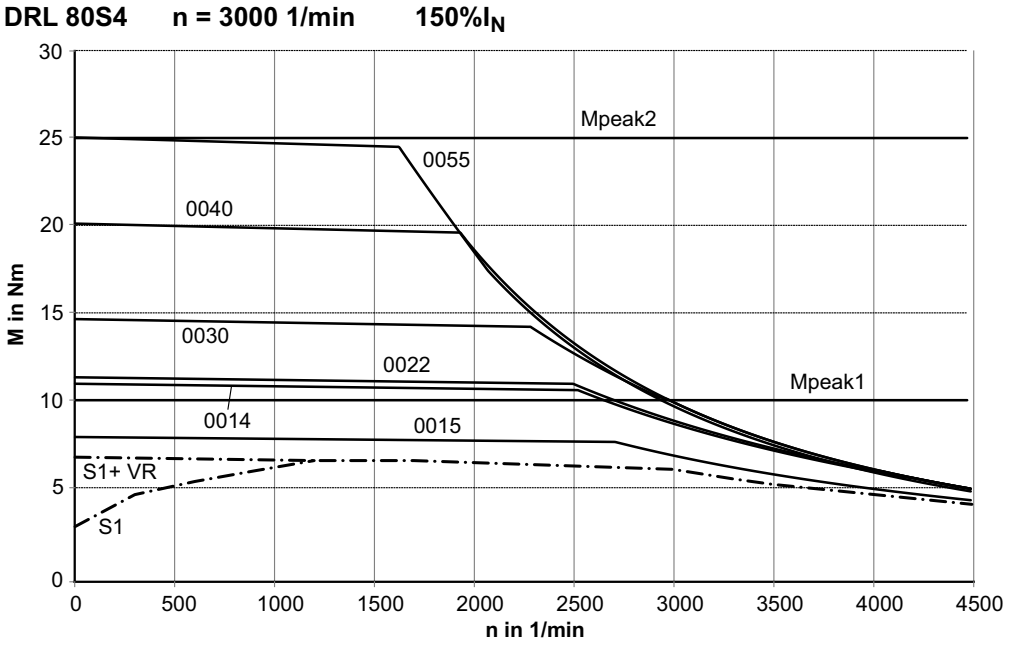
67118axx

DRL80S4, n_N = 3000 min^{-1}, 100% I_N



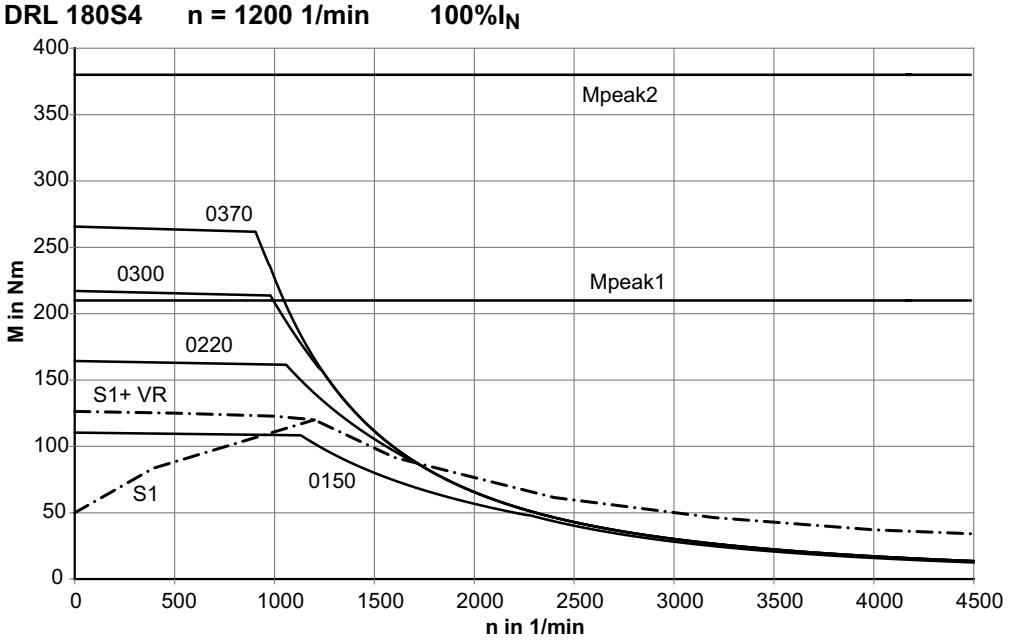
67119axx

DRL80S4, n_N = 3000 min^{-1}, 150% I_N



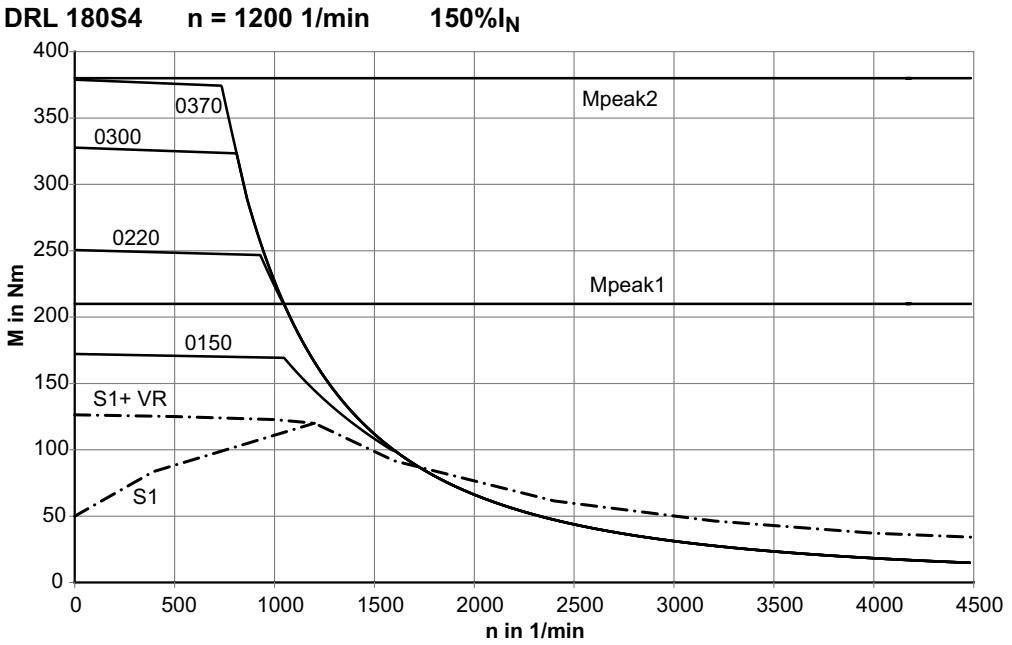
67120axx

DRL180S4, n_N = 1200 min^{-1}, 100% I_N



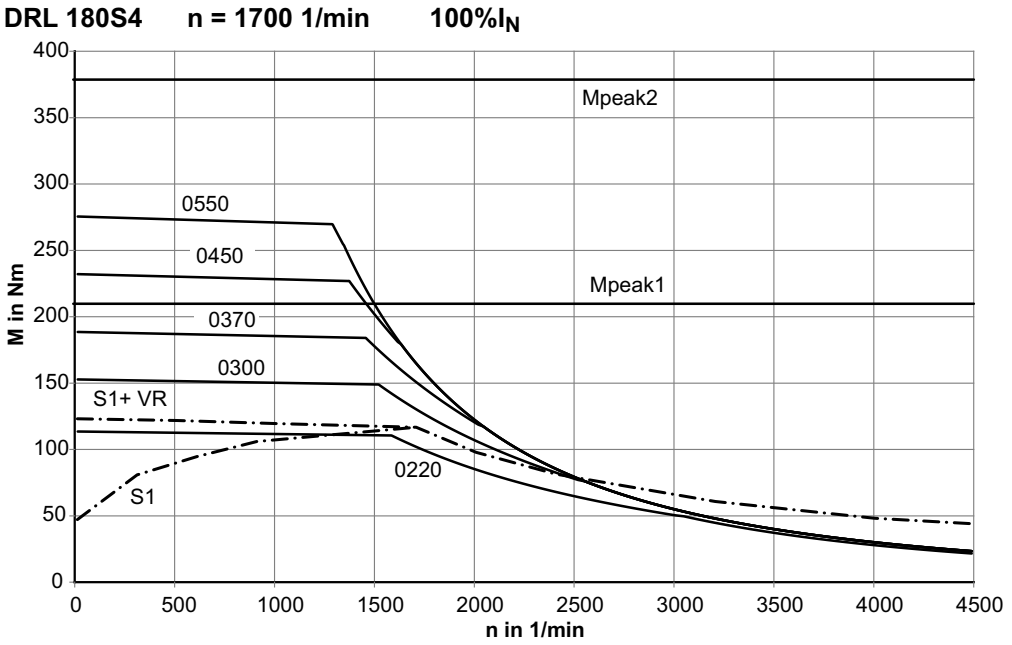
67121axx

DRL180S4, n_N = 1200 min^{-1}, 150% I_N



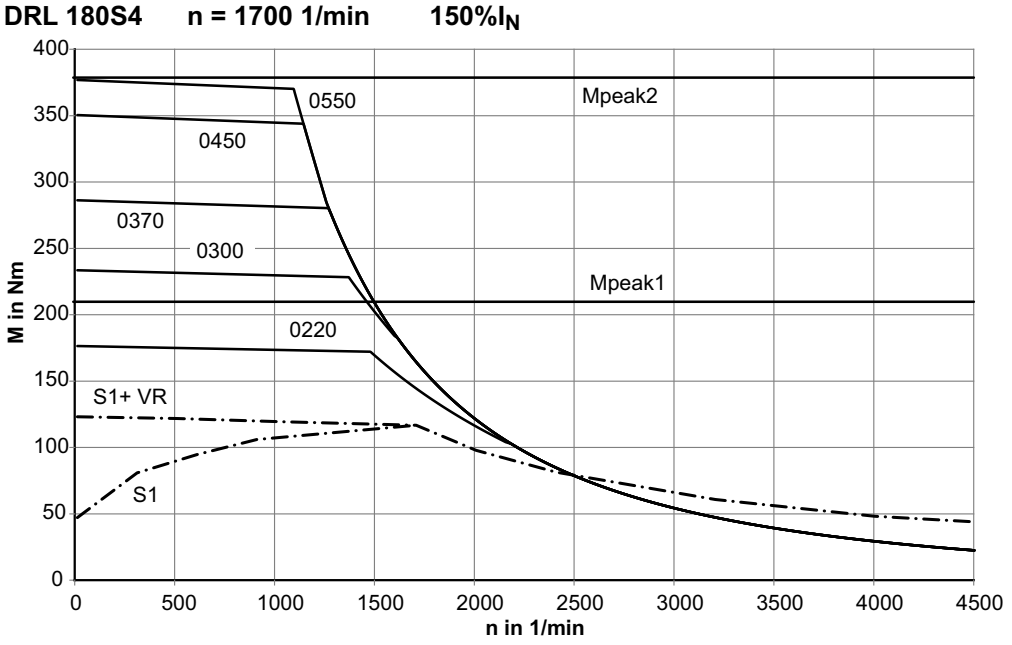
67122axx

DRL180S4, n_N = 1700 min^{-1}, 100% I_N



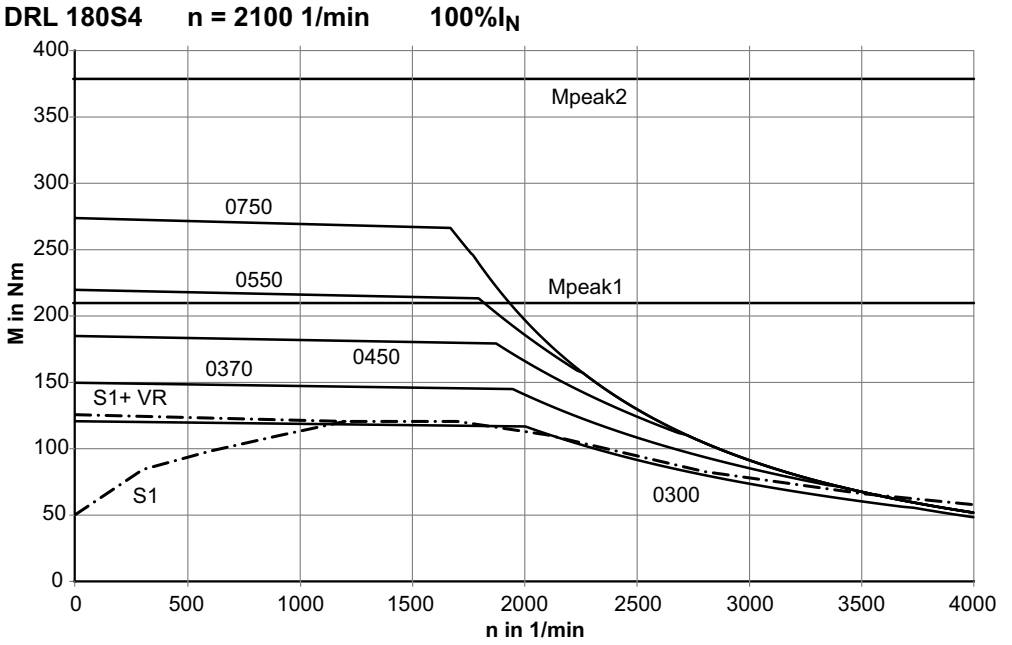
67123axx

DRL180S4, n_N = 1700 min^{-1}, 150% I_N



67124axx

DRL180S4, n_N = 2100 min^{-1}, 100% I_N



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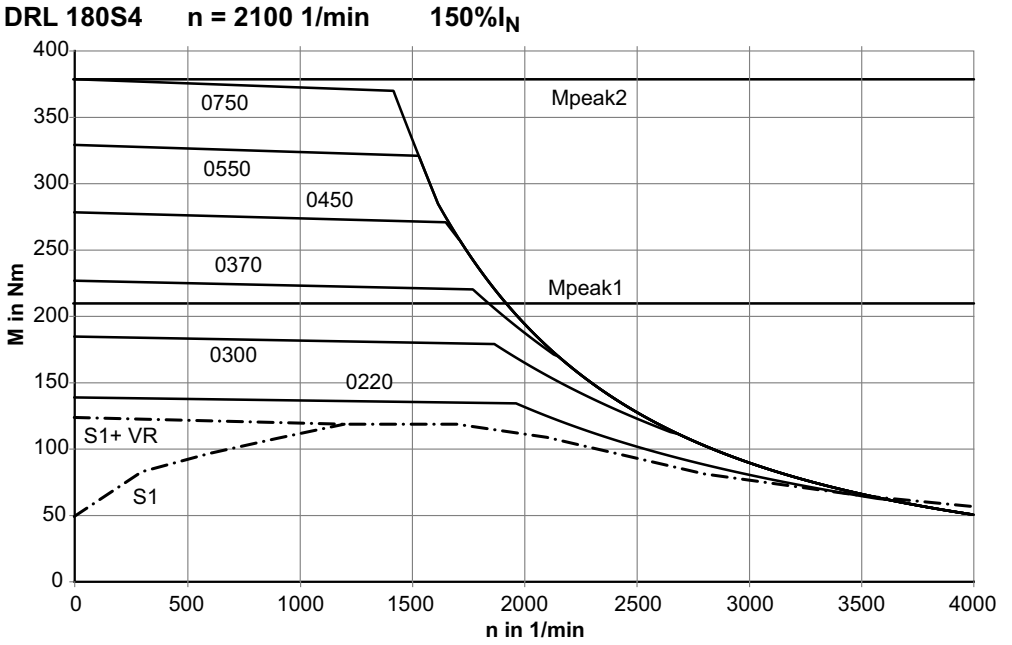
DRL180S4, n_N = 2100 min^{-1}, 150% I_N



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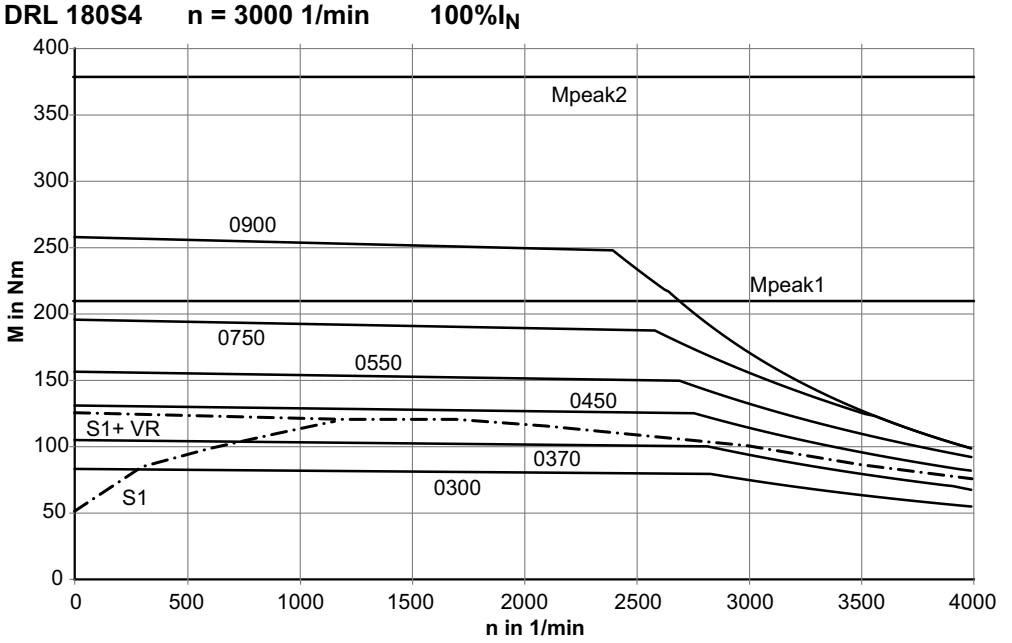
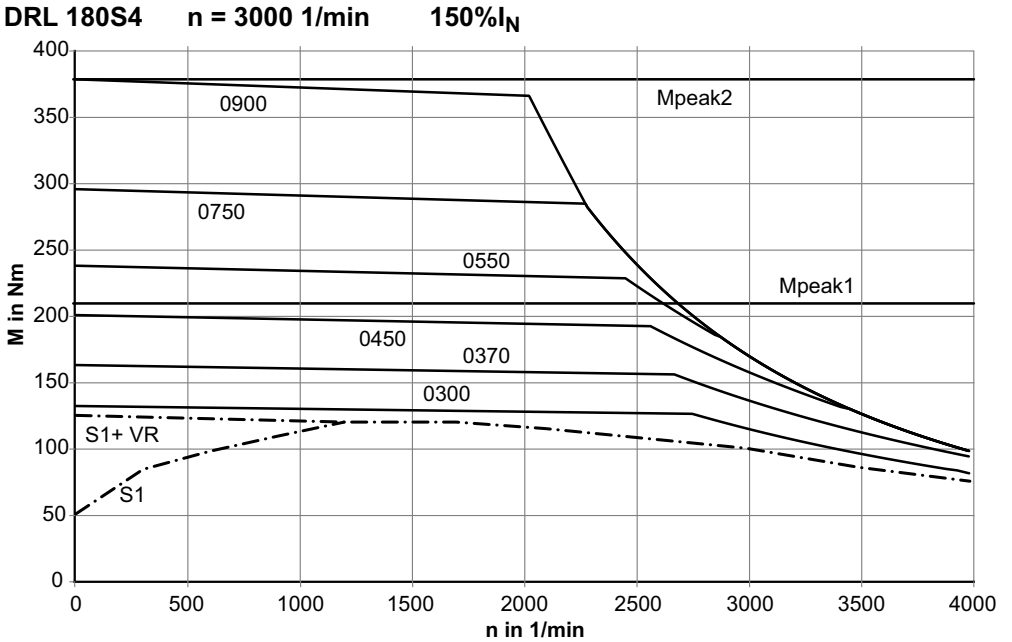
DRL180S4, n_N = 3000 min^{-1}, 100% I_N



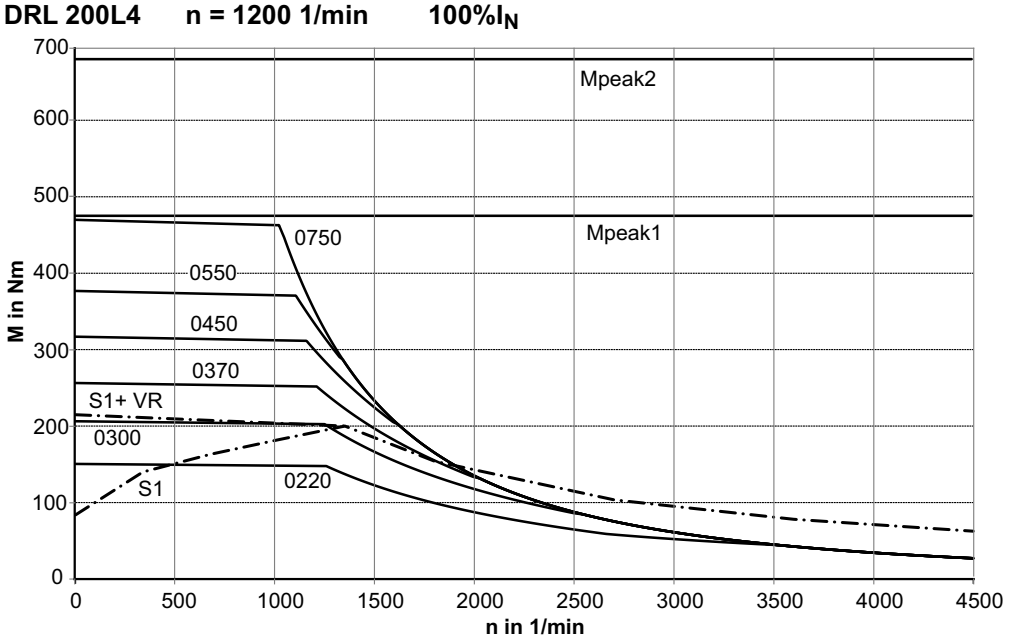
67127axx

DRL180S4, n_N = 3000 min^{-1}, 150% I_N



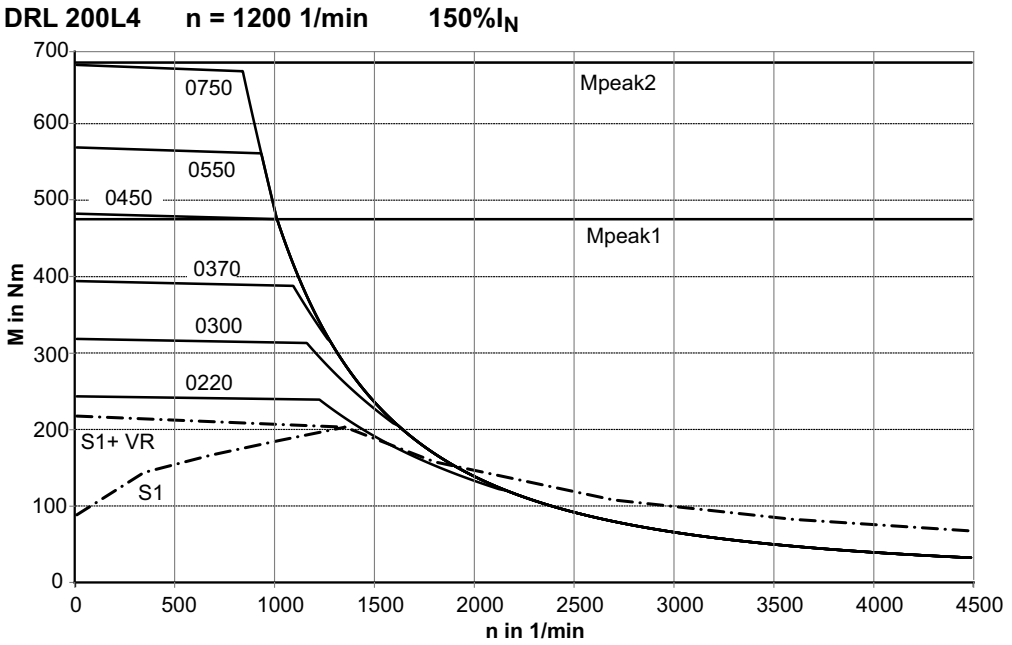
67128axx

DRL200L4, n_N = 1200 min^{-1}, 100% I_N



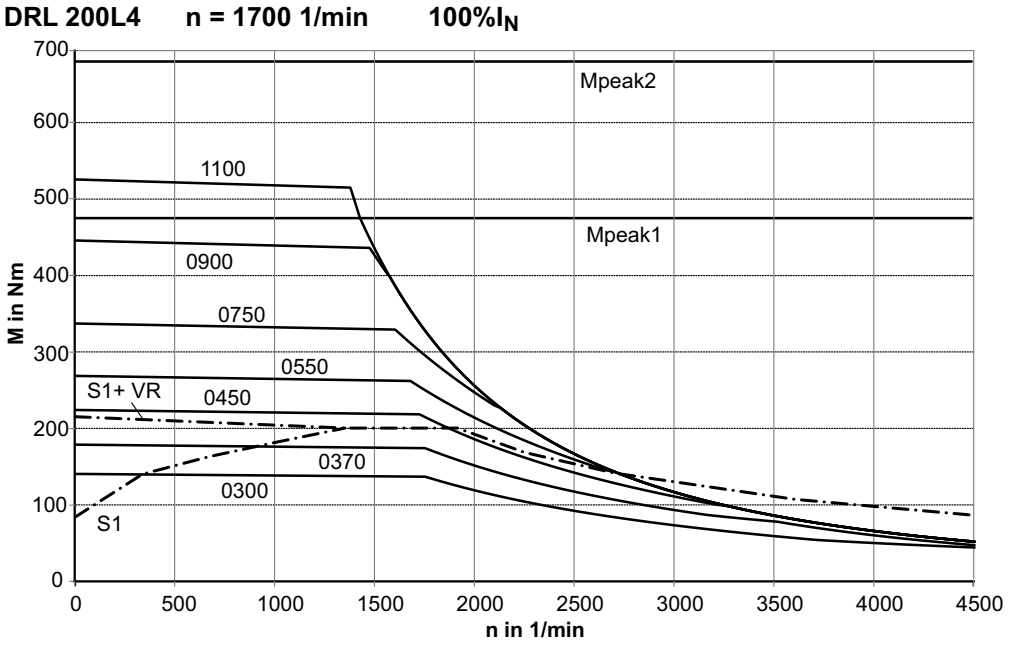
67129axx

DRL200L4, n_N = 1200 min^{-1}, 150% I_N



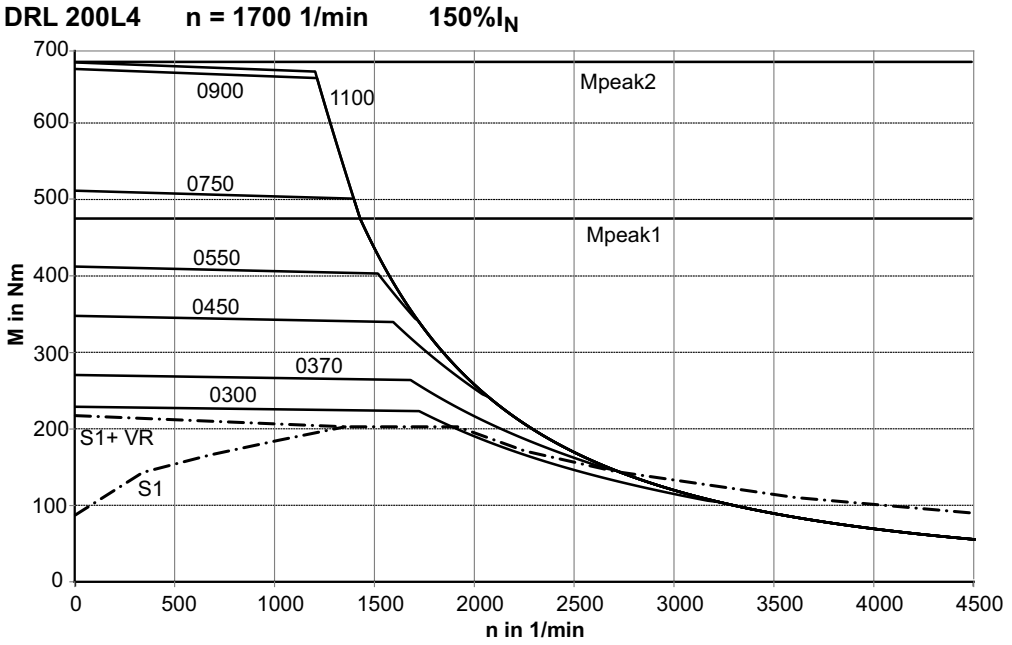
67130axx

DRL200L4, n_N = 1700 min^{-1}, 100% I_N



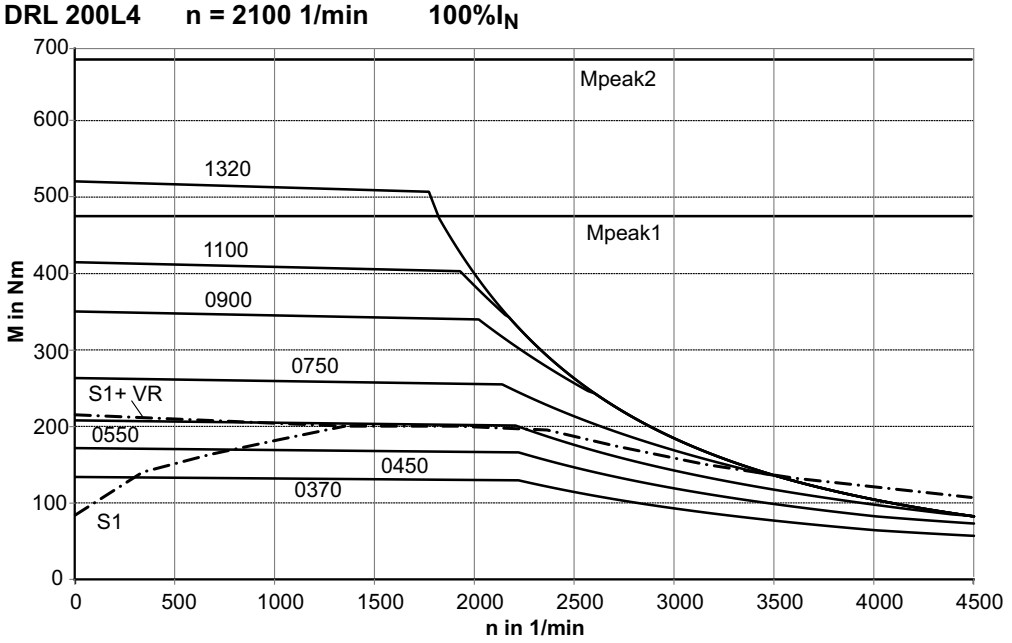
67131axx

DRL200L4, n_N = 1700 min^{-1}, 150% I_N



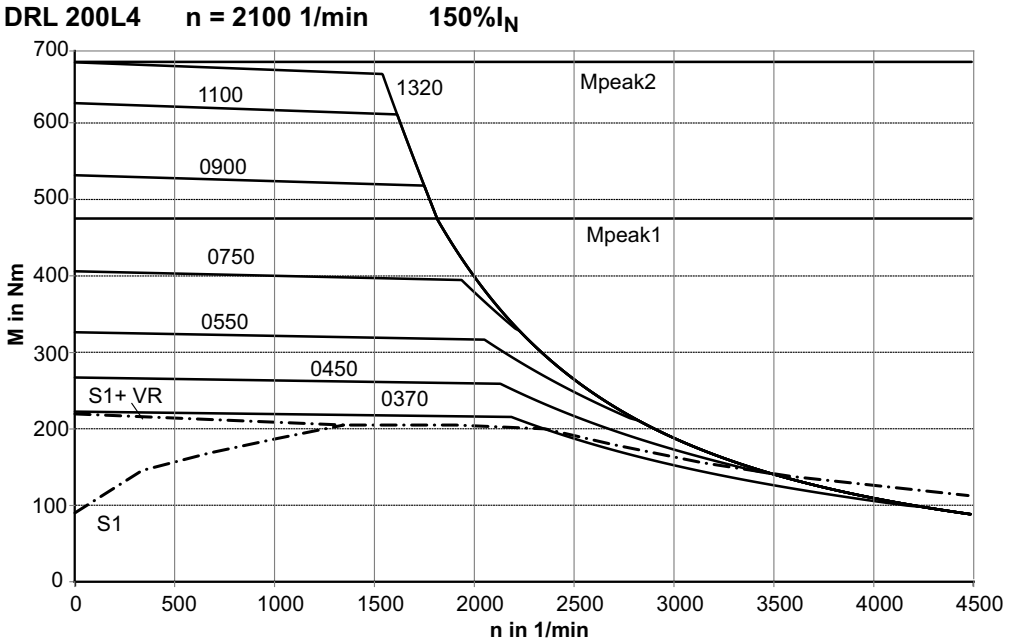
67132axx

DRL200L4, n_N = 2100 min^{-1}, 100% I_N



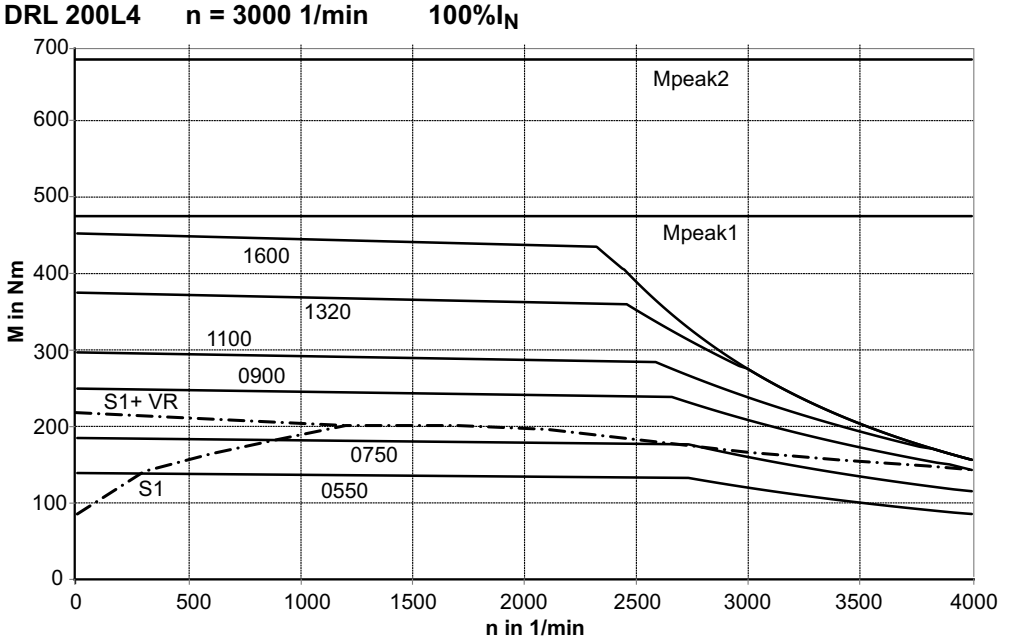
67133axx

DRL200L4, n_N = 2100 min^{-1}, 150% I_N



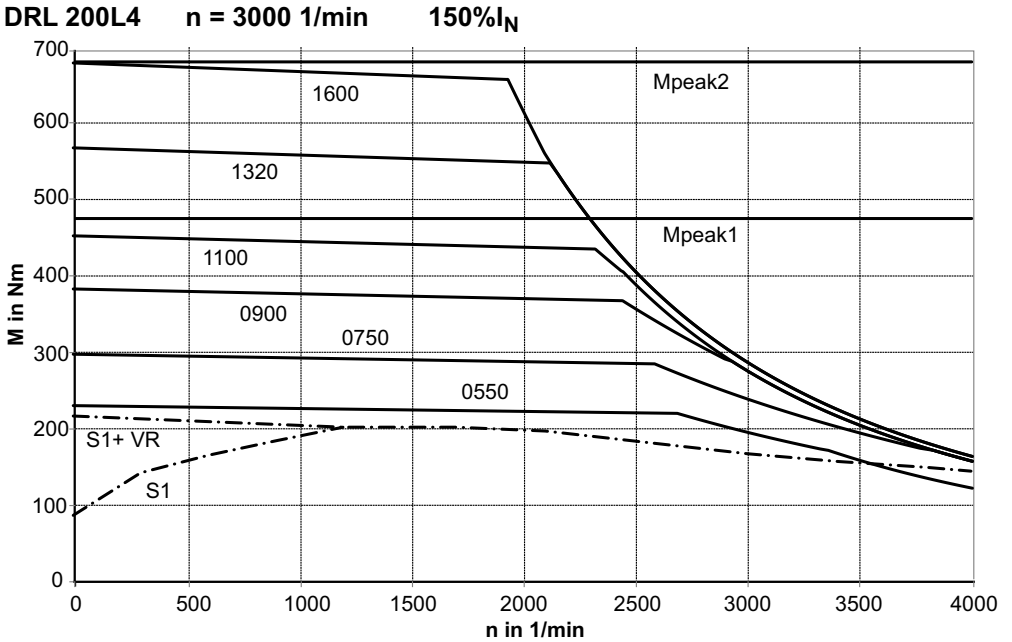
67134axx

DRL200L4, n_N = 3000 min^{-1}, 100% I_N



67135axx

DRL200L4, n_N = 3000 min^{-1}, 150% I_N



67136axx

4 Combination Overview, Characteristic Curves DRL - MOVIAXIS®, 8 kHz

4.1 Combination overviews DRL - MOVIAXIS®, PWM = 8 kHz

1. Rated speed n_N = 1200 1/min, dynamics package 1, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	15.33									
DRL80S4	n_{base} V_{line}=400 V	1/min	914									
	n_{base} $V_{DC\ link}$=750 V	1/min	1400									
	M_{max}	Nm							266.27	421.33		
DRL180S4	n_{base} V_{line}= 400 V	1/min							1068	1068		
	n_{base} $V_{DC\ link}$= 750 V	1/min							1468	1468		
	M_{max}	Nm									539.24	876.11
DRL200L4	n_{base} V_{line}= 400 V	1/min									926	926
	n_{base} $V_{DC\ link}$= 750 V	1/min									1258	1258

2. Rated speed n_N = 1200 1/min, dynamics package 2, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	15.33	32.66								
DRL80S4	n_{base} V_{line}= 400 V	1/min	574	182								
	n_{base} $V_{DC\ link}$= 750 V	1/min	961	527								
	M_{max}	Nm							266.27	421.33	571.66	
DRL180S4	n_{base} V_{line}= 400 V	1/min							875	738	738	
	n_{base} $V_{DC\ link}$= 750 V	1/min							1213	1042	1042	
	M_{max}	Nm									539.24	876.11
DRL200L4	n_{base} V_{line}= 400 V	1/min									840	754
	n_{base} $V_{DC\ link}$= 750 V	1/min									1148	1035

3. Rated speed n_N = 1700 1/min, dynamics package 1, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
DRL80S4	M_{max}	Nm	16.85									
	n_{base} V_{line}= 400 V	1/min	1471									
	n_{base} $V_{DC\ link}$= 750 V	1/min	2115									
DRL180S4	M_{max}	Nm								294.16	406.24	
	n_{base} V_{line}= 400 V	1/min								1534	1534	
	n_{base} $V_{DC\ link}$= 750 V	1/min								2083	2083	
DRL200L4	M_{max}	Nm									358.66	609.69
	n_{base} V_{line}= 400 V	1/min									1418	1336
	n_{base} $V_{DC\ link}$= 750 V	1/min									1879	1781

4. Rated speed n_N = 1700 1/min, dynamics package 2, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
DRL80S4	M_{max}	Nm	16.85	35.54								
	n_{base} V_{line}= 400 V	1/min	1295	656								
	n_{base} $V_{DC\ link}$= 750 V	1/min	1863	1131								
DRL180S4	M_{max}	Nm								294.16	406.24	650.9
	n_{base} V_{line}= 400 V	1/min								1217	1094	1094
	n_{base} $V_{DC\ link}$= 750 V	1/min								1670	1512	1512
DRL200L4	M_{max}	Nm									358.66	609.69
	n_{base} V_{line}= 400 V	1/min									1418	1148
	n_{base} $V_{DC\ link}$= 750 V	1/min									1906	1559

5. Rated speed n_N = 2100 1/min, dynamics package 1, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		17.98								
DRL80S4	n_{base} V_{line}= 400 V	1/min		2045								
	n_{base} $V_{DC\ link}$= 750 V	1/min		2912								
	M_{max}	Nm								221.42	313.63	510.78
DRL180S4	n_{base} V_{line}= 400 V	1/min								1973	1973	1973
	n_{base} $V_{DC\ link}$= 750 V	1/min								2668	2668	2668
	M_{max}	Nm										475.9
DRL200L4	n_{base} V_{line}= 400 V	1/min										1680
	n_{base} $V_{DC\ link}$= 750 V	1/min										2254

6. Rated speed n_N = 2100 1/min, dynamics package 2, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		17.98	37.67							
DRL80S4	n_{base} V_{line}= 400 V	1/min		1301	955							
	n_{base} $V_{DC\ link}$= 750 V	1/min		3012	1535							
	M_{max}	Nm									313.63	510.78
DRL180S4	n_{base} V_{line}= 400 V	1/min									1538	1428
	n_{base} $V_{DC\ link}$= 750 V	1/min									2092	1956
	M_{max}	Nm										475.9
DRL200L4	n_{base} V_{line}= 400 V	1/min										1621
	n_{base} $V_{DC\ link}$= 750 V	1/min										2176

7. Rated speed n_N = 3000 1/min, dynamics package 1, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		12.16								
DRL80S4	n_{base} V_{line}= 400 V	1/min		3076								
	n_{base} $V_{DC\ link}$= 750 V	1/min		4277								
	M_{max}	Nm								138.08	212.36	361.73
DRL180S4	n_{base} V_{line}= 400 V	1/min								2668	2747	2782
	n_{base} $V_{DC\ link}$= 750 V	1/min								3568	3687	3735
	M_{max}	Nm										
DRL200L4	n_{base} V_{line}= 400 V	1/min										
	n_{base} $V_{DC\ link}$= 750 V	1/min										

8. Rated speed n_N = 3000 1/min, dynamics package 2, PWM = 8 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		12.16	26.8							
DRL80S4	n_{base} V_{line}= 400 V	1/min		2446	1641							
	n_{base} $V_{DC\ link}$= 750 V	1/min		3398	2438							
	M_{max}	Nm								138.08	212.36	361.73
DRL180S4	n_{base} V_{line}= 400 V	1/min								2668	2474	2044
	n_{base} $V_{DC\ link}$= 750 V	1/min								3568	3327	2769
	M_{max}	Nm										
DRL200L4	n_{base} V_{line}= 400 V	1/min										
	n_{base} $V_{DC\ link}$= 750 V	1/min										

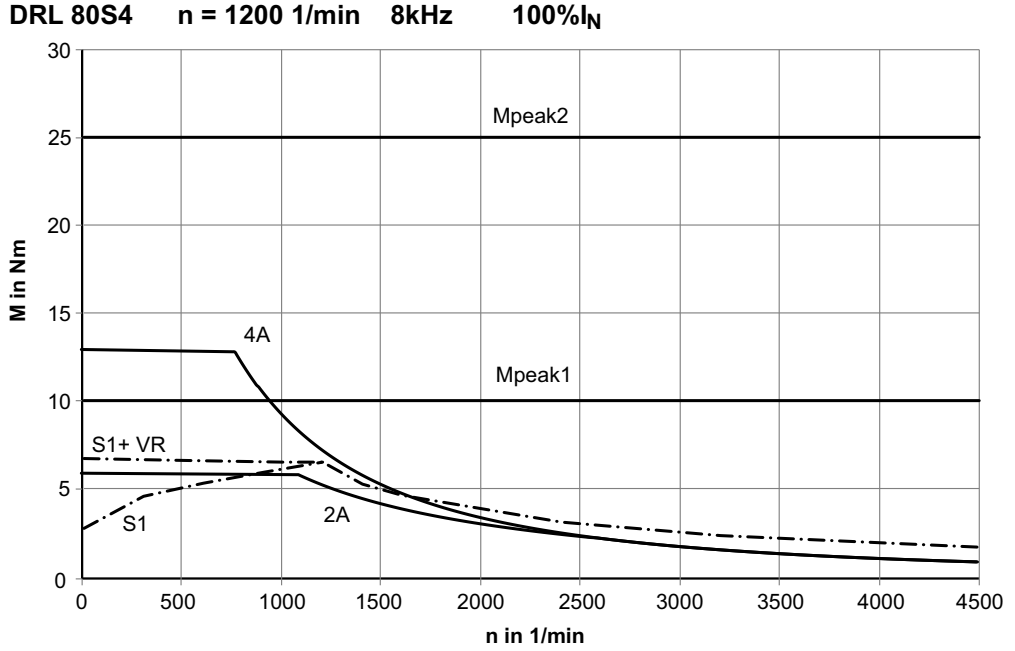
4.2 Limit characteristic curves DRL - MOVIAXIS®, $V_{DC\ link}$ = 565 V, PWM = 8 kHz

Key to the dynamic and thermal limit characteristic curves

S1	S1 characteristic curve (thermal limit characteristic curve)
S1+VR	S1 characteristic curve with forced cooling fan (thermal limit characteristic curve)
M_{peak1}	Maximum limit torque of dynamics package 1
M_{peak2}	Maximum limit torque of dynamics package 2
2 A	2 A nominal output current of the axis module
4 A	4 A nominal output current of the axis module
8 A	8 A nominal output current of the axis module
12 A	12 A nominal output current of the axis module
16 A	16 A nominal output current of the axis module
24 A	24 A nominal output current of the axis module
32 A	32 A nominal output current of the axis module
48 A	48 A nominal output current of the axis module
64 A	64 A nominal output current of the axis module
100 A	100 A nominal output current of the axis module

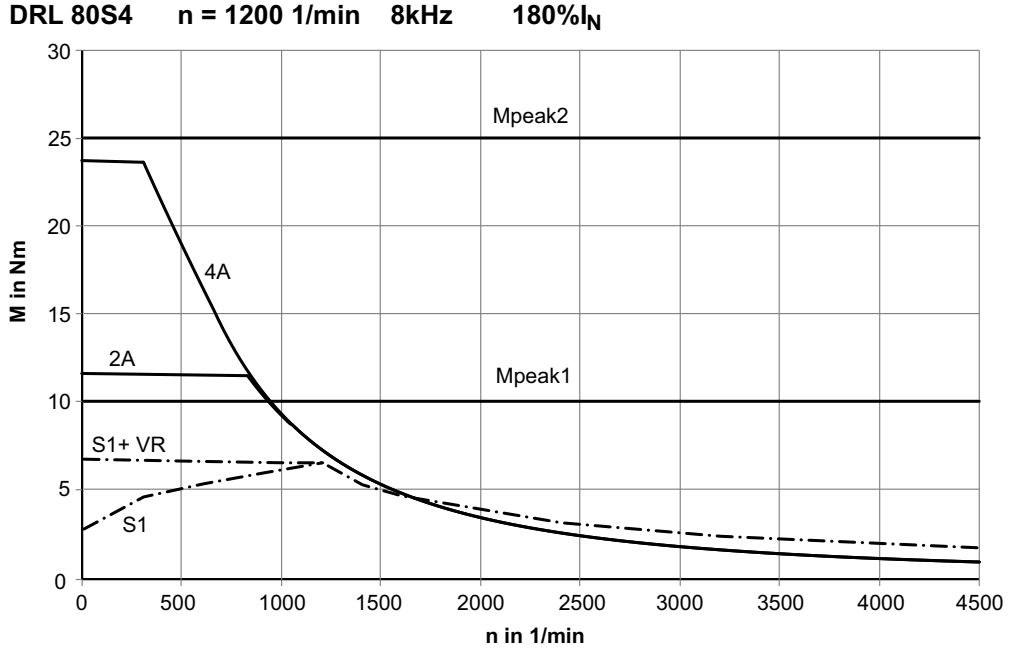
$V_{DC\ link}$ = DC link voltage

DRL80S4, n_N = 1200 min^{-1}, 100% I_N



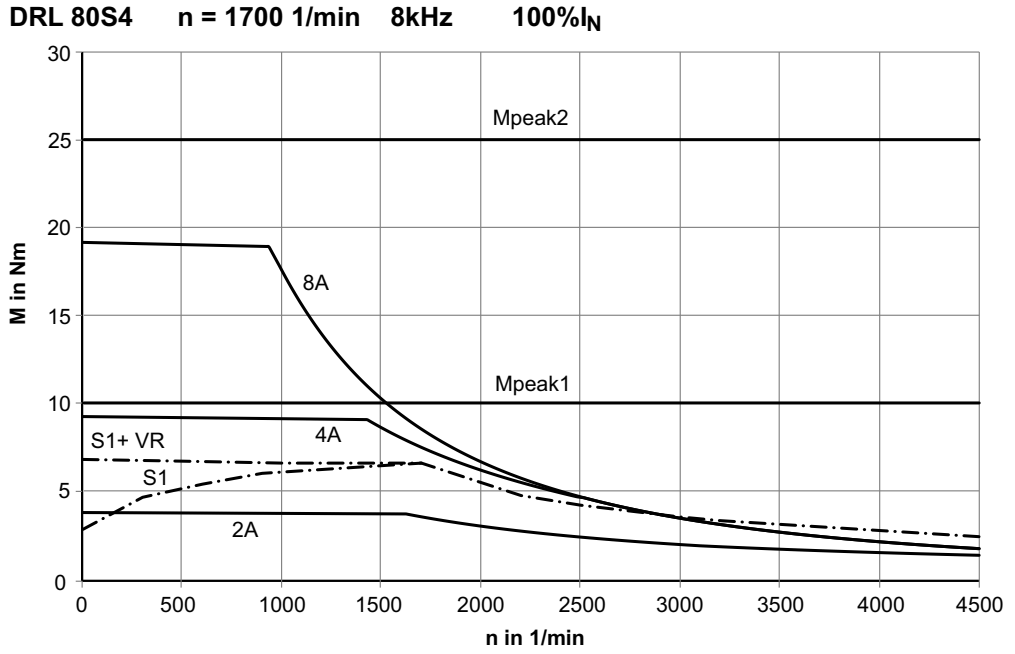
67809axx

DRL80S4, n_N = 1200 min^{-1}, 180% I_N



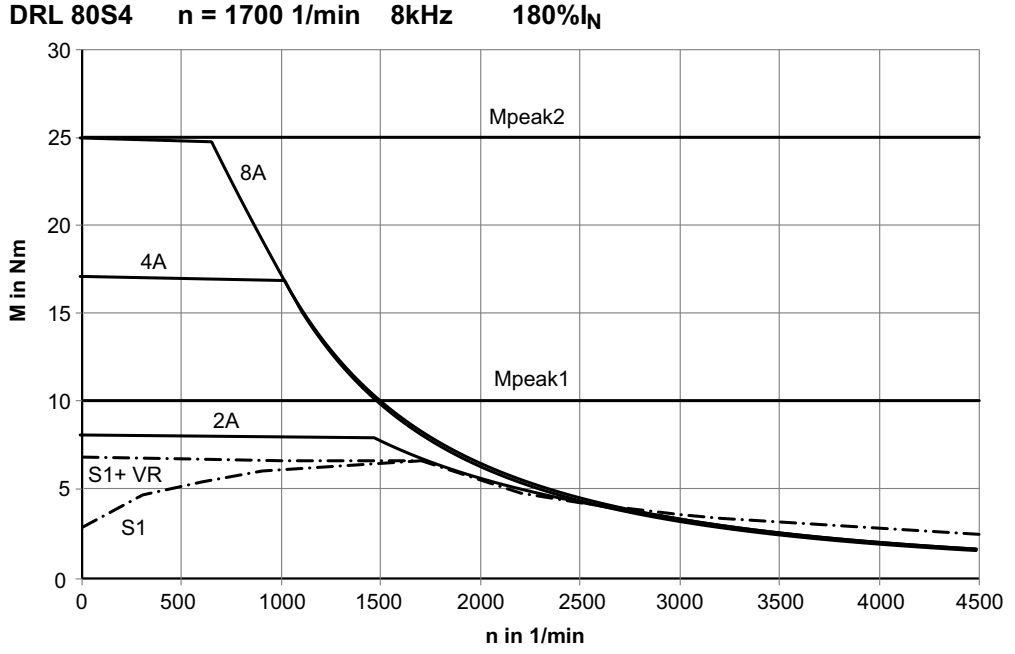
67810axx

DRL80S4, n_N = 1700 min^{-1}, 100% I_N



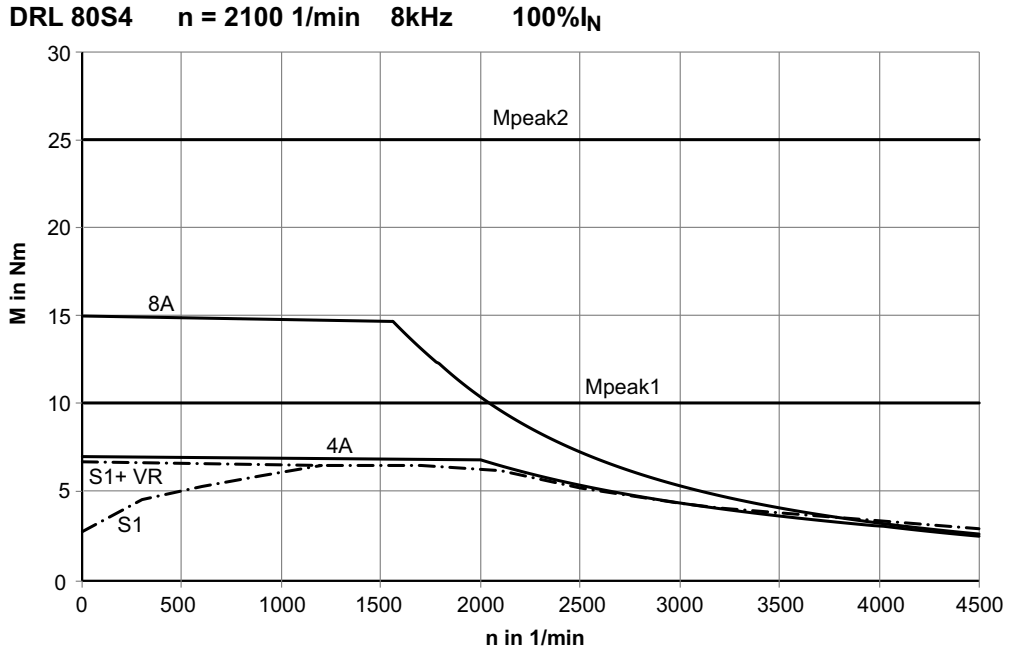
67811axx

DRL80S4, n_N = 1700 min^{-1}, 180% I_N



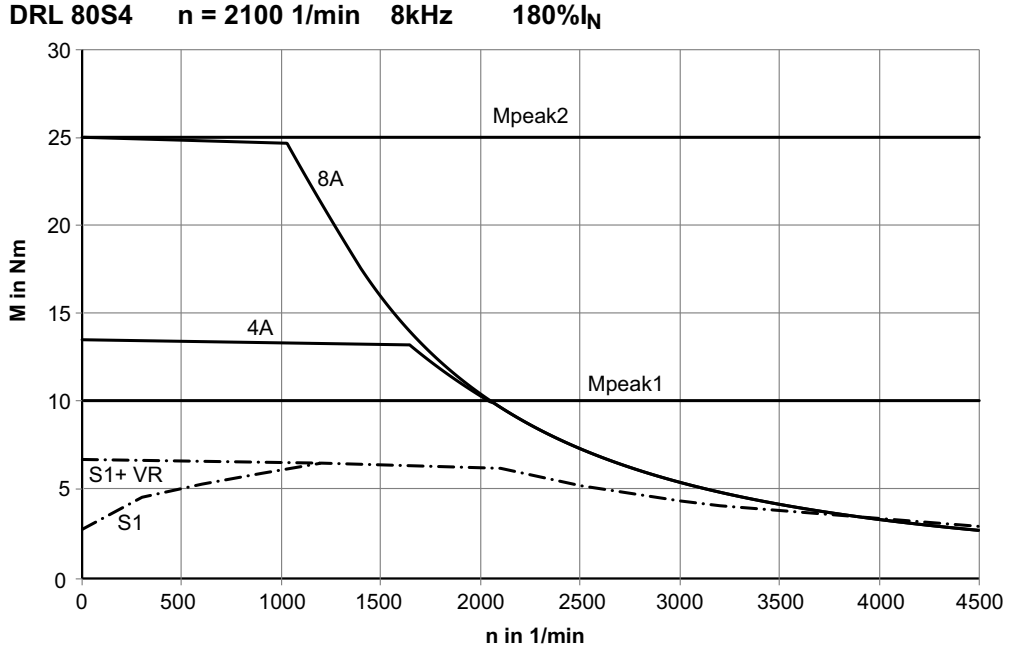
67812axx

DRL80S4, n_N = 2100 min^{-1}, 100% I_N



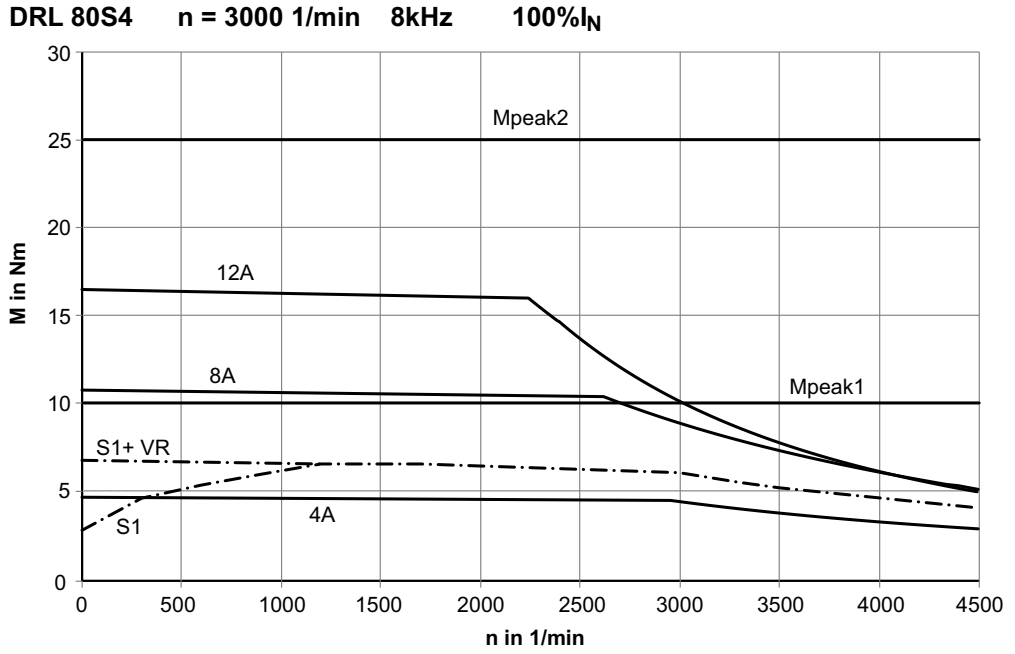
67813axx

DRL80S4, n_N = 2100 min^{-1}, 180% I_N



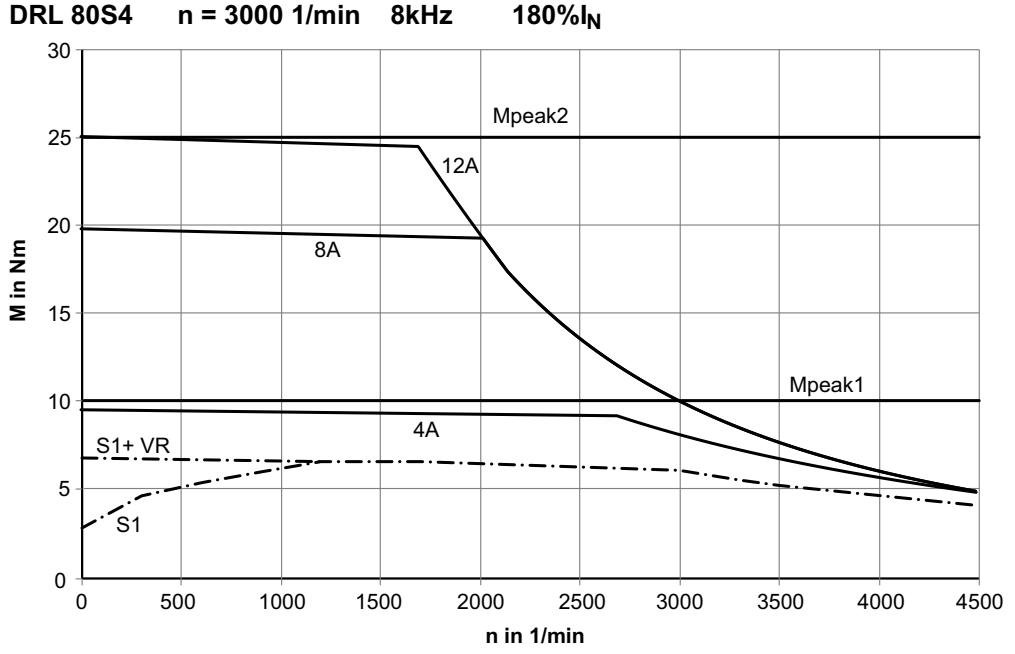
67814axx

DRL80S4, n_N = 3000 min^{-1}, 100% I_N



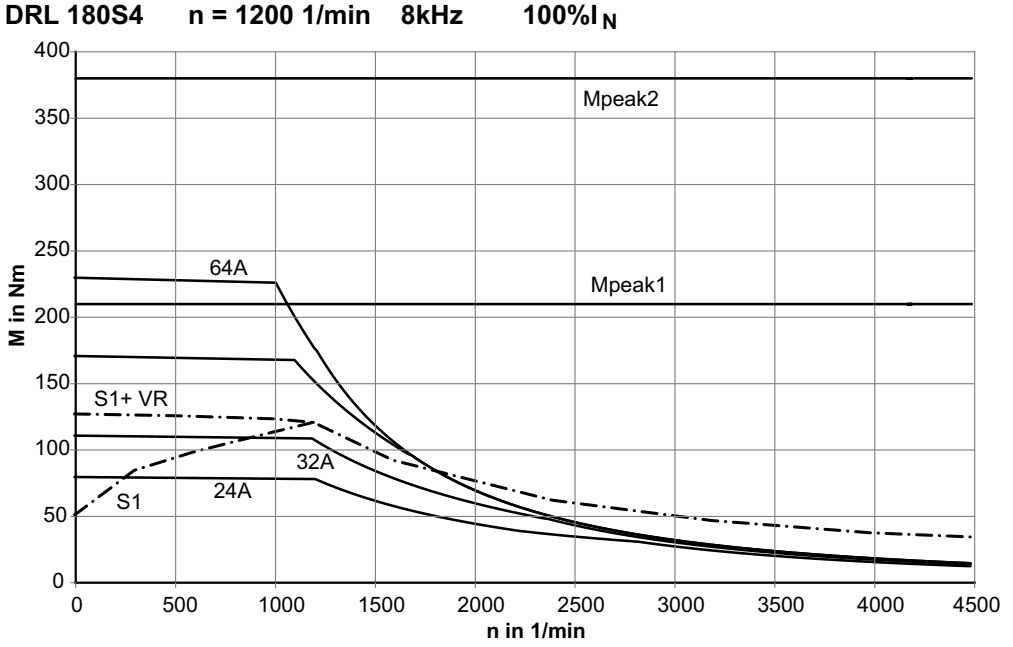
67815axx

DRL80S4, n_N = 3000 min^{-1}, 180% I_N



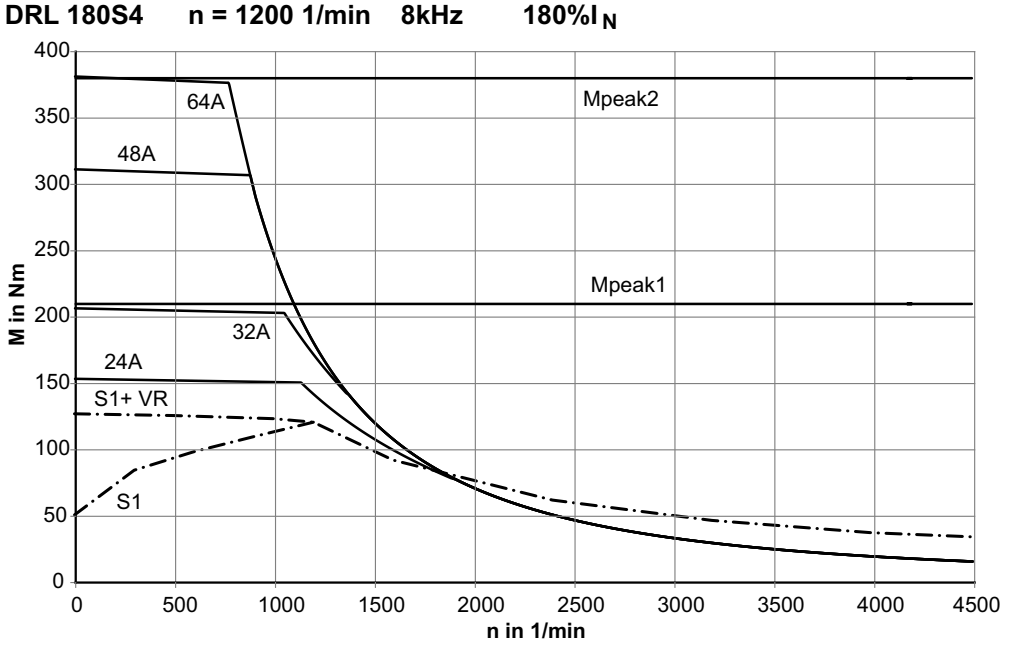
67816axx

DRL180S4, n_N = 1200 min^{-1}, 100% I_N



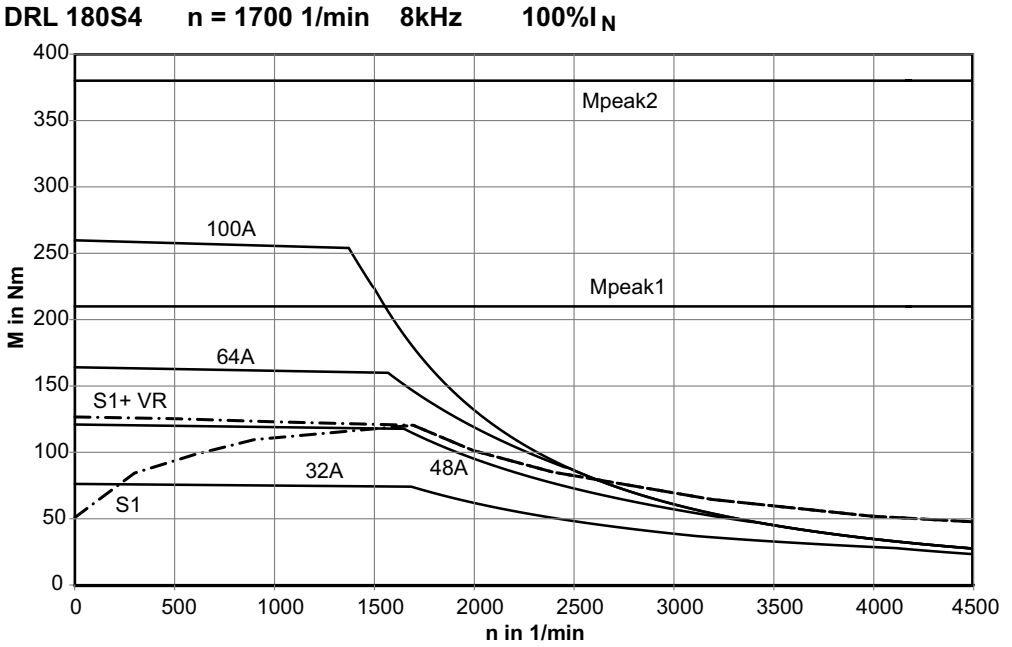
67825axx

DRL180S4, n_N = 1200 min^{-1}, 180% I_N



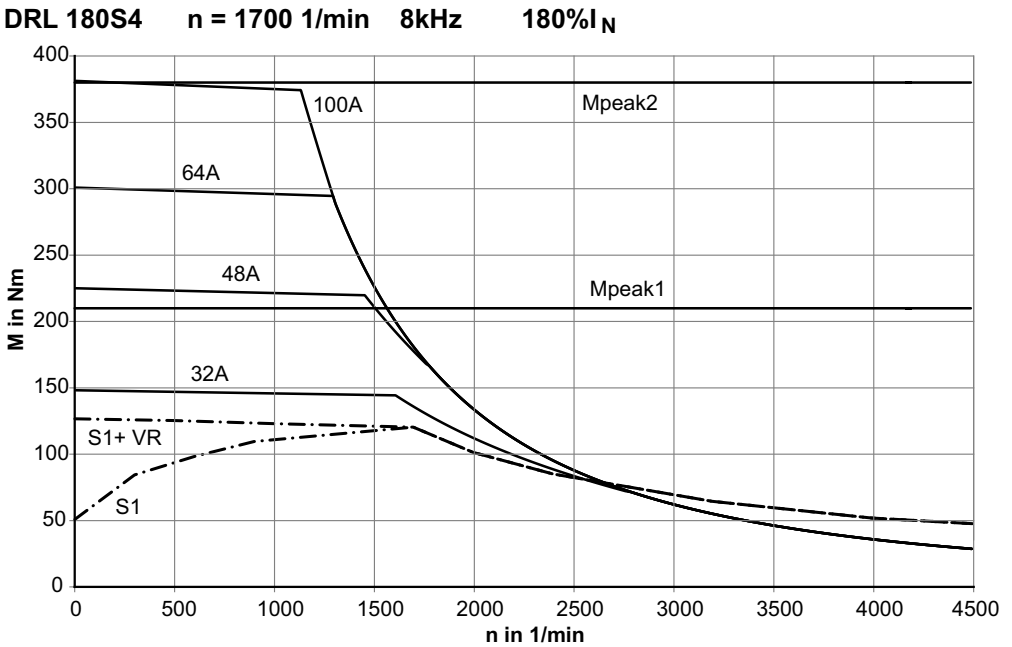
67826axx

DRL180S4, n_N = 1700 min^{-1}, 100% I_N



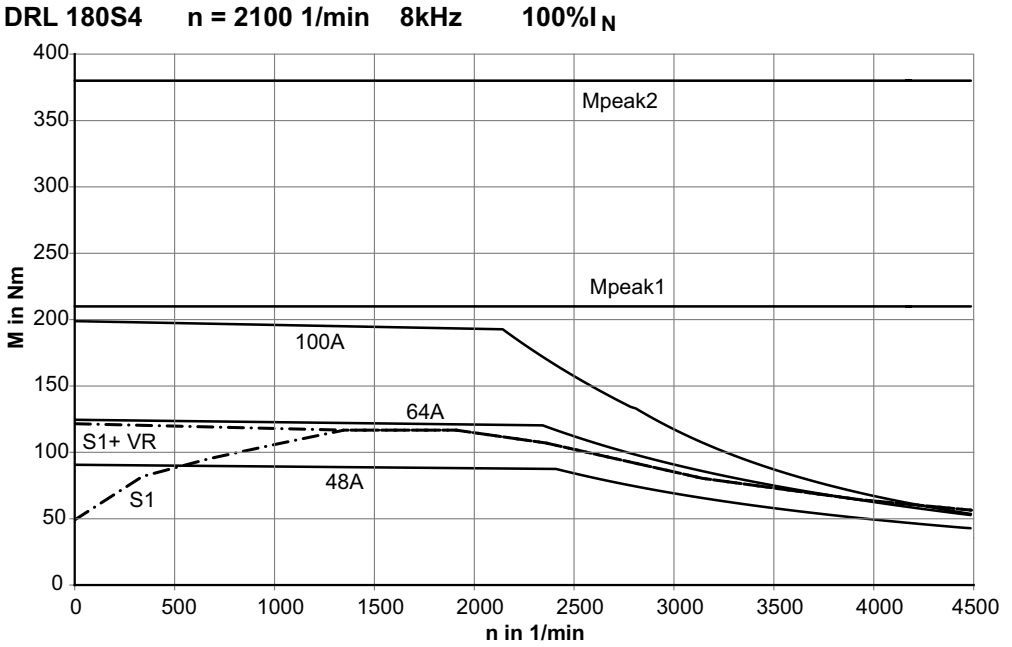
67827axx

DRL180S4, n_N = 1700 min^{-1}, 180% I_N



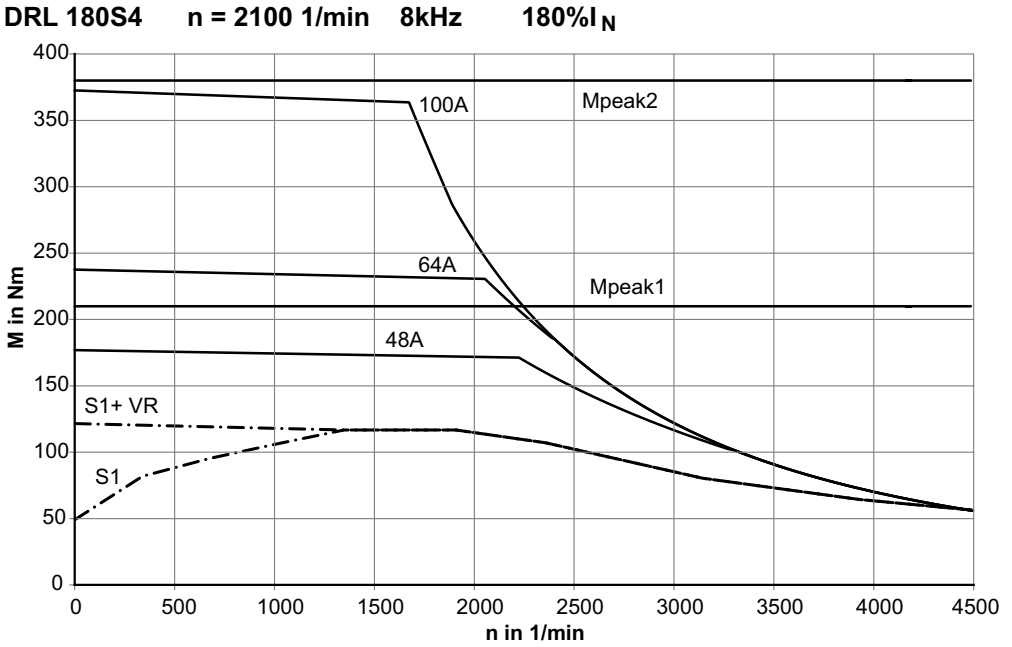
67828axx

DRL180S4, n_N = 2100 min^{-1}, 100% I_N



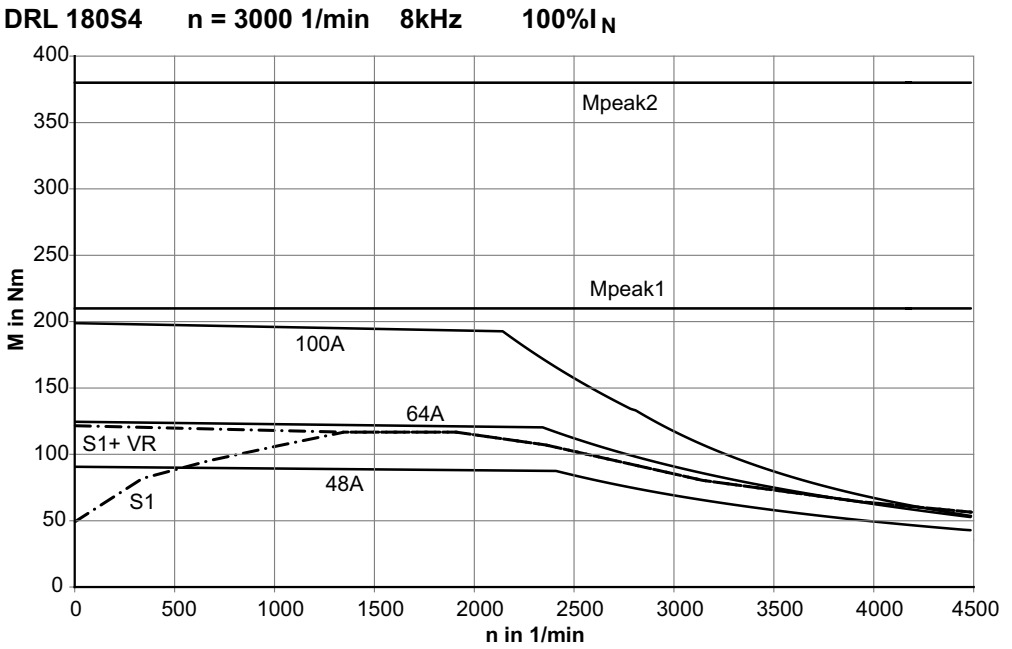
67829axx

DRL180S4, n_N = 2100 min^{-1}, 180% I_N



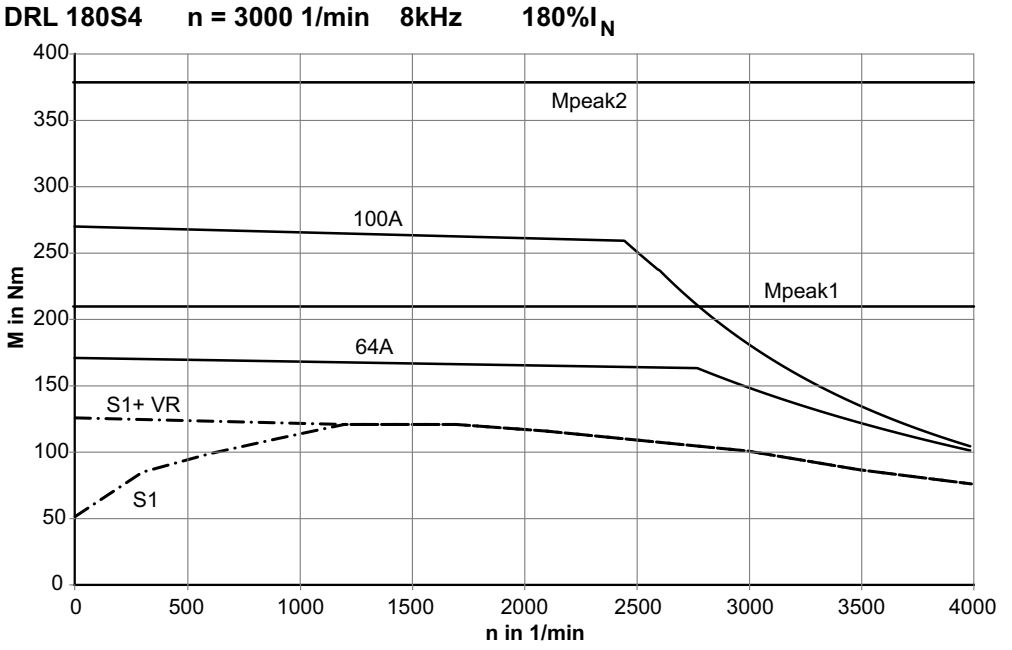
67830axx

DRL180S4, n_N = 3000 min^{-1}, 100% I_N



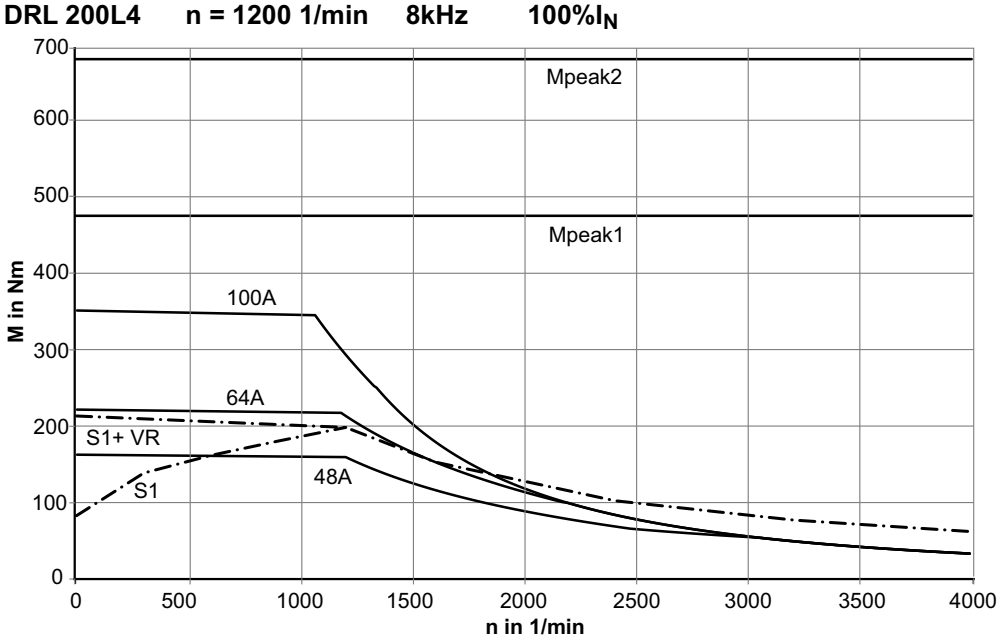
67831axx

DRL180S4, n_N = 3000 min^{-1}, 180% I_N



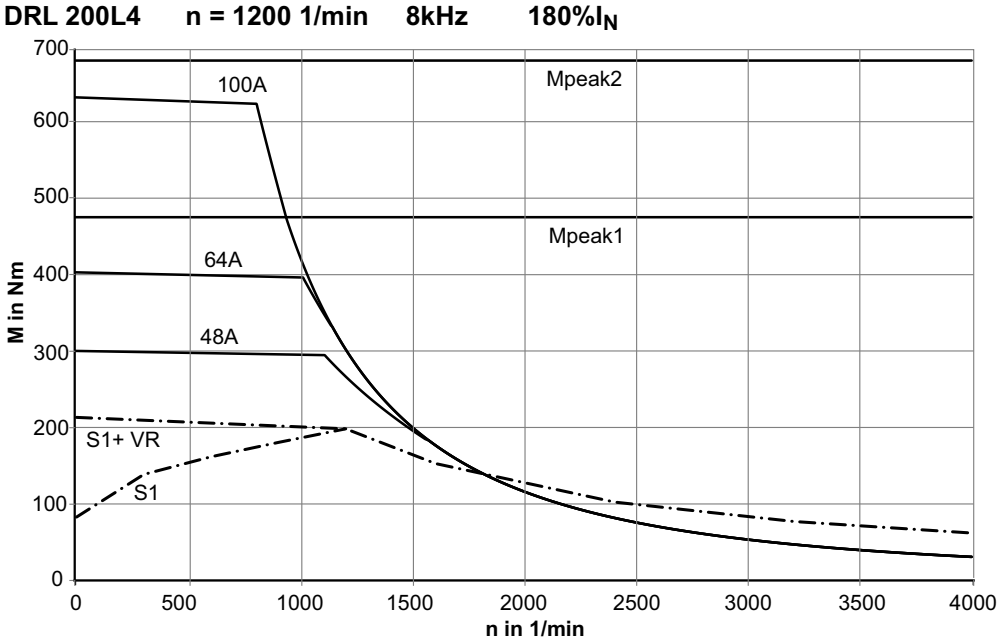
67832axx

DRL200L4, n_N = 1200 min^{-1}, 100% I_N



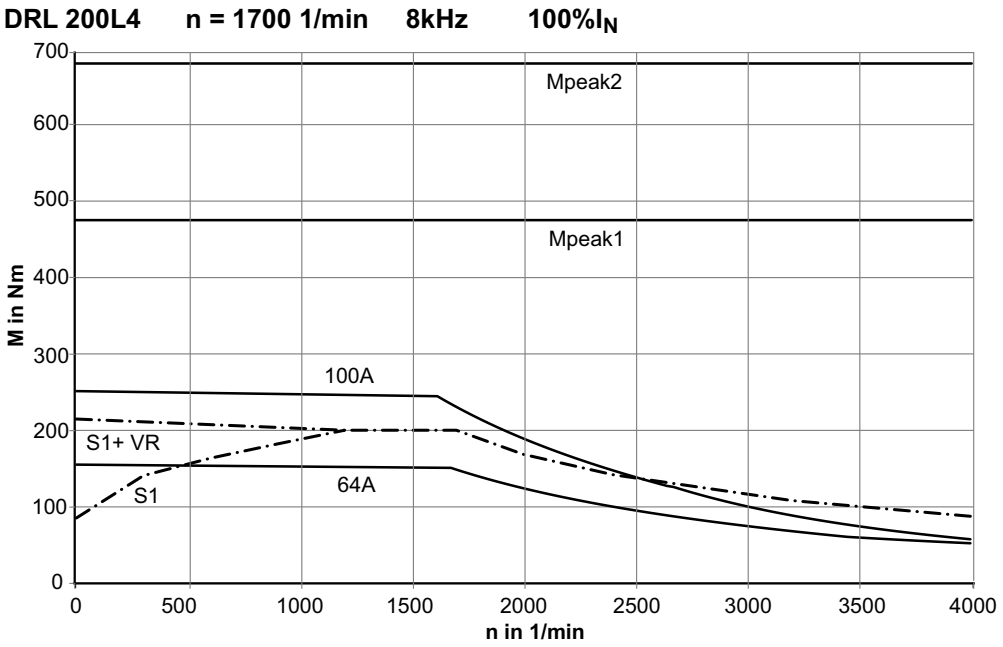
67841axx

DRL200L4, n_N = 1200 min^{-1}, 180% I_N



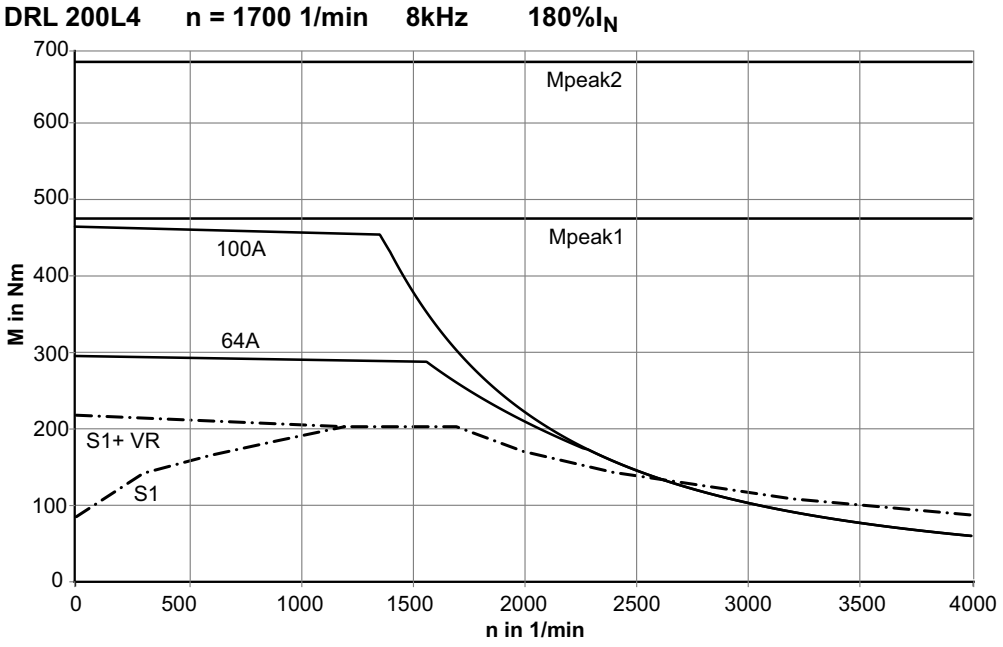
67842axx

DRL200L4, n_N = 1700 min^{-1}, 100% I_N



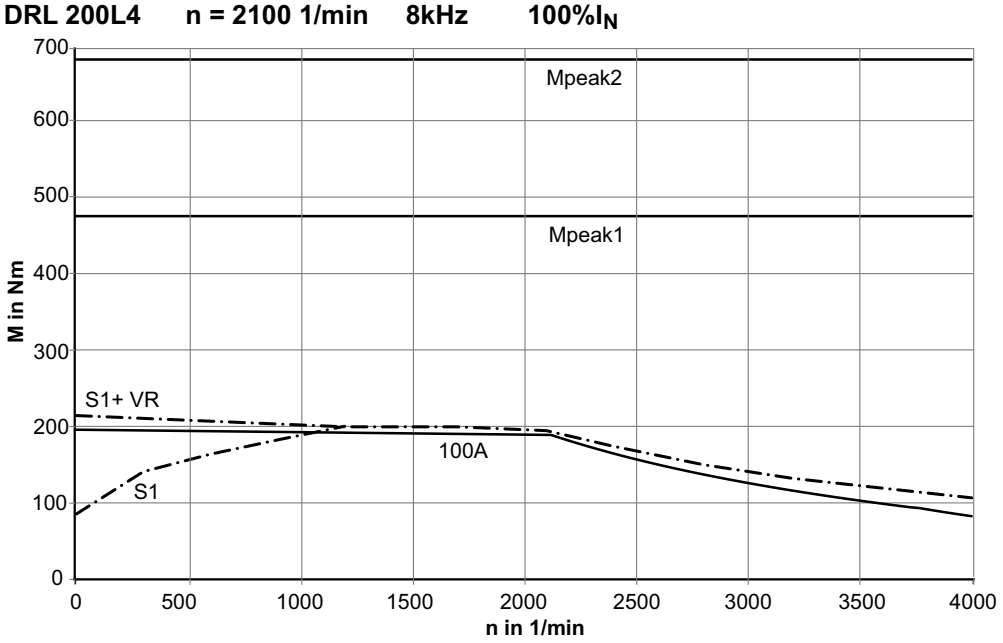
67843axx

DRL200L4, n_N = 1700 min^{-1}, 180% I_N



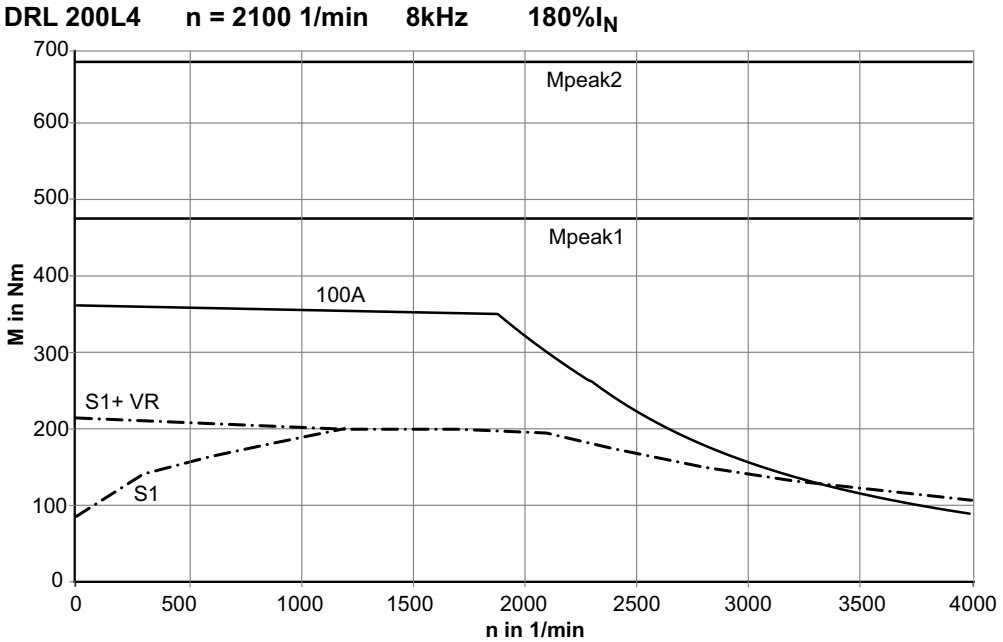
67844axx

DRL200L4, n_N = 2100 min^{-1}, 100% I_N



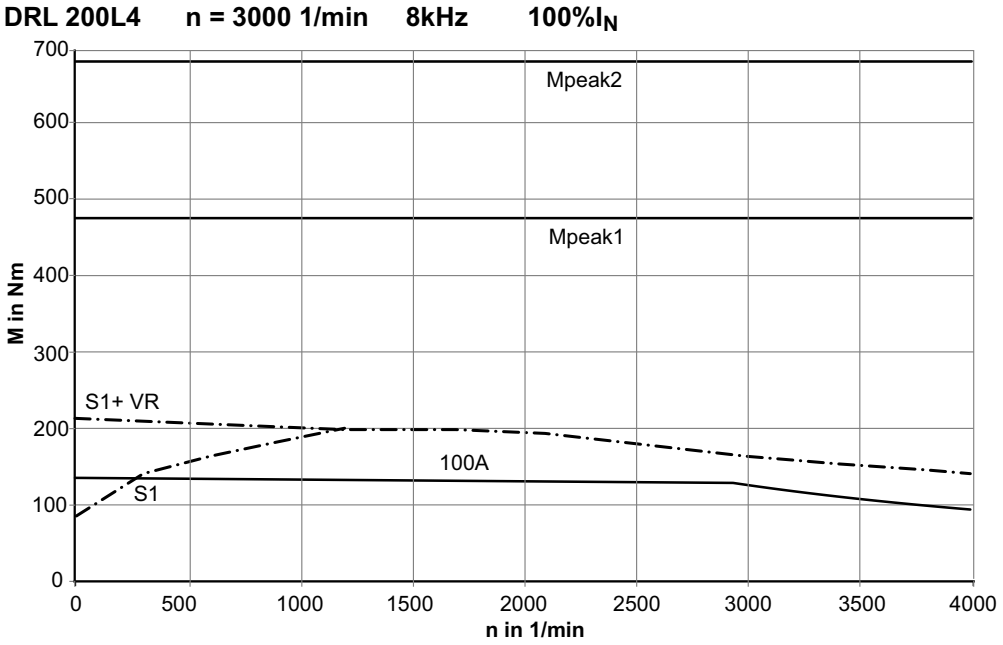
67845axx

DRL200L4, n_N = 2100 min^{-1}, 180% I_N



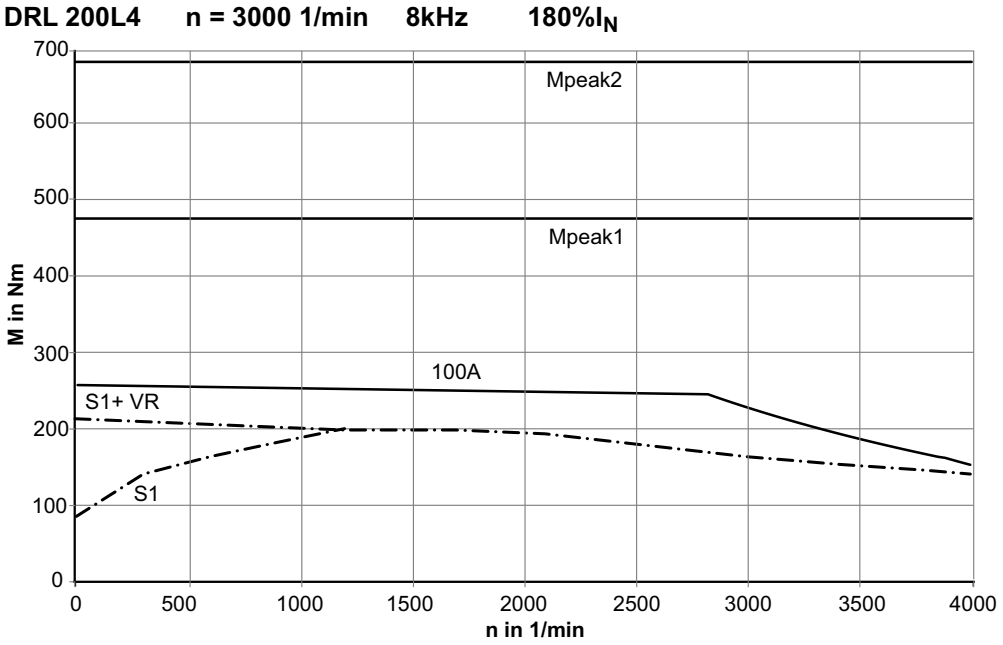
67846axx

DRL200L4, n_N = 3000 min^{-1}, 100% I_N



67847axx

DRL200L4, n_N = 3000 min^{-1}, 180% I_N



67848axx

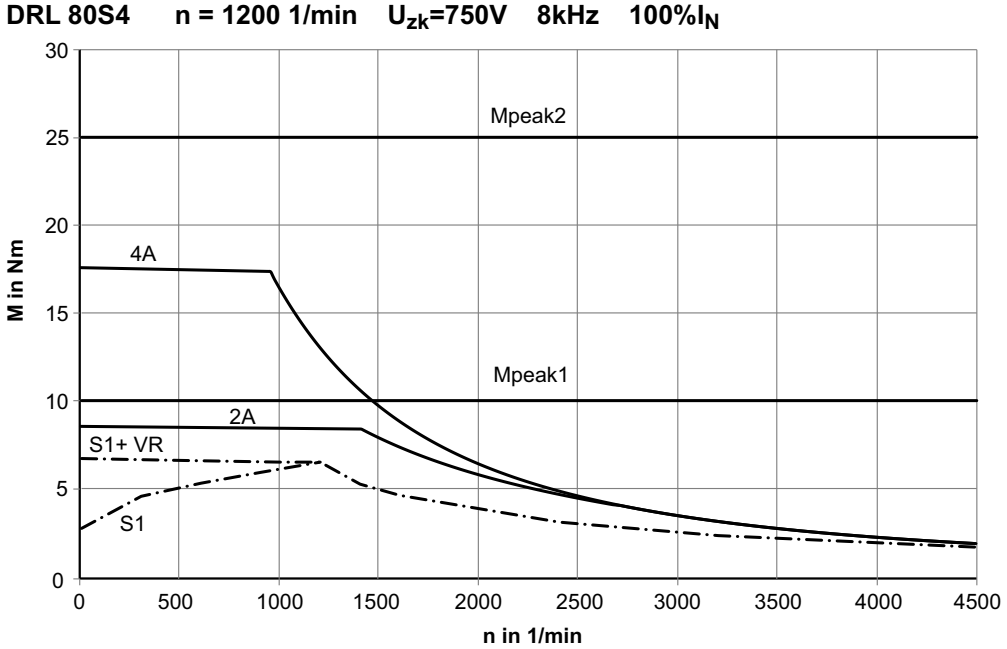
4.3 Limit characteristic curves DRL - MOVIAXIS®, $V_{DC\ link}$ = 750 V, PWM = 8 kHz

Key to the dynamic and thermal limit characteristic curves

S1	S1 characteristic curve (thermal limit characteristic curve)
S1+VR	S1 characteristic curve with forced cooling fan (thermal limit characteristic curve)
M_{peak1}	Maximum limit torque of dynamics package 1
M_{peak2}	Maximum limit torque of dynamics package 2
2 A	2 A nominal output current of the axis module
4 A	4 A nominal output current of the axis module
8 A	8 A nominal output current of the axis module
12 A	12 A nominal output current of the axis module
16 A	16 A nominal output current of the axis module
24 A	24 A nominal output current of the axis module
32 A	32 A nominal output current of the axis module
48 A	48 A nominal output current of the axis module
64 A	64 A nominal output current of the axis module
100 A	100 A nominal output current of the axis module

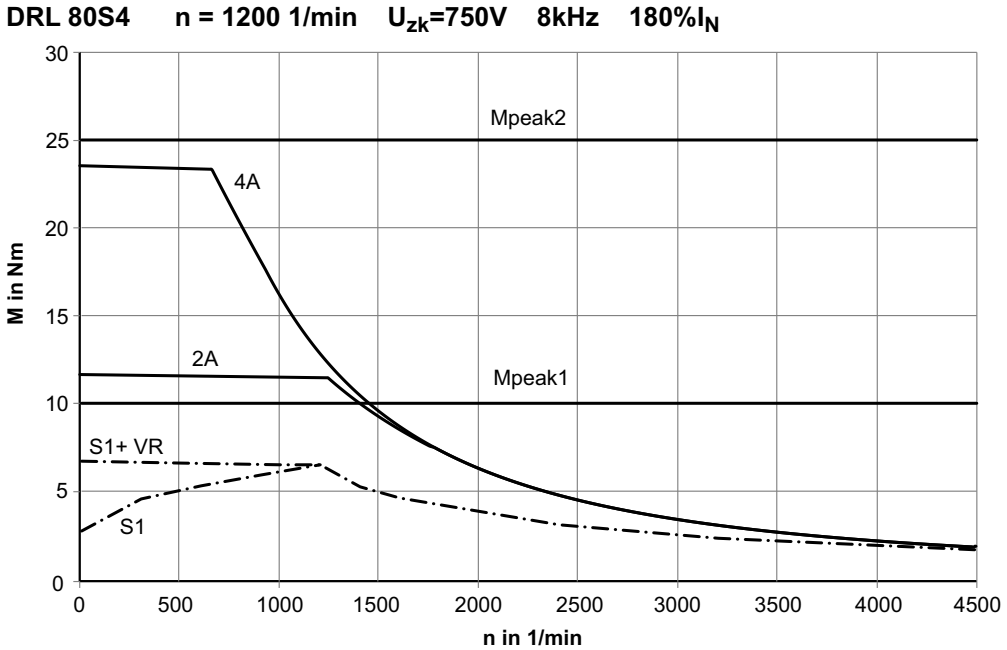
$V_{DC\ link}$ = DC link voltage

DRL80S4, n_N = 1200 min^{-1}, 100% I_N



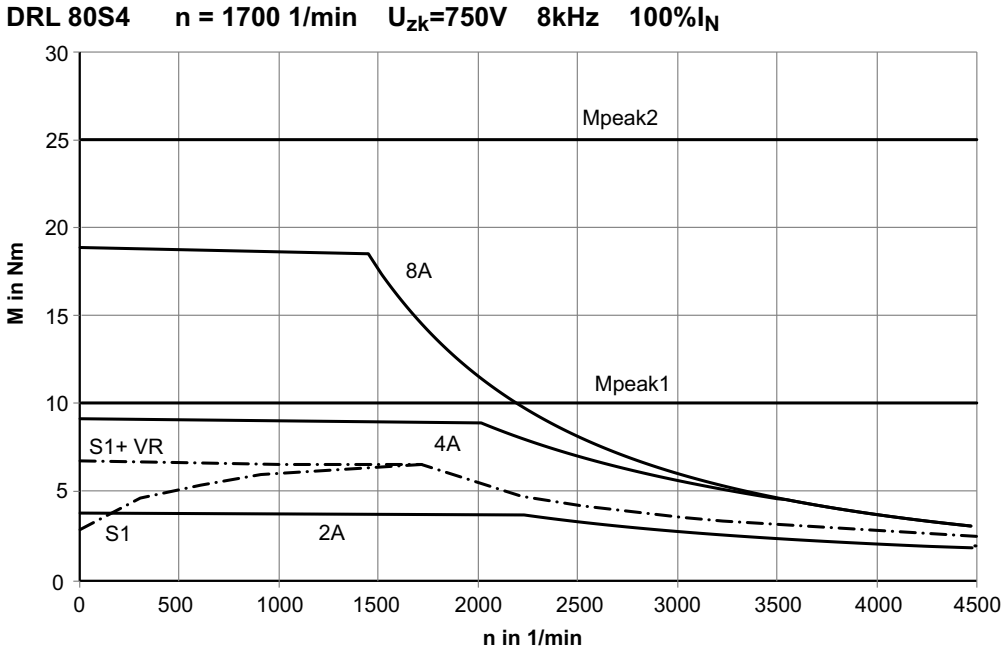
67909axx

DRL80S4, n_N = 1200 min^{-1}, 180% I_N



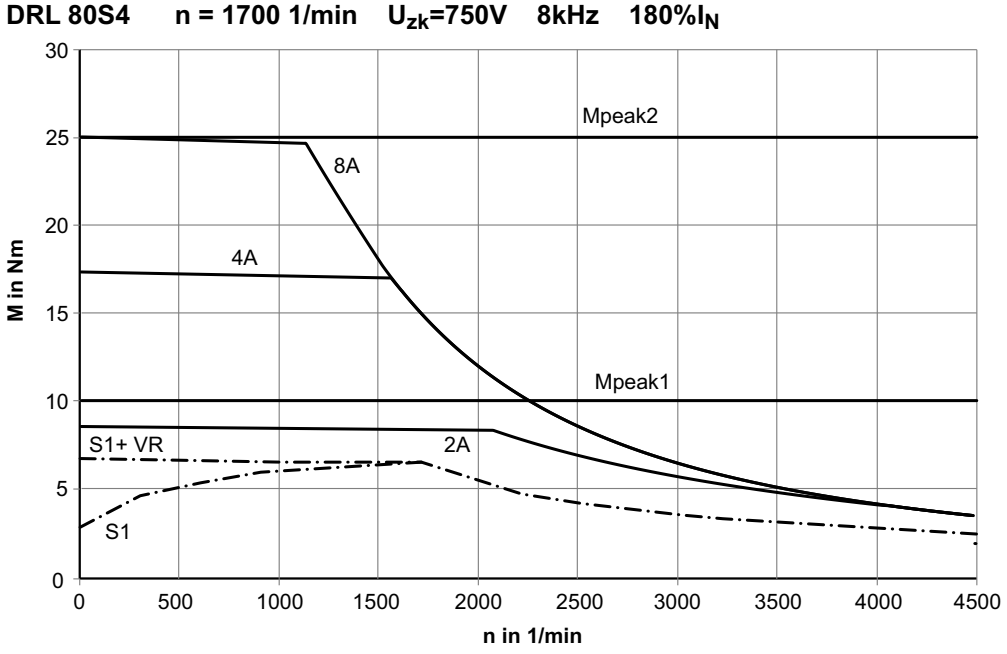
67910axx

DRL80S4, n_N = 1700 min^{-1}, 100% I_N



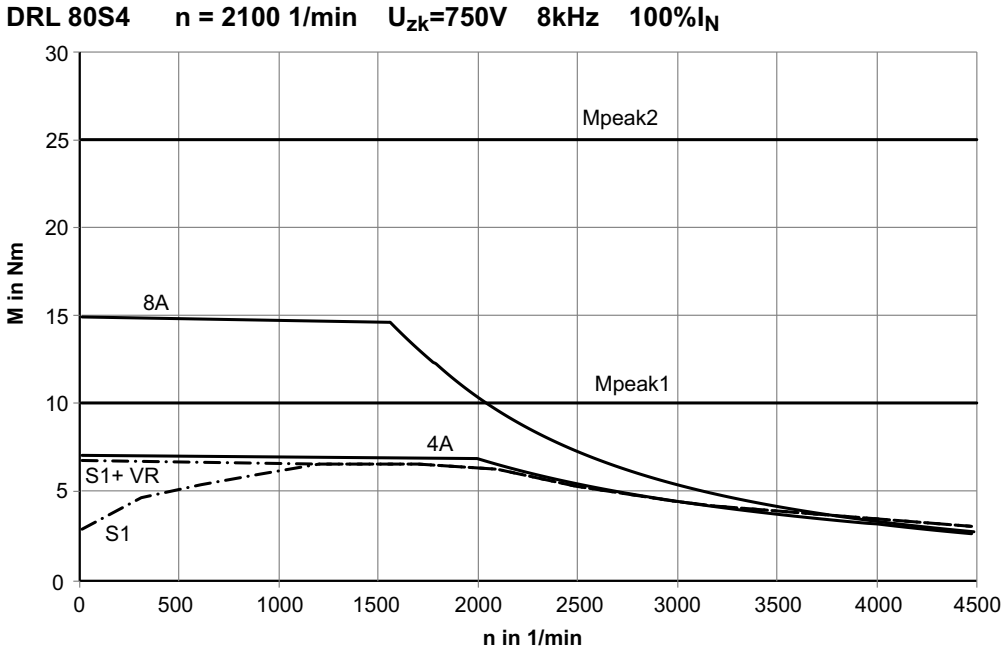
67911axx

DRL80S4, n_N = 1700 min^{-1}, 180% I_N



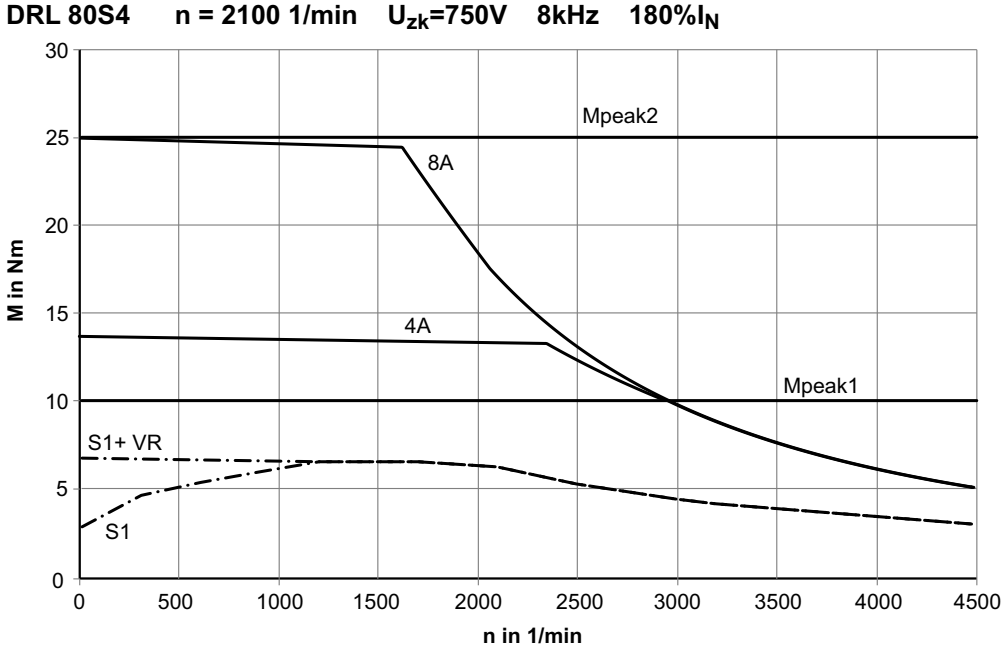
67912axx

DRL80S4, n_N = 2100 min^{-1}, 100% I_N



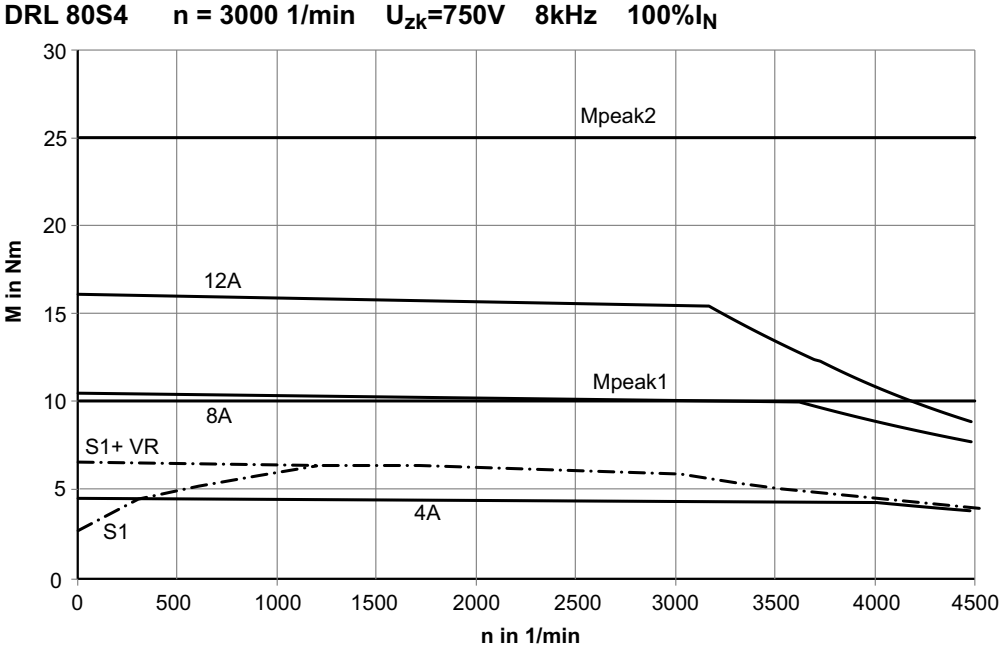
67913axx

DRL80S4, n_N = 2100 min^{-1}, 180% I_N



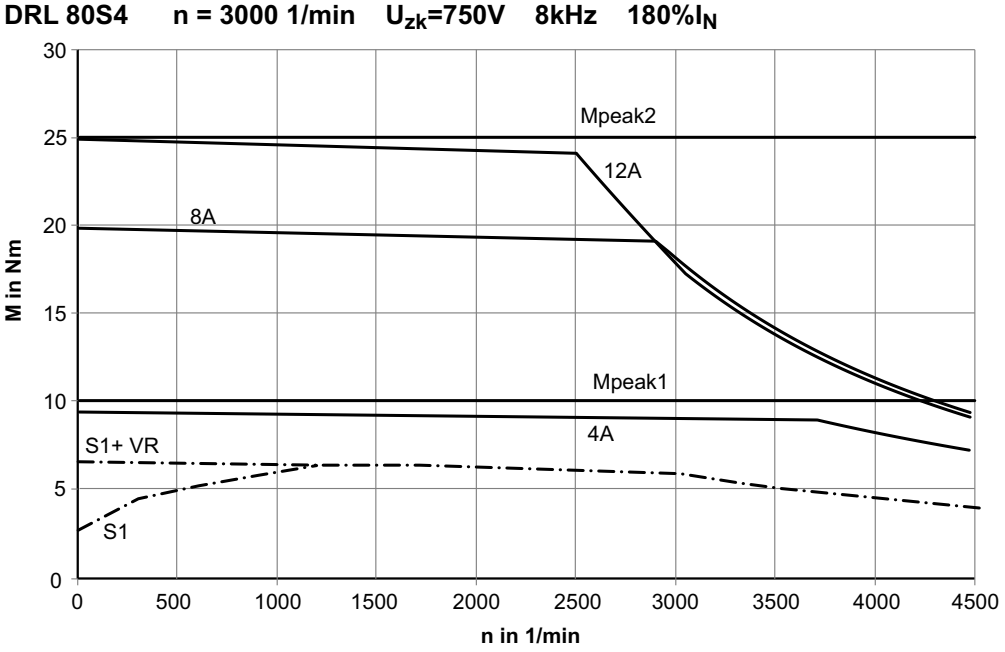
67914axx

DRL80S4, n_N = 3000 min^{-1}, 100% I_N



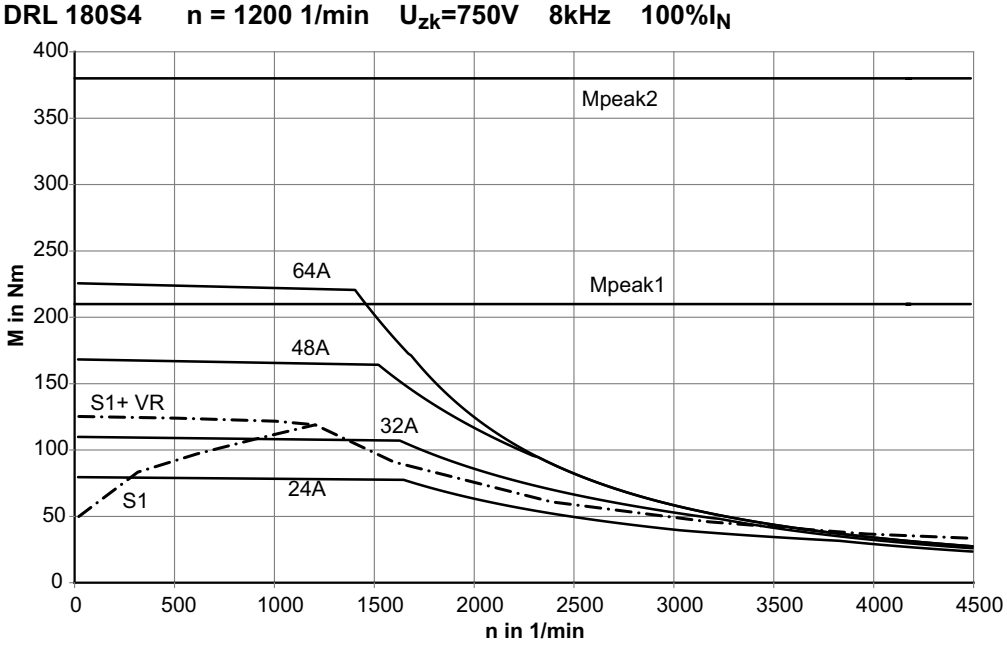
67915axx

DRL80S4, n_N = 3000 min^{-1}, 180% I_N



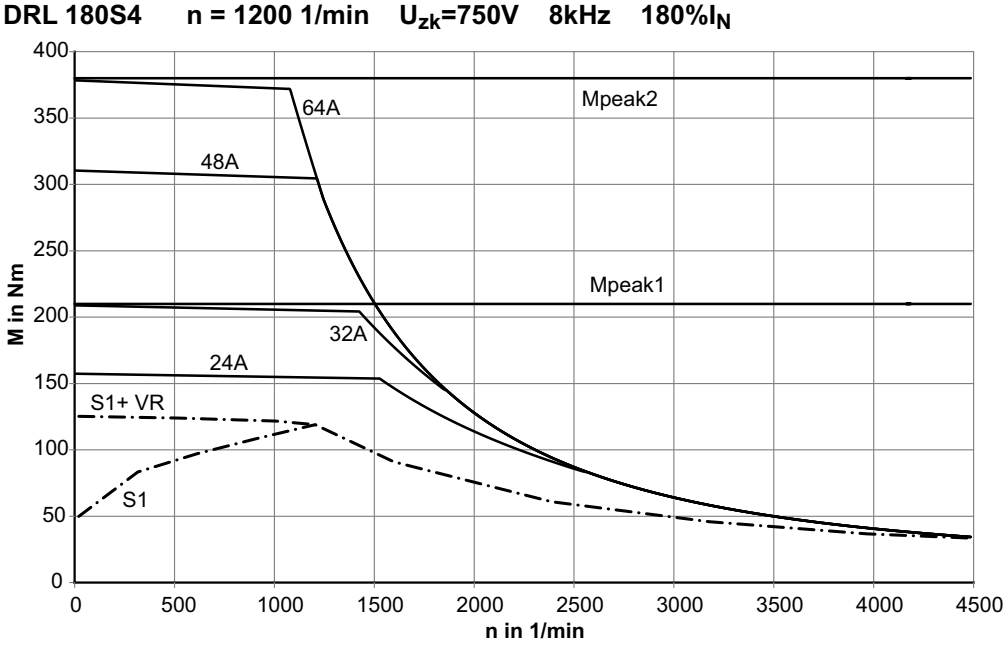
67916axx

DRL180S4, n_N = 1200 min^{-1}, 100% I_N



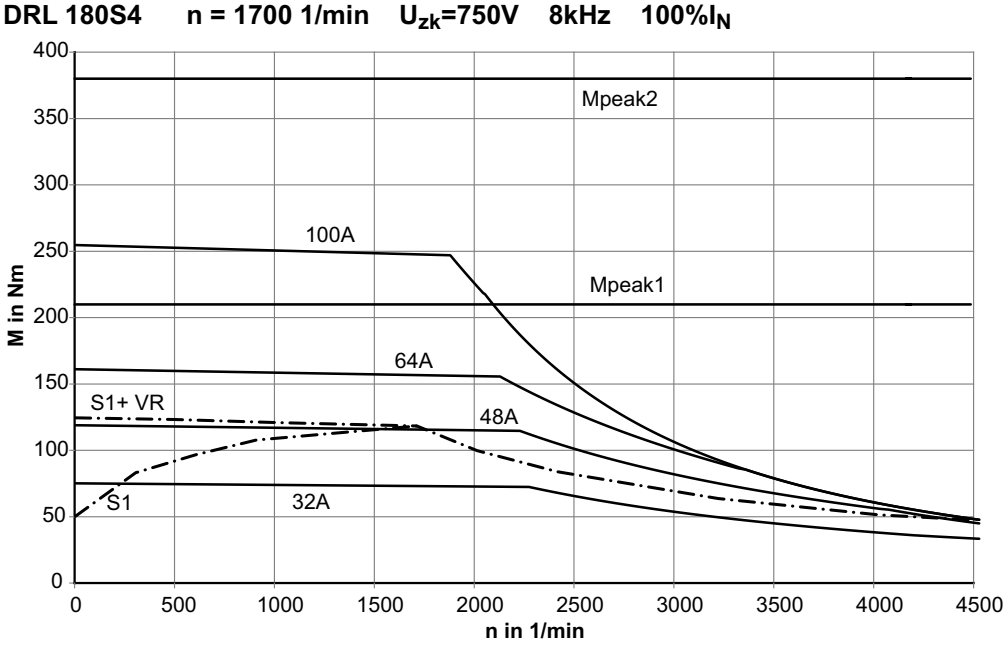
67925axx

DRL180S4, n_N = 1200 min^{-1}, 180% I_N



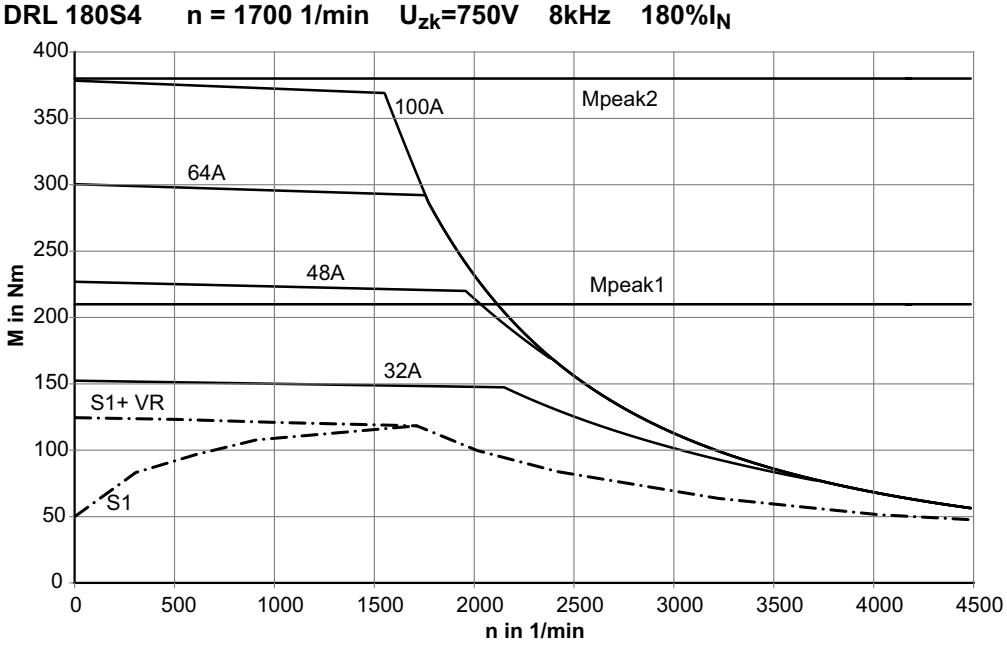
67926axx

DRL180S4, n_N = 1700 min^{-1}, 100% I_N



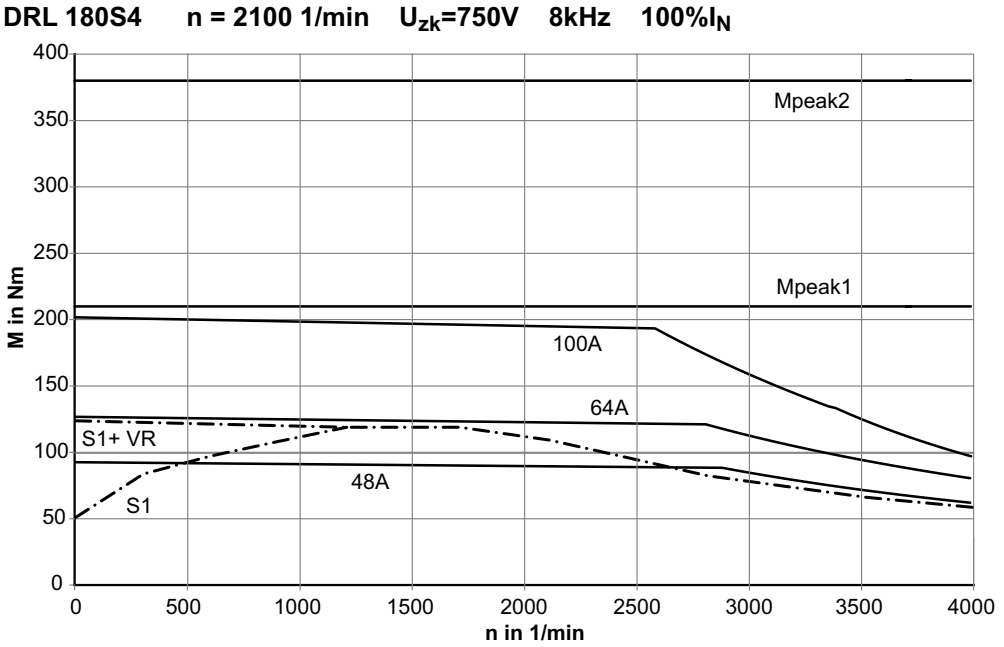
67927axx

DRL180S4, n_N = 1700 min^{-1}, 180% I_N



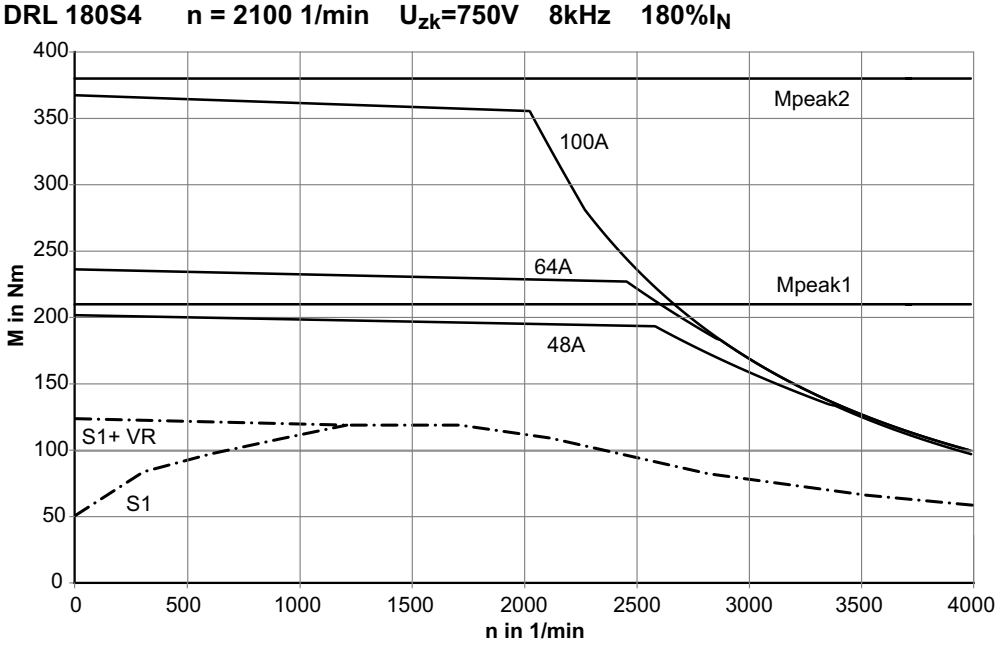
67928axx

DRL180S4, n_N = 2100 min^{-1}, 100% I_N



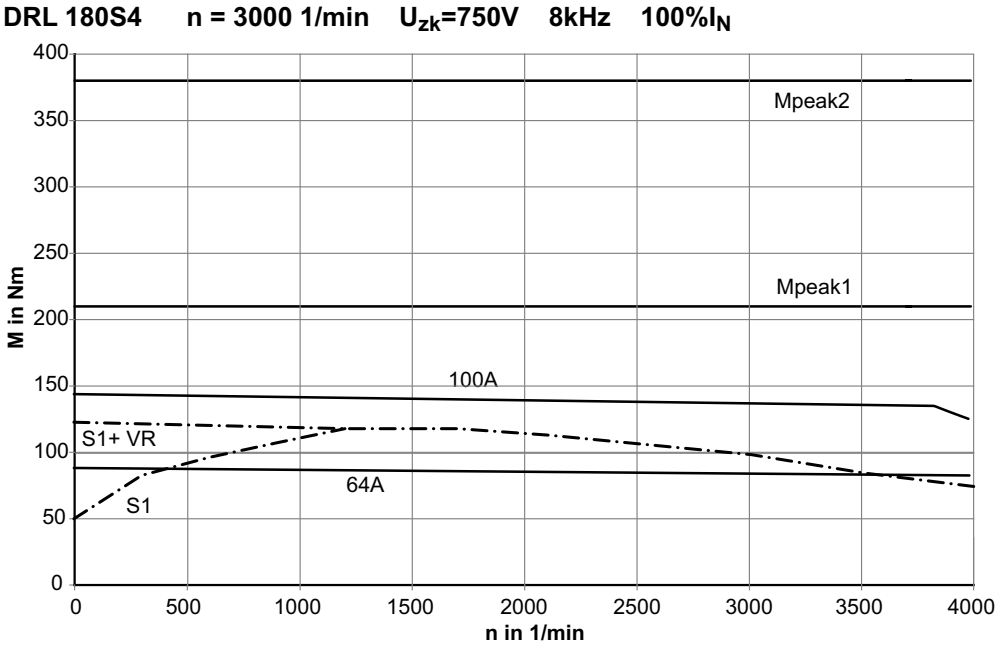
67929axx

DRL180S4, n_N = 2100 min^{-1}, 180% I_N



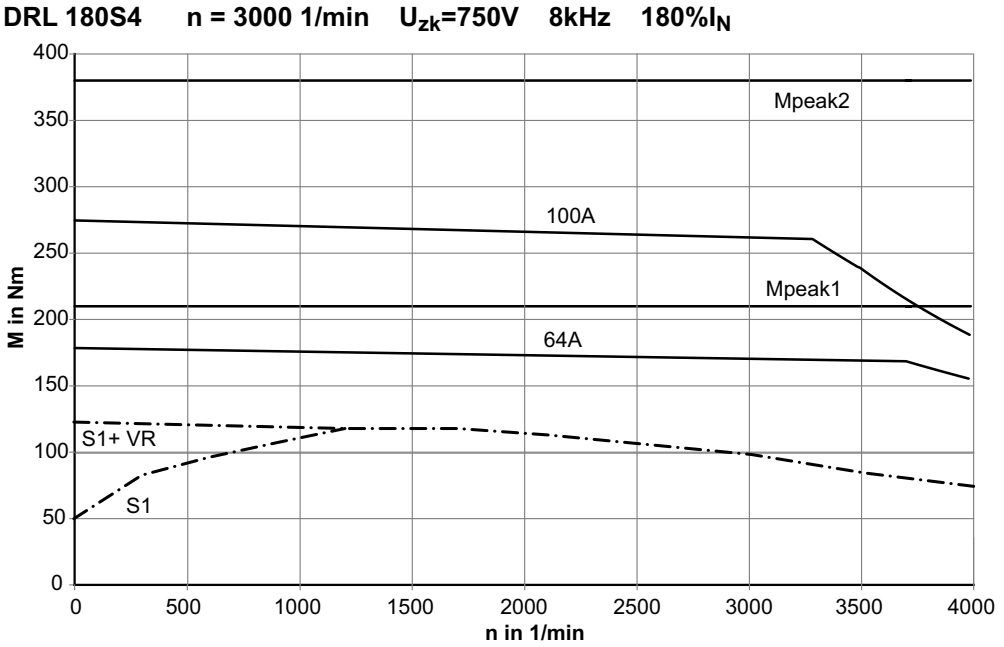
67930axx

DRL180S4, n_N = 3000 min^{-1}, 100% I_N



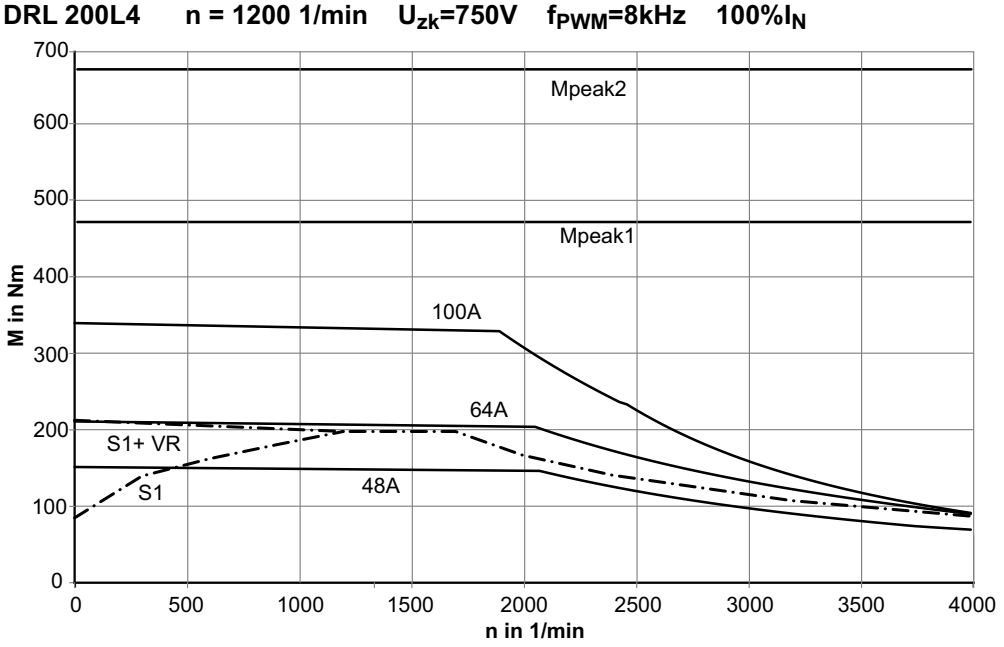
67931axx

DRL180S4, n_N = 3000 min^{-1}, 180% I_N



67932axx

DRL200L4, n_N = 1200 min^{-1}, 100% I_N



67941axx

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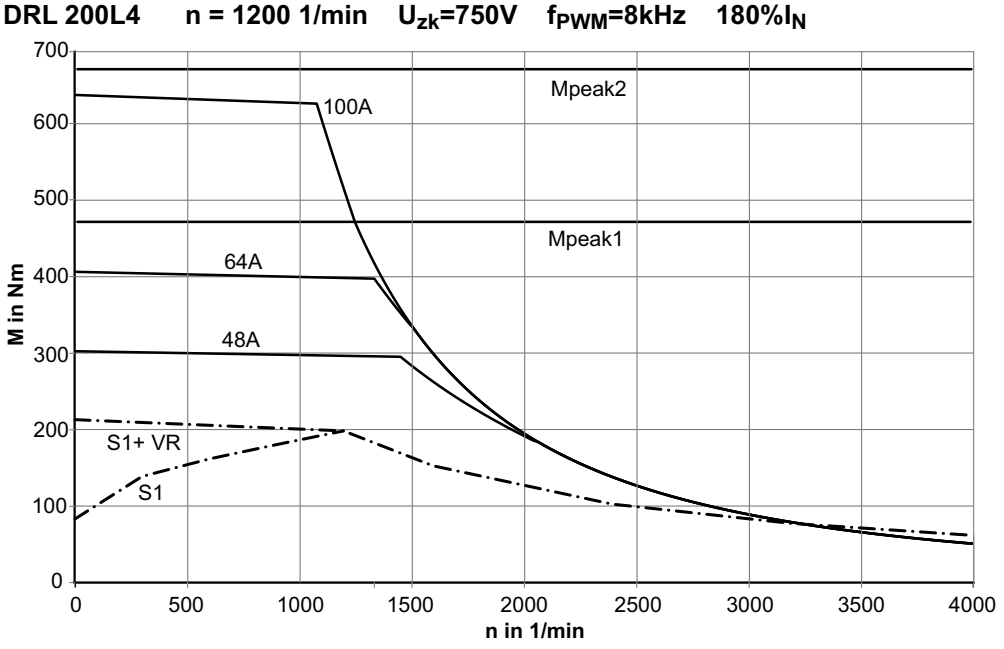
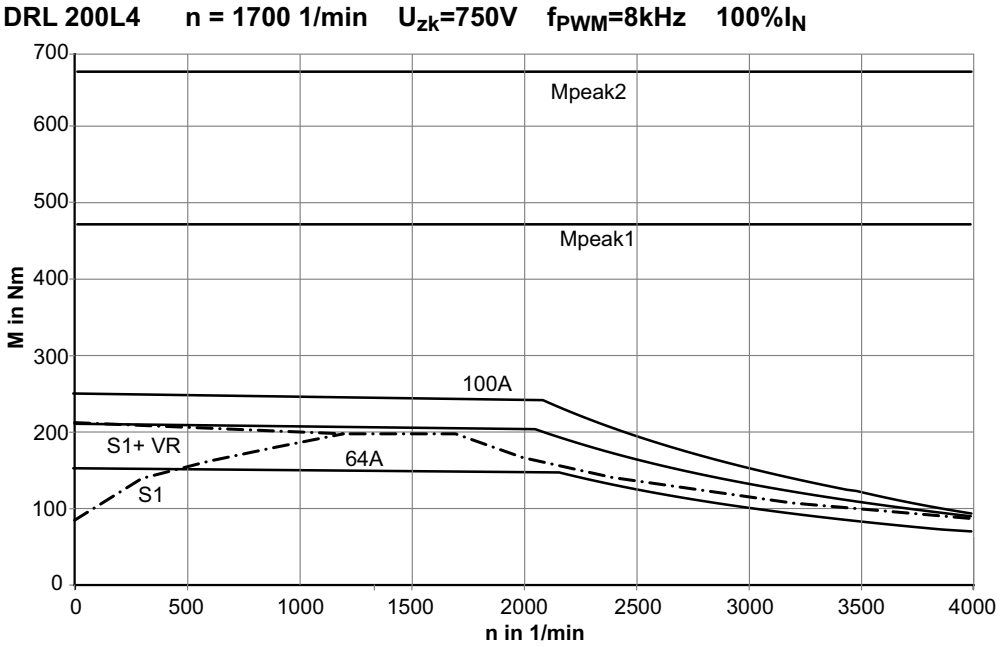


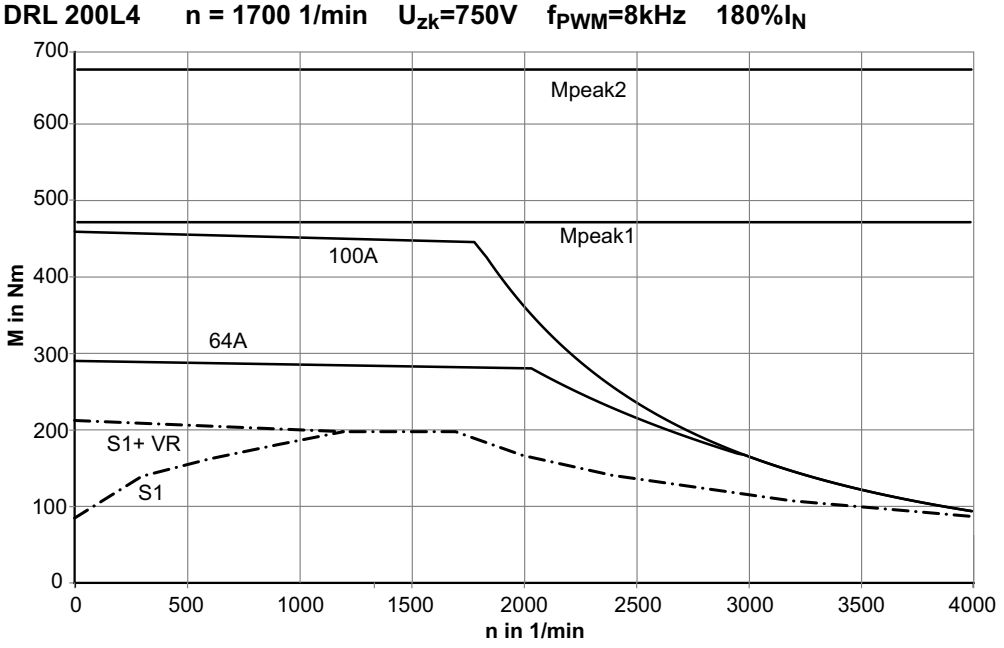
67942axx

DRL200L4, n_N = 1700 min^{-1}, 100% I_N



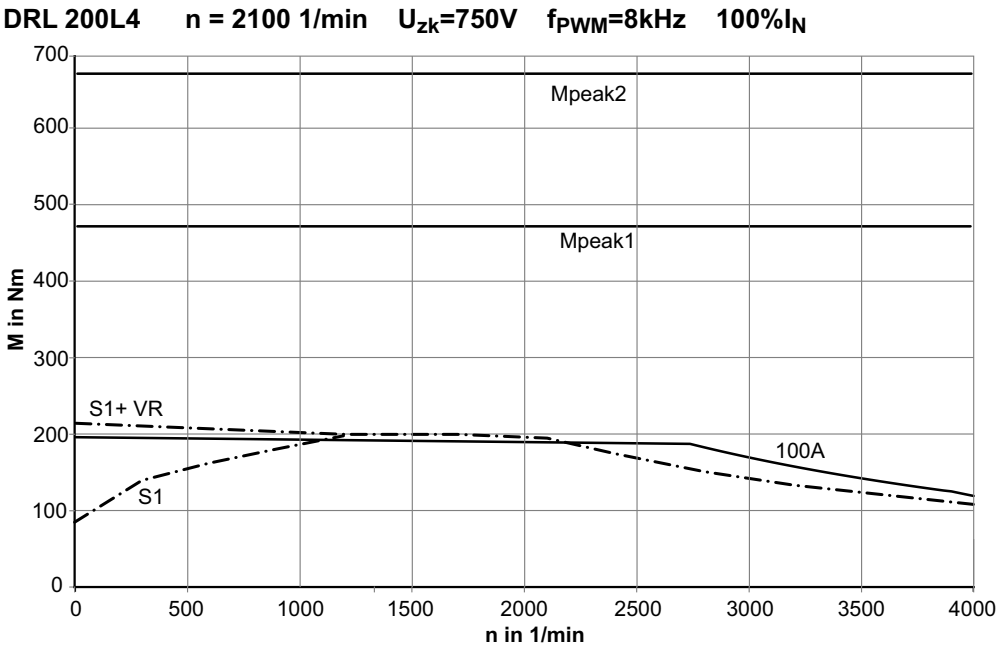
67943axx

DRL200L4, n_N = 1700 min^{-1}, 180% I_N



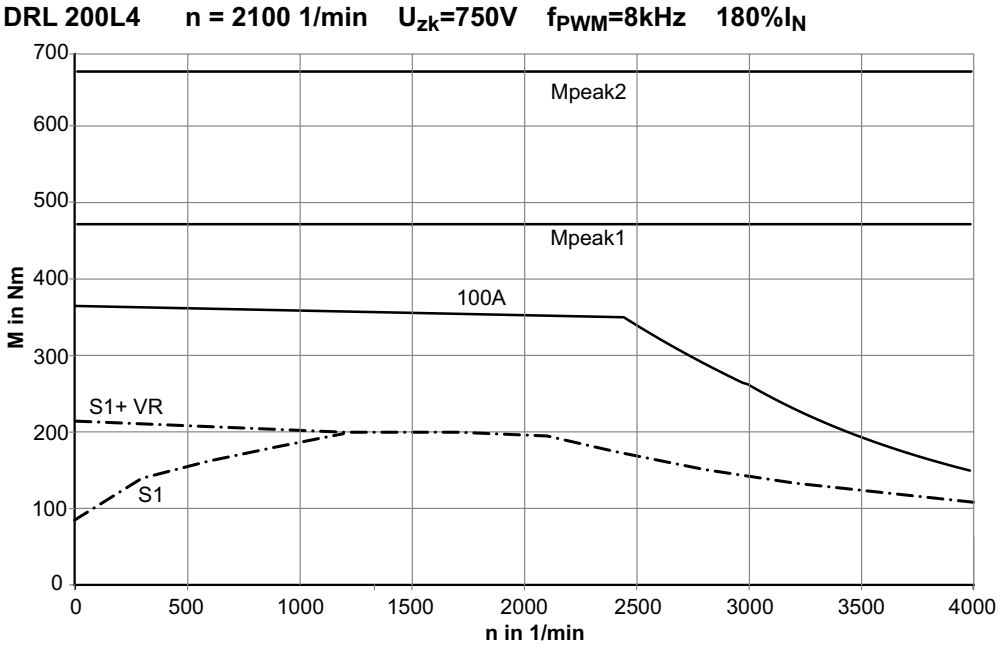
67944axx

DRL200L4, n_N = 2100 min^{-1}, 100% I_N



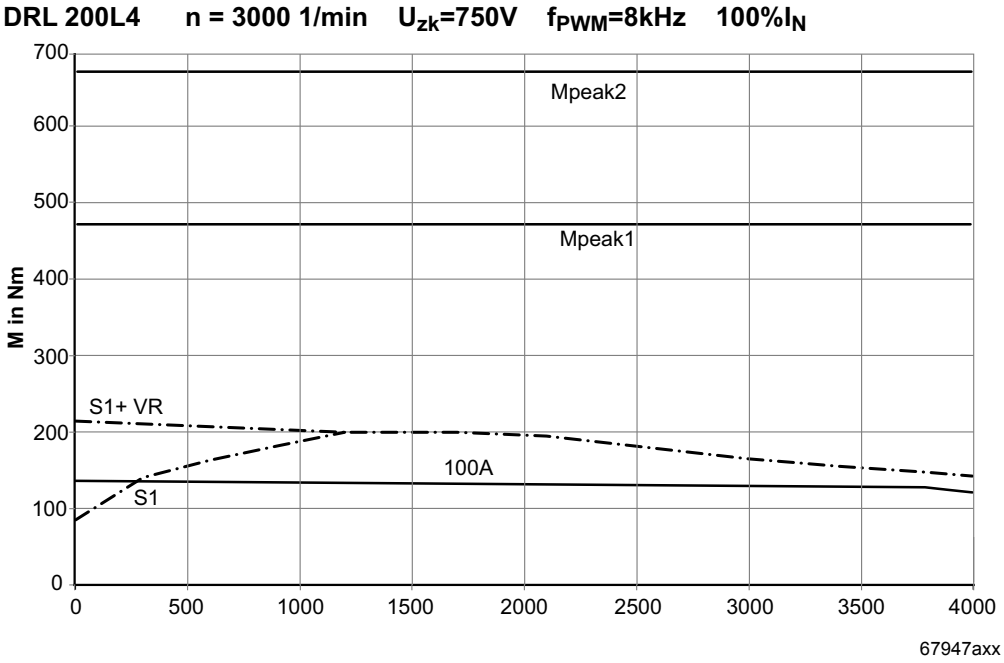
67945axx

DRL200L4, n_N = 2100 min^{-1}, 180% I_N

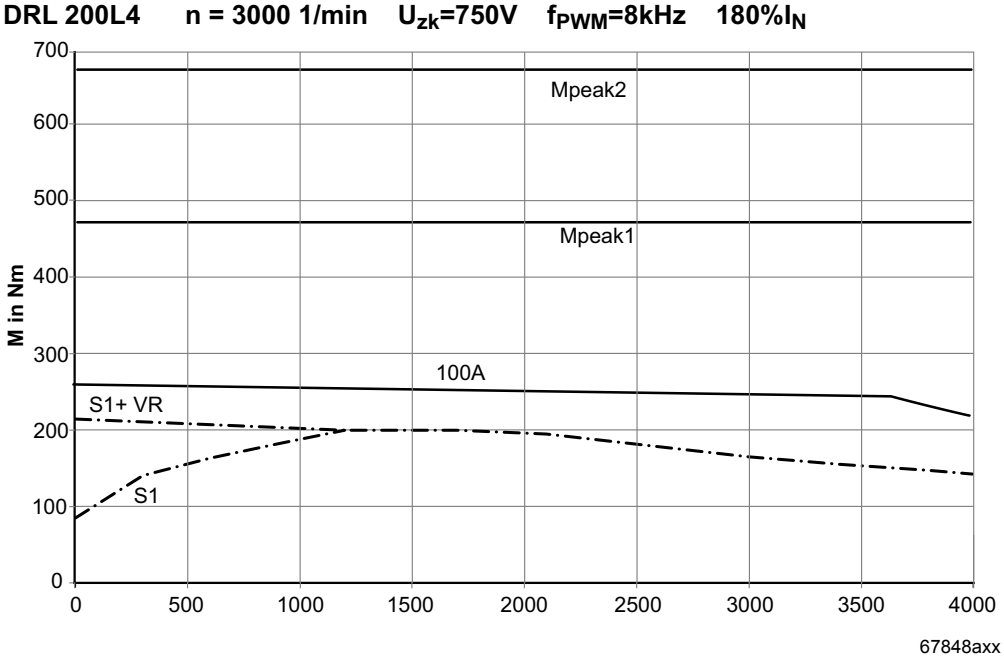


67946axx

DRL200L4, n_N = 3000 min^{-1}, 100% I_N



DRL200L4, n_N = 3000 min^{-1}, 180% I_N



5 Combination Overview, Characteristic Curves DRL - MOVIAXIS®, 4 kHz

5.1 Combination overview DRL - MOVIAXIS®, PWM = 4 kHz

1. Rated speed n_N = 1200 1/min, dynamics package 1, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	15.33									
DRL80S4	n_{base} V_{line}= 400 V	1/min	914									
	n_{base} $V_{DC\ link}$= 750 V	1/min	1400									
	M_{max}	Nm						266.27	364.06			
DRL180S4	n_{base} V_{line}= 400 V	1/min						1086	1068			
	n_{base} $V_{DC\ link}$= 750 V	1/min						1468	1468			
	M_{max}	Nm							320.09	539.24	737.2	
DRL200L4	n_{base} V_{line}= 400 V	1/min							1012	926	926	
	n_{base} $V_{DC\ link}$= 750 V	1/min							1363	1258	1258	

2. Rated speed n_N = 1200 1/min, dynamics package 2, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	15.33	32.66								
DRL80S4	n_{base} V_{line}= 400 V	1/min	574	182								
	n_{base} $V_{DC\ link}$= 750 V	1/min	961	527								
	M_{max}	Nm						266.27	364.06	571.66		
DRL180S4	n_{base} V_{line}= 400 V	1/min						875	875	738		
	n_{base} $V_{DC\ link}$= 750 V	1/min						1213	1213	1042		
	M_{max}	Nm							320.09	539.24	737.2	1178.35
DRL200L4	n_{base} V_{line}= 400 V	1/min							1012	840	840	754
	n_{base} $V_{DC\ link}$= 750 V	1/min							1363	1148	1148	1035

3. Rated speed n_N = 1700 1/min, dynamics package 1, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	16.85									
DRL80S4	n_{base} V_{line}= 400 V	1/min	1471									
	n_{base} $V_{DC\ link}$= 750 V	1/min	2115									
	M_{max}	Nm						174.52	250.75	406.24		
DRL180S4	n_{base} V_{line}= 400 V	1/min						1433	1534	1534		
	n_{base} $V_{DC\ link}$= 750 V	1/min						1534	2083	2083		
	M_{max}	Nm								358.66	507.41	829.63
DRL200L4	n_{base} V_{line}= 400 V	1/min								1418	1336	1336
	n_{base} $V_{DC\ link}$= 750 V	1/min								1906	1801	1801

4. Rated speed n_N = 1700 1/min, dynamics package 2, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm	16.85	35.54								
DRL80S4	n_{base} V_{line}= 400 V	1/min	1295	656								
	n_{base} $V_{DC\ link}$= 750 V	1/min	1863	1131								
	M_{max}	Nm						174.52	250.75	406.24	549.64	
DRL180S4	n_{base} V_{line}= 400 V	1/min						1433	1288	1094	1094	
	n_{base} $V_{DC\ link}$= 750 V	1/min						1938	1758	1512	1512	
	M_{max}	Nm								358.66	507.41	829.63
DRL200L4	n_{base} V_{line}= 400 V	1/min								1418	1354	1102
	n_{base} $V_{DC\ link}$= 750 V	1/min								1906	1695	1496

5. Rated speed n_N = 2100 1/min, dynamics package 1, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		17.98								
DRL80S4	n_{base} V_{line}= 400 V	1/min		2045								
	n_{base} $V_{DC\ link}$= 750 V	1/min		2912								
	M_{max}	Nm							216.83	333.49	444.25	
DRL180S4	n_{base} V_{line}= 400 V	1/min							1881	1973	1973	
	n_{base} $V_{DC\ link}$= 750 V	1/min							2536	2668	2668	
	M_{max}	Nm									434.08	683.57
DRL200L4	n_{base} V_{line}= 400 V	1/min									1731	1680
	n_{base} $V_{DC\ link}$= 750 V	1/min									2320	2254

6. Rated speed n_N = 2100 1/min, dynamics package 2, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
	M_{max}	Nm		17.98	37.67							
DRL80S4	n_{base} V_{line}= 400 V	1/min		1301	955							
	n_{base} $V_{DC\ link}$= 750 V	1/min		3012	1535							
	M_{max}	Nm							216.83	333.49	444.25	696.73
DRL180S4	n_{base} V_{line}= 400 V	1/min							1811	1538	1428	1428
	n_{base} $V_{DC\ link}$= 750 V	1/min							2439	2092	1956	1956
	M_{max}	Nm									434.08	683.57
DRL200L4	n_{base} V_{line}= 400 V	1/min									2320	2254
	n_{base} $V_{DC\ link}$= 750 V	1/min									2320	1883

7. Rated speed n_N = 3000 1/min, dynamics package 1, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
DRL80S4	M_{max}	Nm		12.16								
	n_{base} V_{line}= 400 V	1/min		3076								
	n_{base} $V_{DC\ link}$= 750 V	1/min		4277								
DRL180S4	M_{max}	Nm								212.36	300.91	492.48
	n_{base} V_{line}= 400 V	1/min								2447	2782	2782
	n_{base} $V_{DC\ link}$= 750 V	1/min								3687	3735	3735
DRL200L4	M_{max}	Nm										447.19
	n_{base} V_{line}= 400 V	1/min										2391
	n_{base} $V_{DC\ link}$= 750 V	1/min										3195

8. Rated speed n_N = 3000 1/min, dynamics package 2, PWM = 4 kHz

Motor			Assignment to MOVIAXIS® MXA									
	Size		1			2		3		4	5	6
Type	I_N	[A]	2	4	8	12	16	24	32	48	64	100
	I_{max}	[A]	5	10	20	30	40	60	80	120	160	250
DRL80S4	M_{max}	Nm		12.16	26.8							
	n_{base} V_{line}= 400 V	1/min		2443	1641							
	n_{base} $V_{DC\ link}$= 750 V	1/min		3398	2438							
DRL180S4	M_{max}	Nm								212.36	300.91	492.48
	n_{base} V_{line}= 400 V	1/min								2474	2215	2039
	n_{base} $V_{DC\ link}$= 750 V	1/min								3327	2993	2764
DRL200L4	M_{max}	Nm										447.19
	n_{base} V_{line}= 400 V	1/min										2359
	n_{base} $V_{DC\ link}$= 750 V	1/min										3156

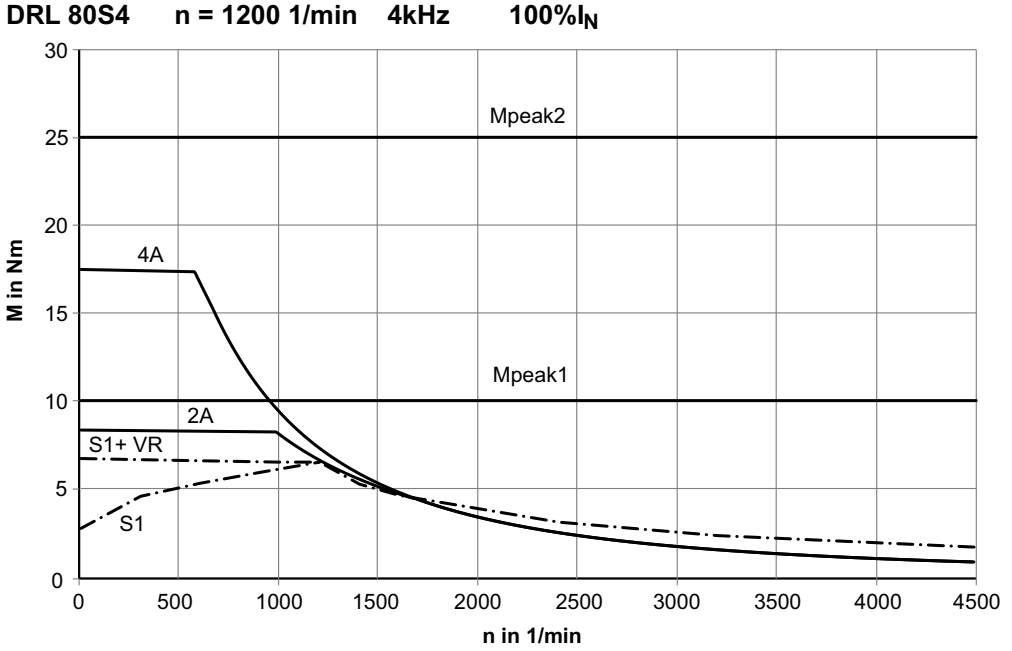
5.2 Limit characteristic curves DRL - MOVIAXIS®, $V_{DC\ link}$ = 565 V, PWM = 4 kHz

Key to the dynamic and thermal limit characteristic curves

S1	S1 characteristic curve (thermal limit characteristic curve)
S1+VR	S1 characteristic curve with forced cooling fan (thermal limit characteristic curve)
M_{peak1}	Maximum limit torque of dynamics package 1
M_{peak2}	Maximum limit torque of dynamics package 2
2 A	2 A nominal output current of the axis module
4 A	4 A nominal output current of the axis module
8 A	8 A nominal output current of the axis module
12 A	12 A nominal output current of the axis module
16 A	16 A nominal output current of the axis module
24 A	24 A nominal output current of the axis module
32 A	32 A nominal output current of the axis module
48 A	48 A nominal output current of the axis module
64 A	64 A nominal output current of the axis module
100 A	100 A nominal output current of the axis module

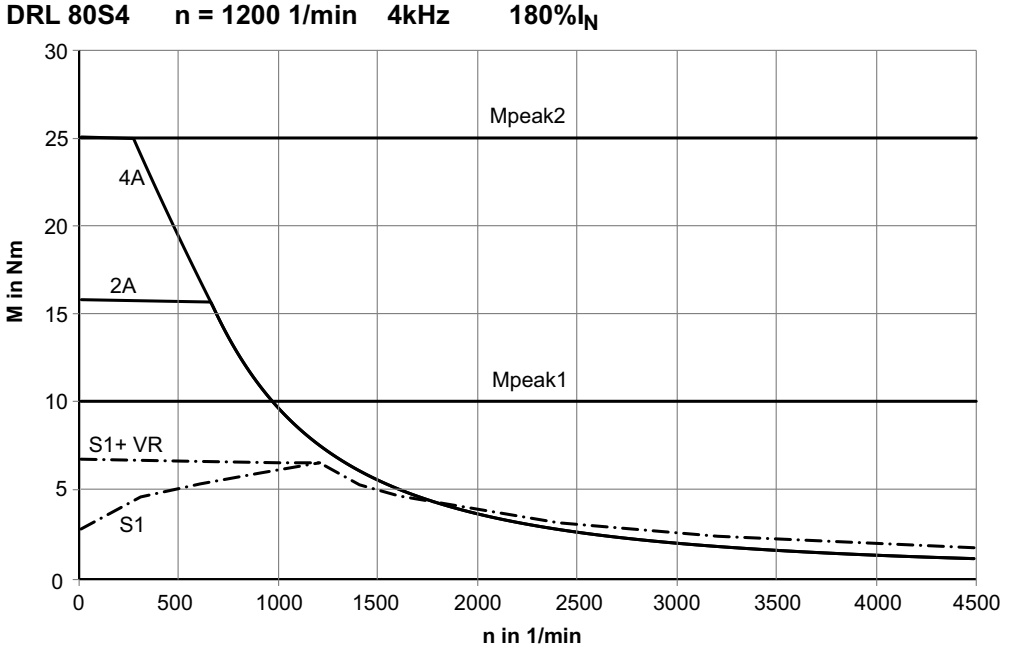
$V_{DC\ link}$ = DC link voltage

DRL80S4, n_N = 1200 min^{-1}, 100% I_N



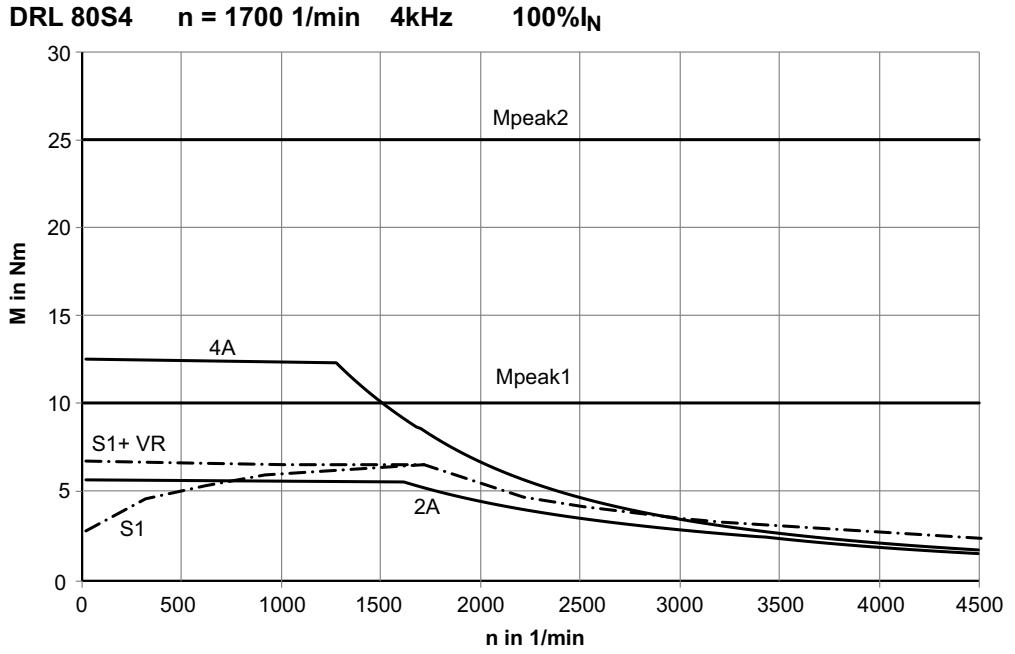
67801axx

DRL80S4, n_N = 1200 min^{-1}, 180% I_N



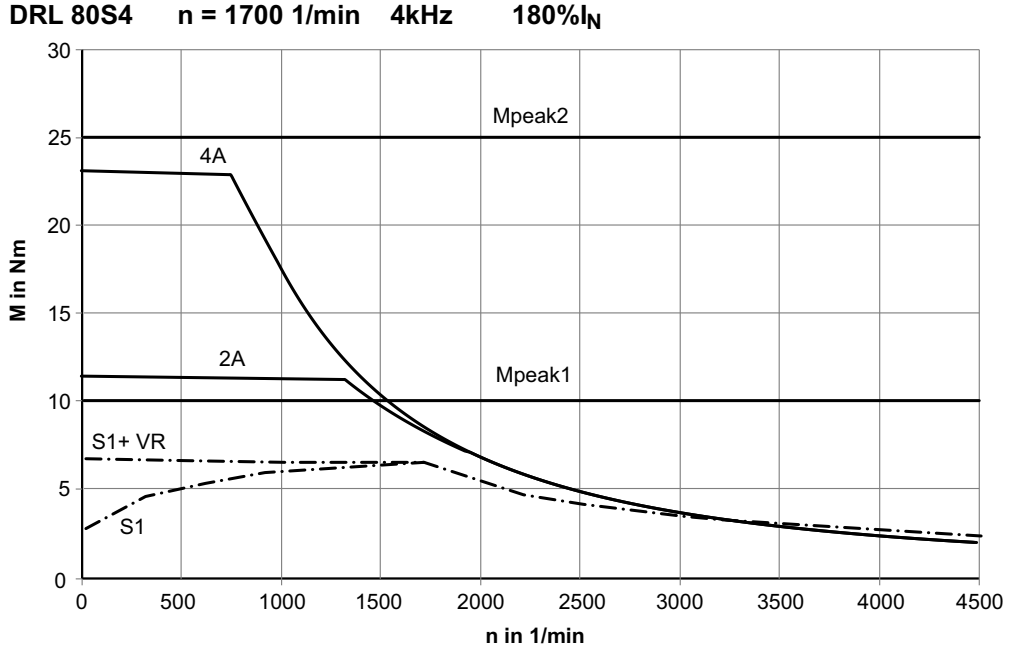
67802axx

DRL80S4, n_N = 1700 min^{-1}, 100% I_N



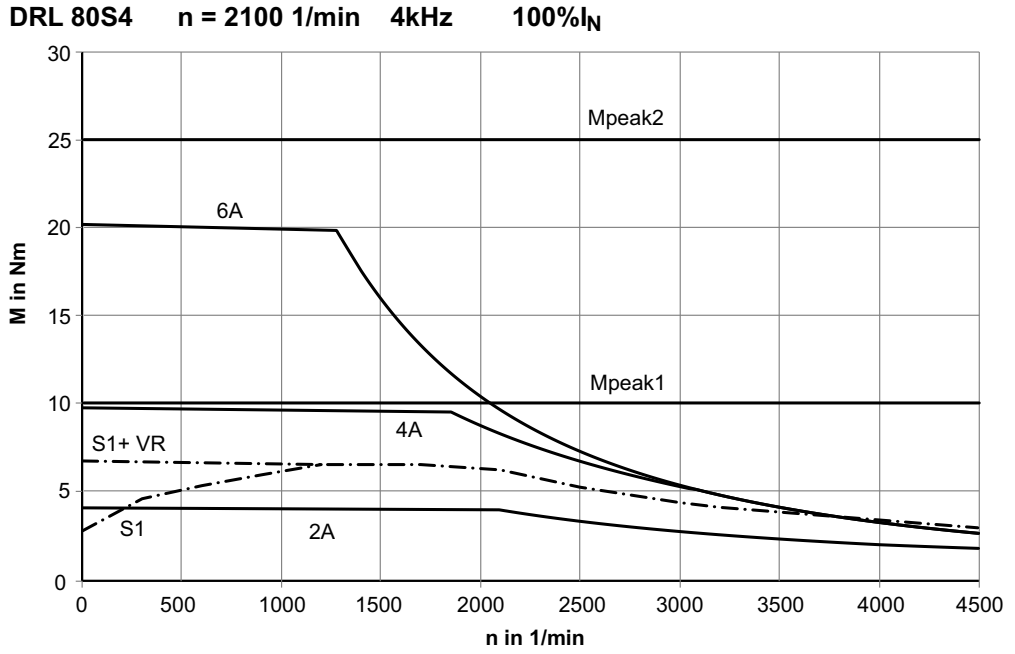
67803axx

DRL80S4, n_N = 1700 min^{-1}, 180% I_N



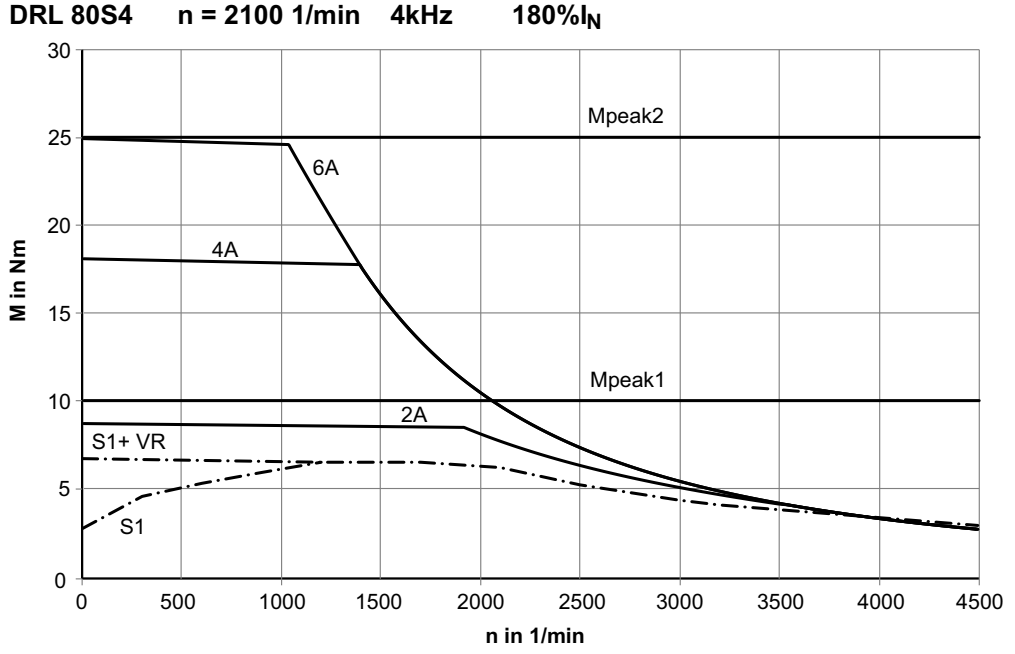
67804axx

DRL80S4, n_N = 2100 min^{-1}, 100% I_N



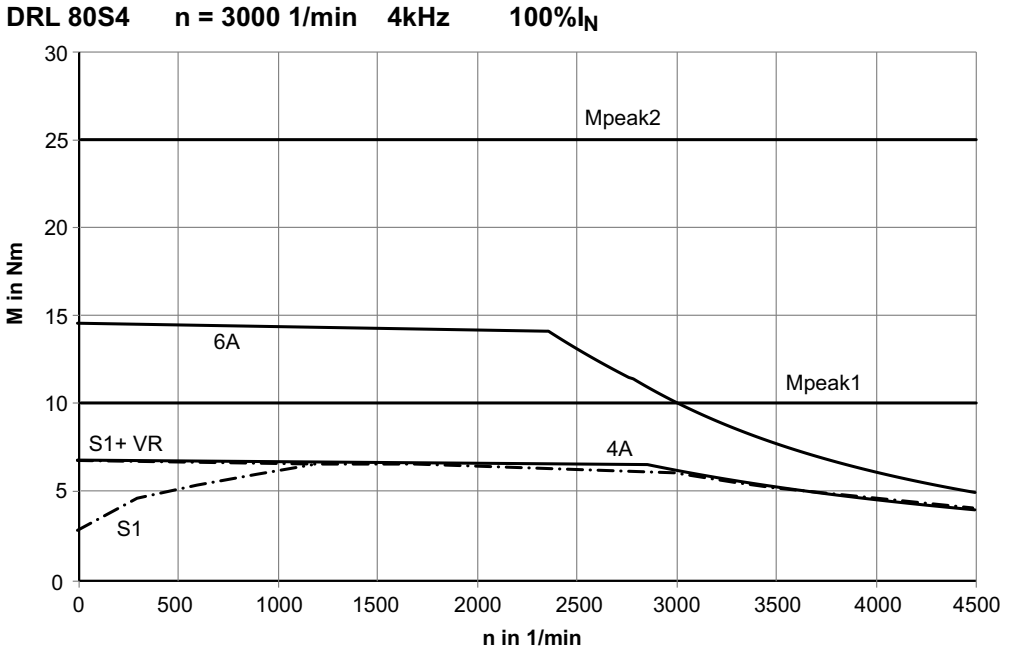
67805axx

DRL80S4, n_N = 2100 min^{-1}, 180% I_N



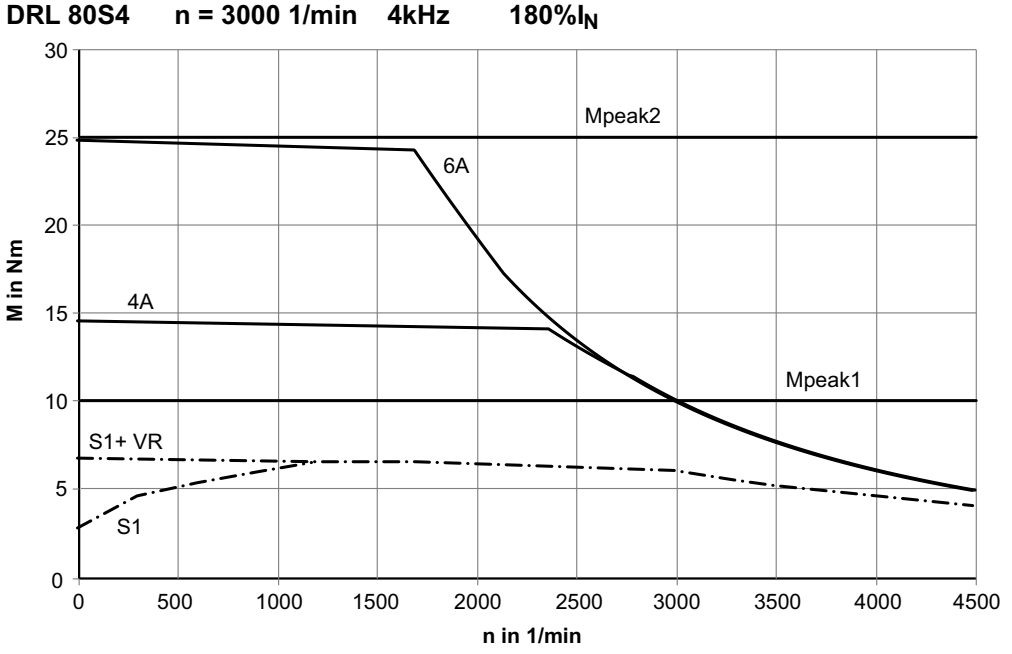
67806axx

DRL80S4, n_N = 3000 min^{-1}, 100% I_N



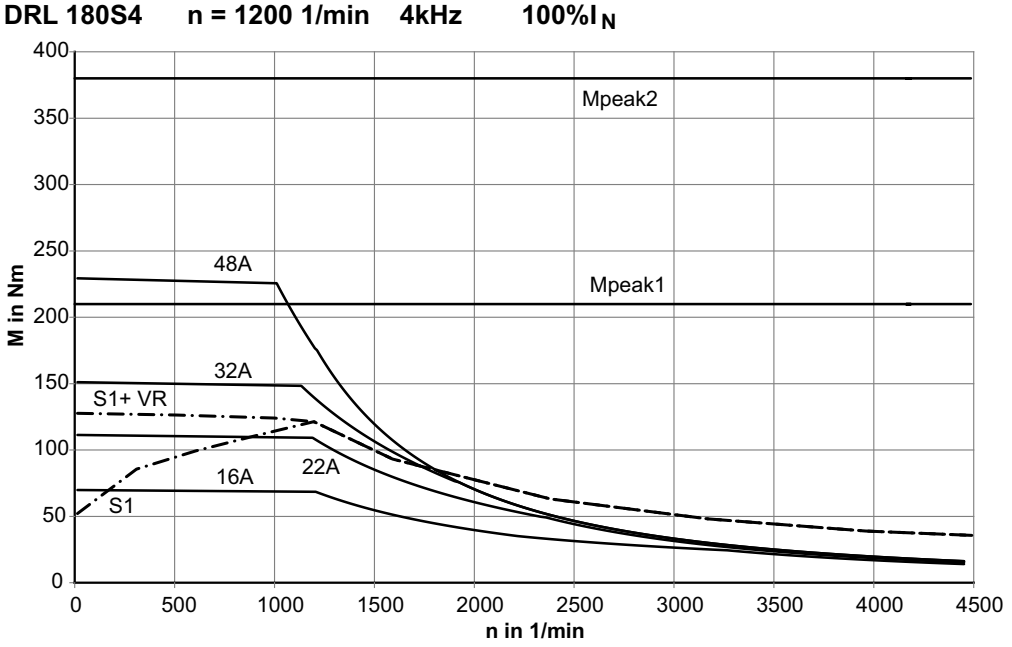
67807axx

DRL80S4, n_N = 3000 min^{-1}, 180% I_N



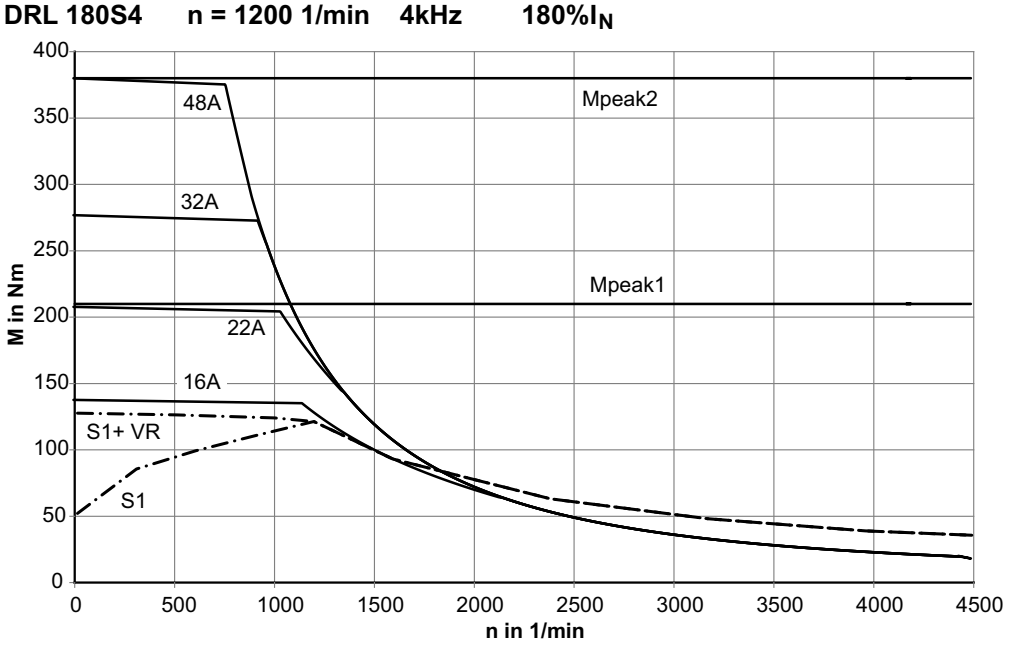
67808axx

DRL180S4, n_N = 1200 min^{-1}, 100% I_N



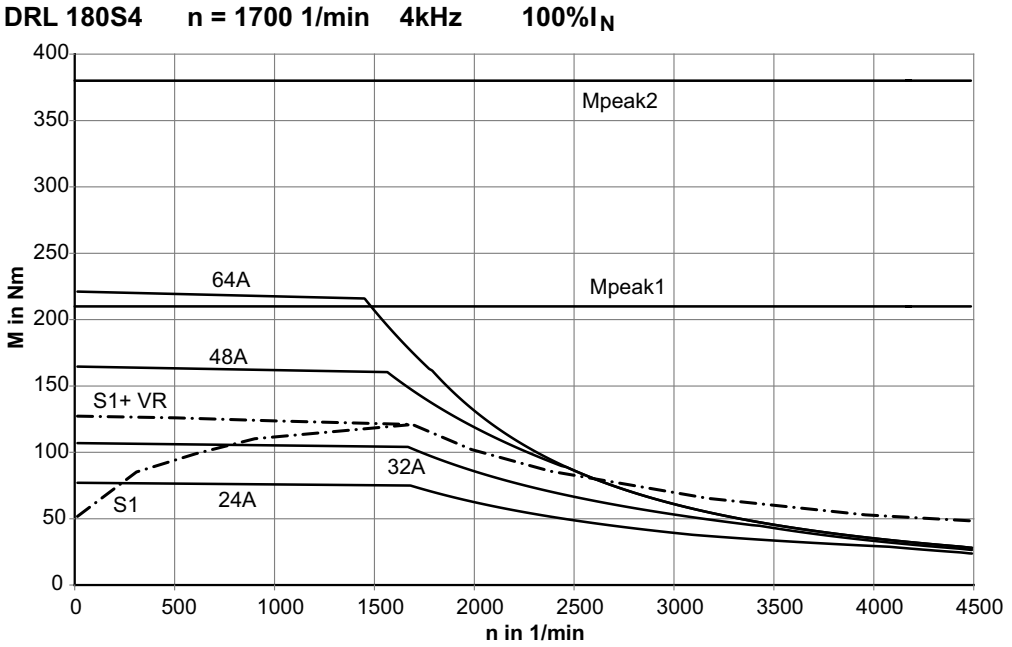
67817axx

DRL180S4, n_N = 1200 min^{-1}, 180% I_N



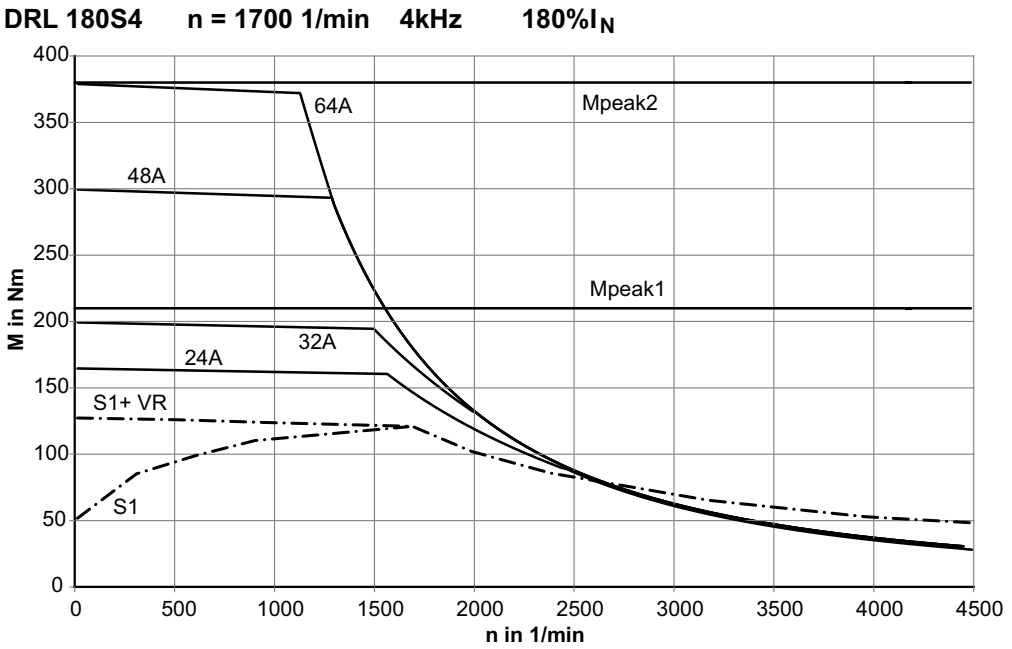
67818axx

DRL180S4, n_N = 1700 min^{-1}, 100% I_N



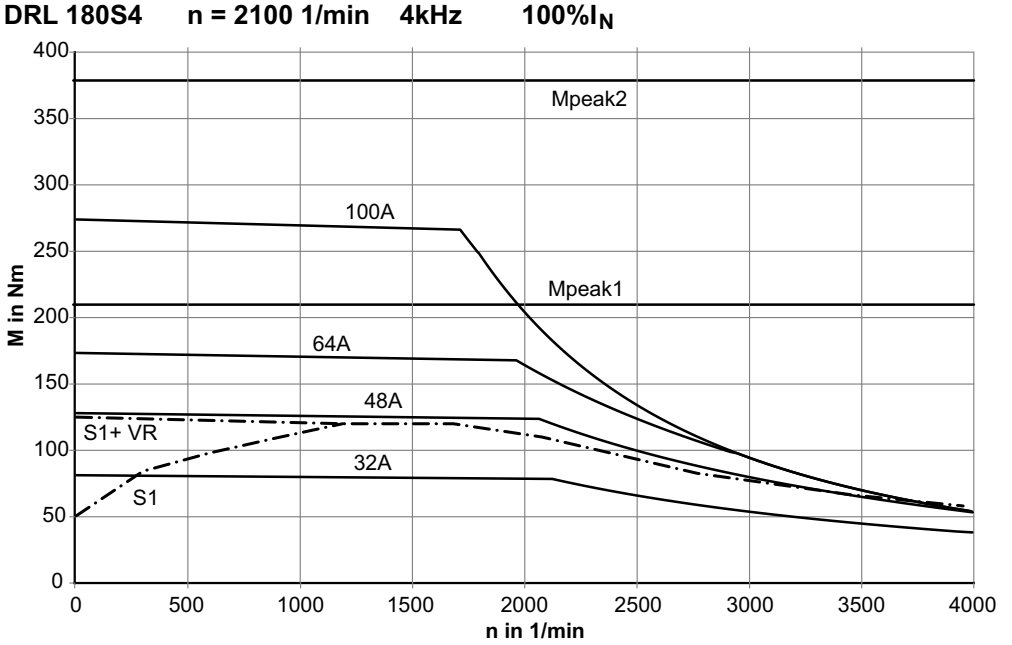
67819axx

DRL180S4, n_N = 1700 min^{-1}, 180% I_N



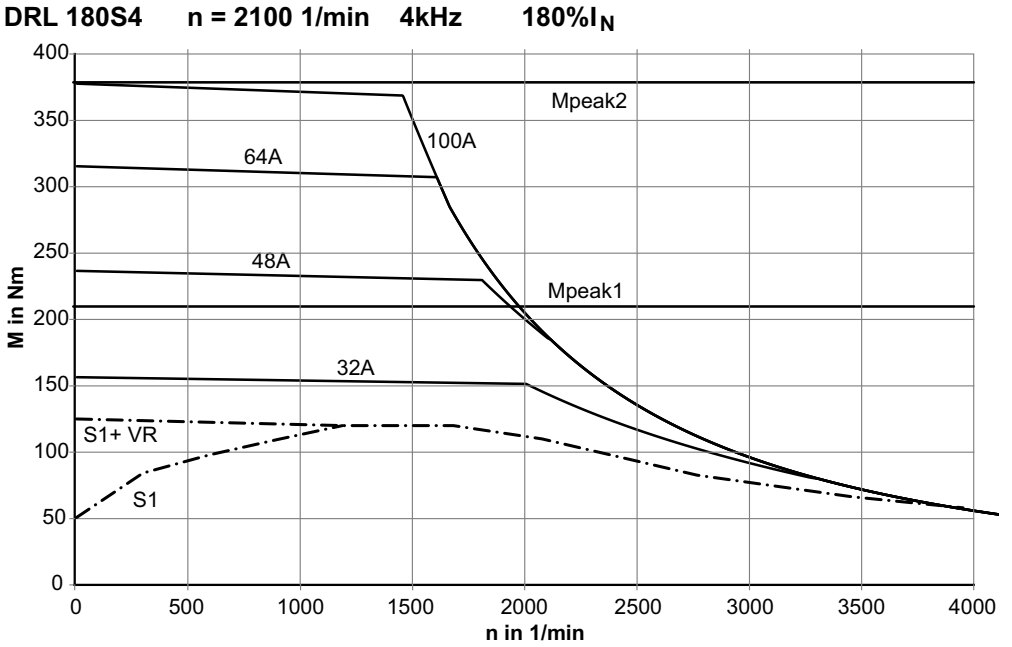
67820axx

DRL180S4, n_N = 2100 min^{-1}, 100% I_N



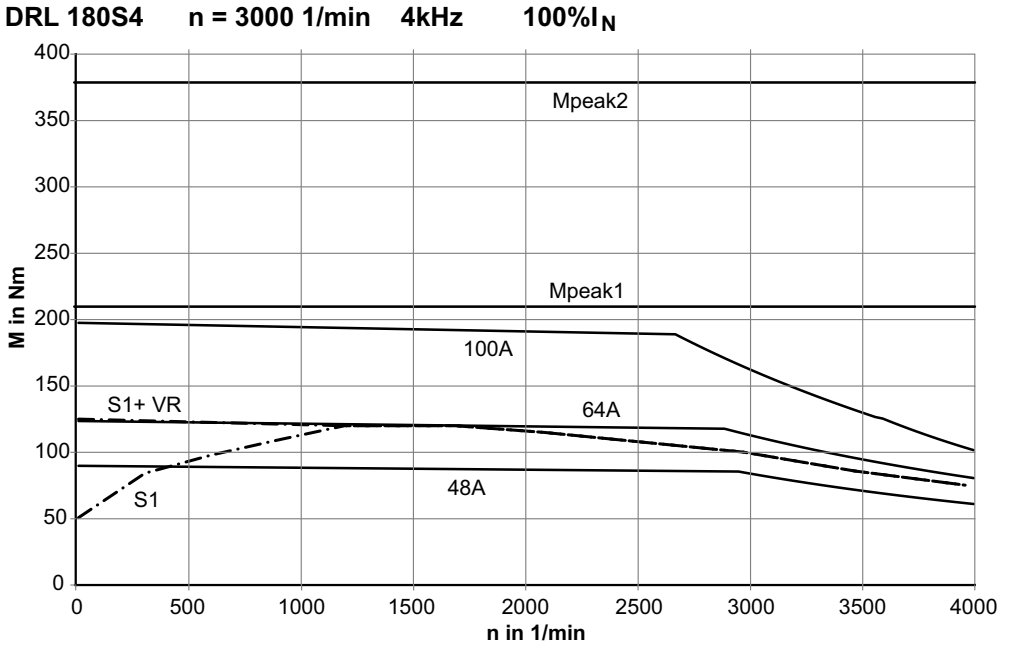
67821axx

DRL180S4, n_N = 2100 min^{-1}, 180% I_N



67822axx

DRL180S4, n_N = 3000 min^{-1}, 100% I_N



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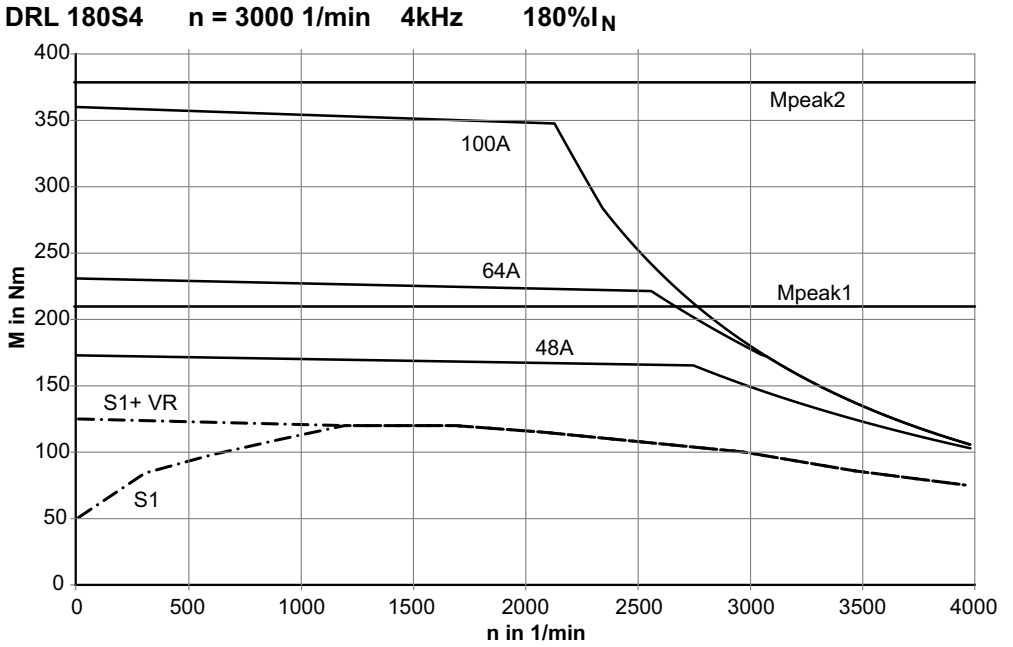
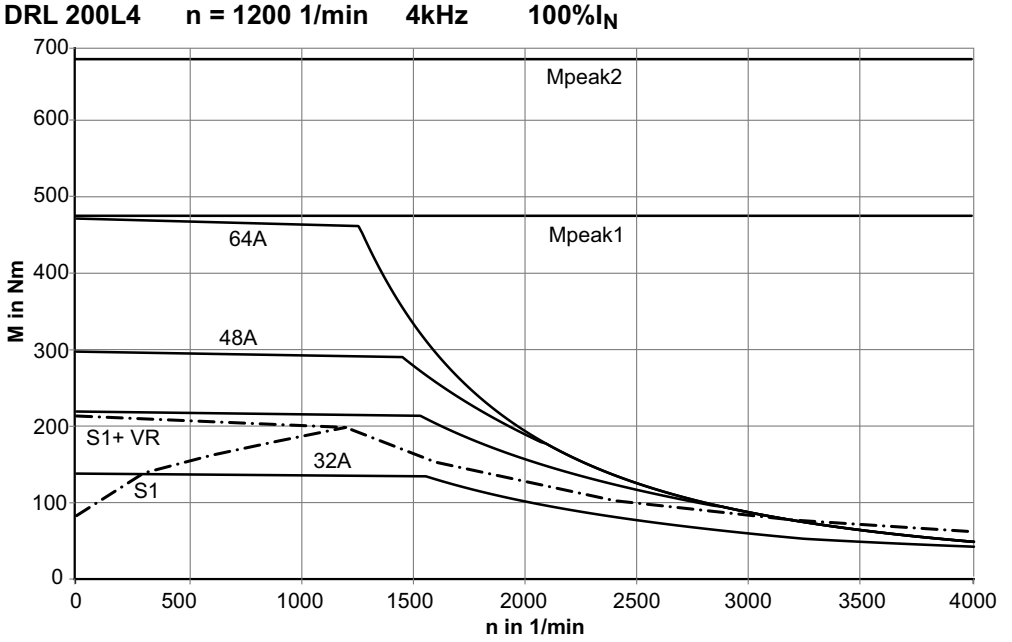
DRL180S4, n_N = 3000 min^{-1}, 180% I_N



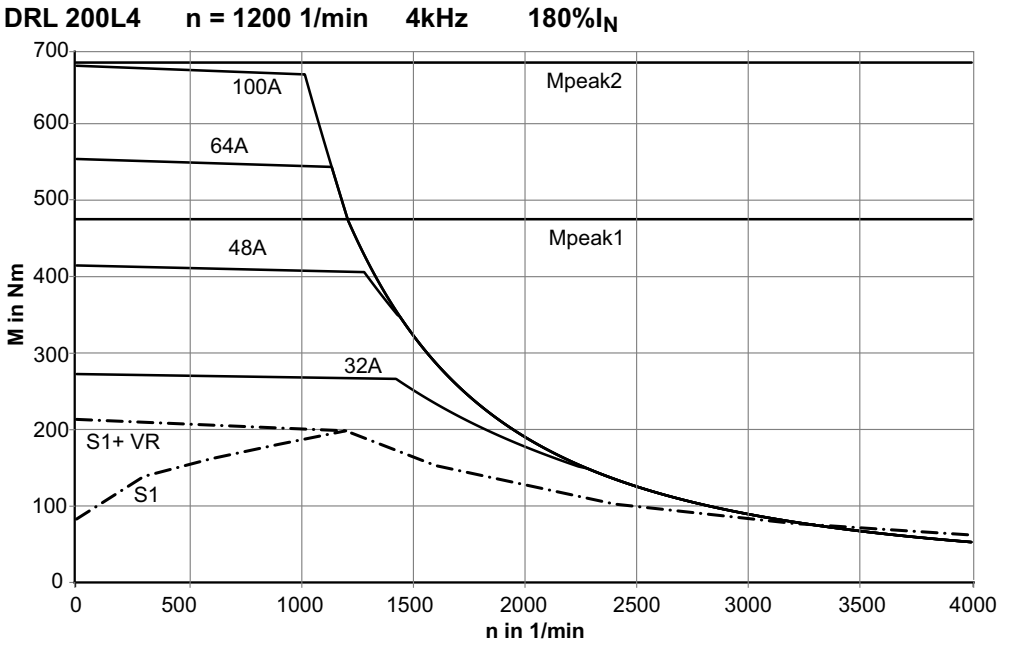
67824axx

DRL200L4, n_N = 1200 min^{-1}, 100% I_N



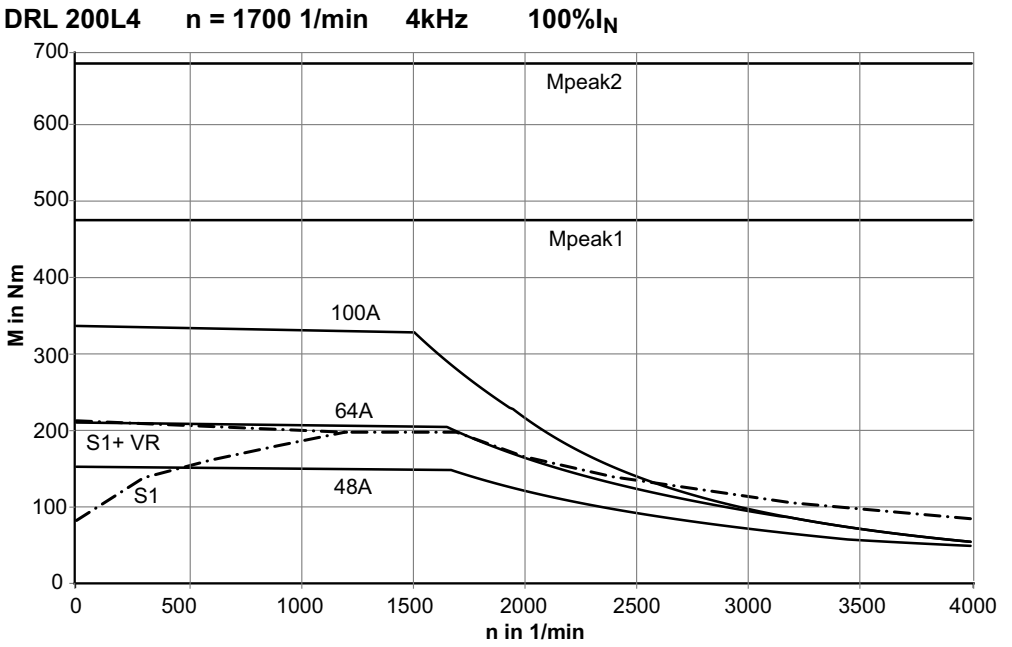
67833axx

DRL200L4, n_N = 1200 min^{-1}, 180% I_N



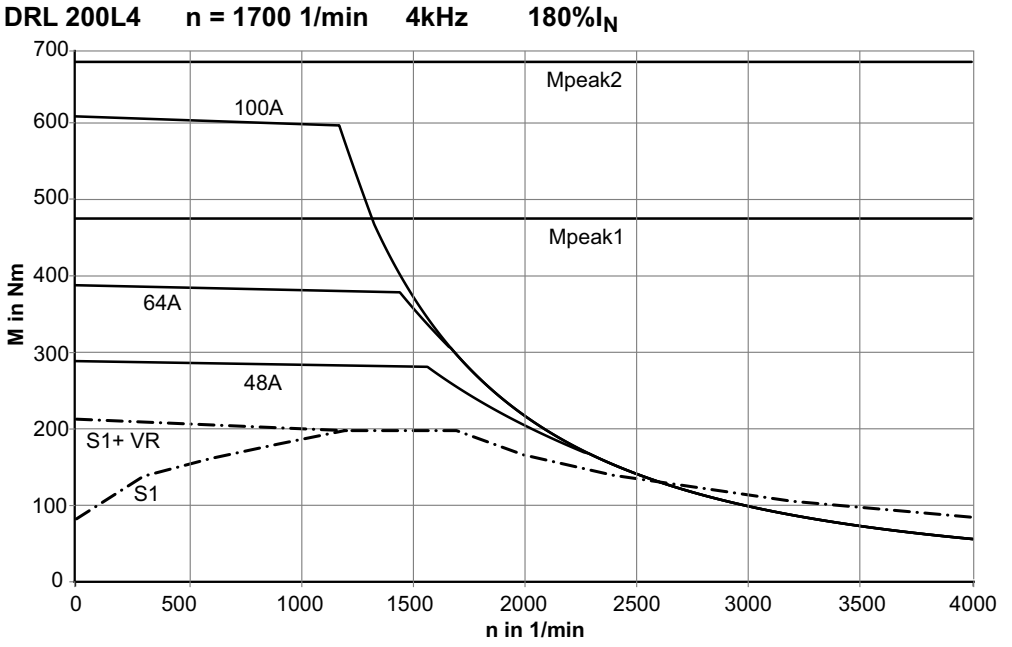
67834axx

DRL200L4, n_N = 1700 min^{-1}, 100% I_N



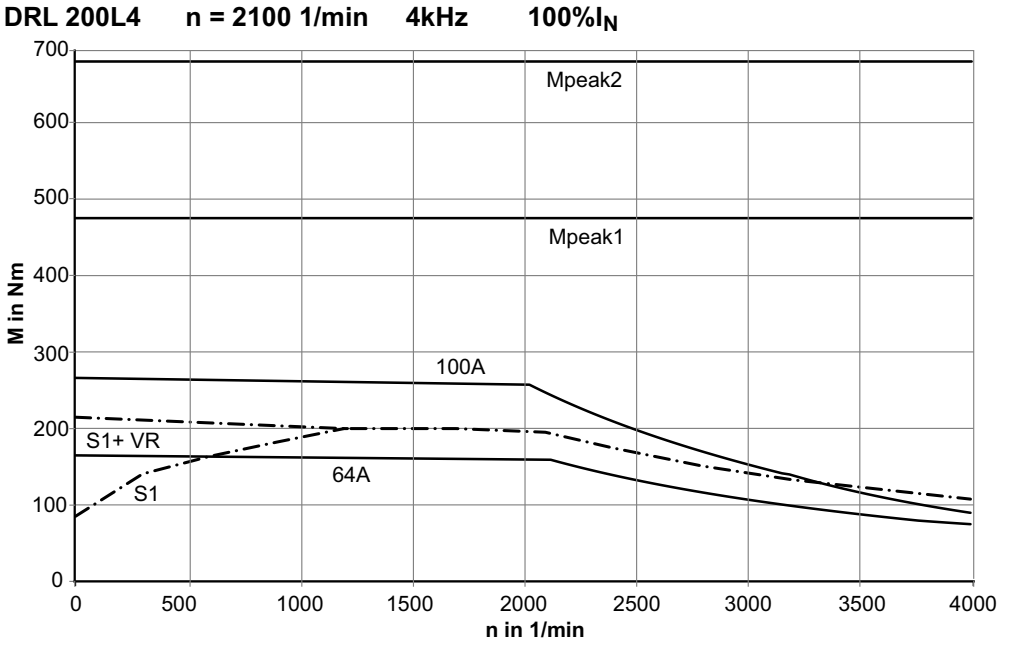
67835axx

DRL200L4, n_N = 1700 min^{-1}, 180% I_N



67836axx

DRL200L4, n_N = 2100 min^{-1}, 100% I_N



67837axx

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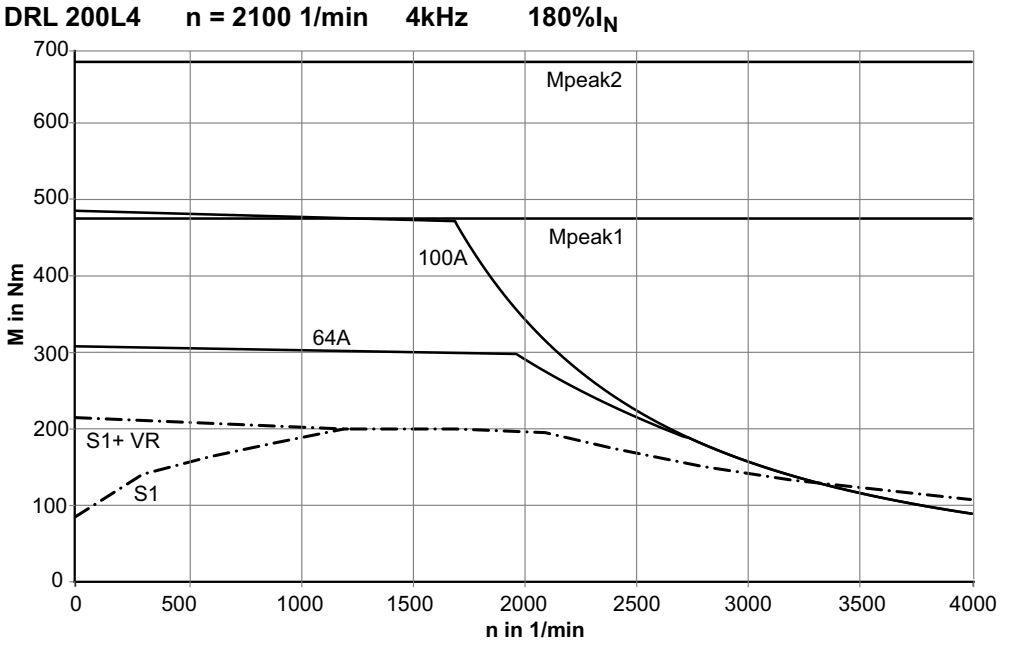
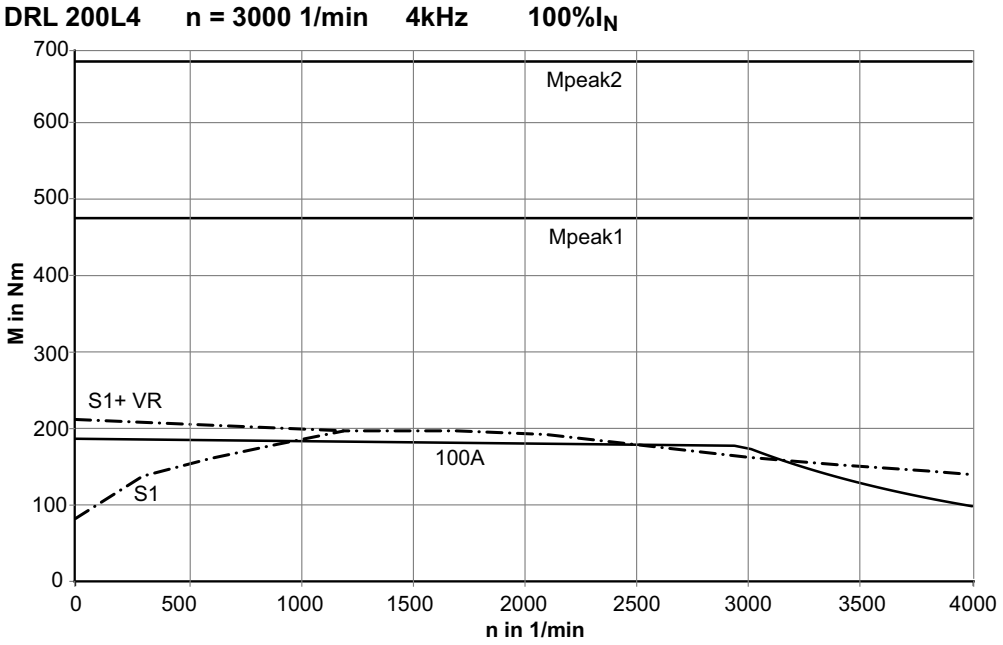


67838axx

DRL200L4, n_N = 3000 min^{-1}, 100% I_N



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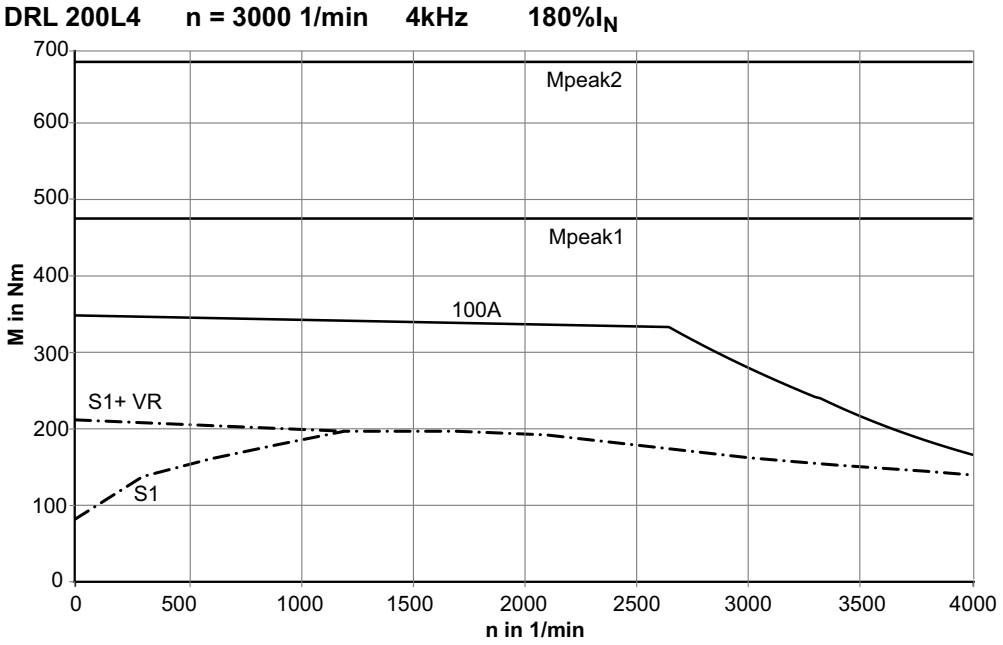
DRL200L4, n_N = 3000 min^{-1}, 180% I_N



67840axx

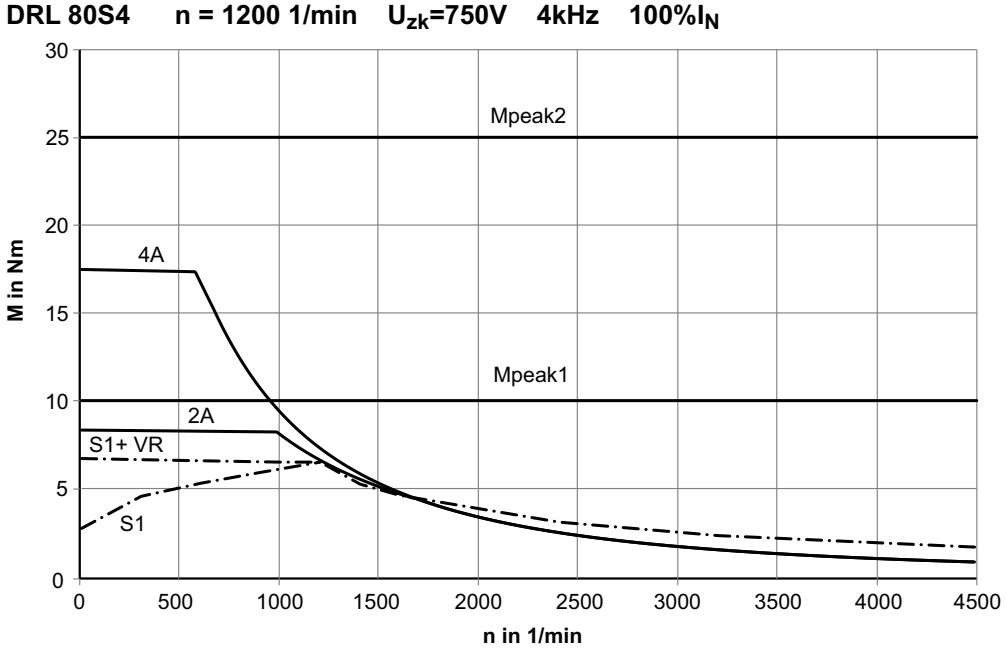
5.3 Limit characteristic curves DRL - MOVIAXIS®, $V_{DC\ link}$ = 750 V, PWM = 4 kHz

Key to the dynamic and thermal limit characteristic curves

S1	S1 characteristic curve (thermal limit characteristic curve)
S1+VR	S1 characteristic curve with forced cooling fan (thermal limit characteristic curve)
M_{peak1}	Maximum limit torque of dynamics package 1
M_{peak2}	Maximum limit torque of dynamics package 2
2 A	2 A nominal output current of the axis module
4 A	4 A nominal output current of the axis module
8 A	8 A nominal output current of the axis module
12 A	12 A nominal output current of the axis module
16 A	16 A nominal output current of the axis module
24 A	24 A nominal output current of the axis module
32 A	32 A nominal output current of the axis module
48 A	48 A nominal output current of the axis module
64 A	64 A nominal output current of the axis module
100 A	100 A nominal output current of the axis module

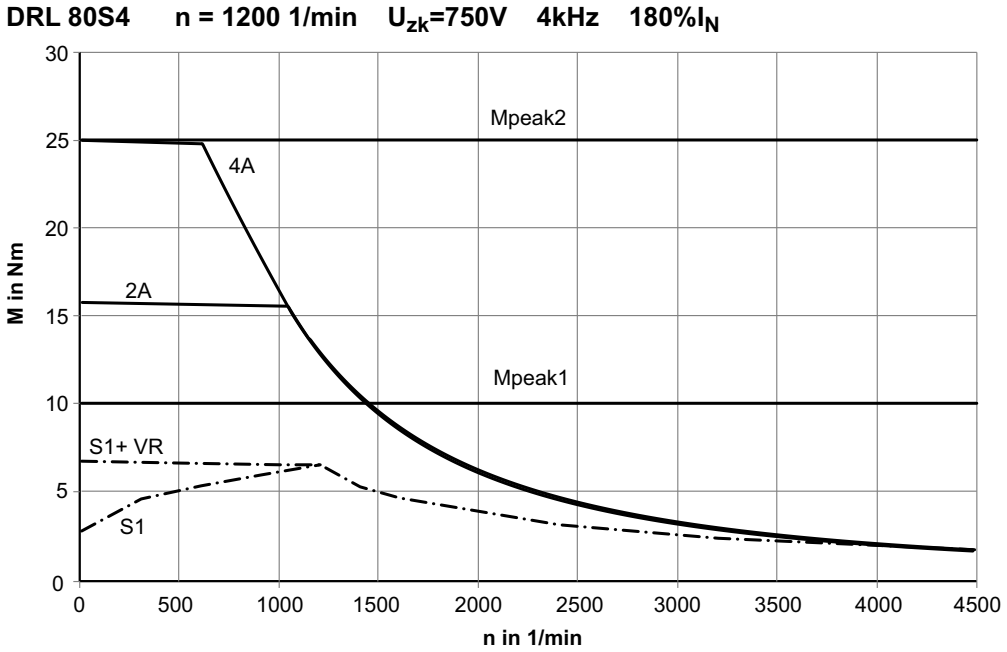
$V_{DC\ link}$ = DC link voltage

DRL80S4, n_N = 1200 min^{-1}, 100% I_N



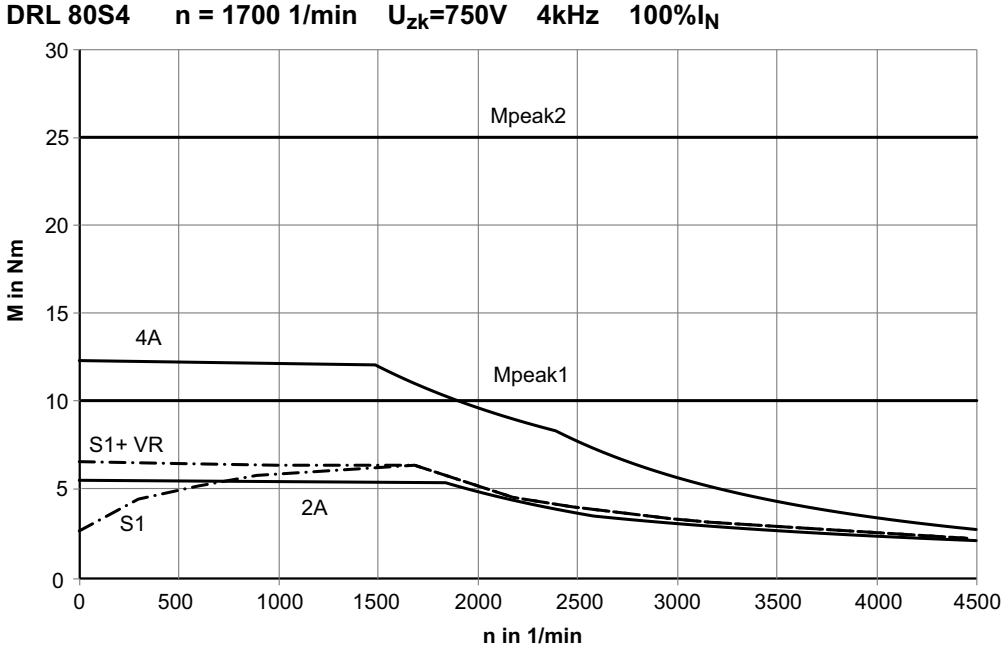
67901axx

DRL80S4, n_N = 1200 min^{-1}, 180% I_N



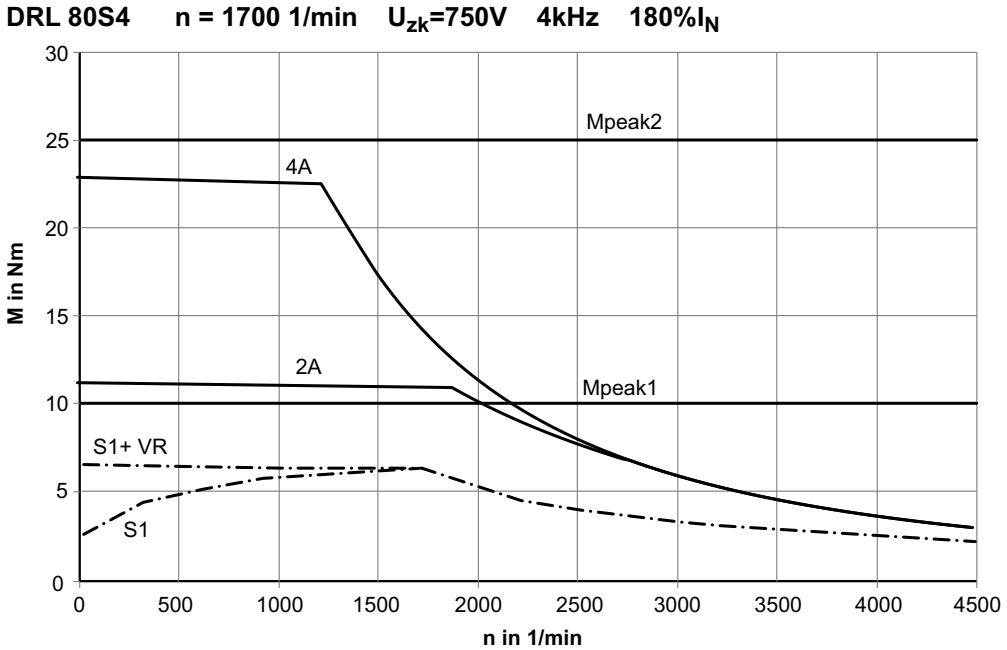
67902axx

DRL80S4, n_N = 1700 min^{-1}, 100% I_N



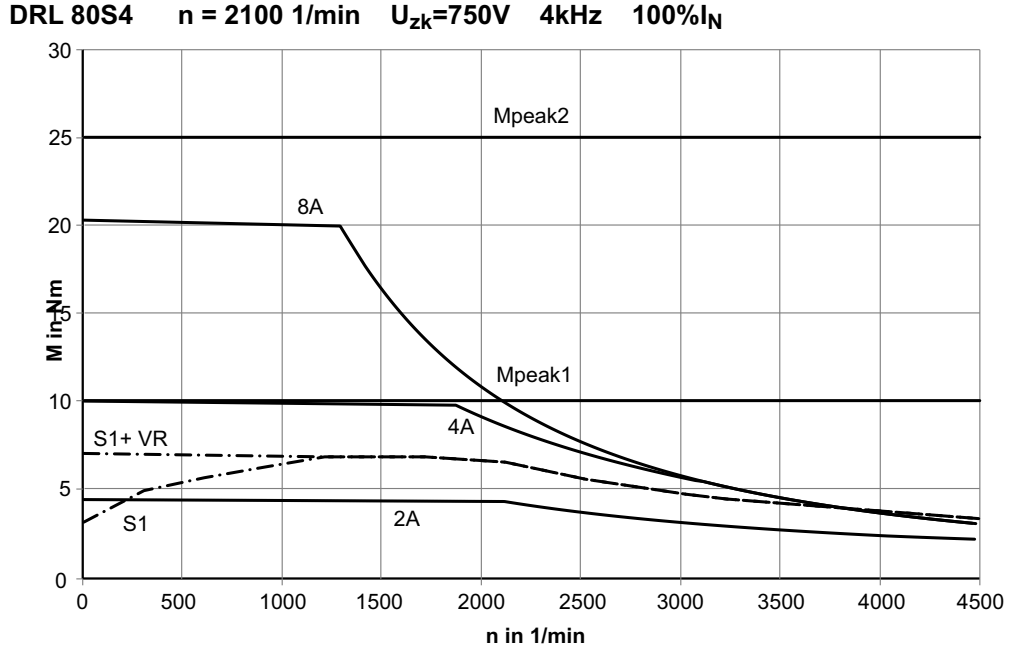
67903axx

DRL80S4, n_N = 1700 min^{-1}, 180% I_N



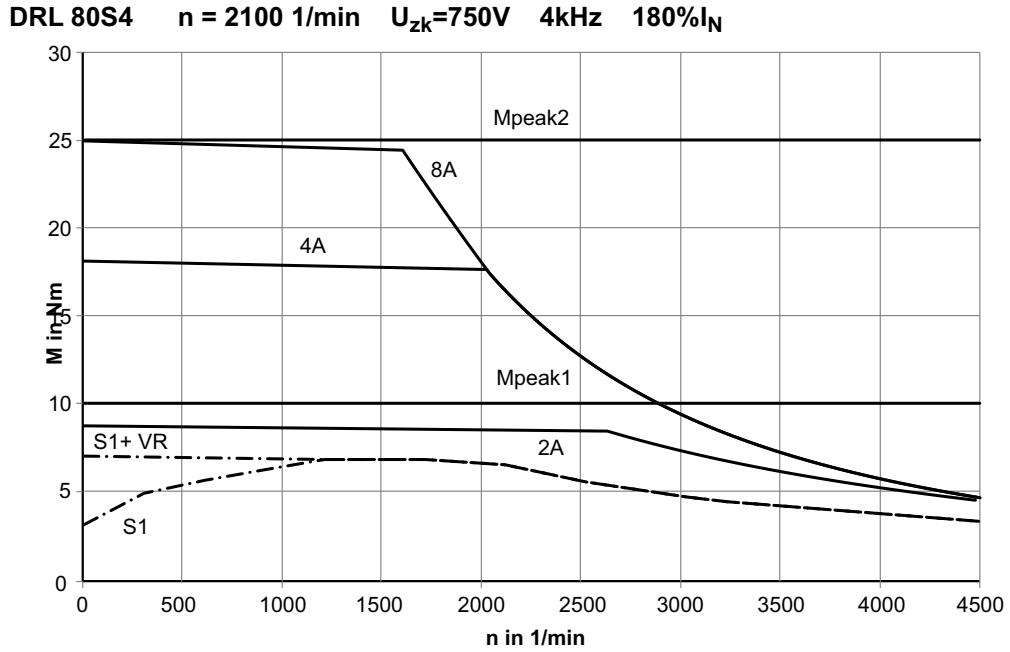
67904axx

DRL80S4, n_N = 2100 min^{-1}, 100% I_N



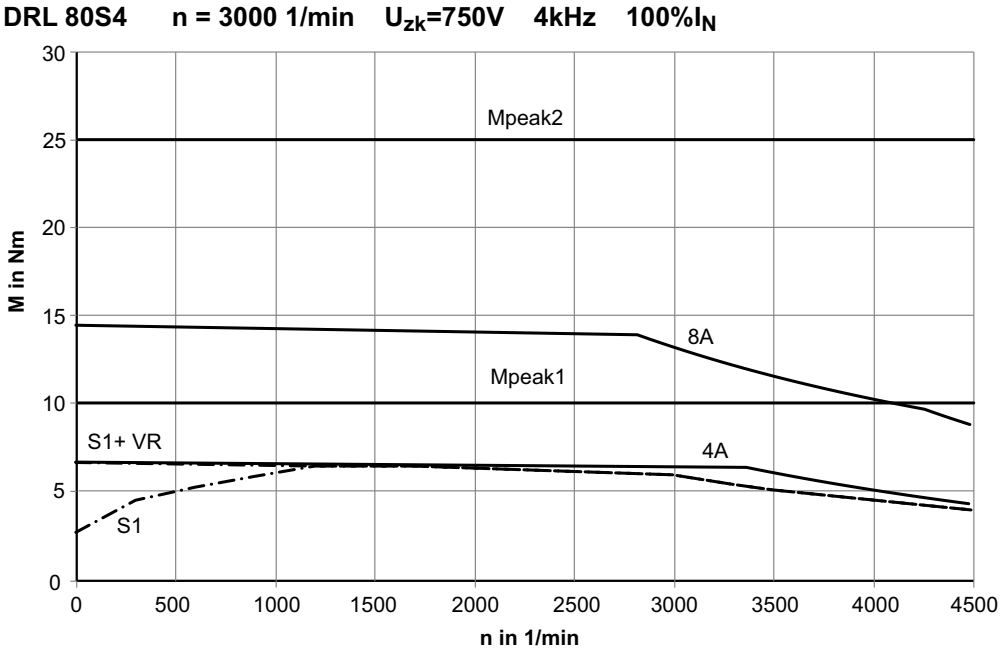
67905axx

DRL80S4, n_N = 2100 min^{-1}, 180% I_N



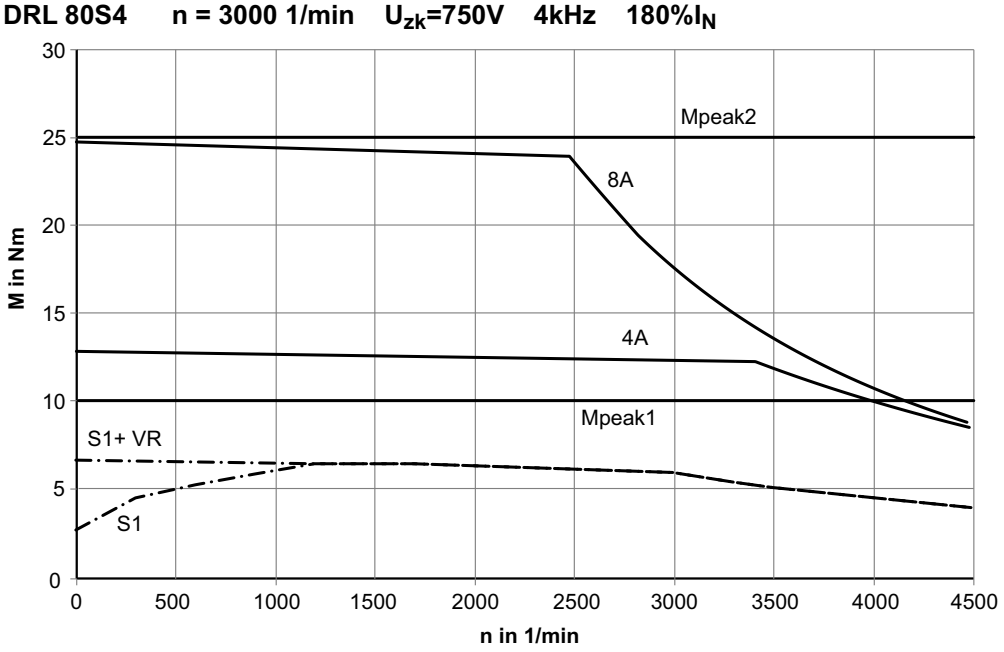
67906axx

DRL80S4, n_N = 3000 min^{-1}, 100% I_N



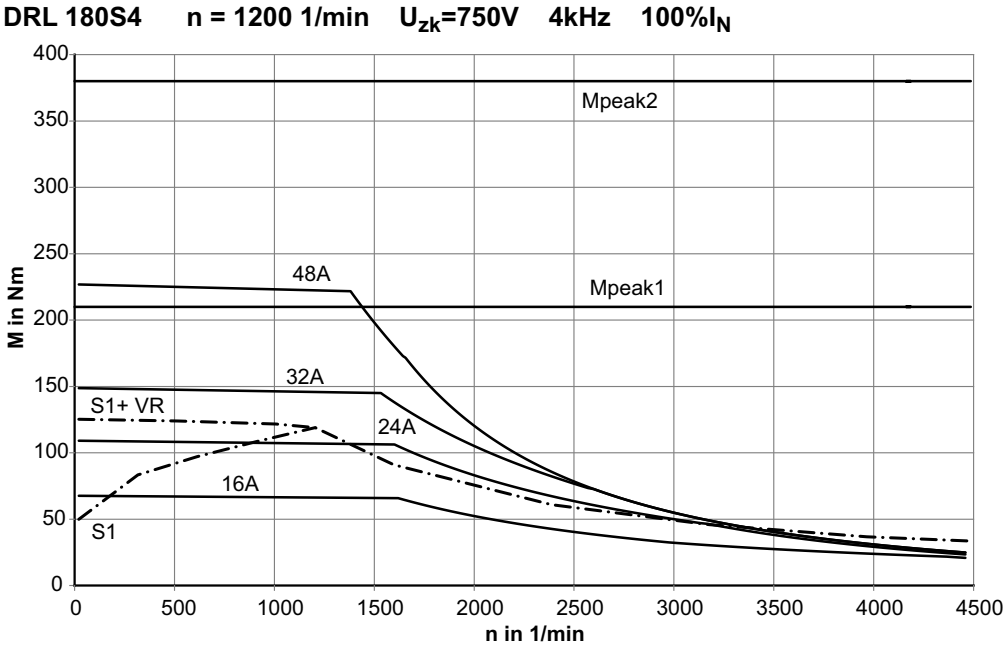
67907axx

DRL80S4, n_N = 3000 min^{-1}, 180% I_N



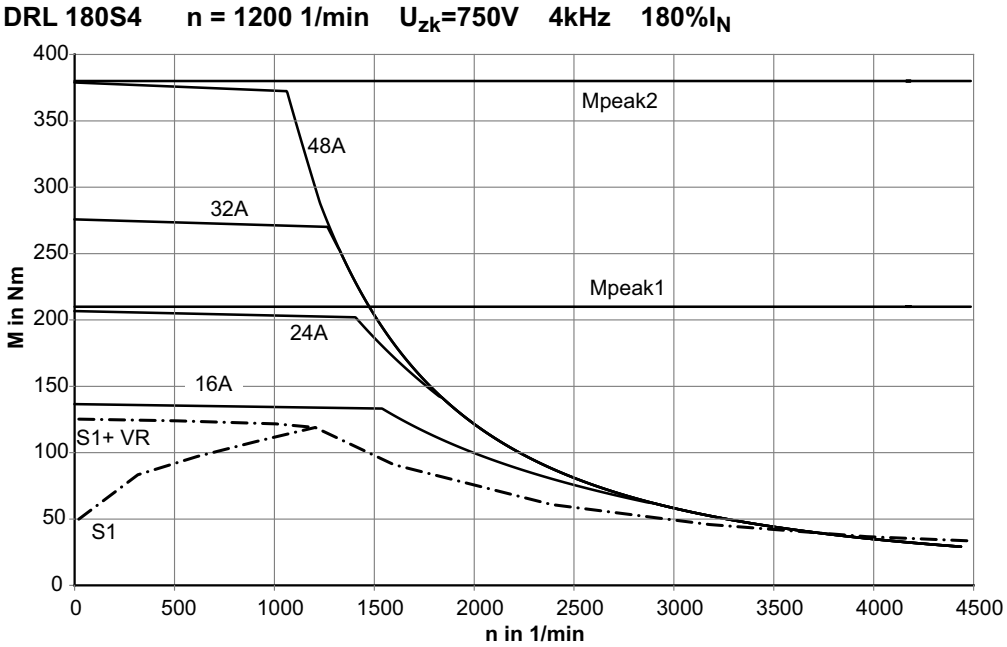
67908axx

DRL180S4, n_N = 1200 min^{-1}, 100% I_N



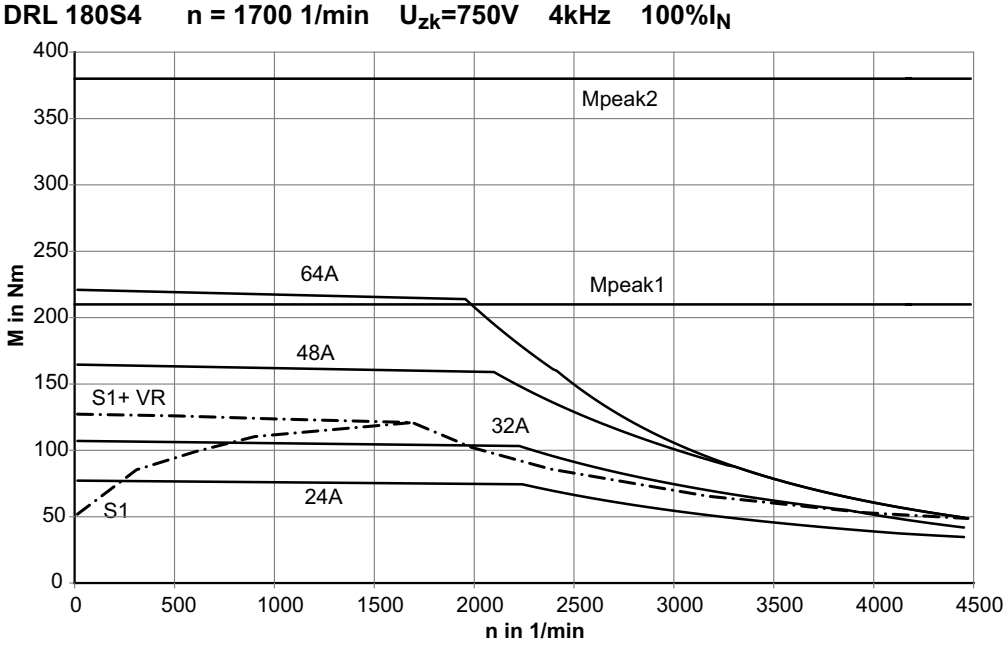
67917axx

DRL180S4, n_N = 1200 min^{-1}, 180% I_N



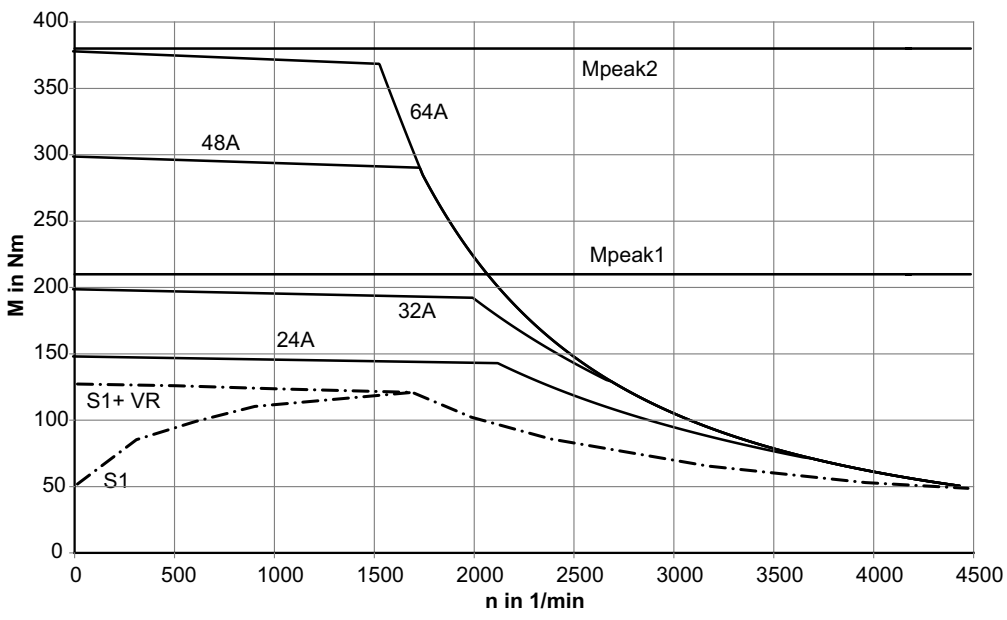
67918axx

DRL180S4, n_N = 1700 min^{-1}, 100% I_N



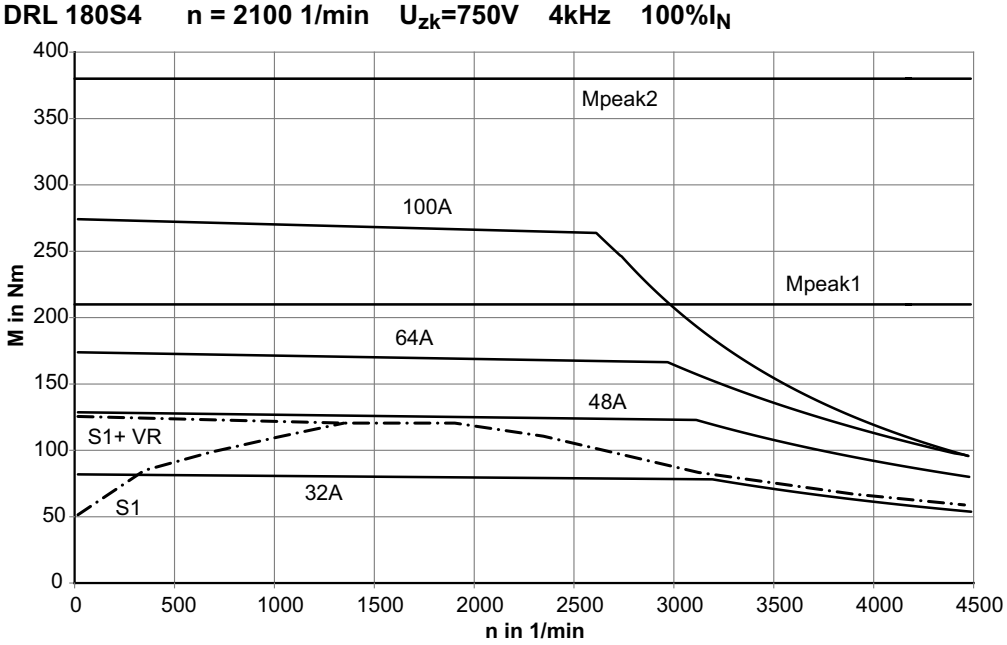
67919axx

DRL180S4, n_N = 1700 min^{-1}, 180% I_N



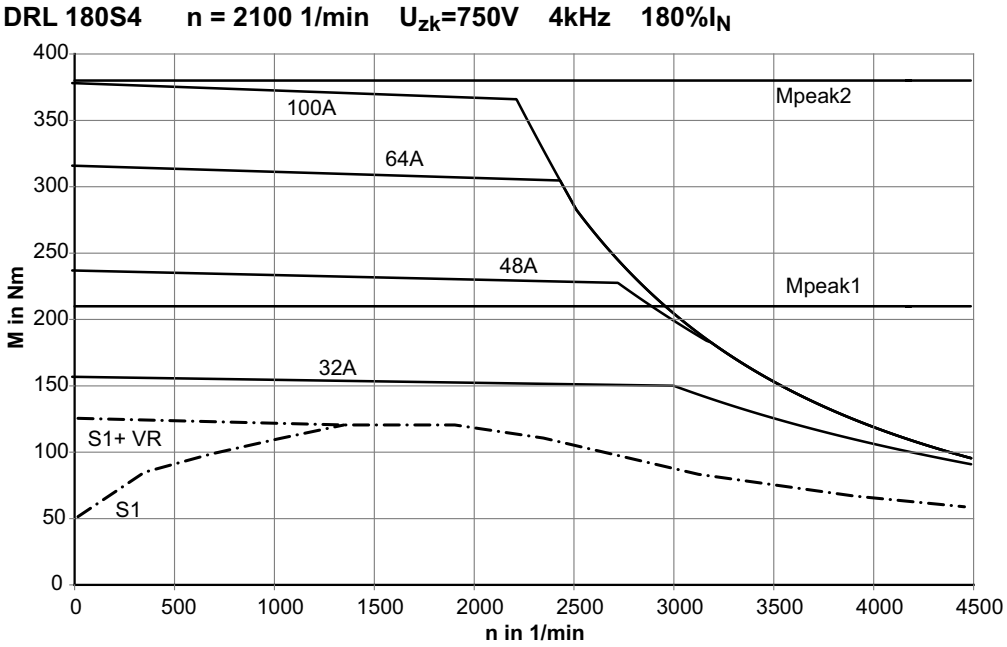
67920axx

DRL180S4, n_N = 2100 min^{-1}, 100% I_N



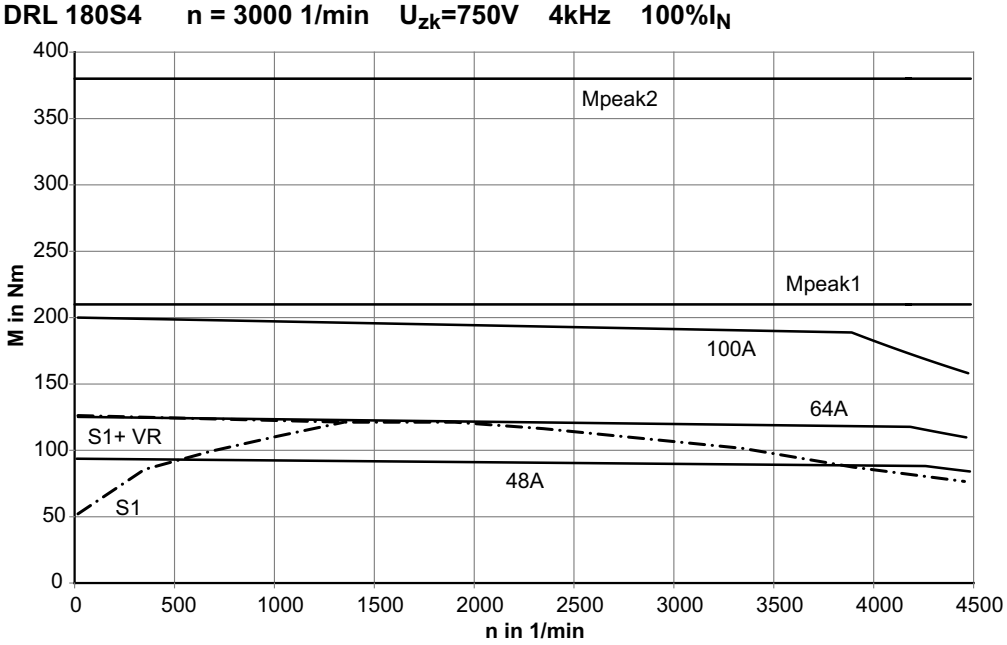
67921axx

DRL180S4, n_N = 2100 min^{-1}, 180% I_N



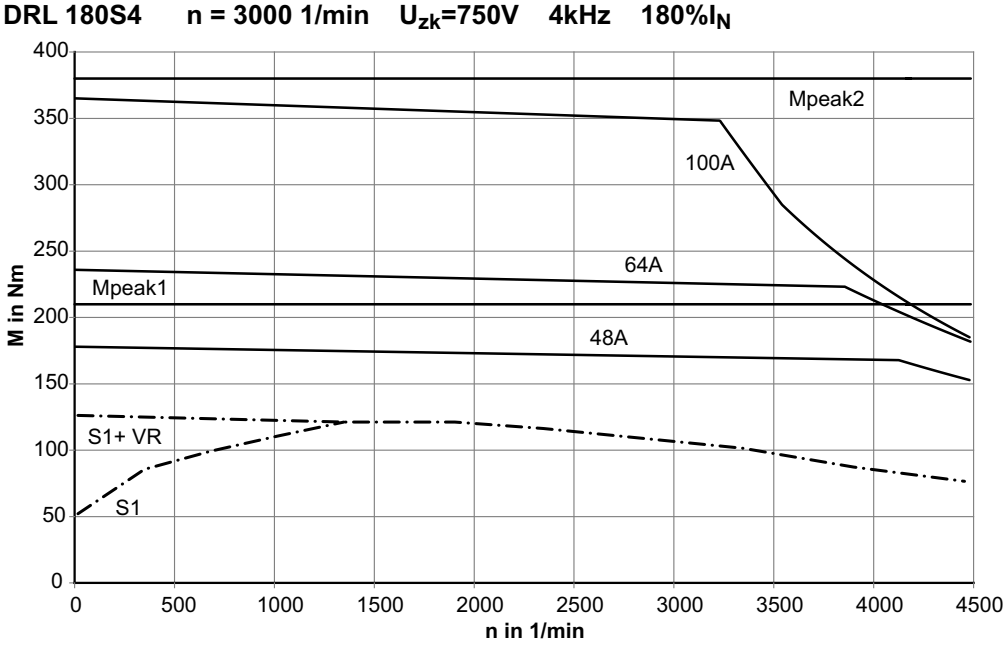
67922axx

DRL180S4, n_N = 3000 min^{-1}, 100% I_N



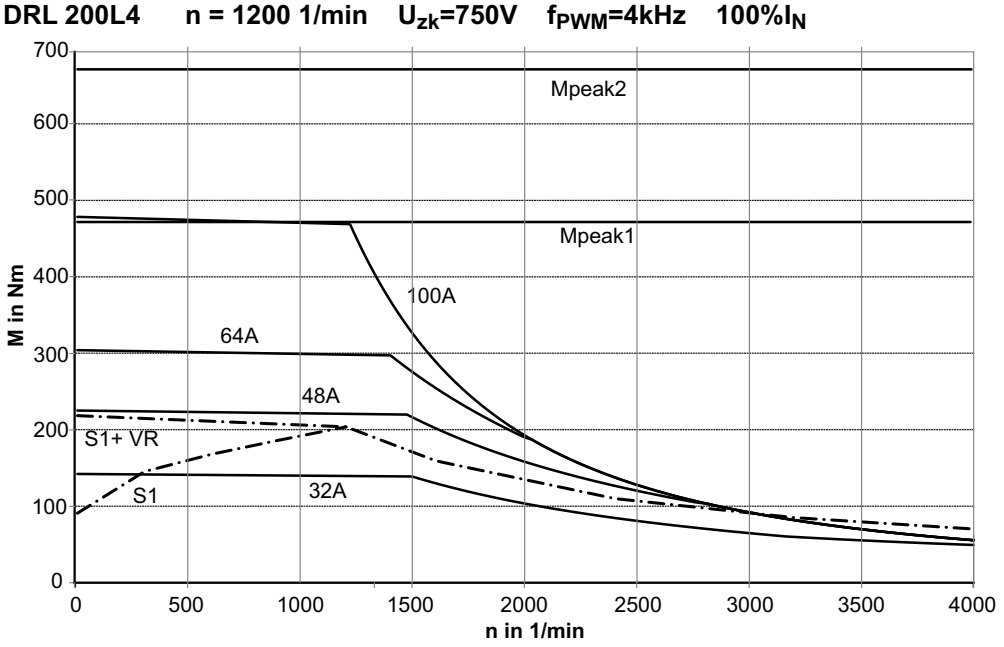
67923axx

DRL180S4, n_N = 3000 min^{-1}, 180% I_N



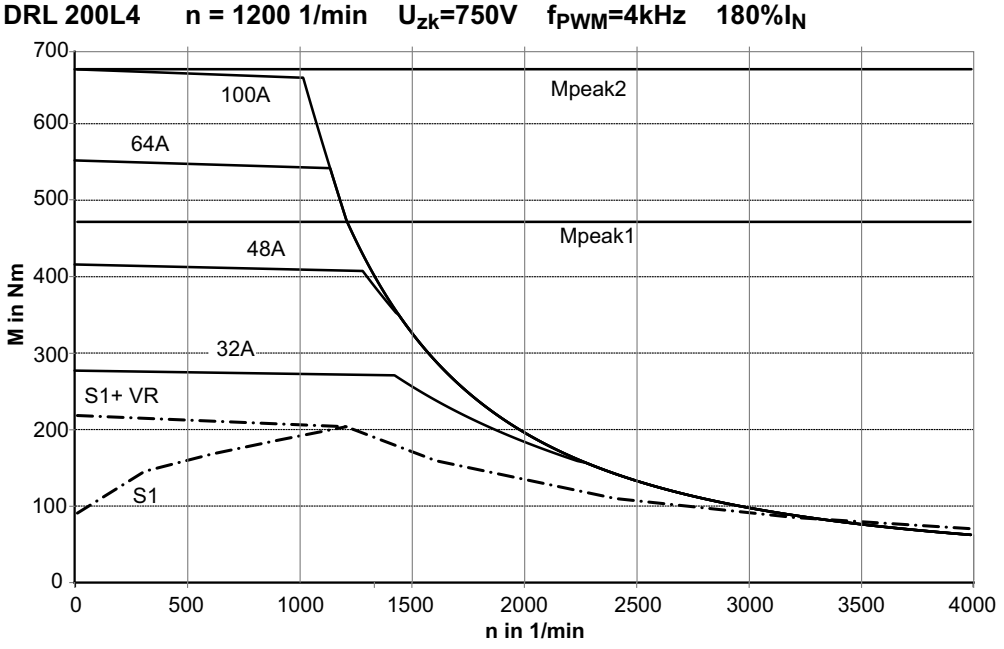
67924axx

DRL200L4, n_N = 1200 min^{-1}, 100% I_N



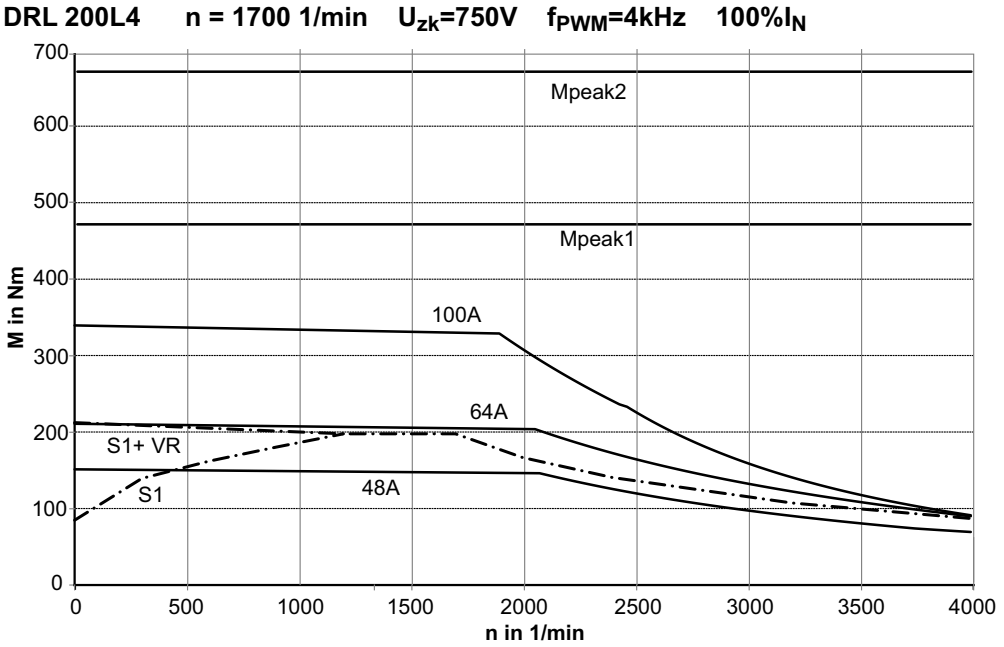
67933axx

DRL200L4, n_N = 1200 min^{-1}, 180% I_N



67934axx

DRL200L4, n_N = 1700 min^{-1}, 100% I_N



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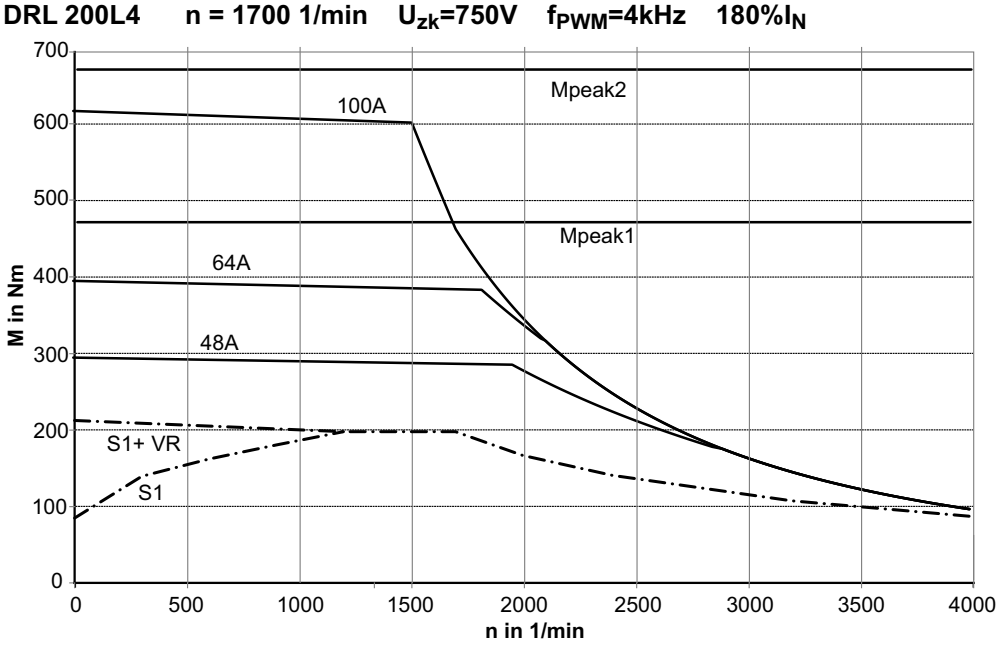
DRL200L4, n_N = 1700 min^{-1}, 180% I_N



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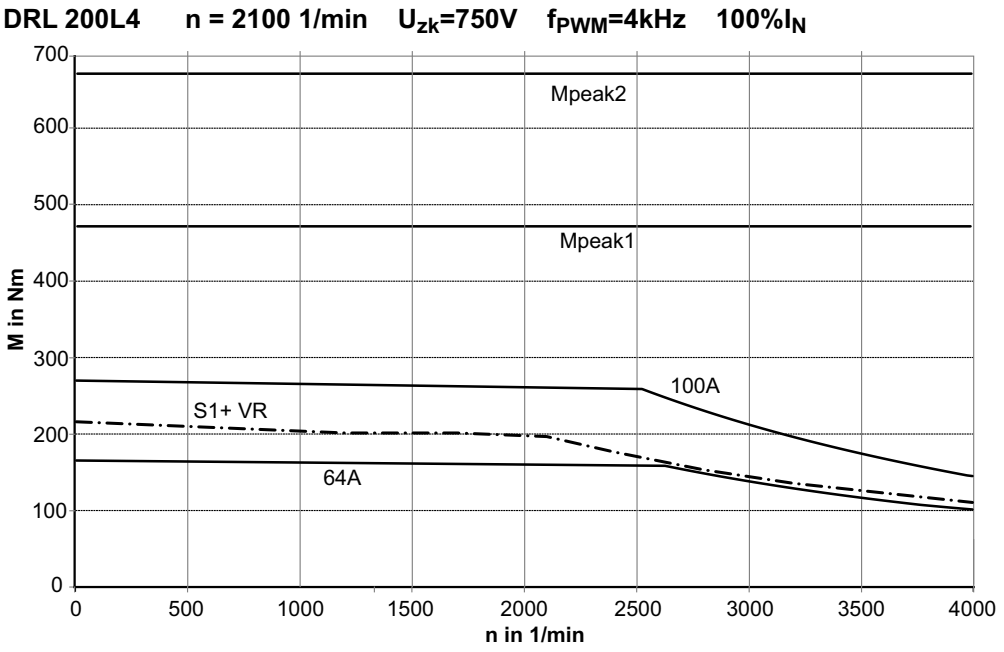
DRL200L4, n_N = 2100 min^{-1}, 100% I_N



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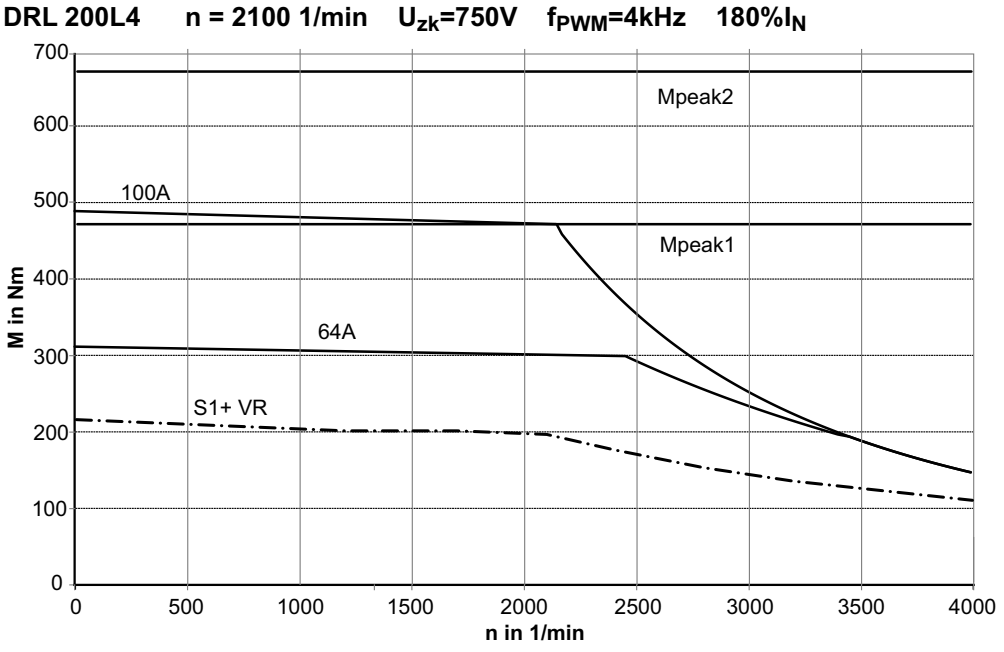
DRL200L4, n_N = 2100 min^{-1}, 180% I_N



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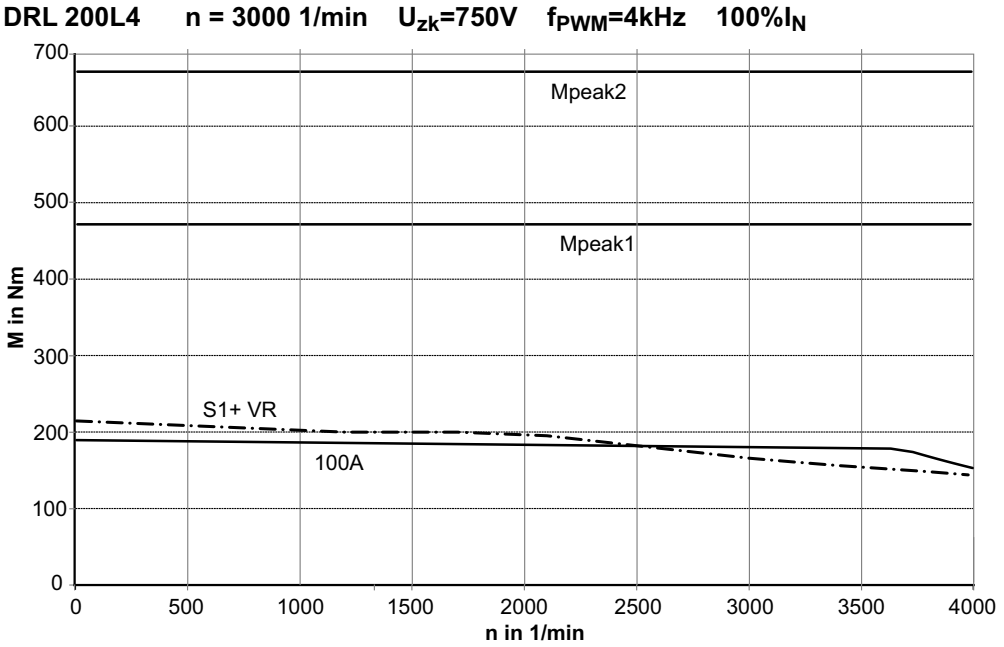
DRL200L4, n_N = 3000 min^{-1}, 100% I_N



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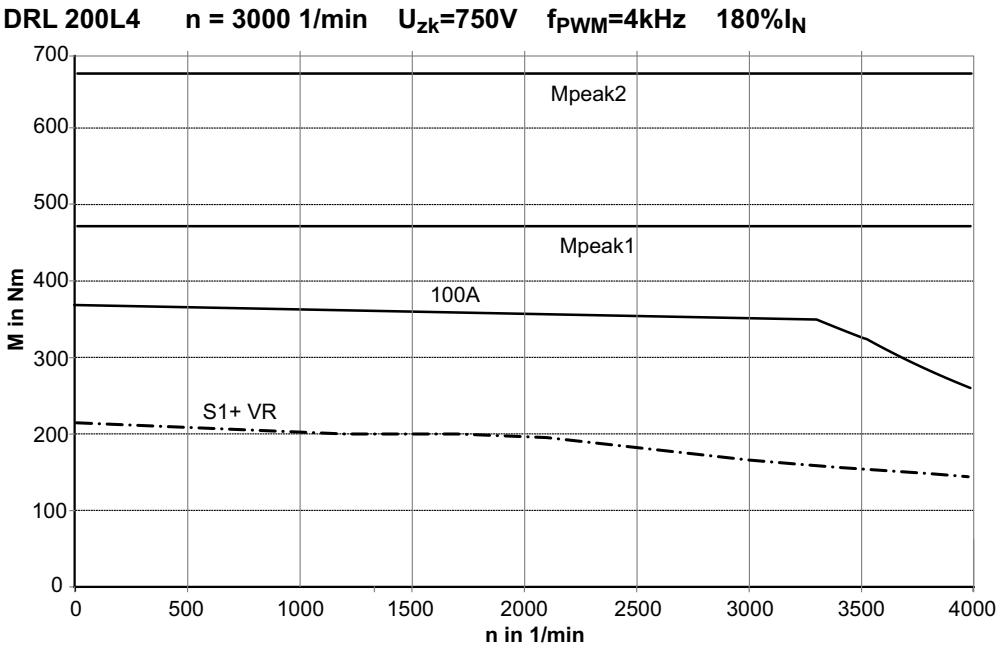
DRL200L4, n_N = 3000 min^{-1}, 180% I_N



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