UNIM034

Knowledge Base Document

Technical Support Department, U79, Newtown

Title: **Unidrive M ratings for low output frequency operation.**

Document Category:	Power Stage	**Product Category:**	Unidrive M
Credits	E&D		

Revision History

Revision	Date	Revising Author	Released for Website ?	Mark X	Authorised By	Comments
1.0	11/11/15	Richard Morgan	**CTSupport** **CTVip** **Both** **None**	x x	Gareth Jones	
2.0	09/11/16	Richard Morgan				Unidrive M Frame 11 690 V ratings update for switching frequency limitation.
3.0	06/02/17	Leighton Davies				

Summary of Contents

Detailing overload and continuous current capabilities at low output frequencies with different switching frequencies, ambient temperature and stable internal drive temperatures.

1.0 Introduction

The Unidrive M thermal protection algorithm ensures that the power stage has adequate thermal protection across the whole output frequency range. At low output frequencies this can result in reduced maximum output currents. When operating at low output frequencies each IGBT carries the current for longer causing an increase in the device heating hence a larger temperature ripple.

Operating the drive outside the limits detailed below may result in an OHt Inverter trip (IGBT junction over temperature based on firmware thermal model trip).

Maximum drive output currents at low frequencies and within specific operating conditions are detailed in graphical form for Unidrive M frame 11 to frame 4 (see table 1, section 2 below). The overload available depends on the switching frequency, output frequency, the ambient temperature and previous operating conditions.

Modular drives (Unidrive M frame 9 to 11) have the same rating for both the docked condition (rectifier and converter mounted together, power formats ‘A’, ‘E’ and ‘T’) and the undocked condition (separately mounted rectifier and inverter, power format ‘D’).

2.0 Drives

The performance of each drive listed in table 1 is detailed in the charts in section 5 (rating charts).

A further 5% derate should be applied to the published rating for modular drives connected in parallel.

Table 1 – Drive model number and page reference for relevant performance chart.

Voltage Rating	Drive Model	Page
200V	Unidrive M 04200137	6
200V	Unidrive M 04200185	7
400V	Unidrive M 04400150	8
400V	Unidrive M 04400172	9
200V	Unidrive M 05200250	10
400V	Unidrive M 05400270	11
400V	Unidrive M 05400300	12
575V	Unidrive M 05500030	13
575V	Unidrive M 05500040	13
575V	Unidrive M 05500069	13
200V	Unidrive M 06200330	14
200V	Unidrive M 06200440	15
400V	Unidrive M 06400350	16
400V	Unidrive M 06400420	17
400V	Unidrive M 06400470	18
575V	Unidrive M 06500100	19
575V	Unidrive M 06500150	20
575V	Unidrive M 06500190	21
575V	Unidrive M 06500230	22
575V	Unidrive M 06500290	23
575V	Unidrive M 06500350	24
200V	Unidrive M 07200610	25
200V	Unidrive M 07200750	26
200V	Unidrive M 07200830	27
400V	Unidrive M 07400660	28
400V	Unidrive M 07400770	29
400V	Unidrive M 07401000	30
575V	Unidrive M 07500440	31
575V	Unidrive M 07500550	32
690V	Unidrive M 07600190	33
690V	Unidrive M 07600240	34
690V	Unidrive M 07600290	35
690V	Unidrive M 07600380	36
690V	Unidrive M 07600440	37
690V	Unidrive M 07600540	38
200V	Unidrive M 08201160	39
200V	Unidrive M 08201320	40
400V	Unidrive M 08401340	41
400V	Unidrive M 08401570	42
575V	Unidrive M 08500630	43
575V	Unidrive M 08500860	44
690V	Unidrive M 08600630	45
690V	Unidrive M 08600860	46
200V	Unidrive M 09201760	47
200V	Unidrive M 09202190	48
400V	Unidrive M 09402000	49
400V	Unidrive M 09402240	50

Table 2 continued – Drive model number and page reference for relevant performance chart.

575V	Unidrive M 09501040	51
575V	Unidrive M 09501310	52
690V	Unidrive M 09601040	53
690V	Unidrive M 09601310	54
200V	Unidrive M 10202830	55
200V	Unidrive M 10203000	56
400V	Unidrive M 10402700	57
400V	Unidrive M 10403200	58
575V	Unidrive M 10501520	59
575V	Unidrive M 10501900	60
690V	Unidrive M 10601500	61
690V	Unidrive M 10601780	62
400V	Unidrive M 11403770	63
400V	Unidrive M 11404170	64
400V	Unidrive M 11404640	65
575V	Unidrive M 11502000	66
575V	Unidrive M 11502540	67
575V	Unidrive M 11502850	68
690V	Unidrive M 11602100	69
690V	Unidrive M 11602380	70
690V	Unidrive M 11602630	71

3.0 Operating conditions

All ratings specified within this document are from the hot condition. This operating condition assumes that the drive has been operating at 50Hz, at rated current until all internal drive temperatures have stabilised. This is followed by a demand for a 150% overload for 7 seconds at a low output frequency (the output frequency and available output current is given in the chart).

Ratings have been generated with the following DC bus voltages:

200 V drives = 340 Vdc
400 V drives = 600 Vdc
575 V drives = 800 Vdc
690 V drives = 975 Vdc

4.0 Description of charts

Two charts have been produced for each drive, a low frequency derate chart and an overload current / overload duration from hot chart. An overload current of 150% **applied to the derated continuous current** can be achieved for 7 seconds from the hot condition.

4.1 Low Frequency Derate Charts

This chart gives the maximum continuous output currents achievable for a duty cycle which also includes 150% overload for 7 seconds. Ratings are given for 2 kHz, 3 kHz, 6 kHz and worst case switching frequency (16 kHz in the example of Unidrive M 08201320 shown in figure 1 below), for both 40 °C and 50 °C ambient temperatures. The standard heavy duty (HD) continuous rating is represented by a dashed grey line.

Output frequency is plotted against a logarithmic scale.

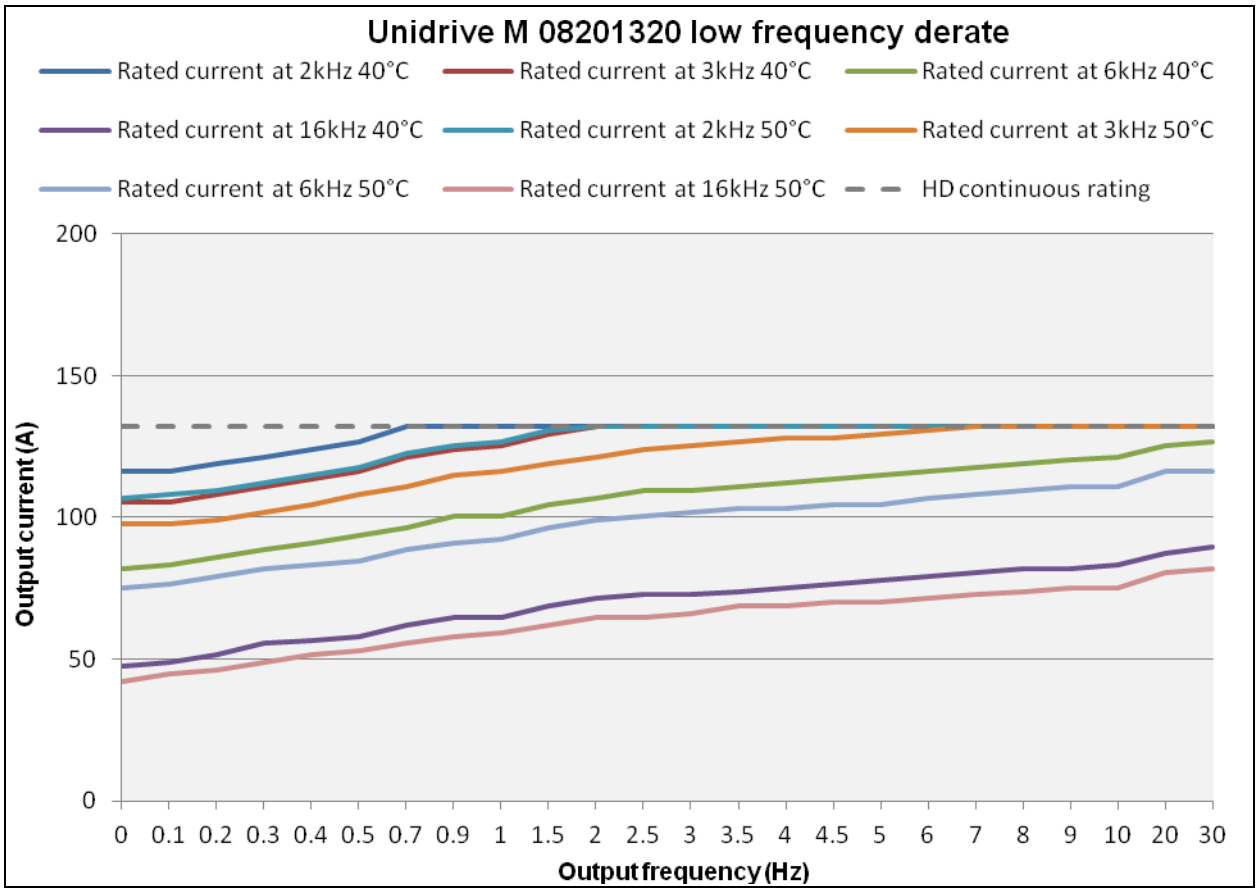


Figure 1 – Continuous current ratings for Unidrive M 08201320 (for a duty cycle which also includes 150% overload for 7 seconds)

Example:

Rated current at 0Hz output frequency, 2 kHz switching frequency and 40 °C ambient = 116 A
Rated current at 0Hz output frequency, 2 kHz switching frequency and 50 °C ambient = 108 A
Standard heavy duty rating = 132 A

4.2) Overload current and duration from hot

This chart shows the maximum 150% overload current for 7 seconds at 2 kHz, 3 kHz, 6 kHz and worst case switching frequency for both 40 °C and 50 °C.

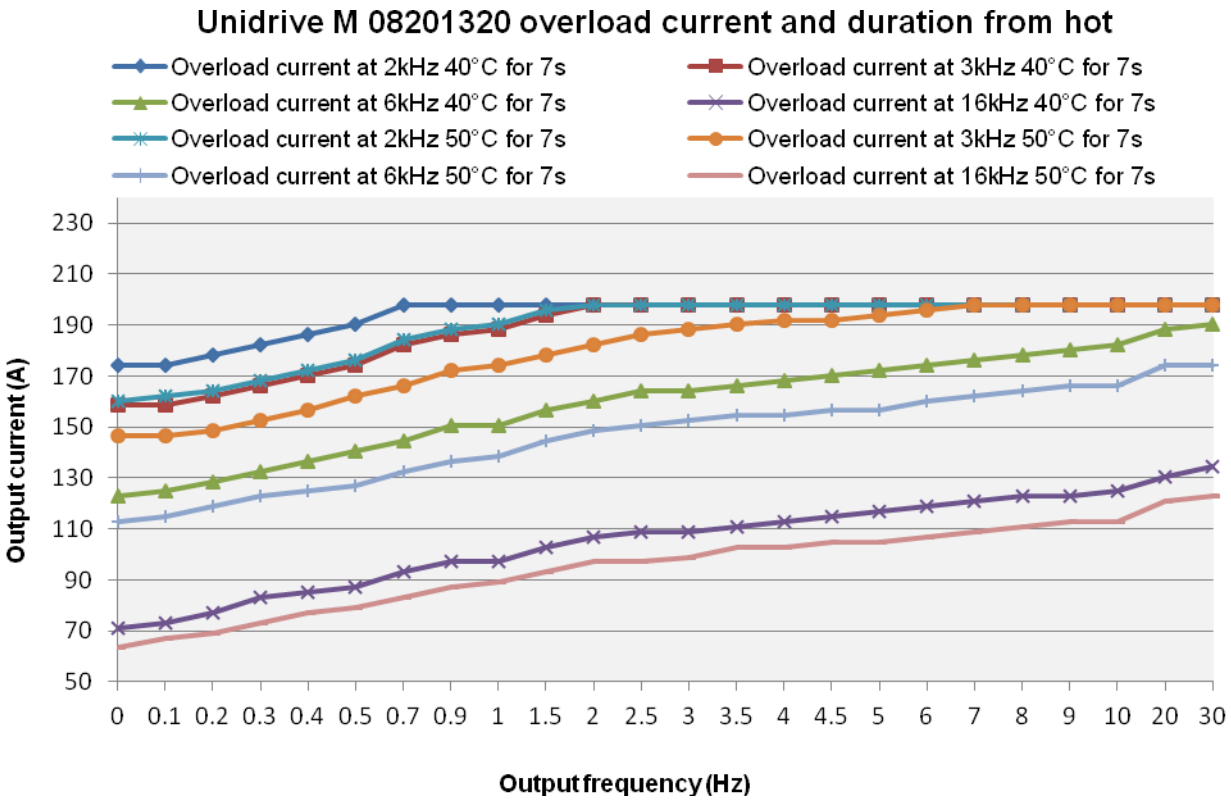


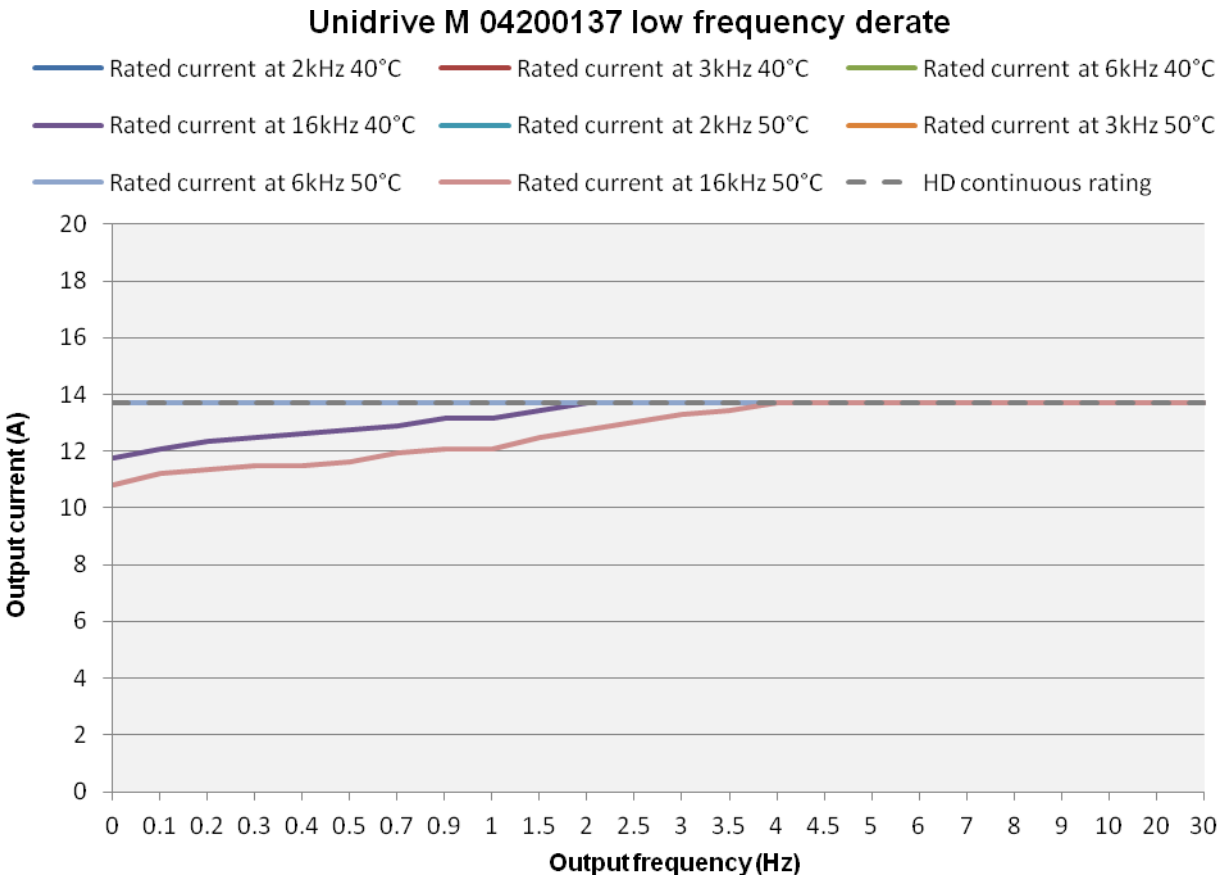
Figure 2 – 150% overload ratings for Unidrive M 08201320 for 7 seconds

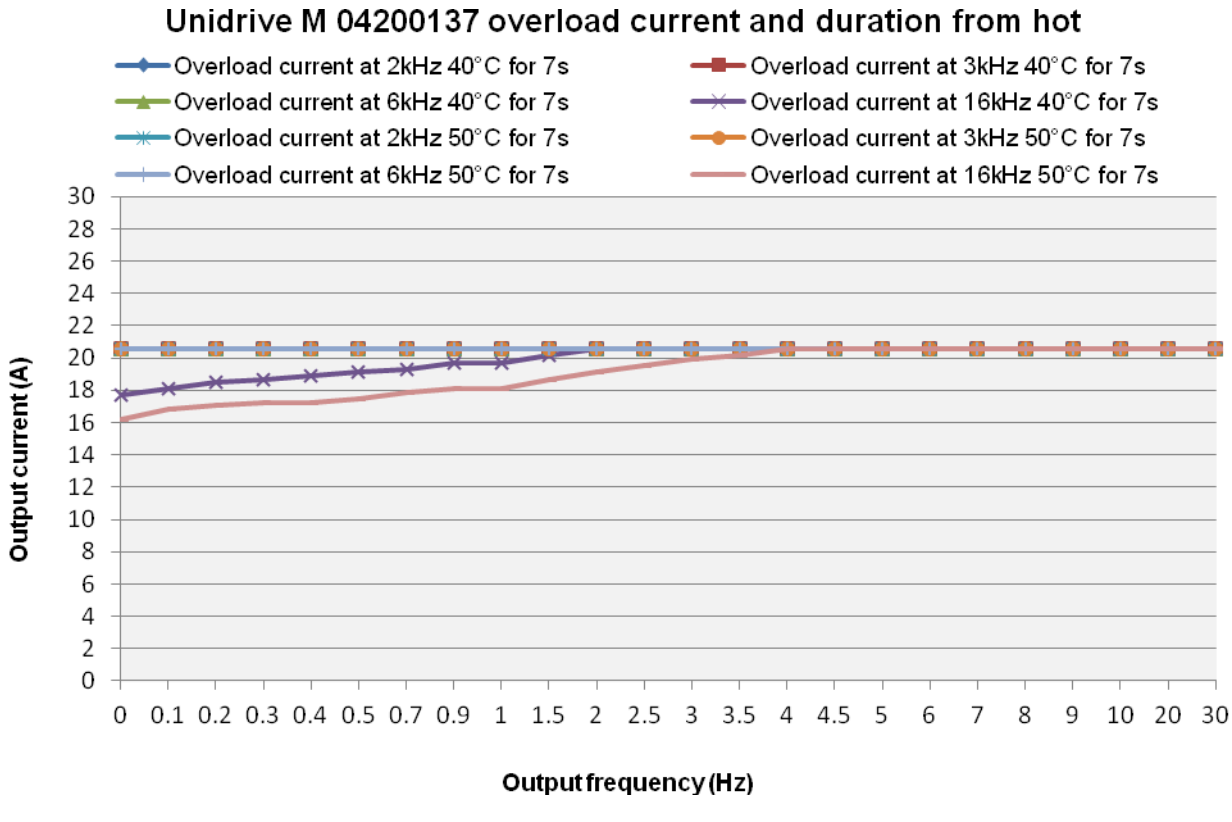
Example:

Overload current at 0Hz output frequency, 2 kHz switching frequency and 40 °C ambient = 174 A
Overload current at 0Hz output frequency, 2 kHz switching frequency and 50 °C ambient = 160 A

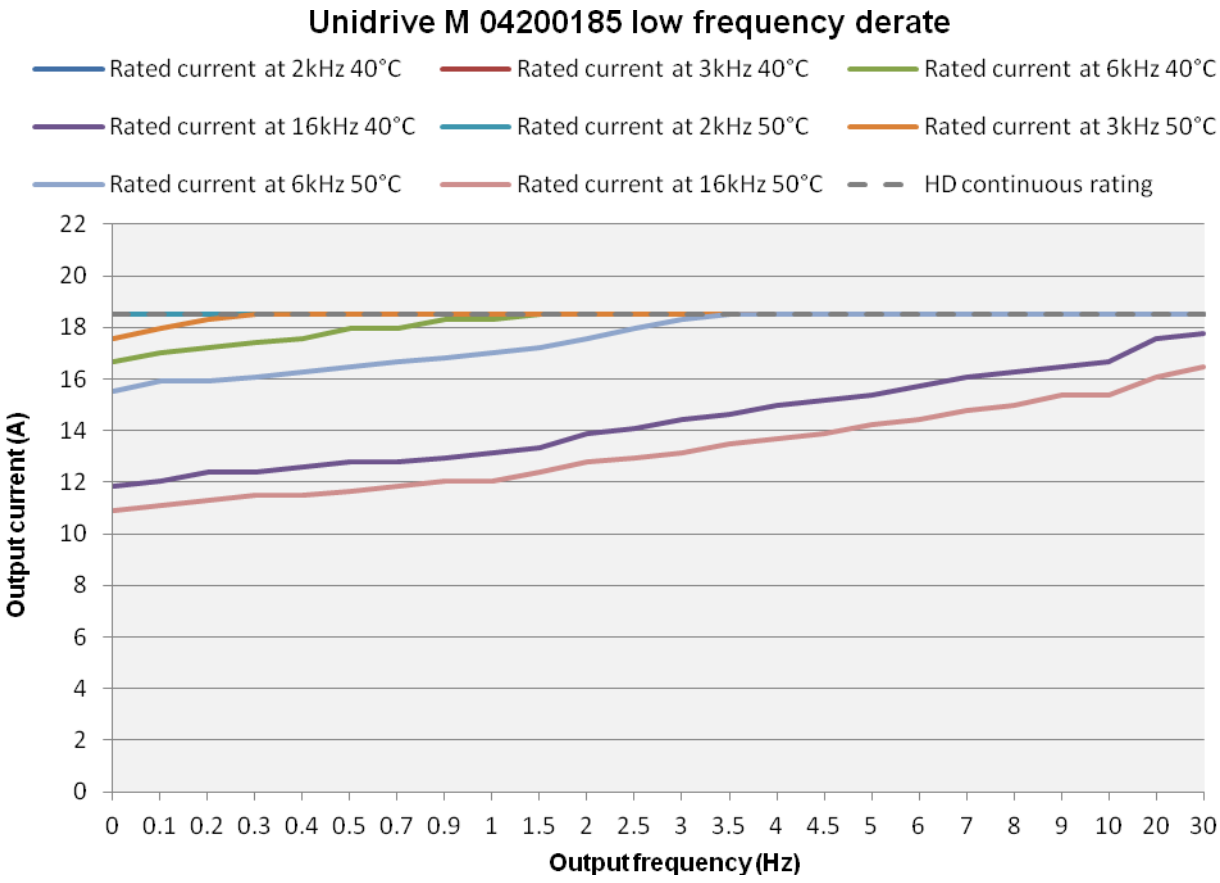
5.0 Rating Charts

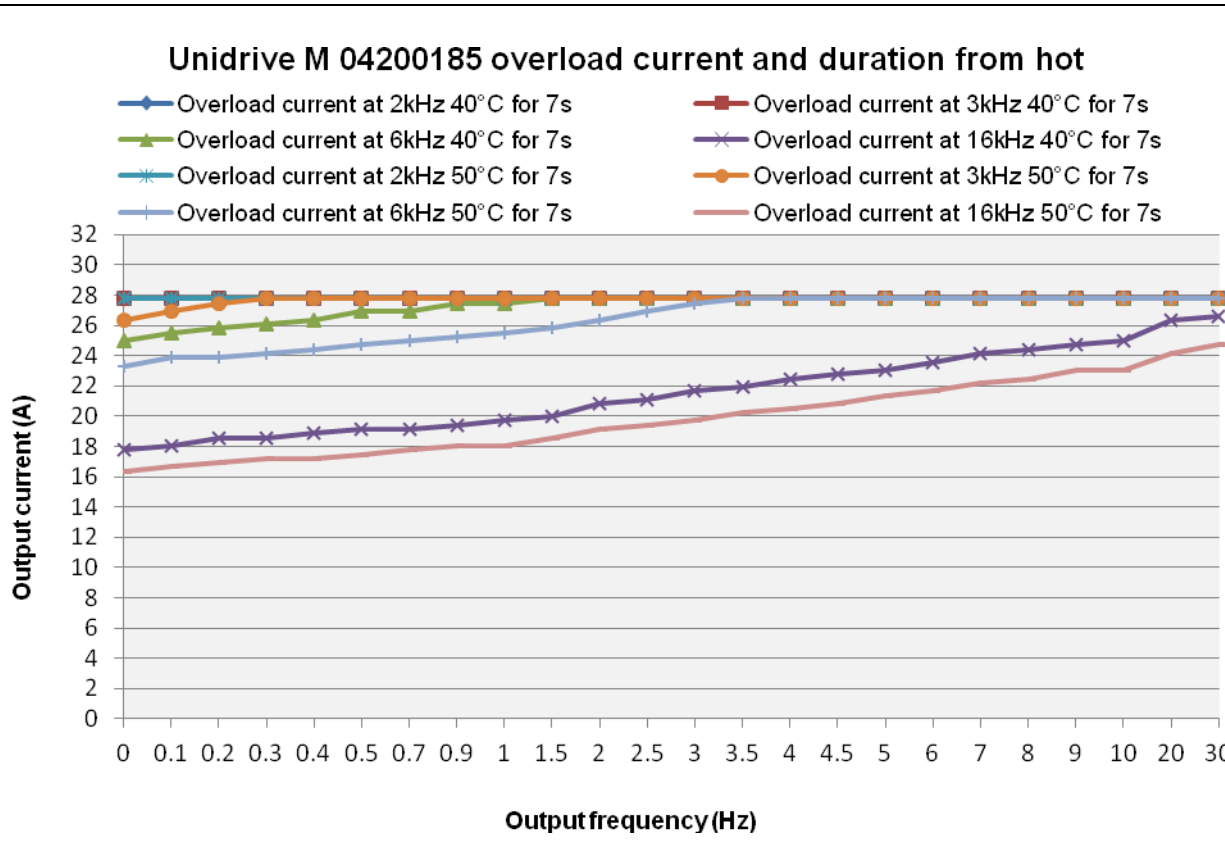
Unidrive M 04200137



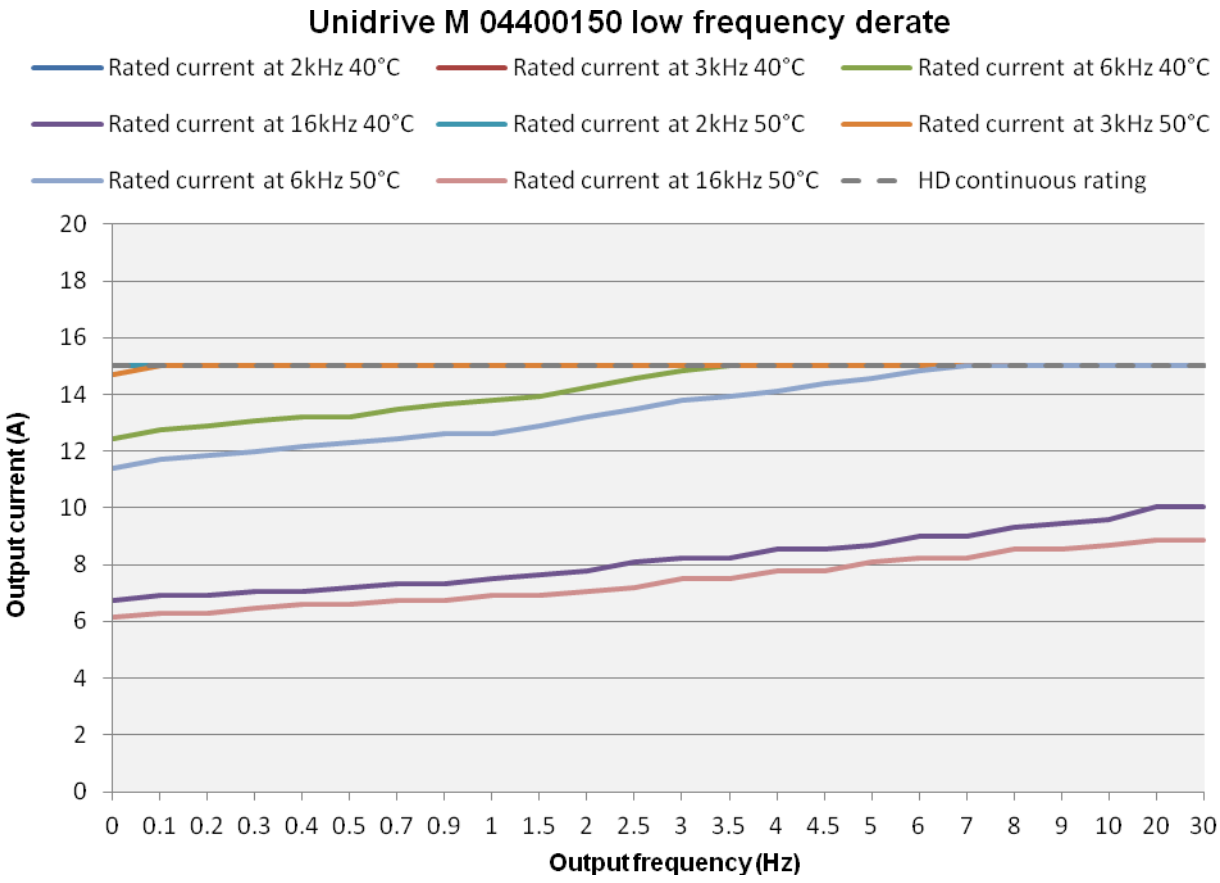


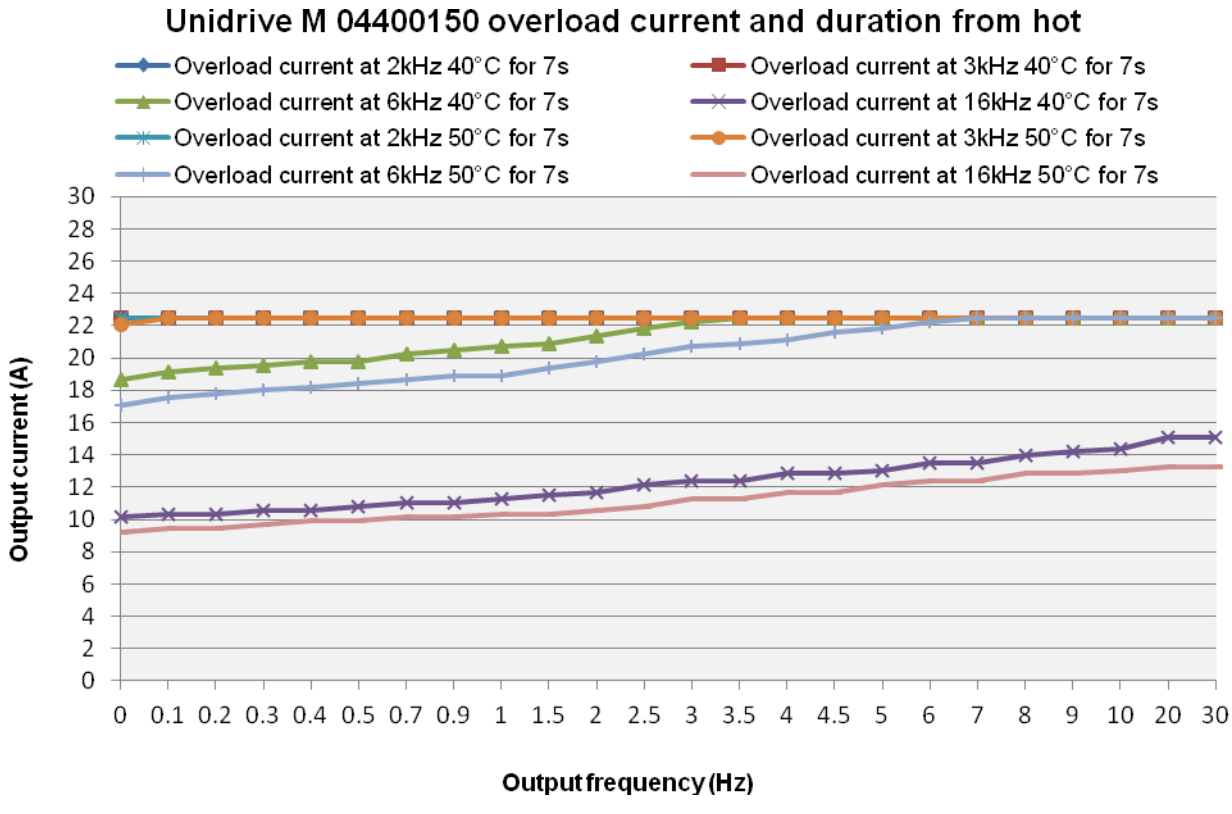
Unidrive M 04200185



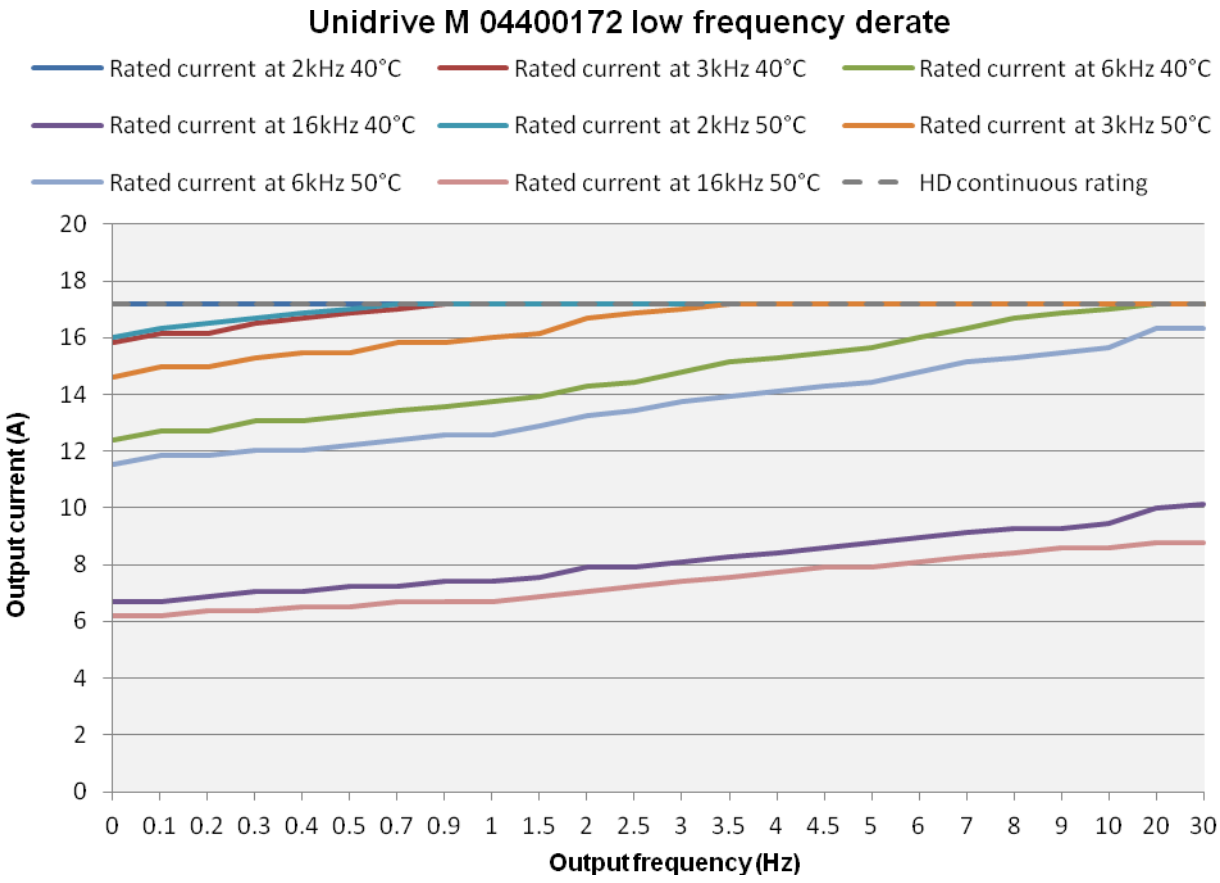


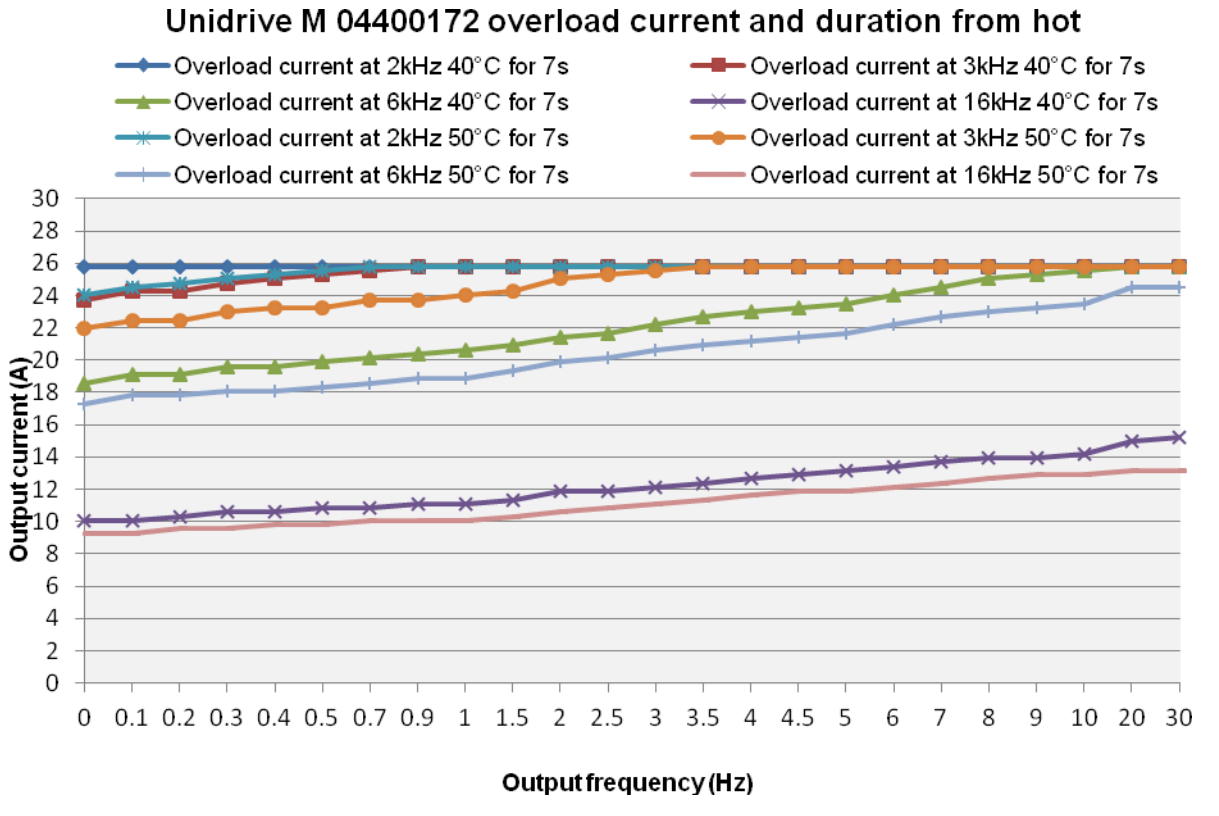
Unidrive M 04400150



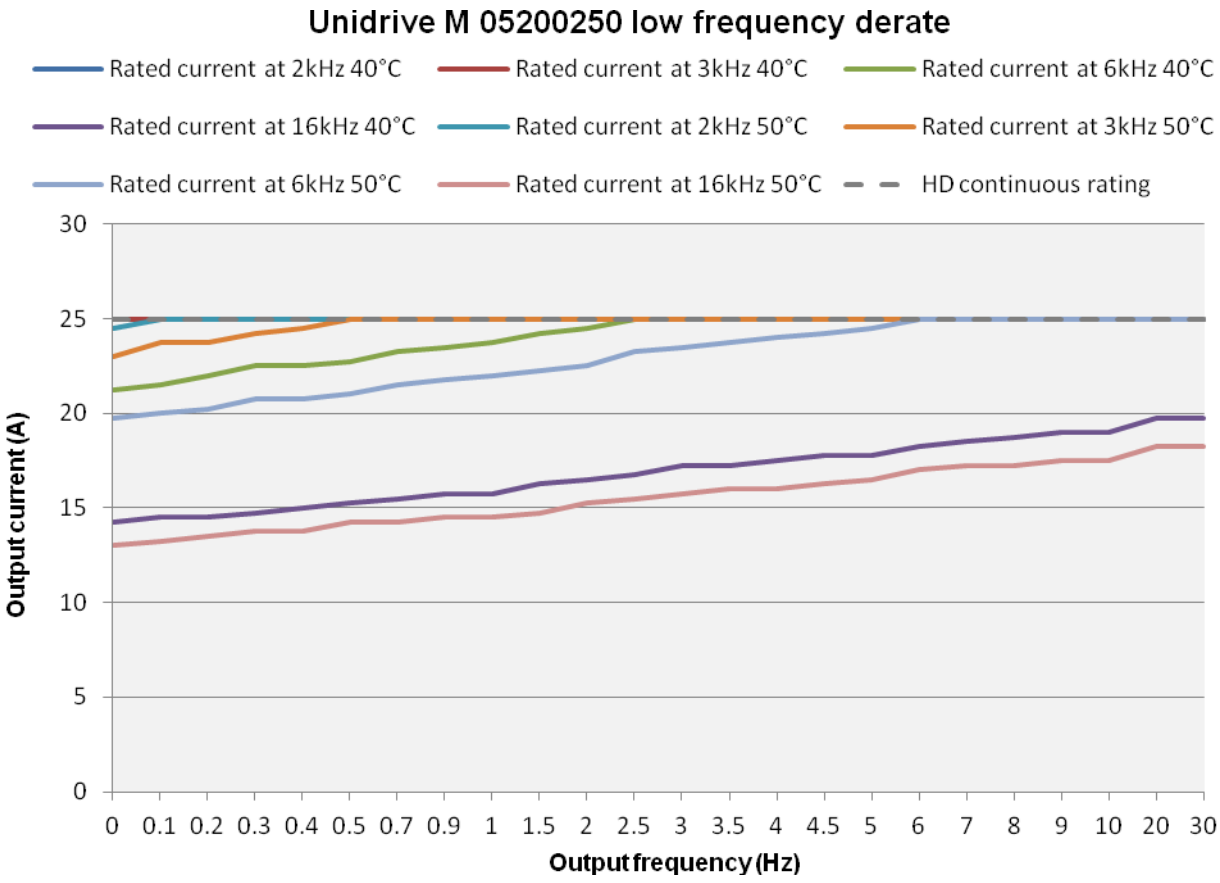


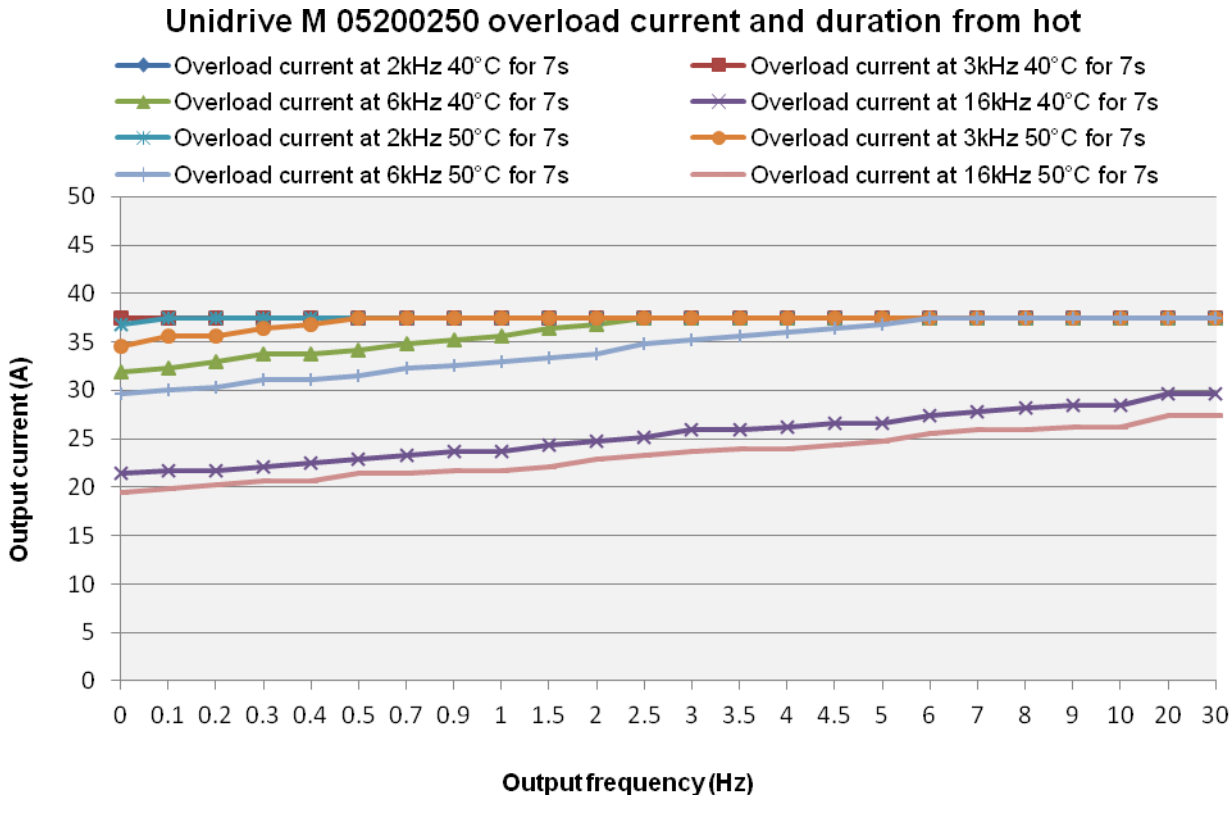
Unidrive M 04400172





Unidrive M 05200250





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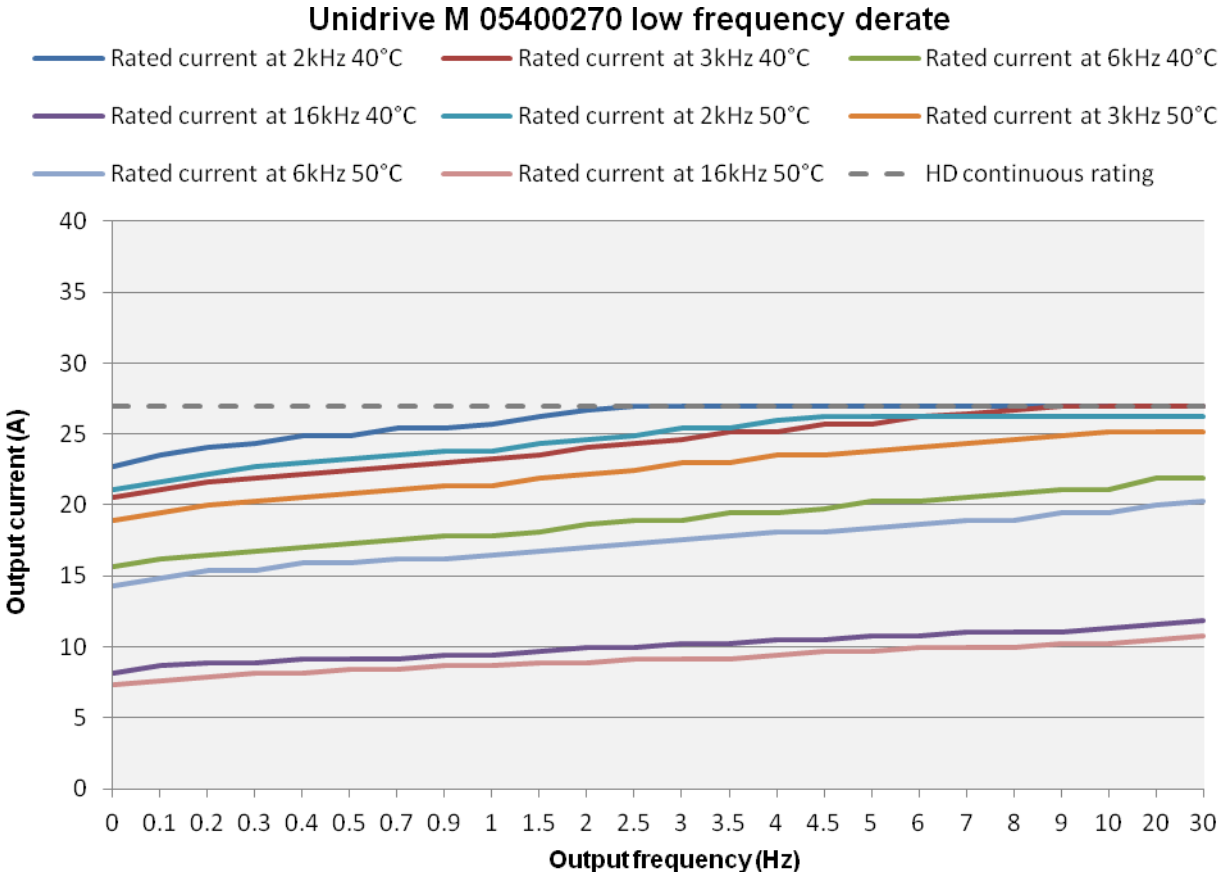
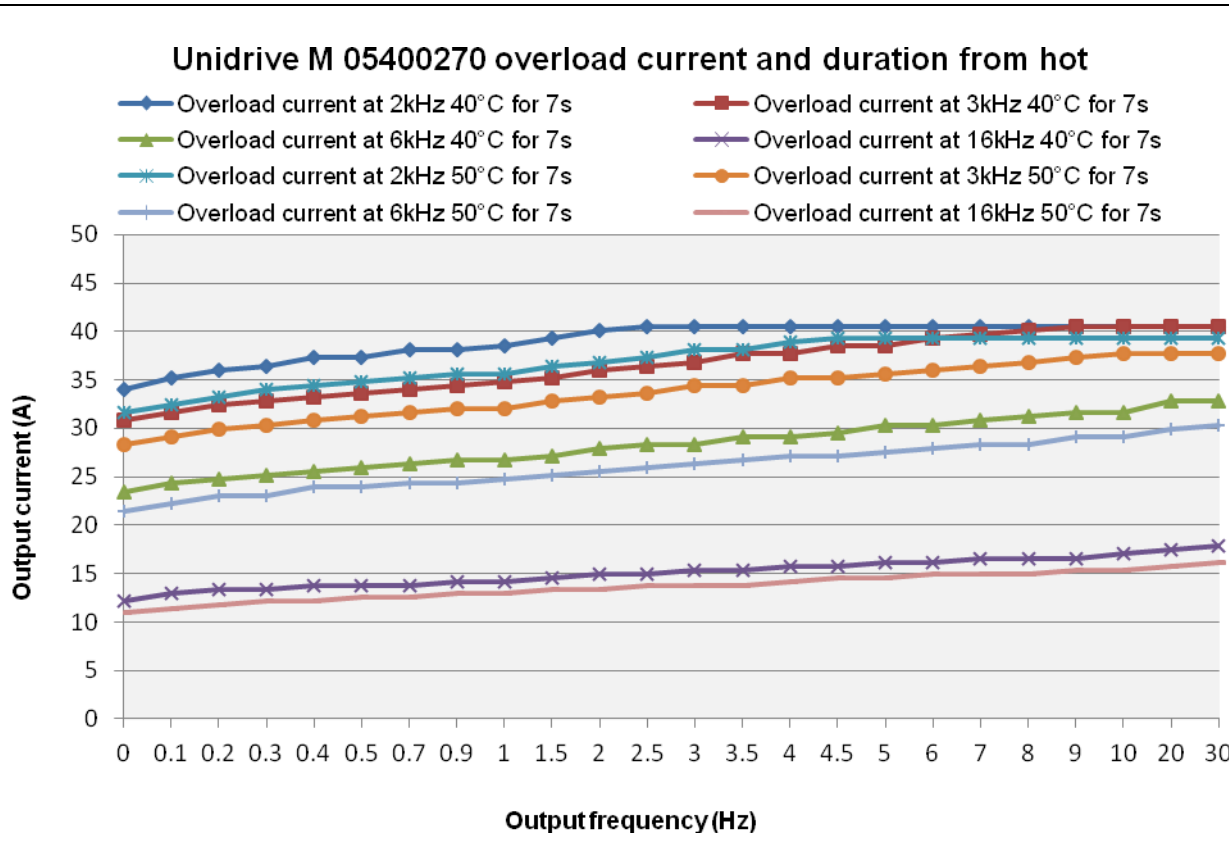
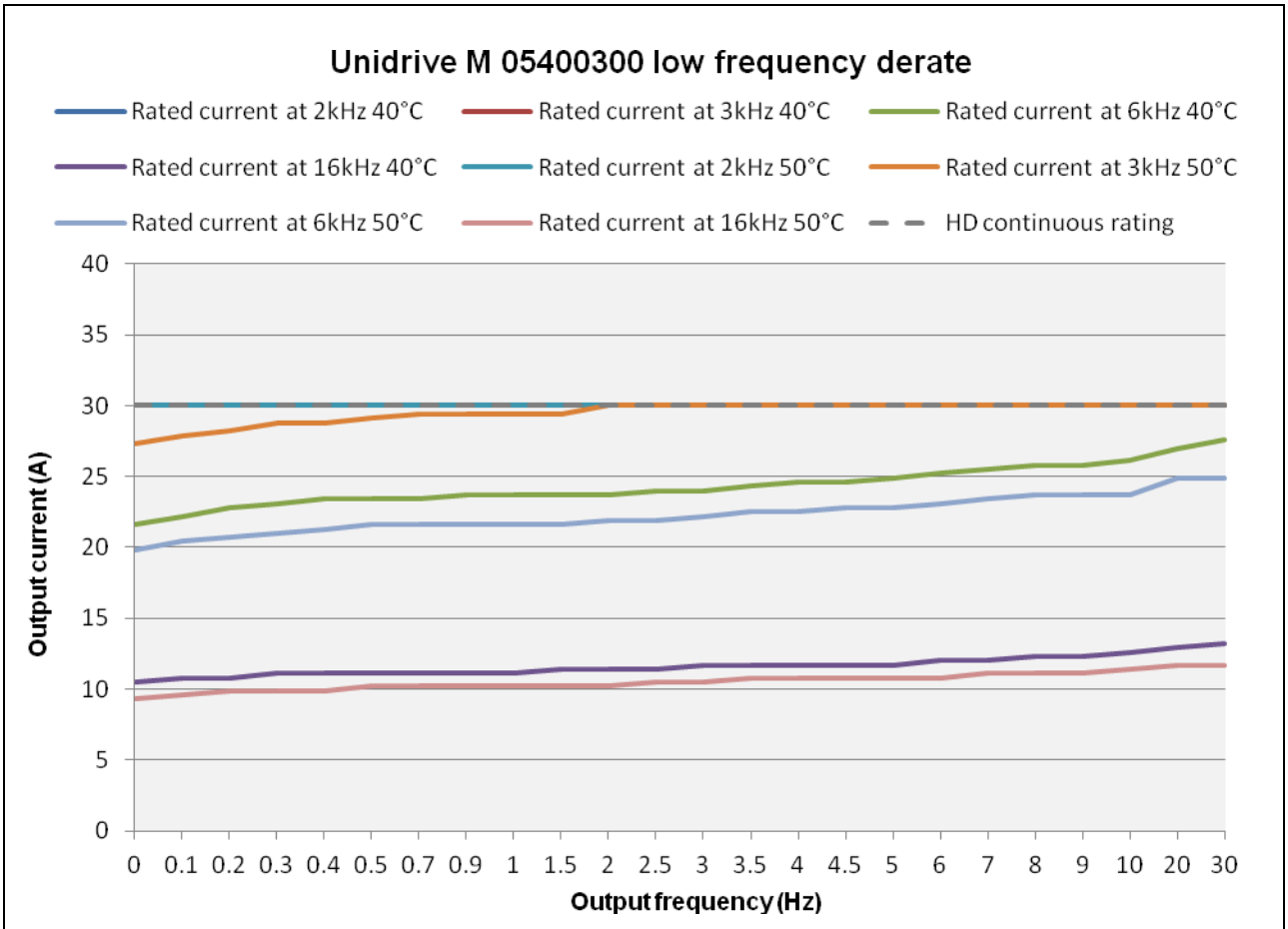
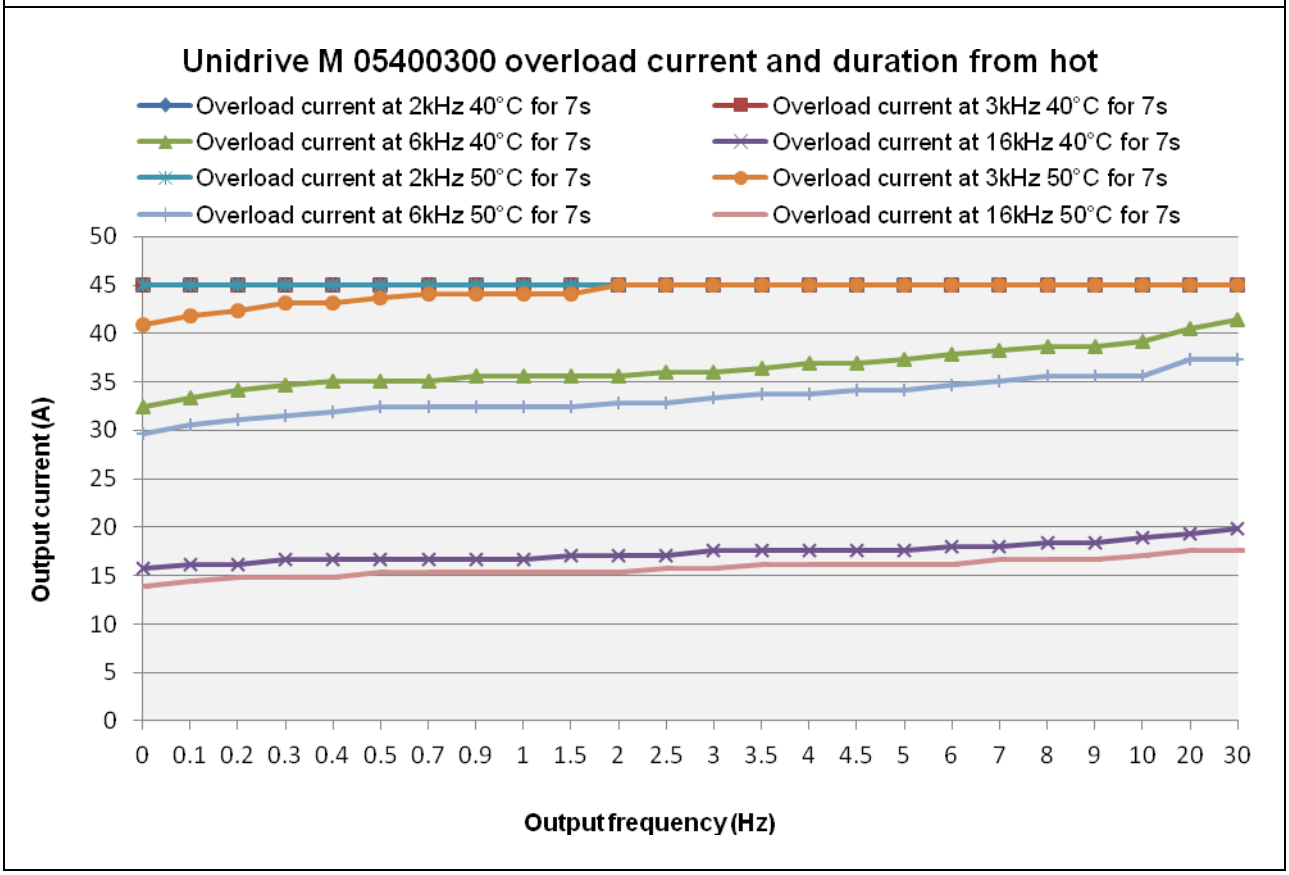




Unidrive M 05400300

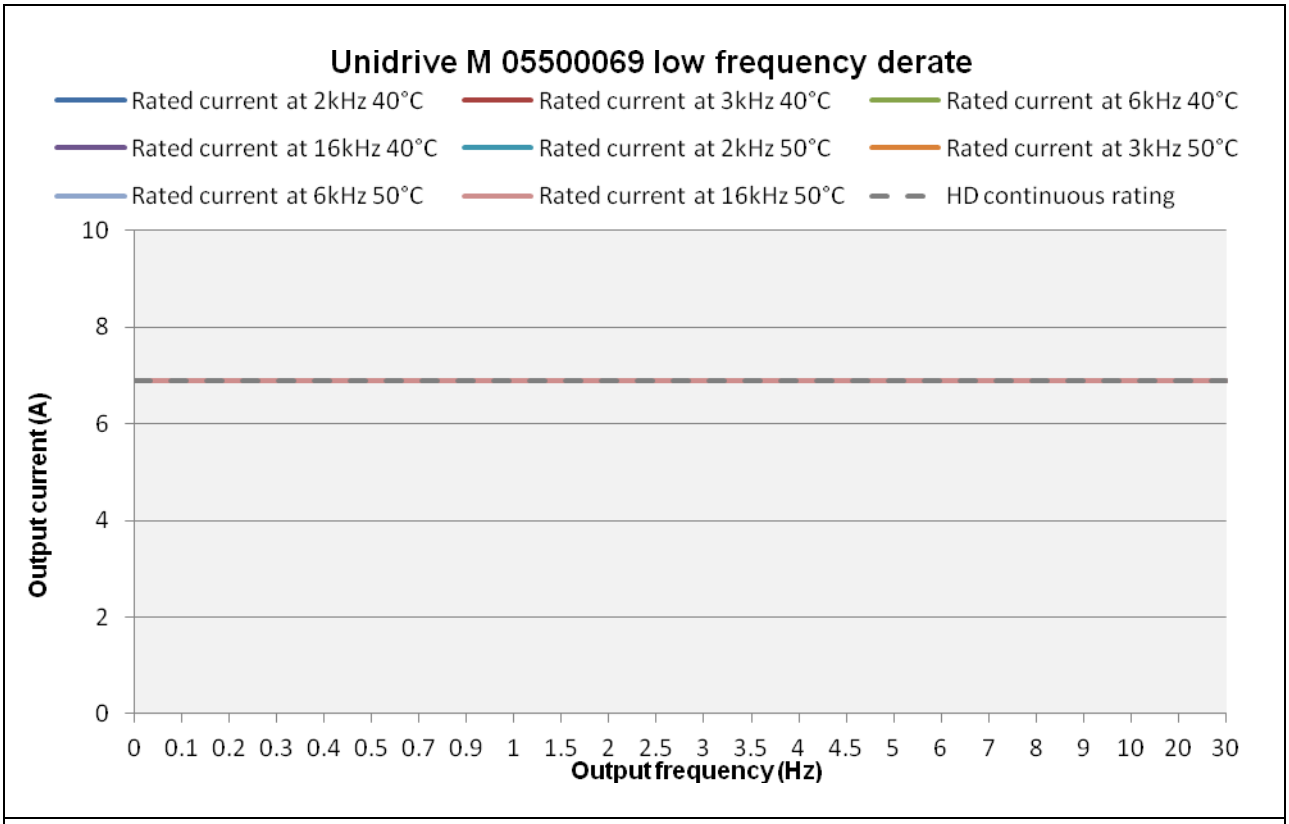


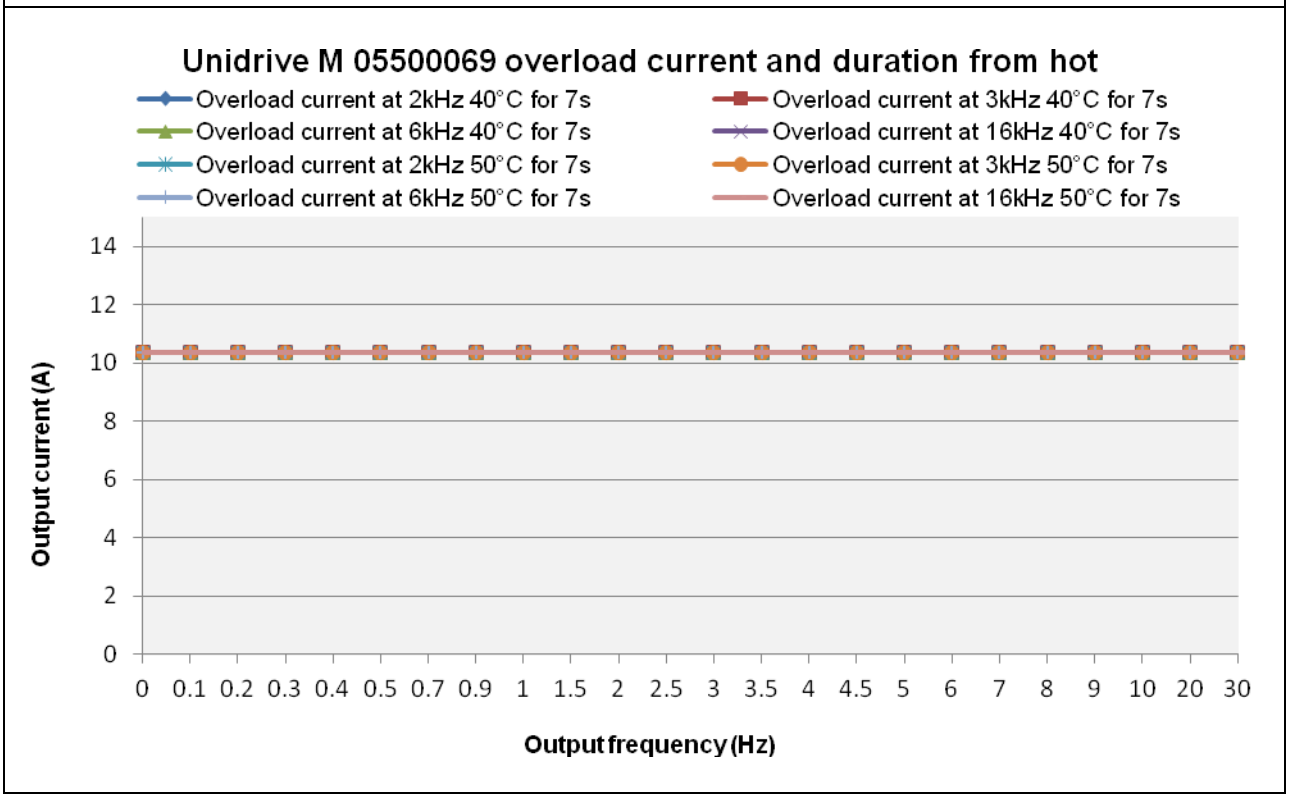


Unidrive M 05500030 and Unidrive M 05500040

Standard ratings apply – no de-rate necessary

Unidrive M 05500069





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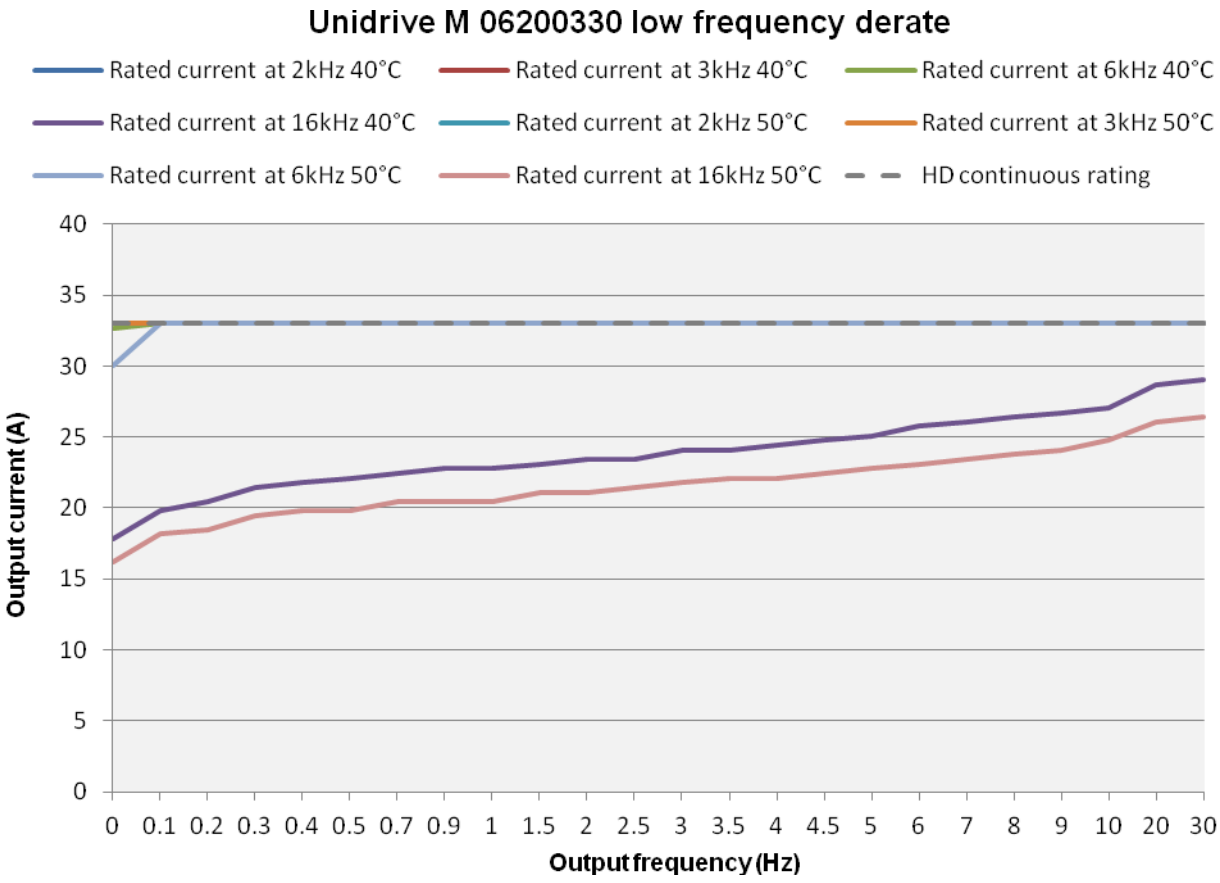

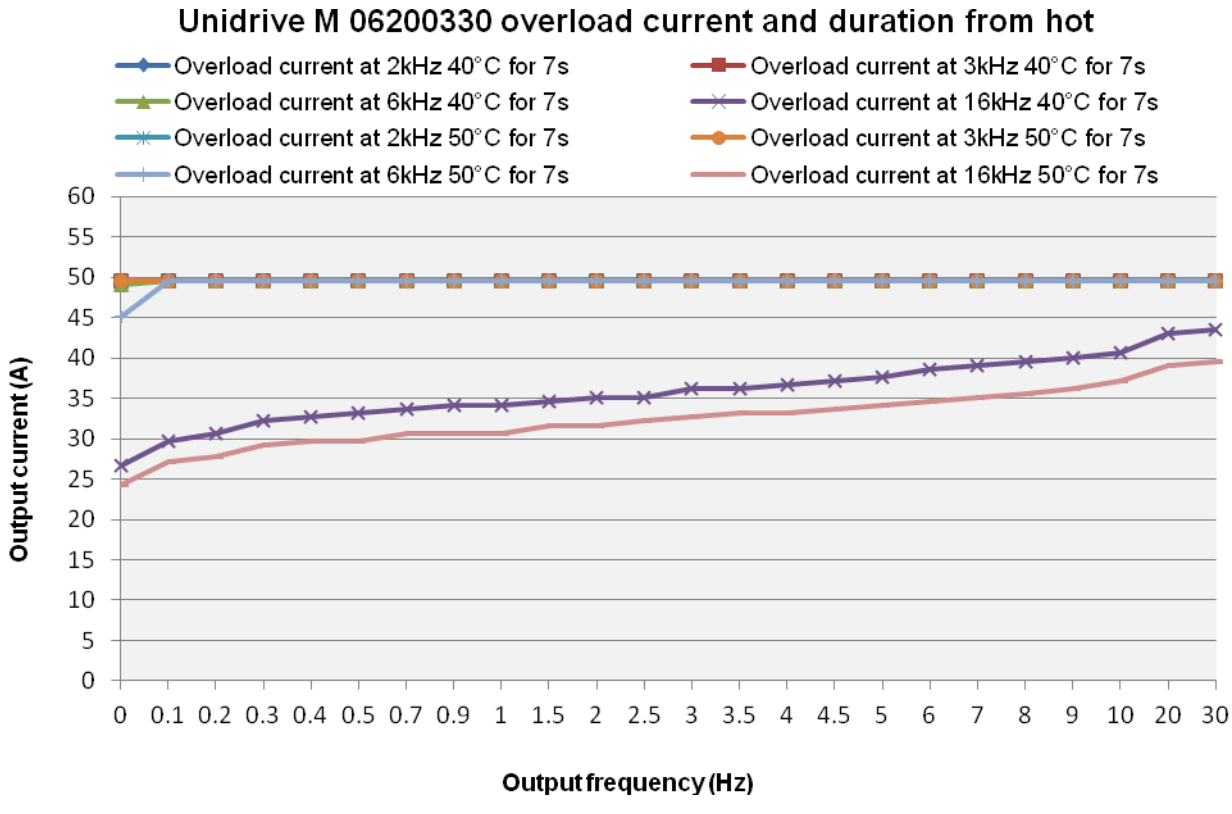

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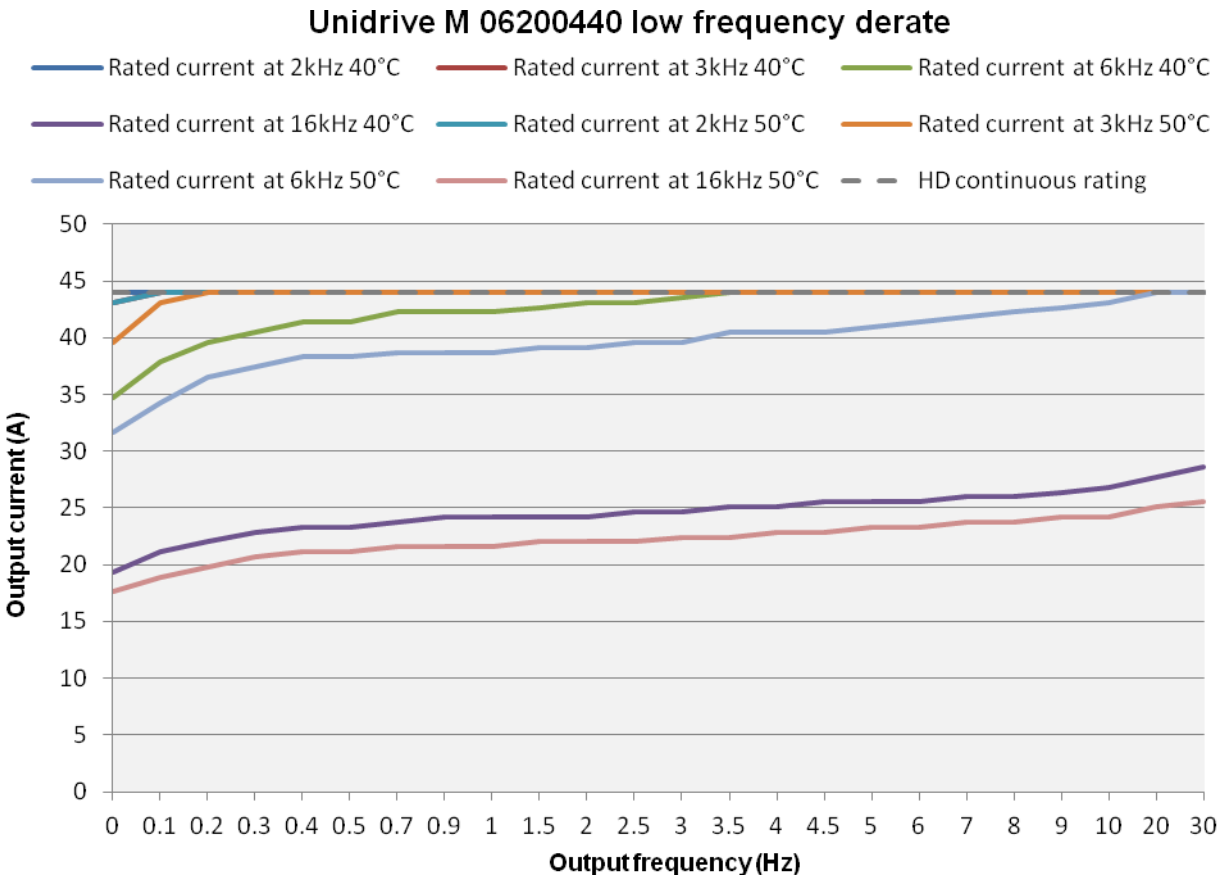

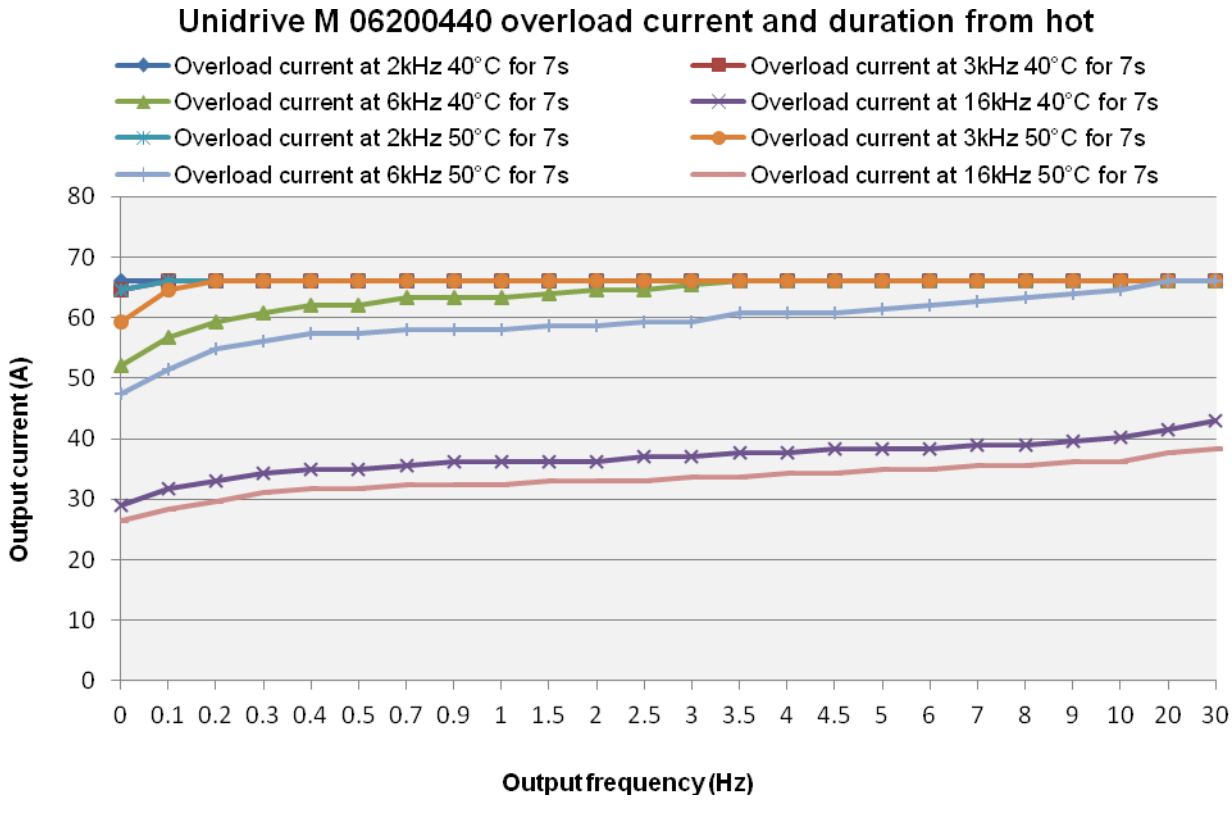

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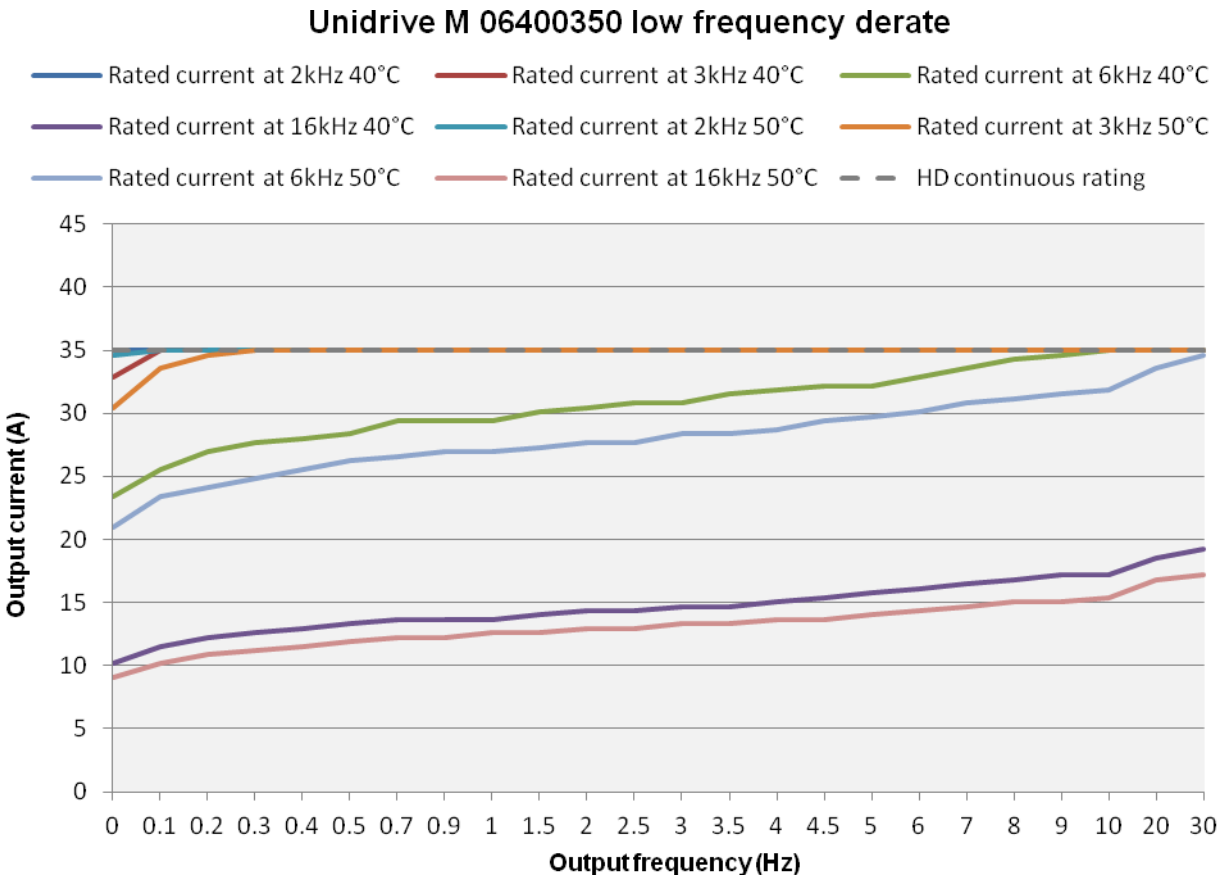

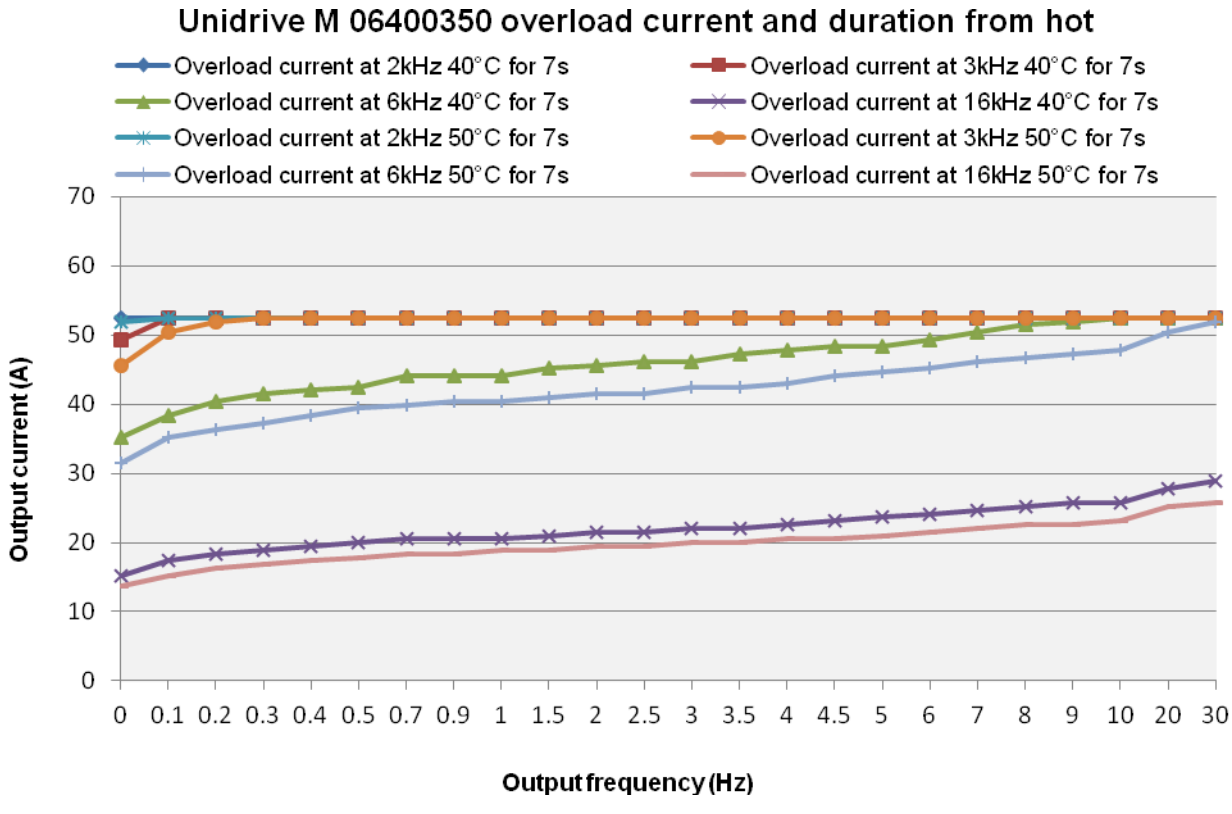

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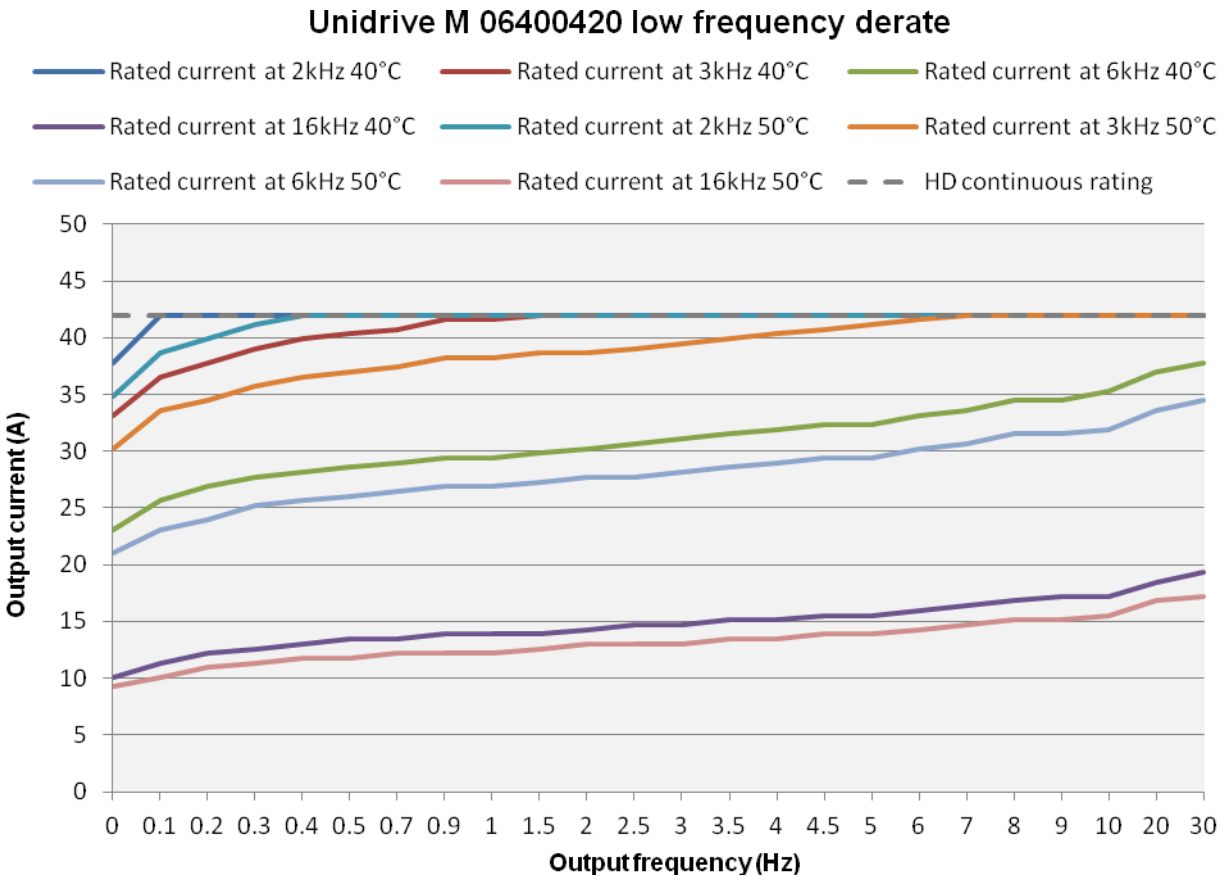

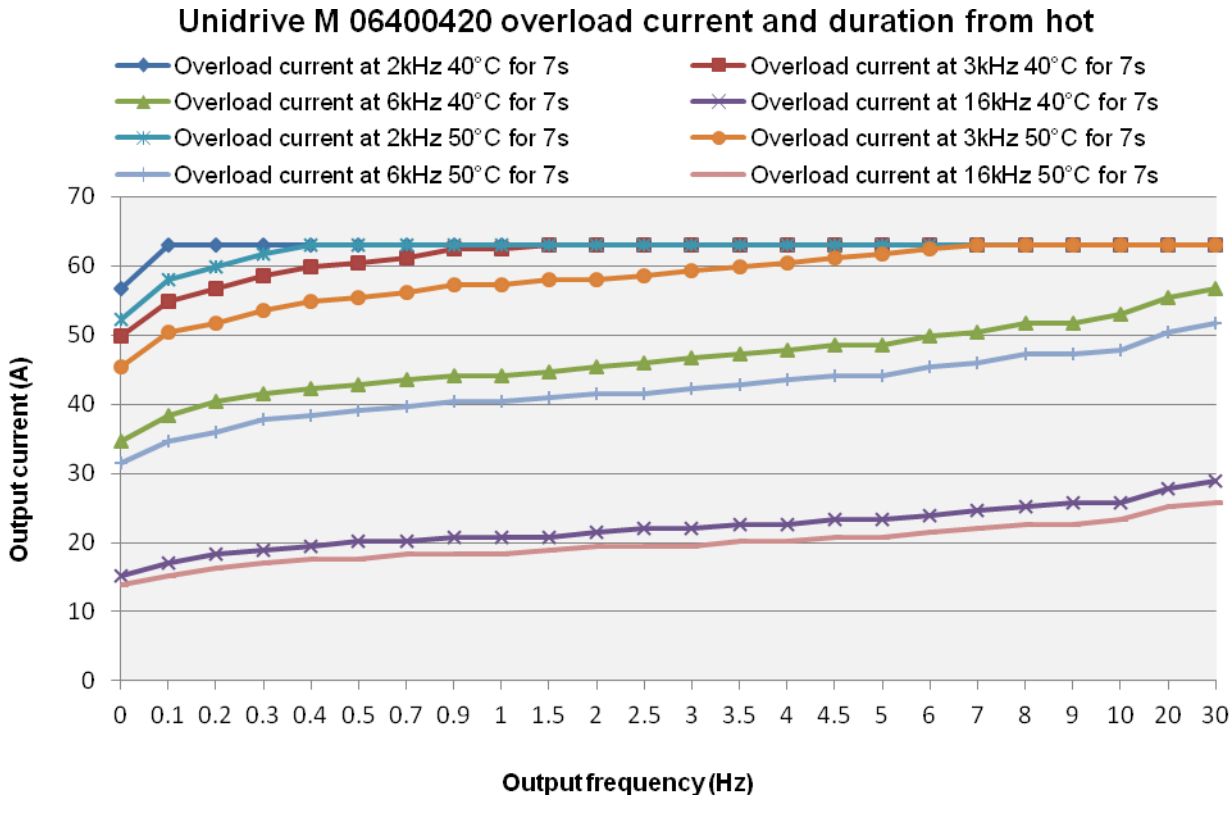

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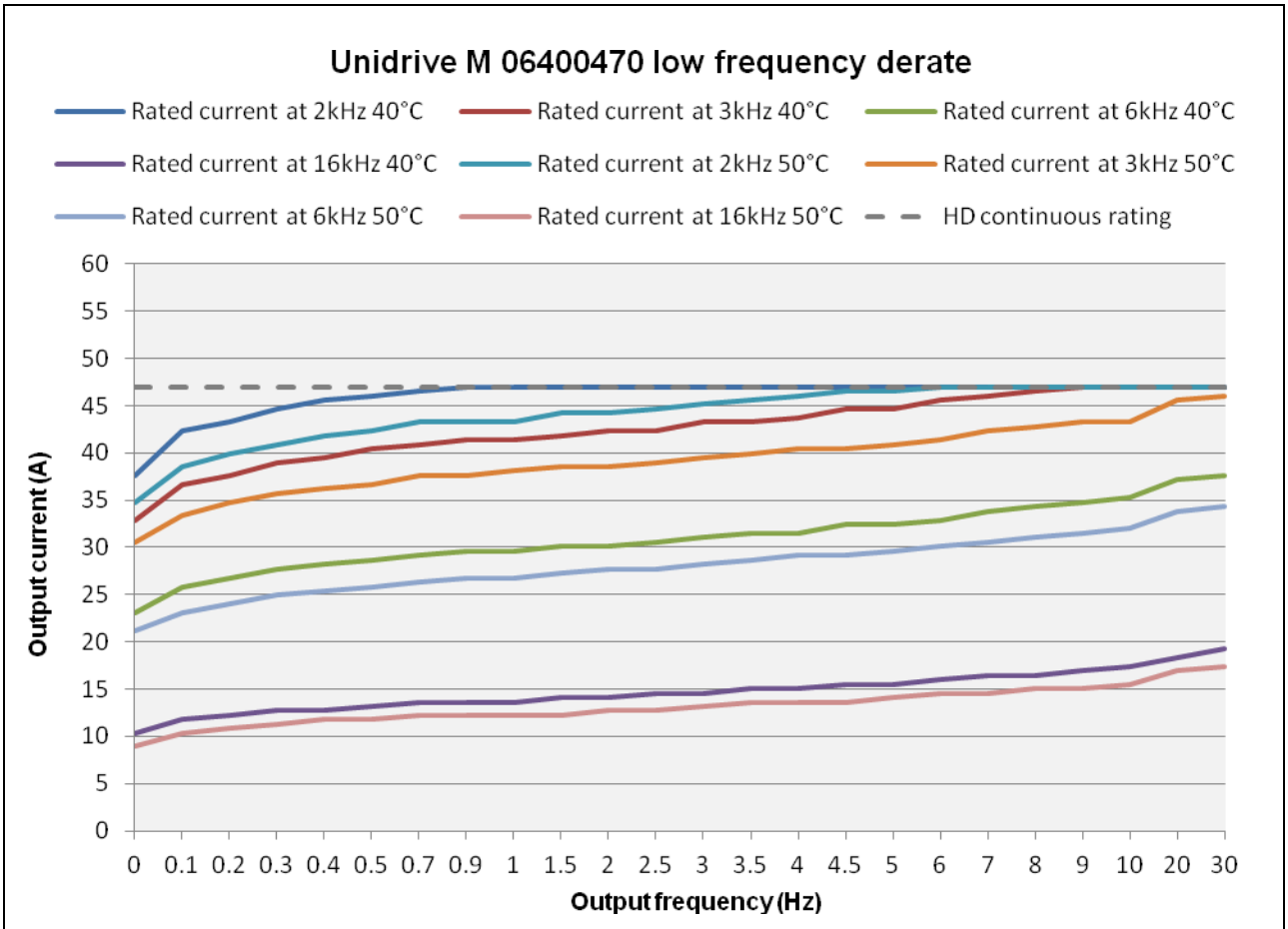

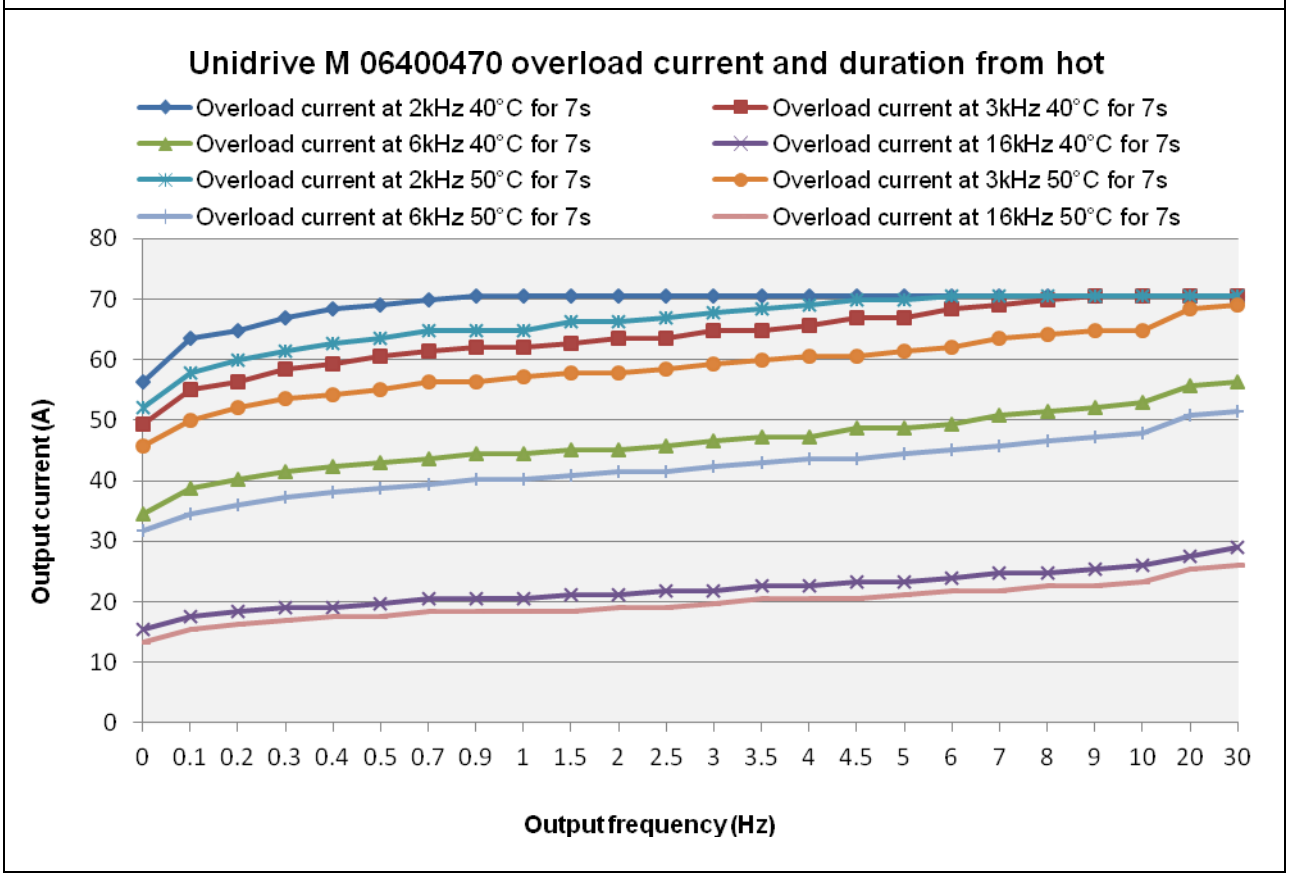

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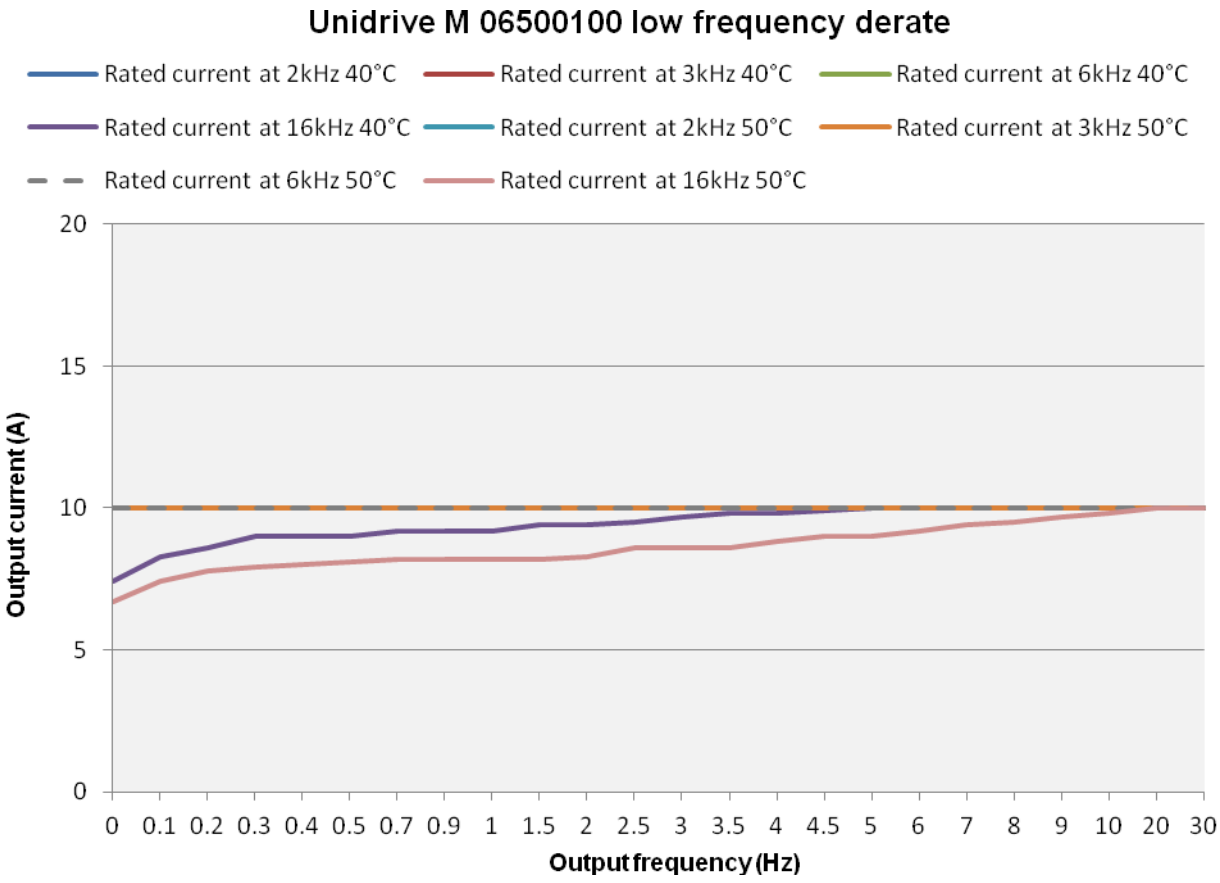

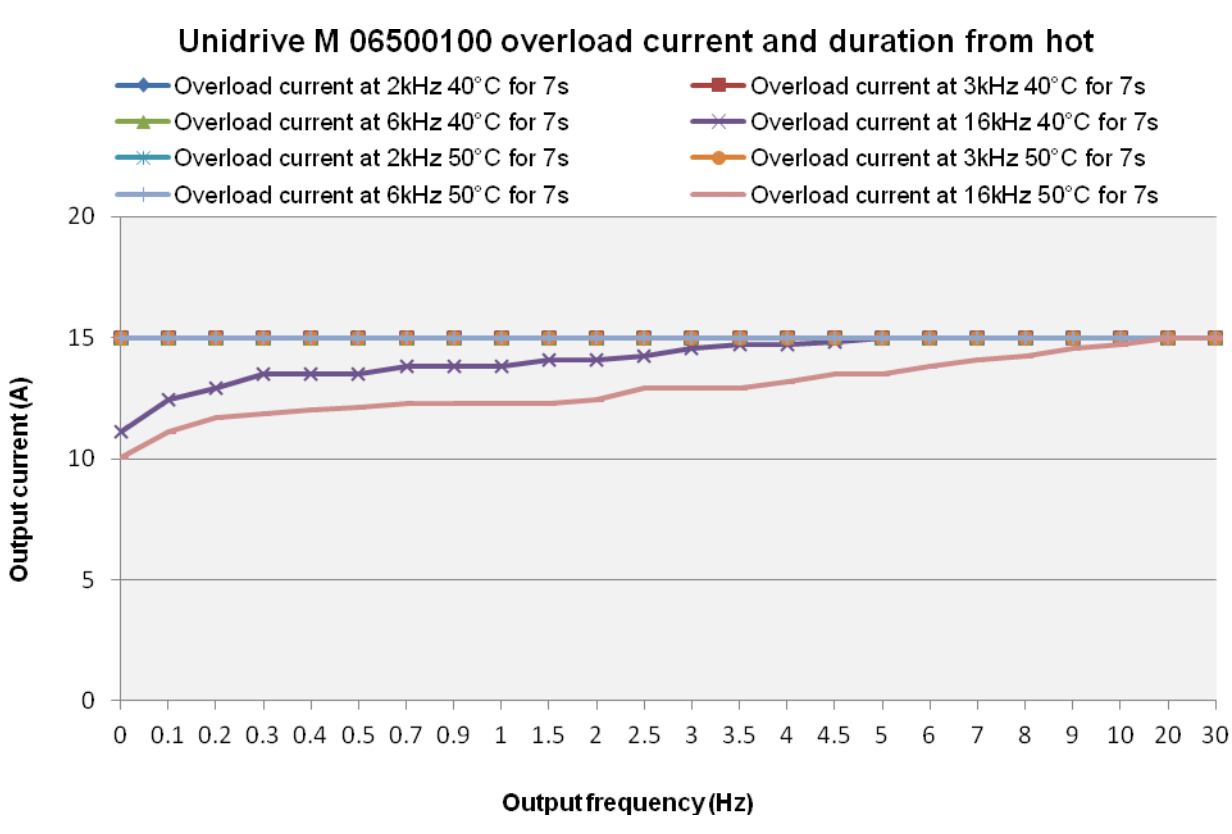

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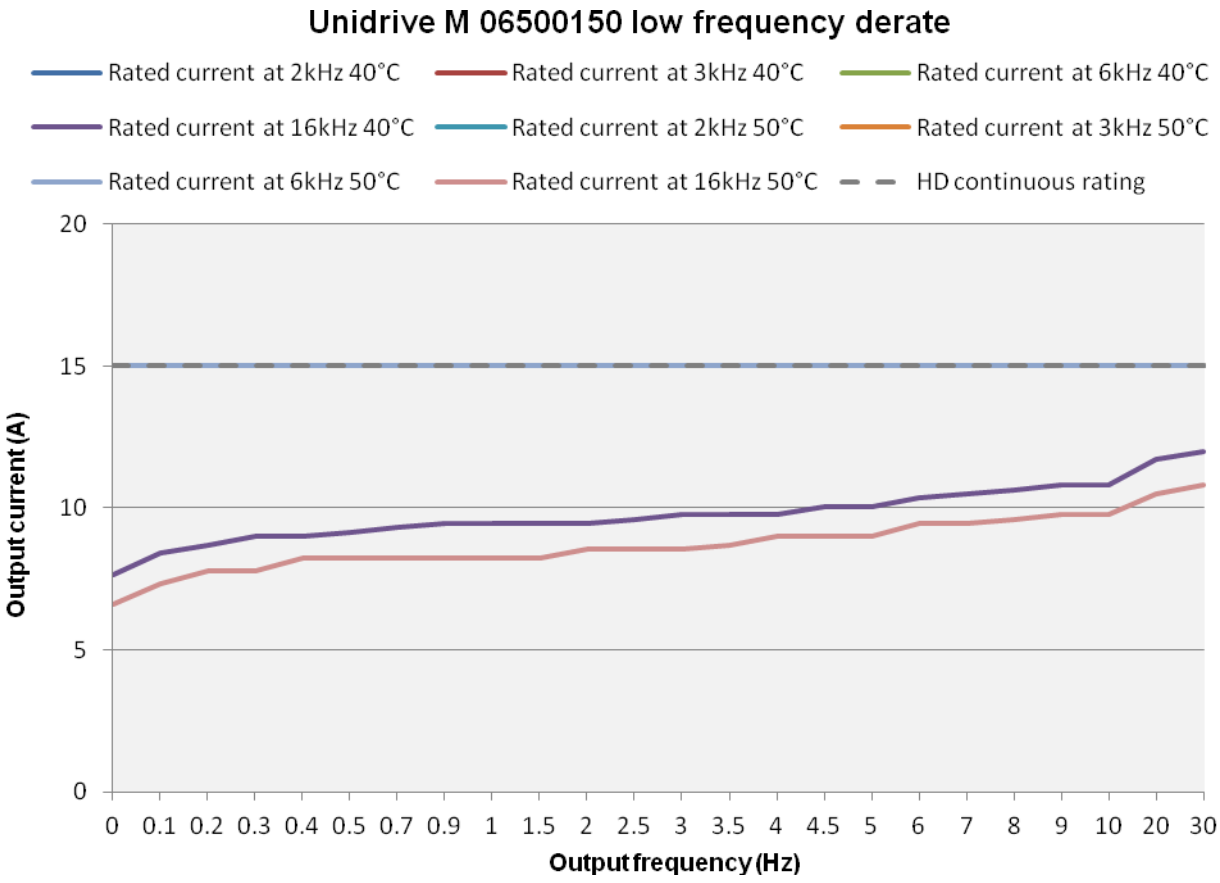

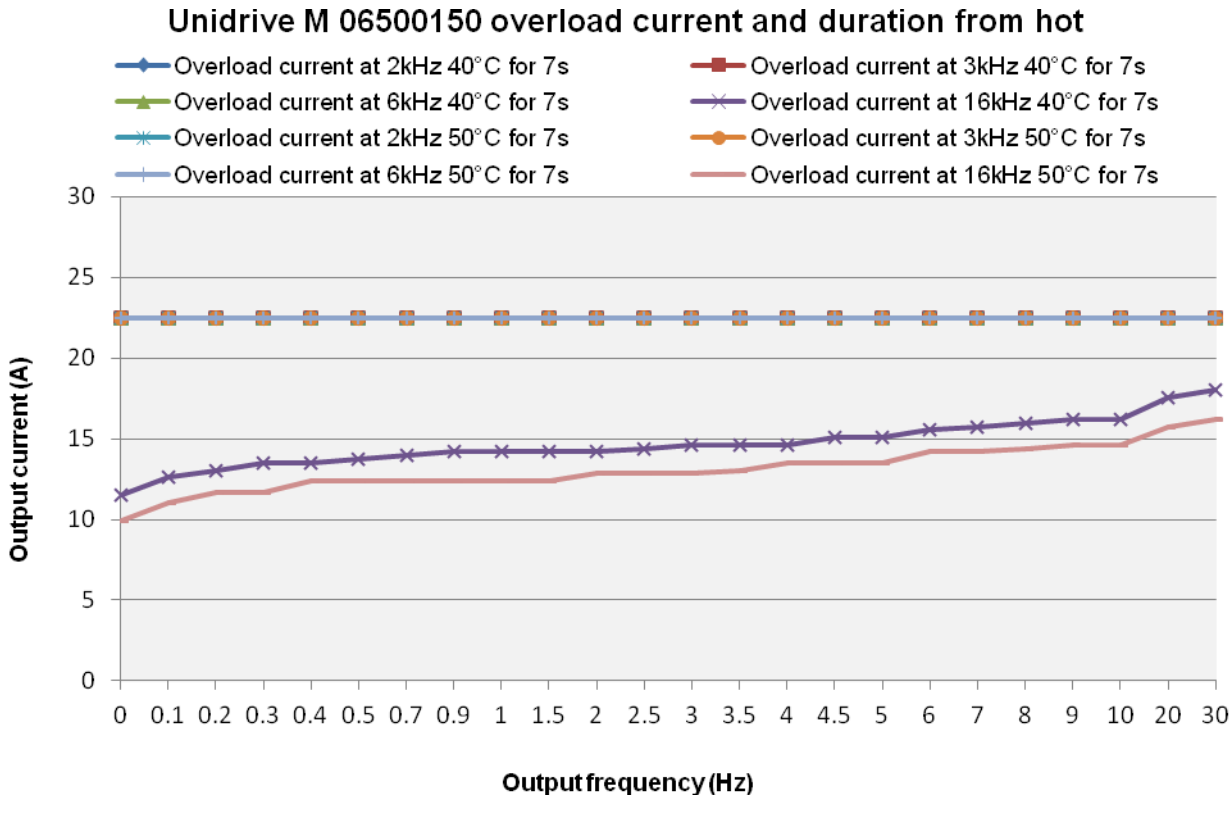

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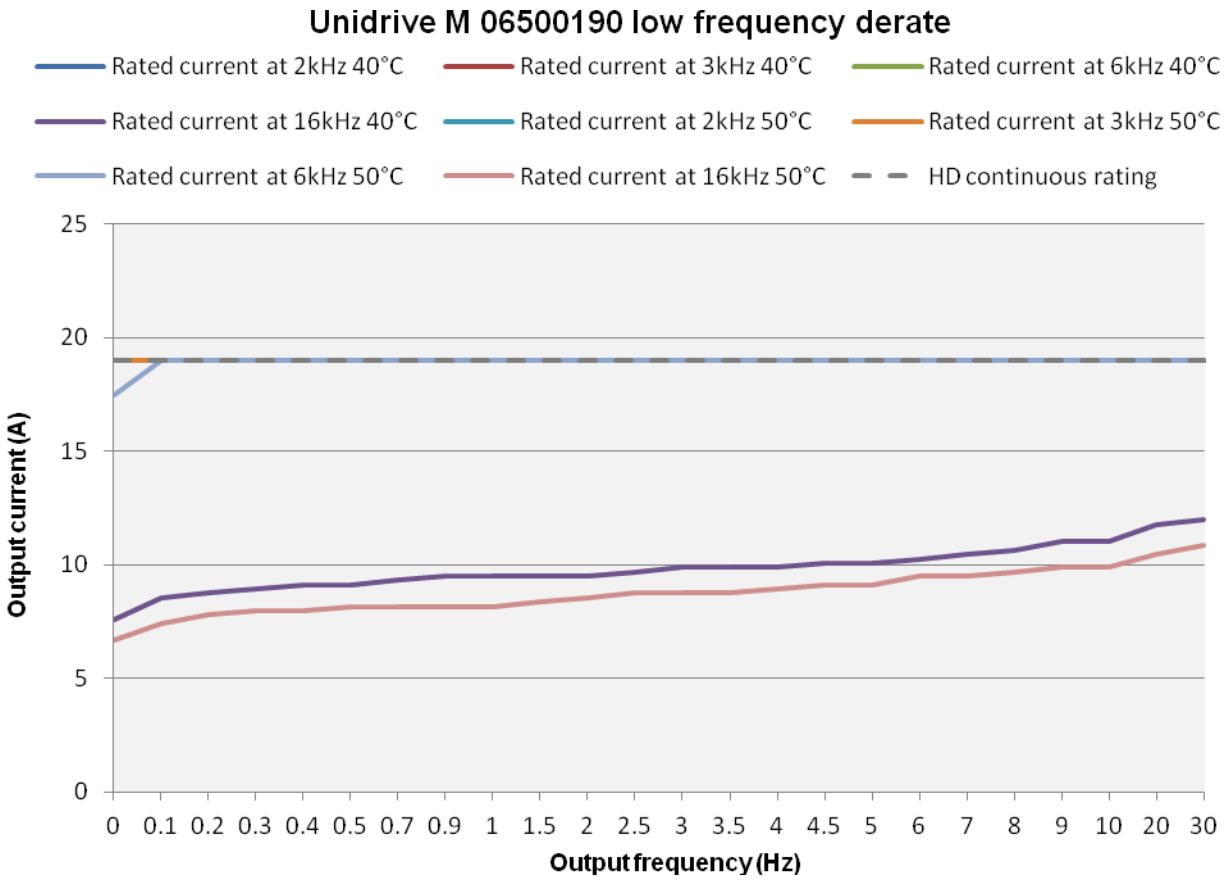

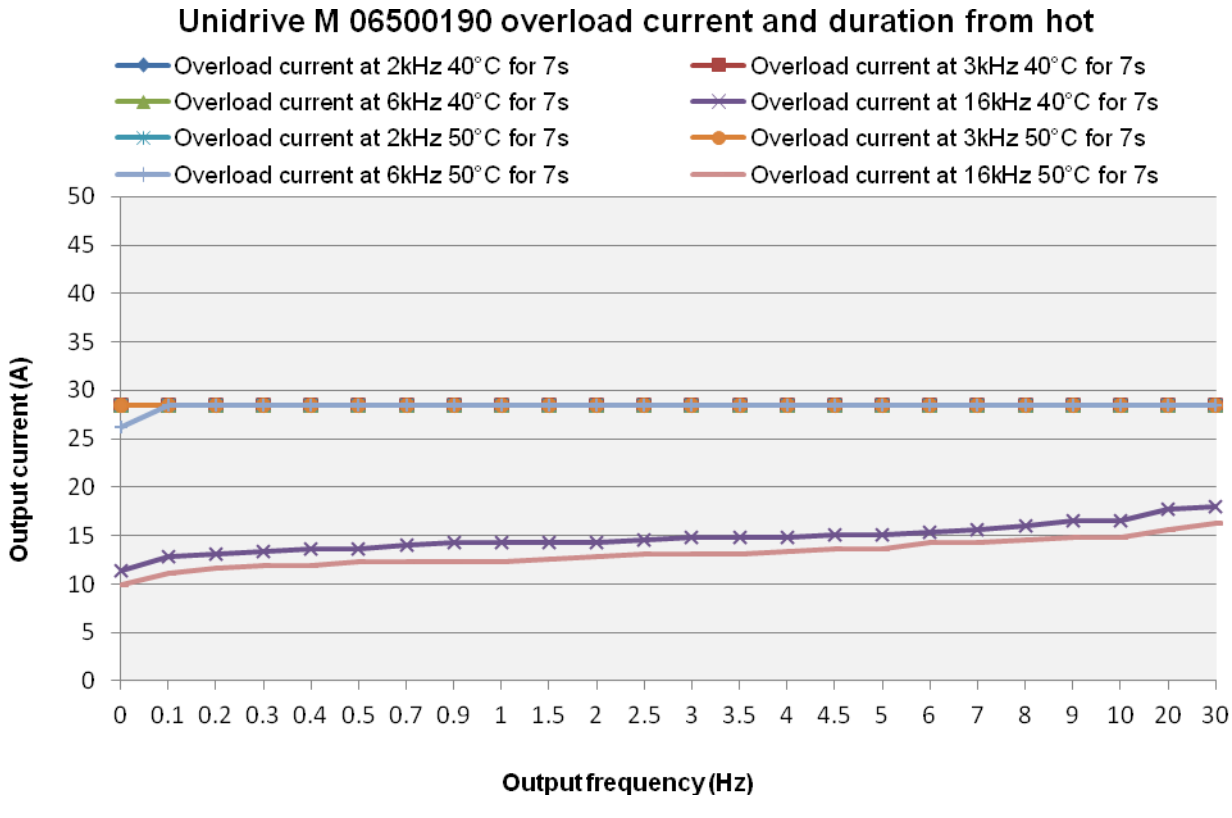

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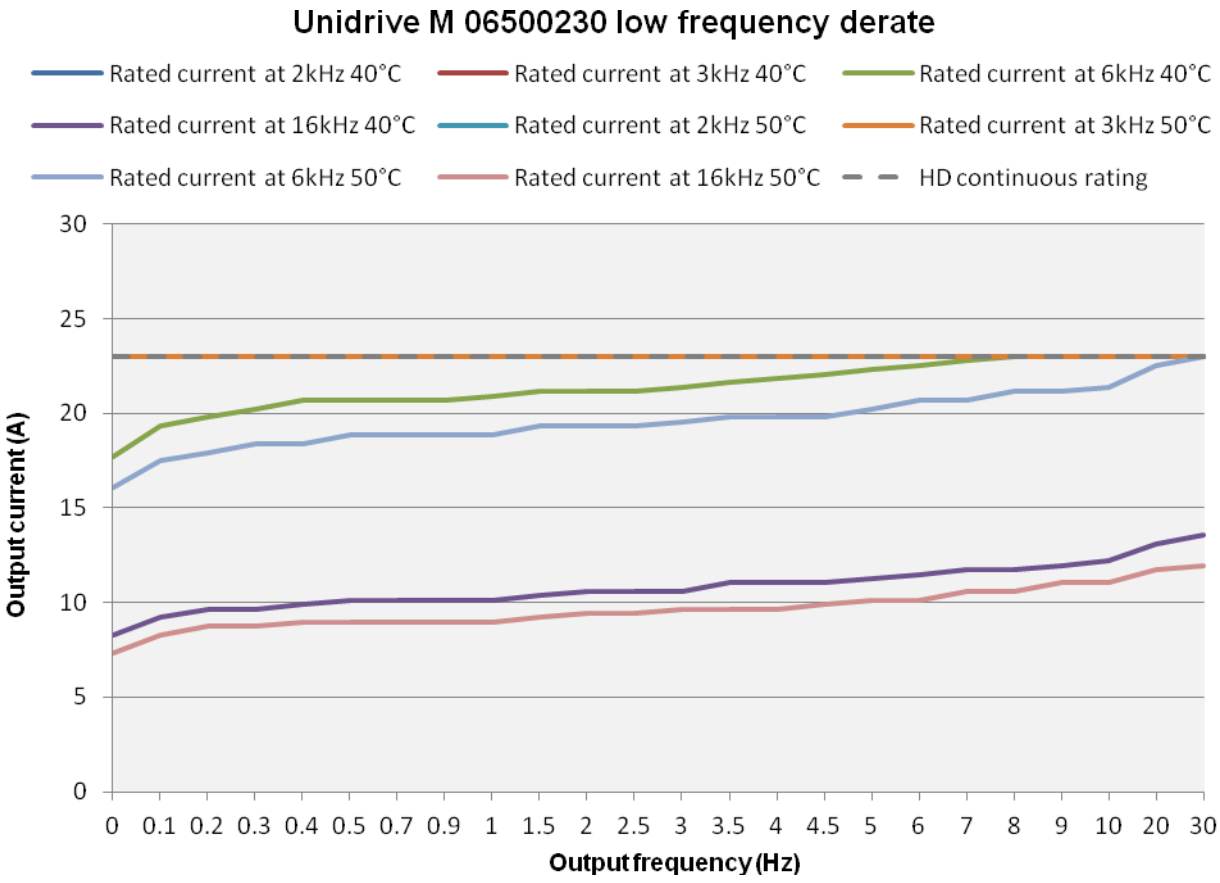

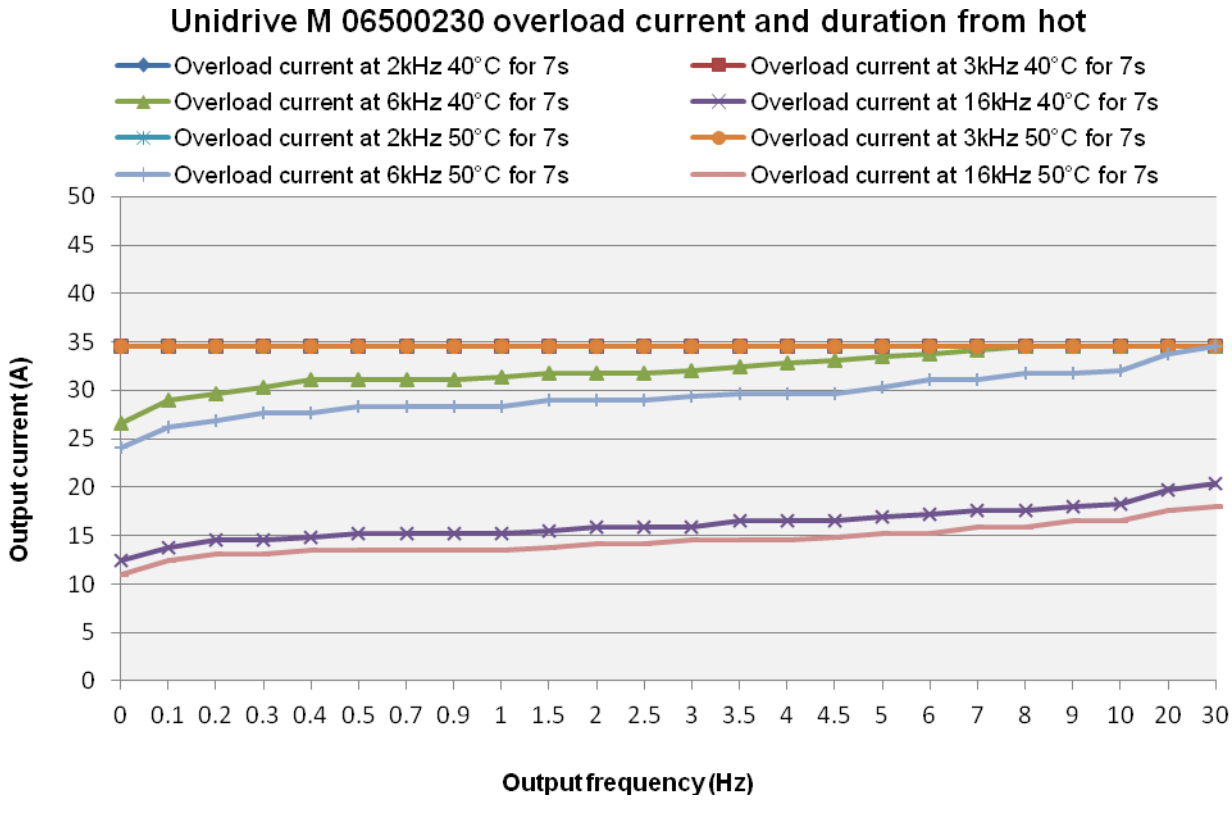

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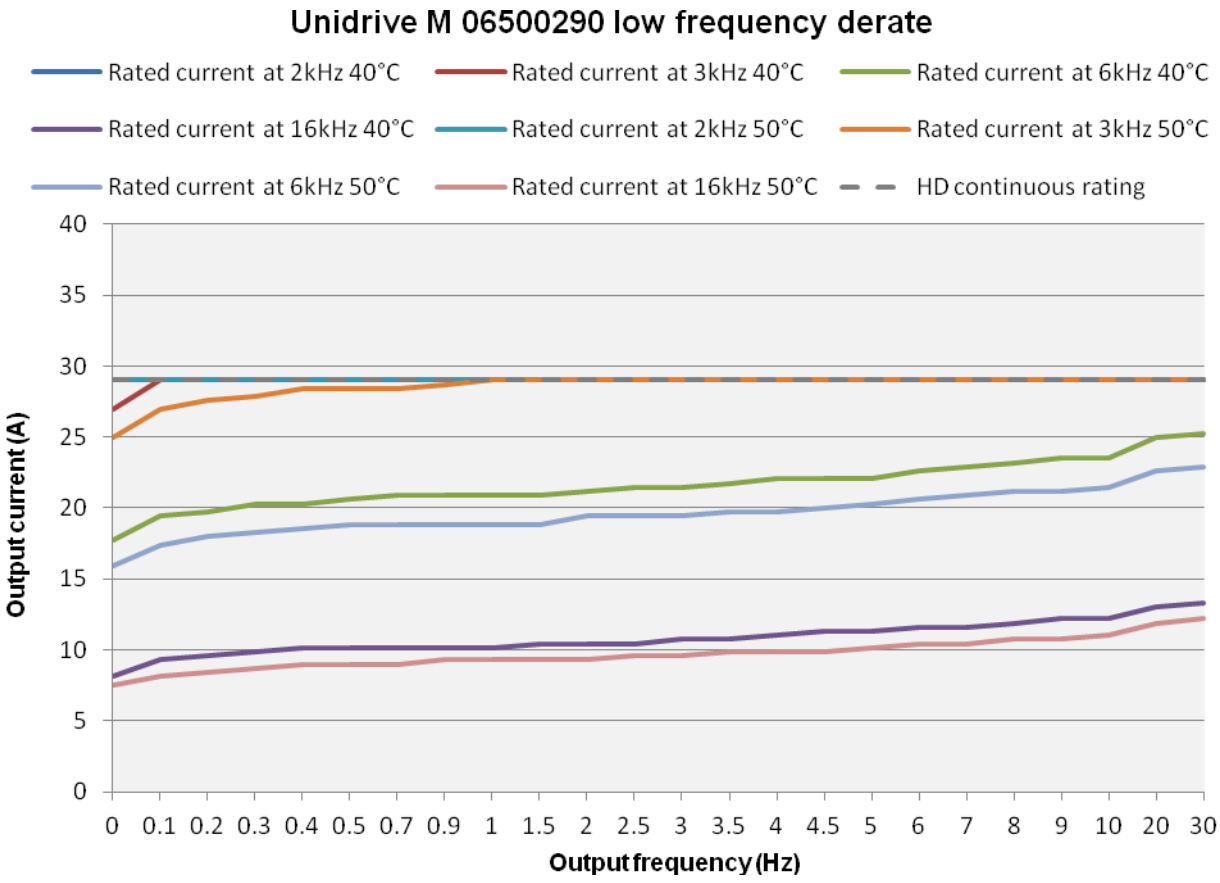

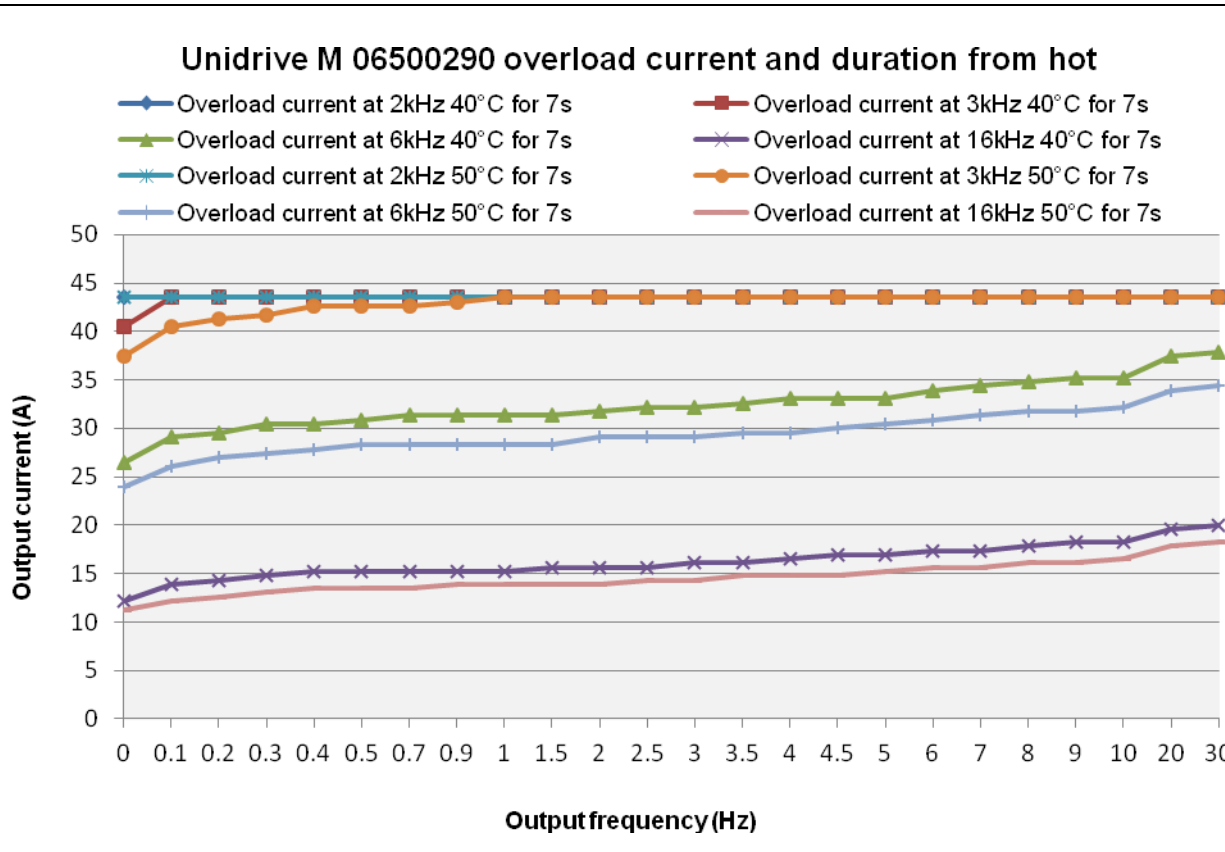

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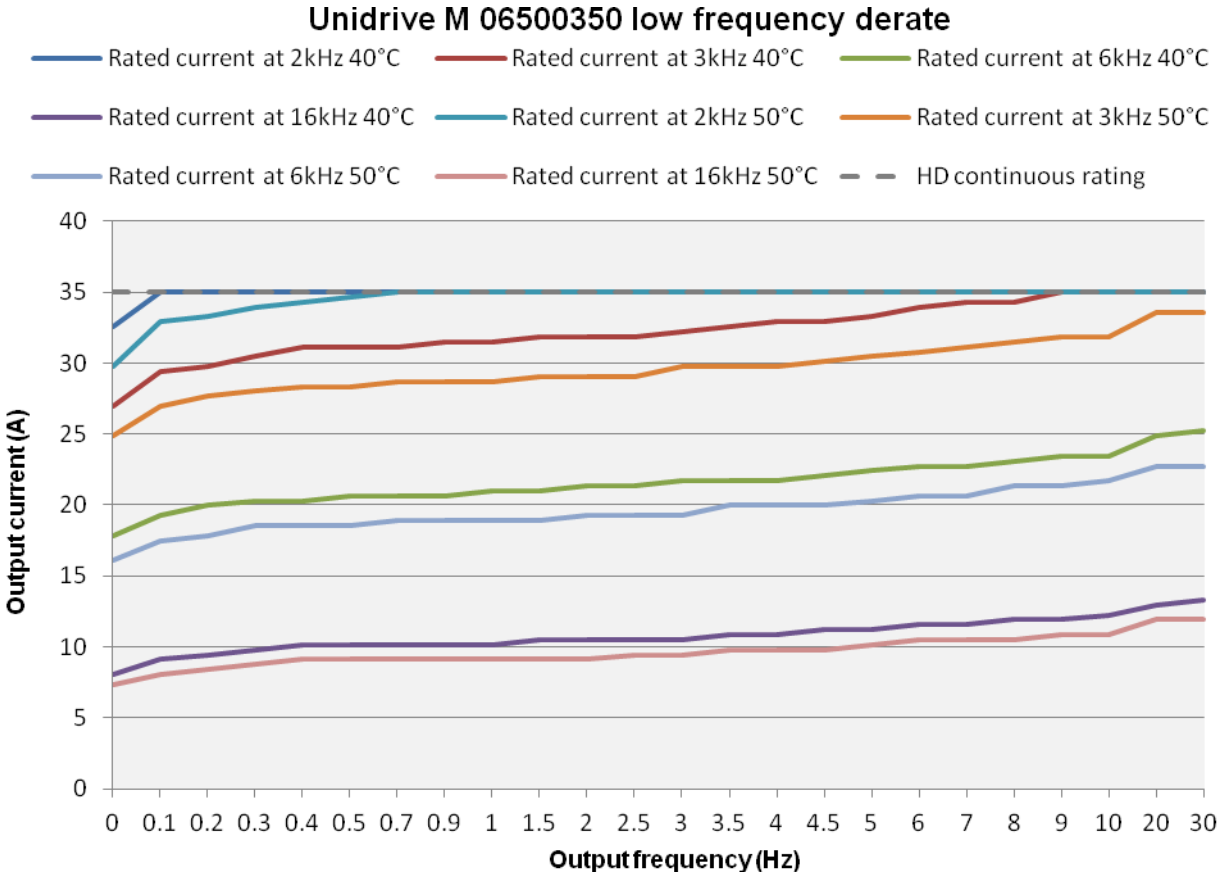
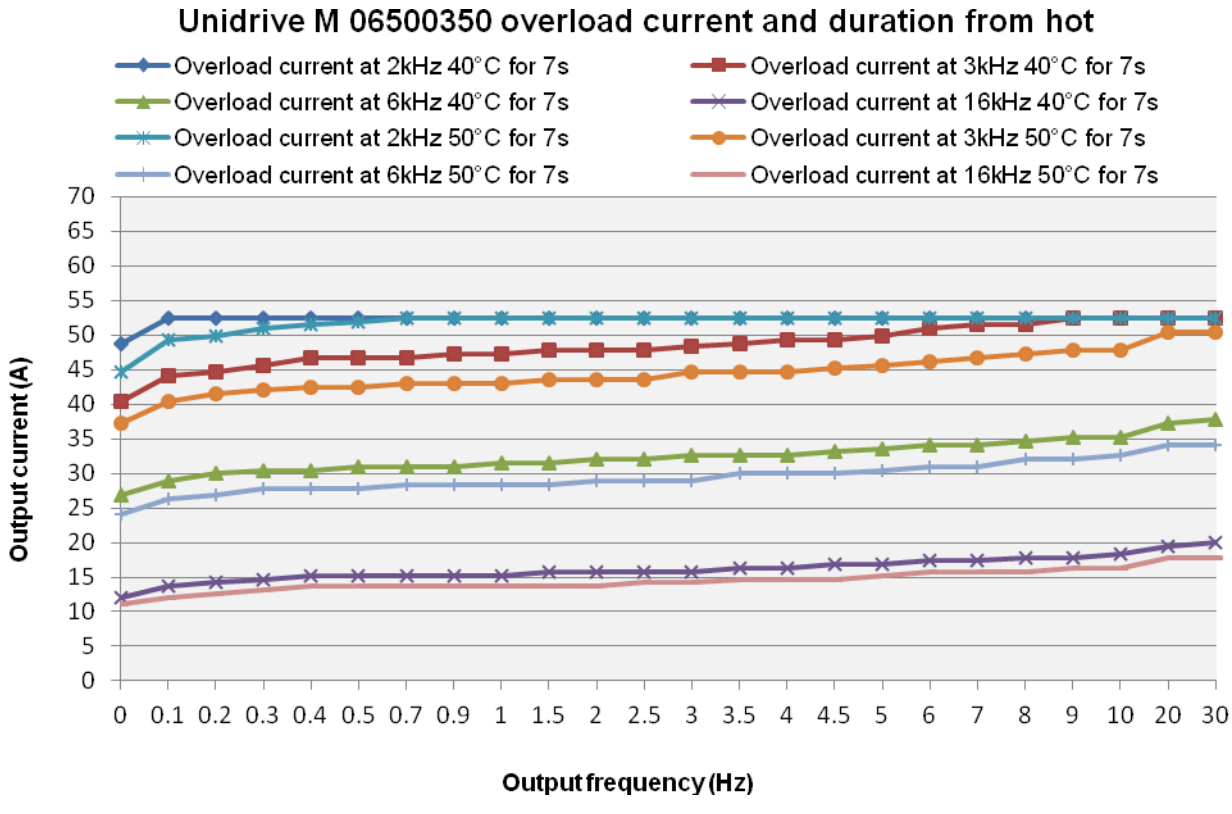
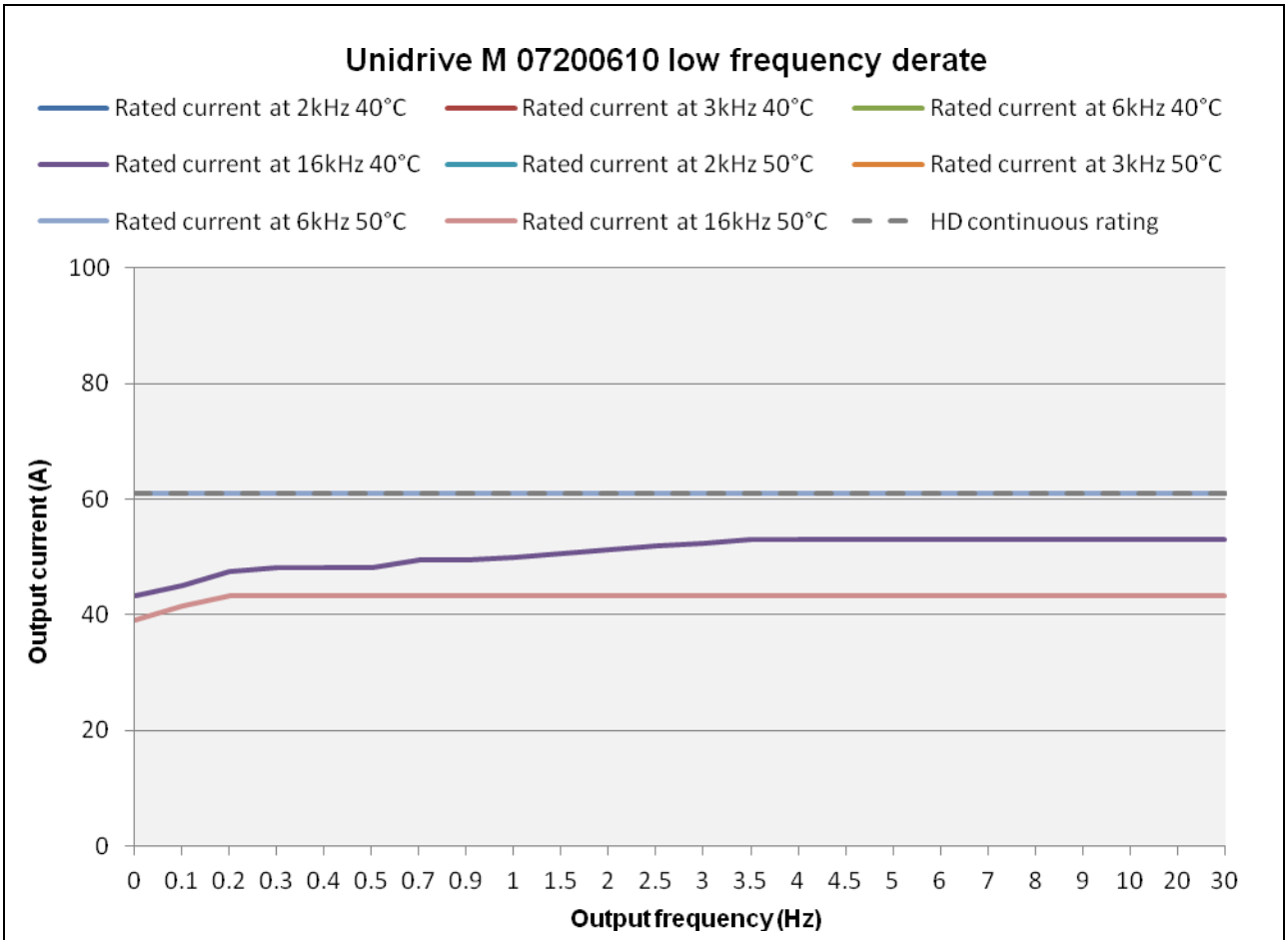
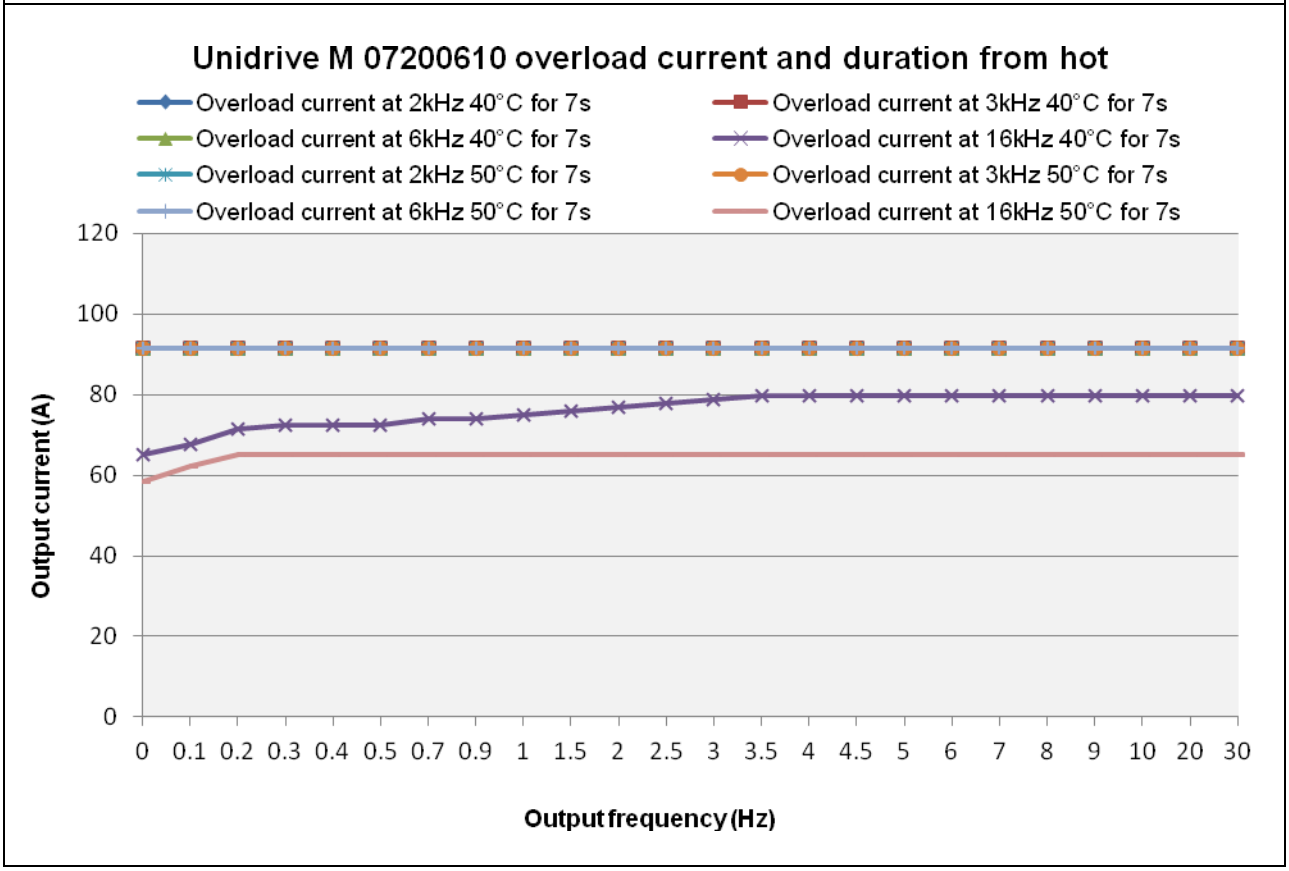




Unidrive M 07200610





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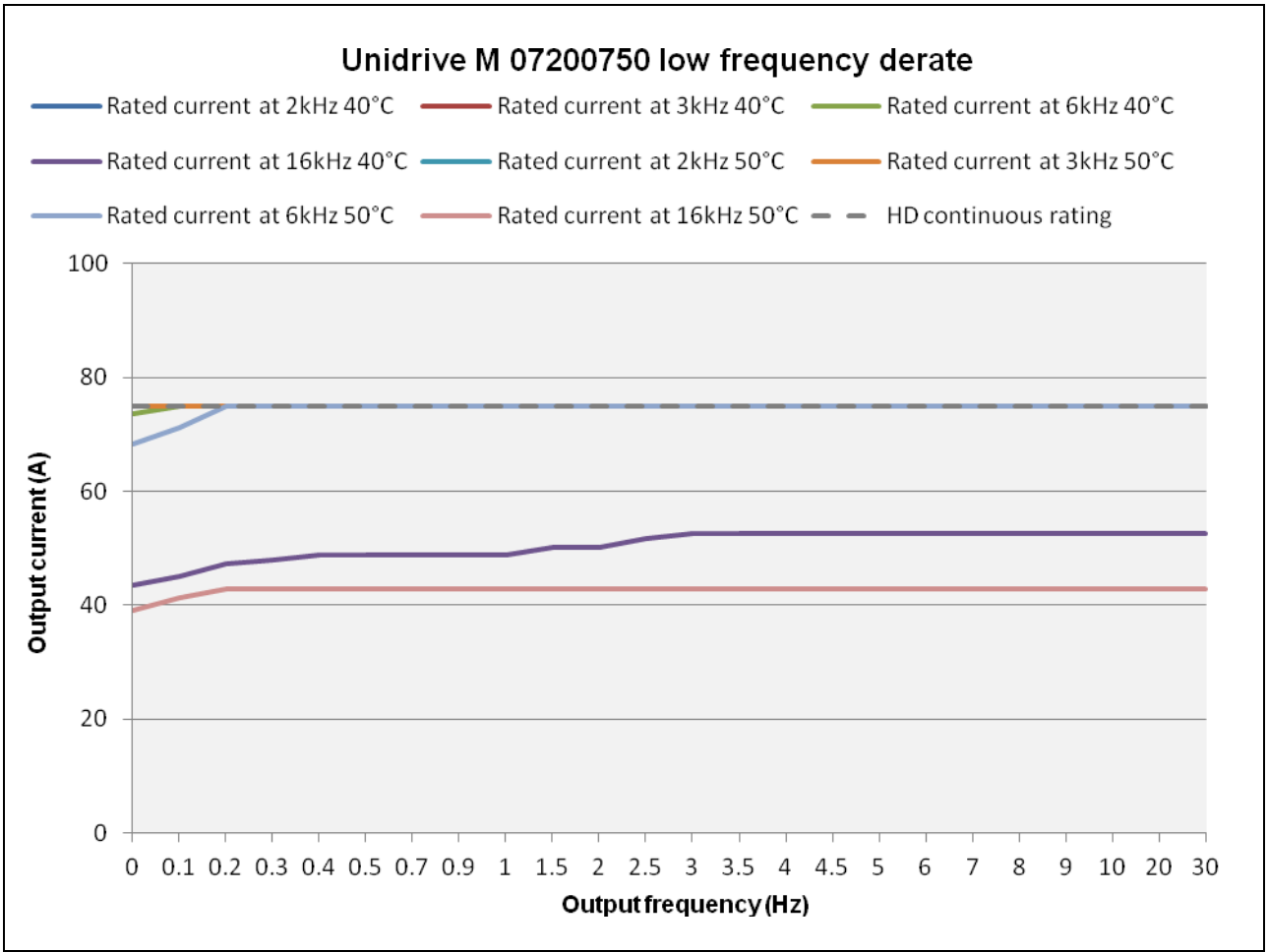

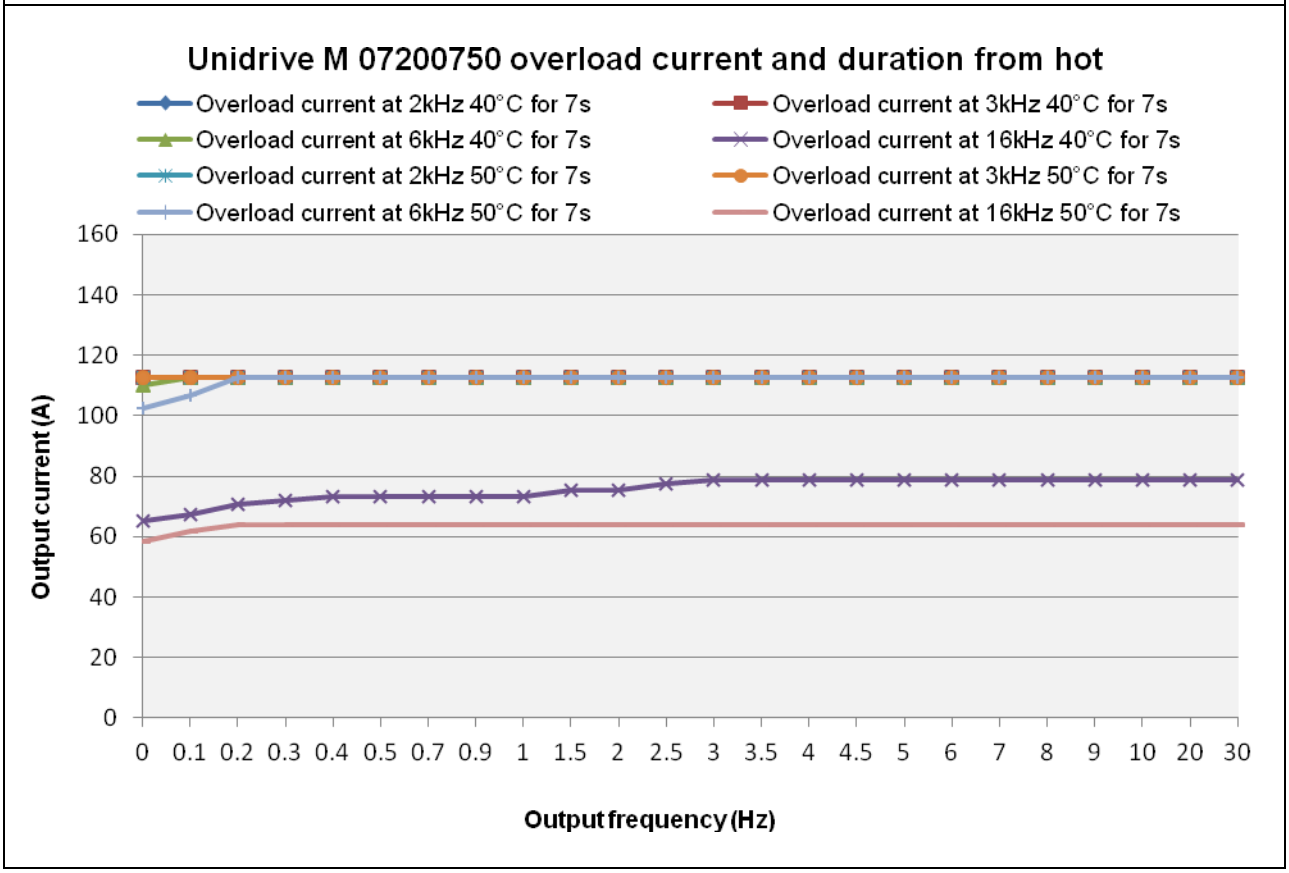

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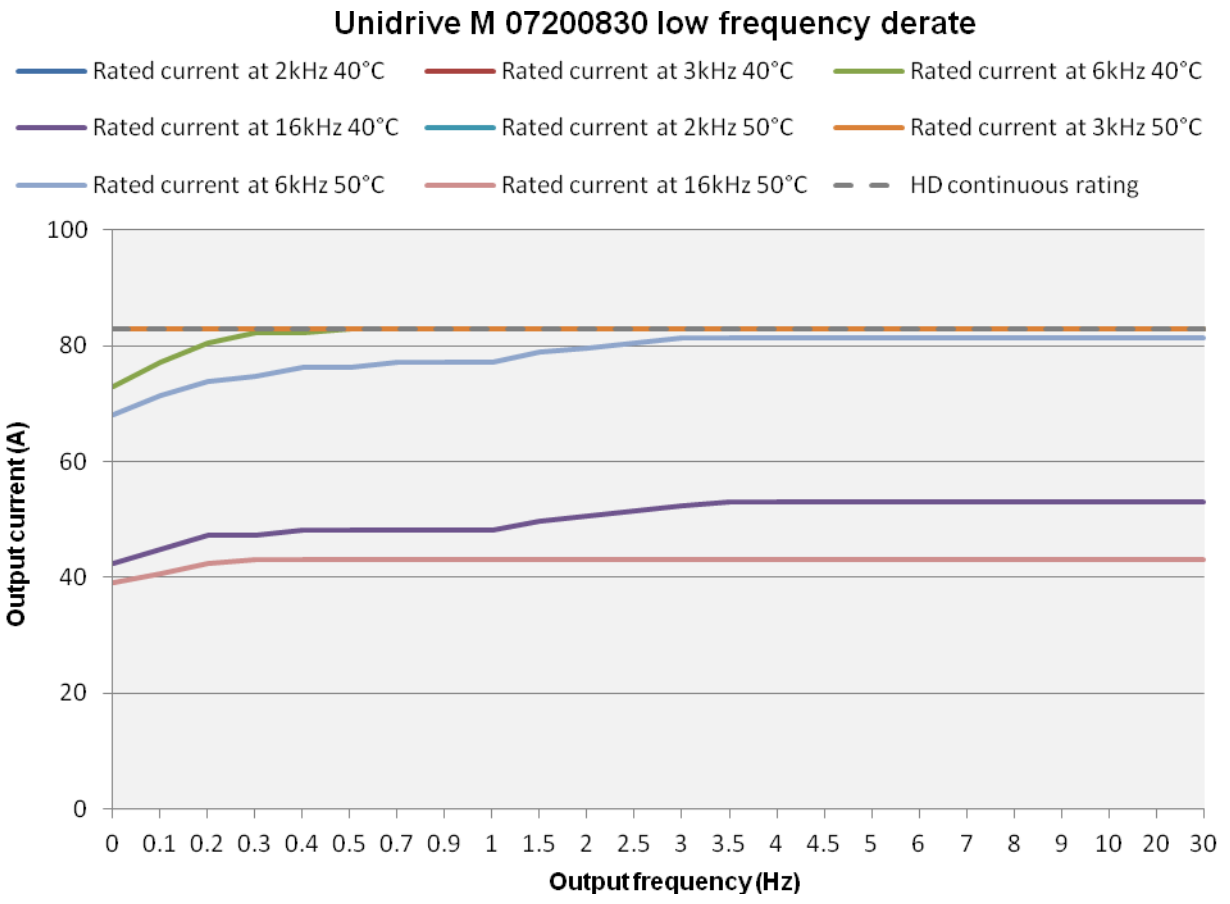

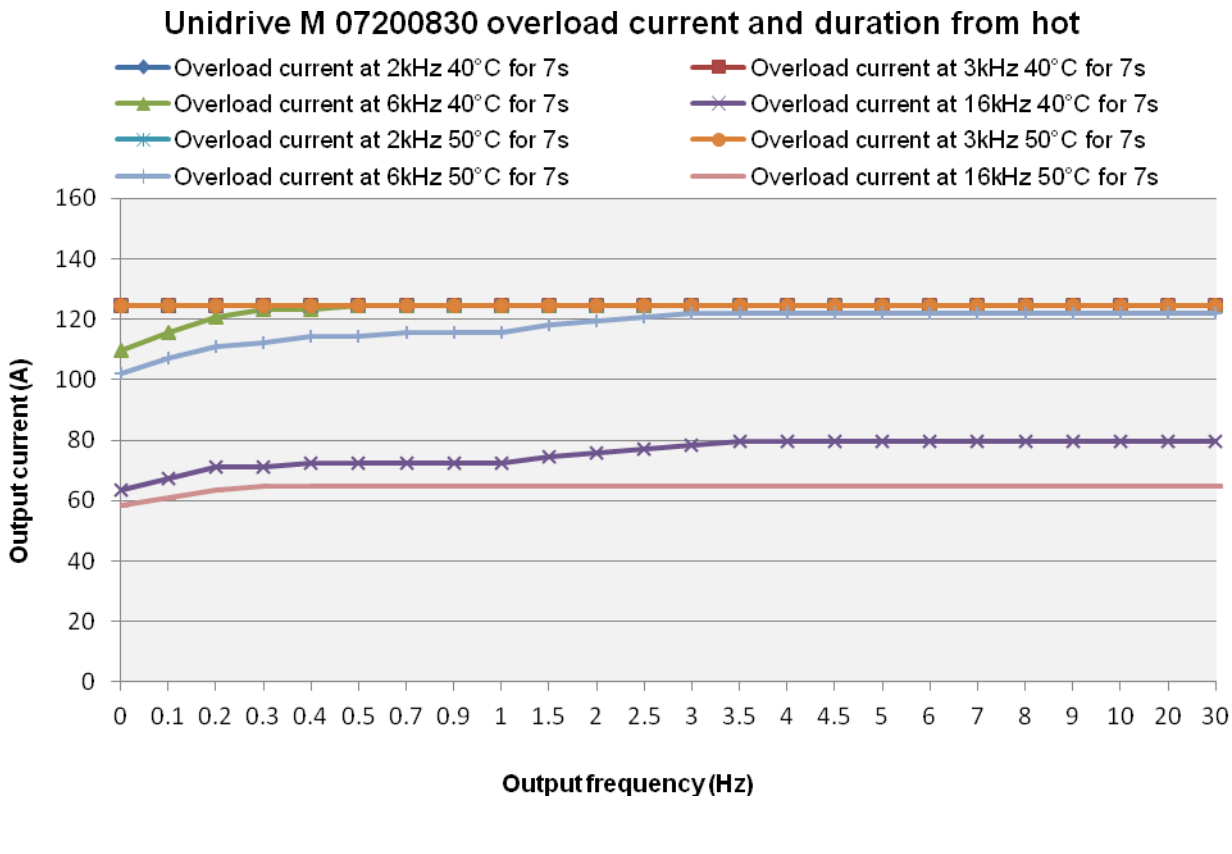

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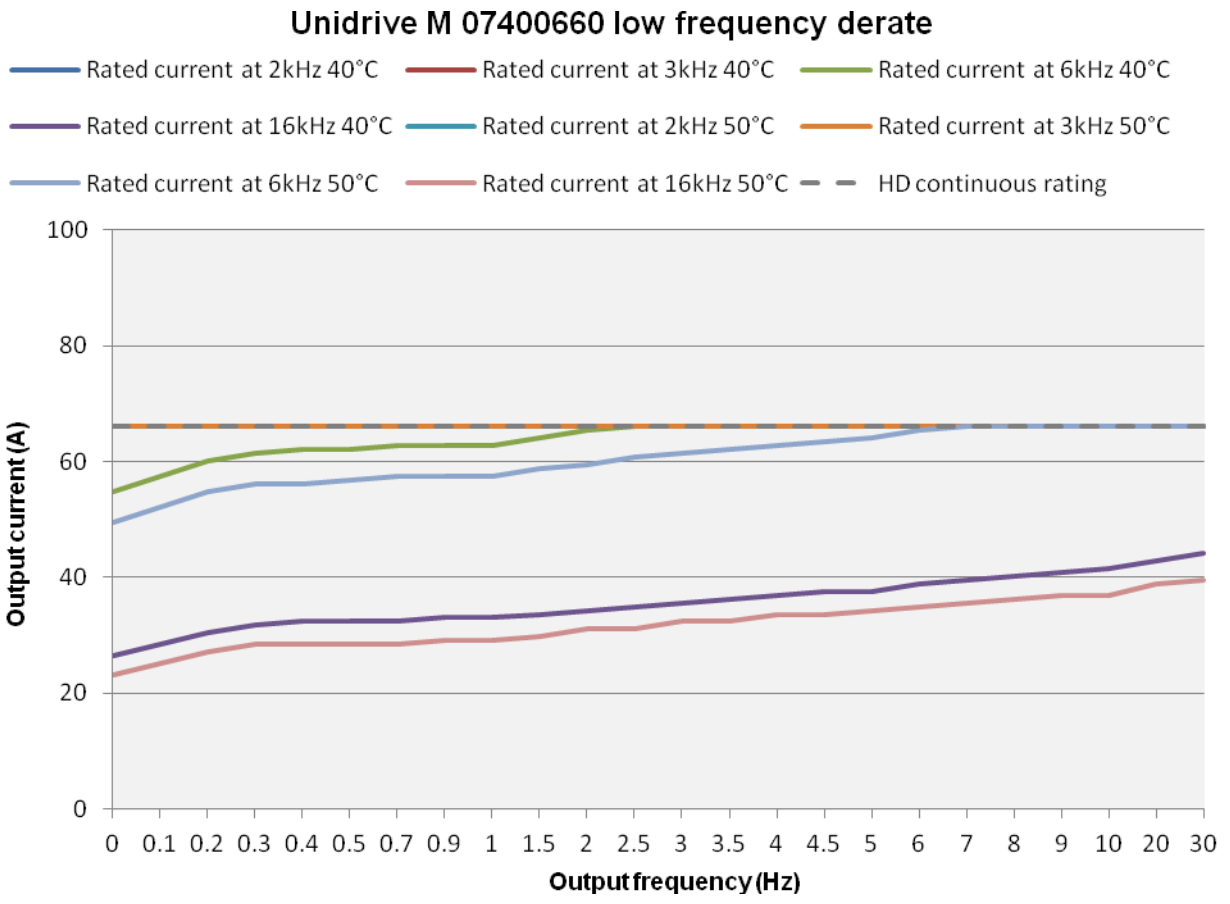

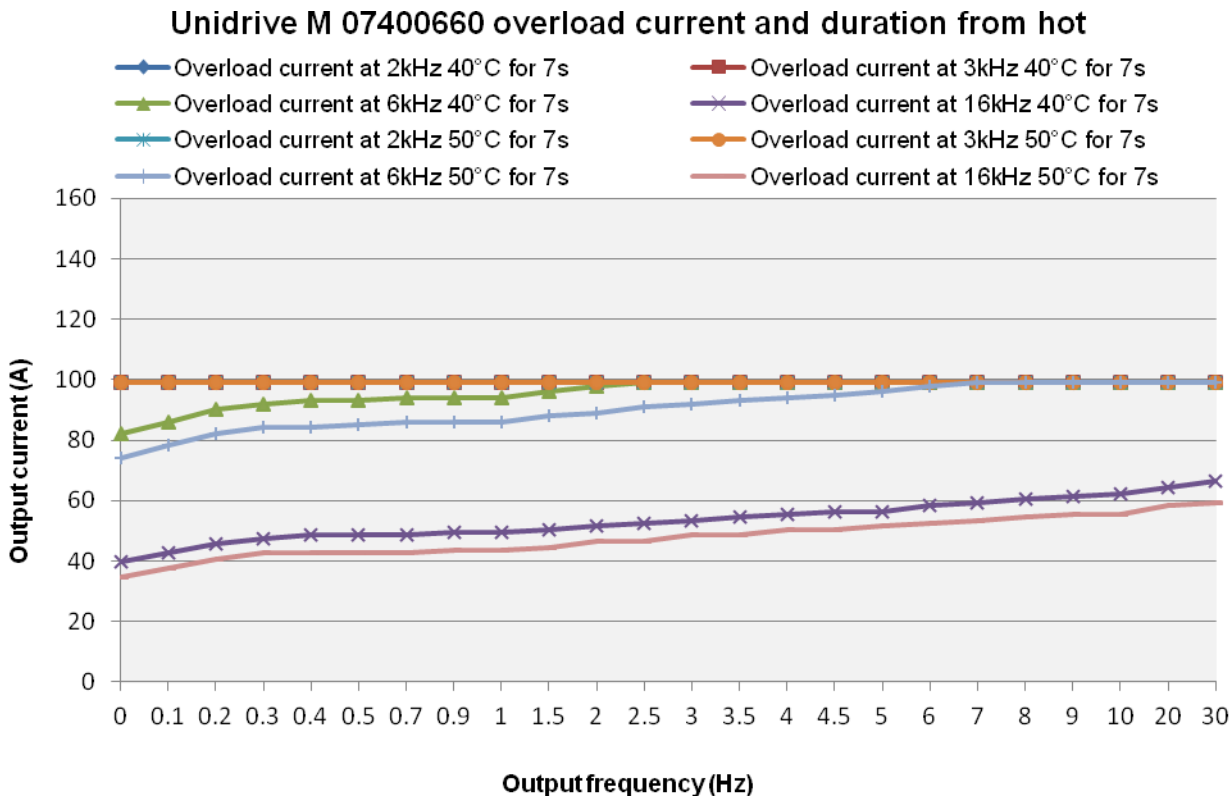

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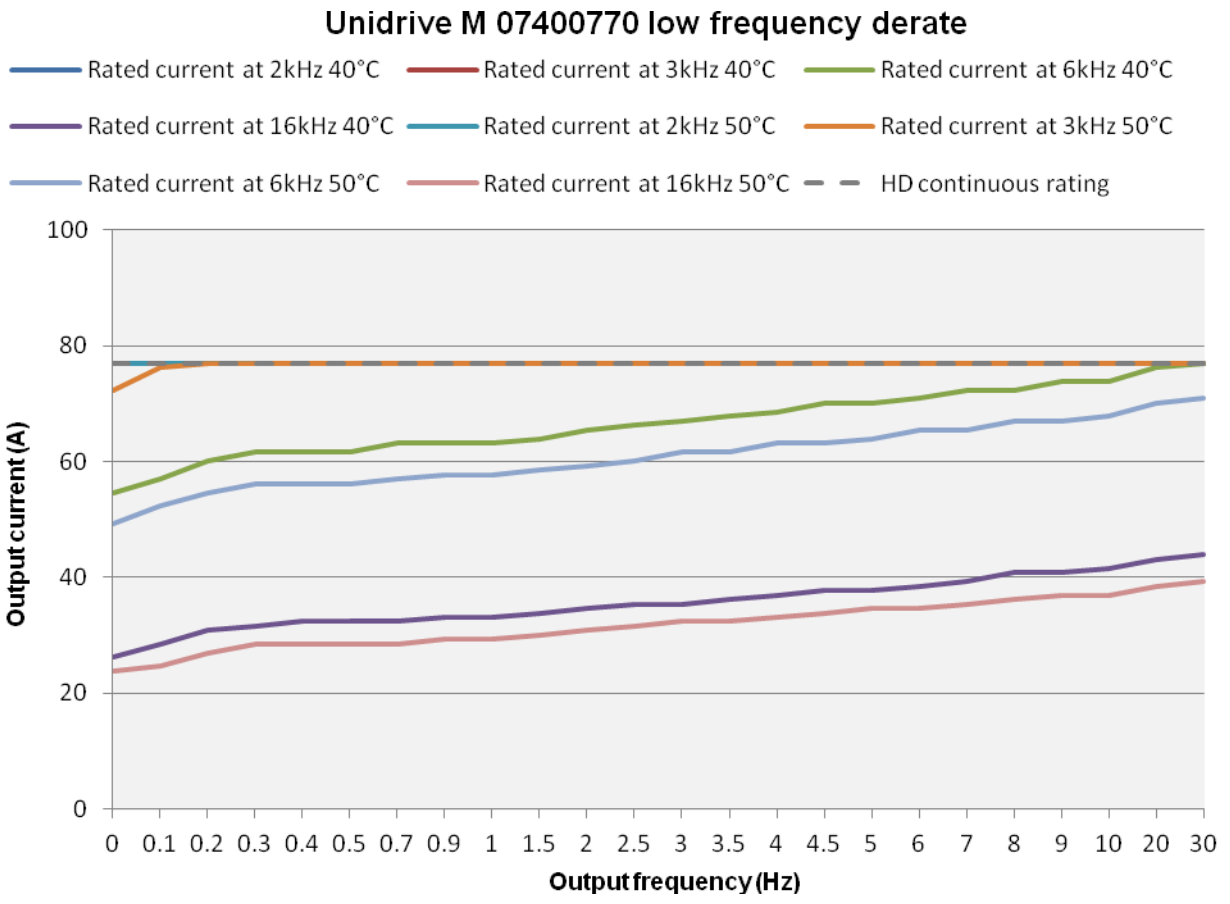

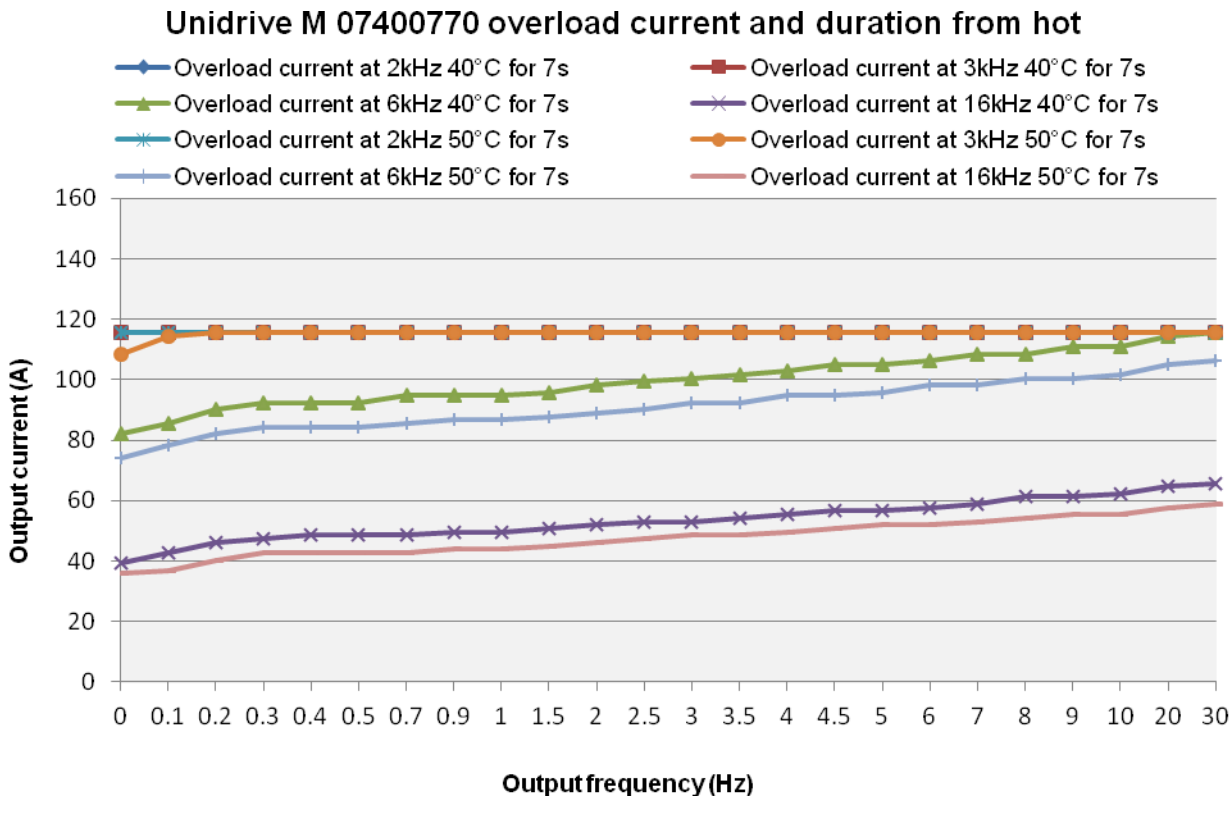

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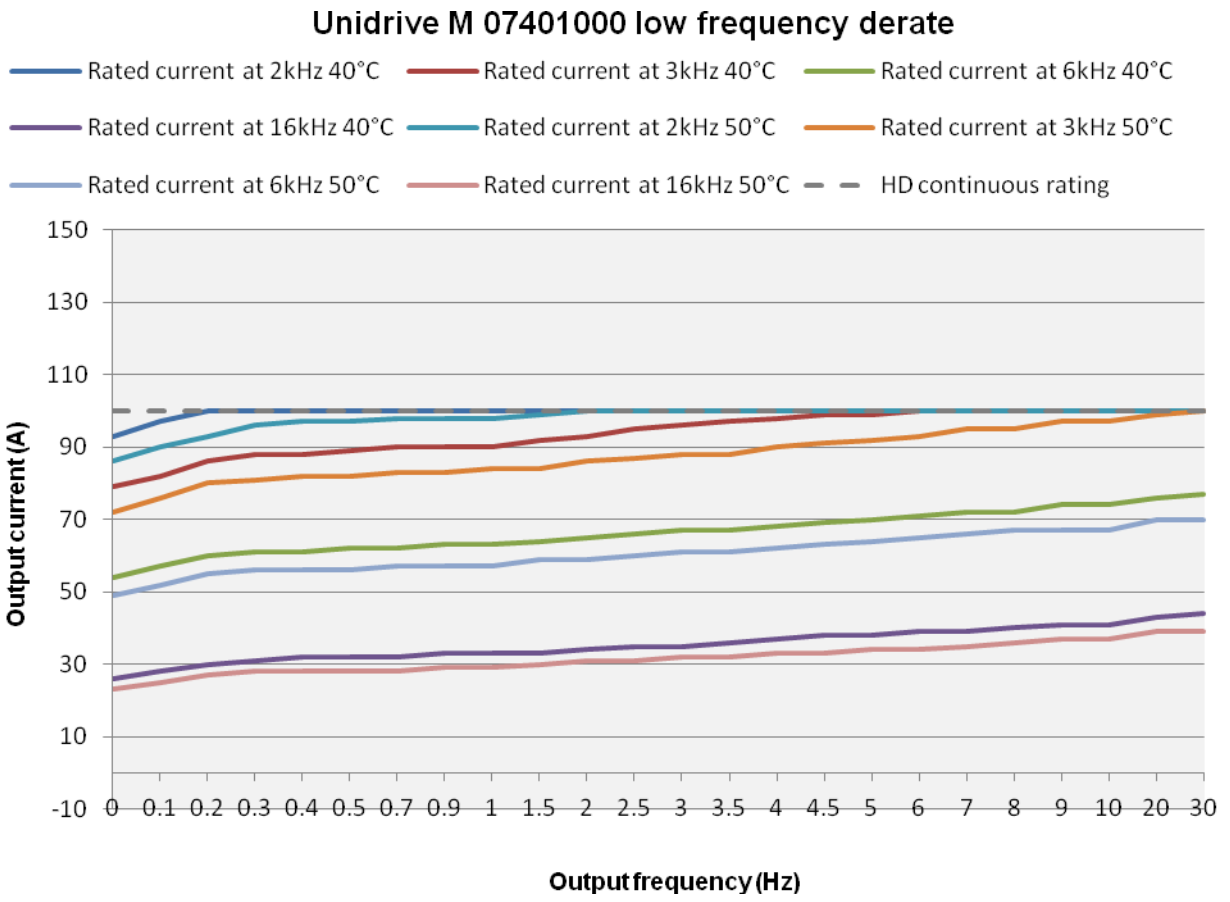

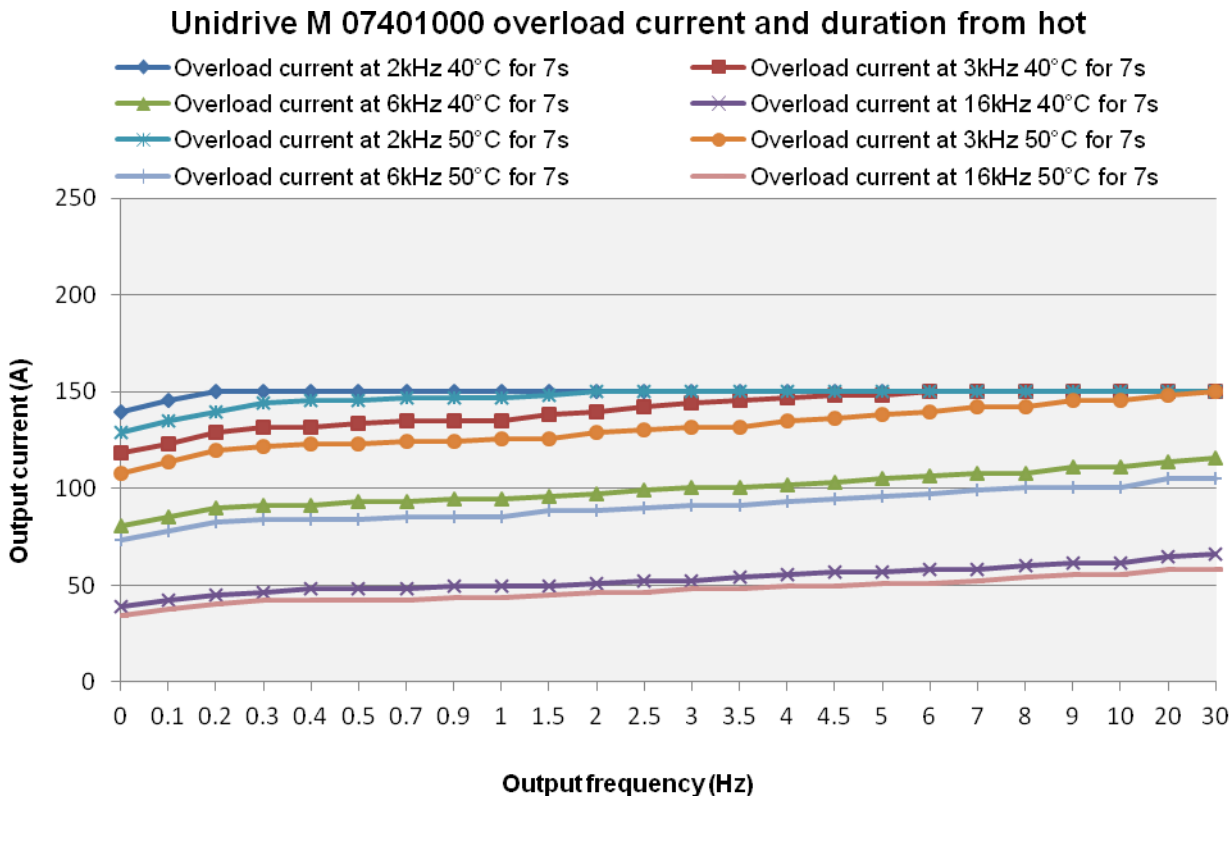

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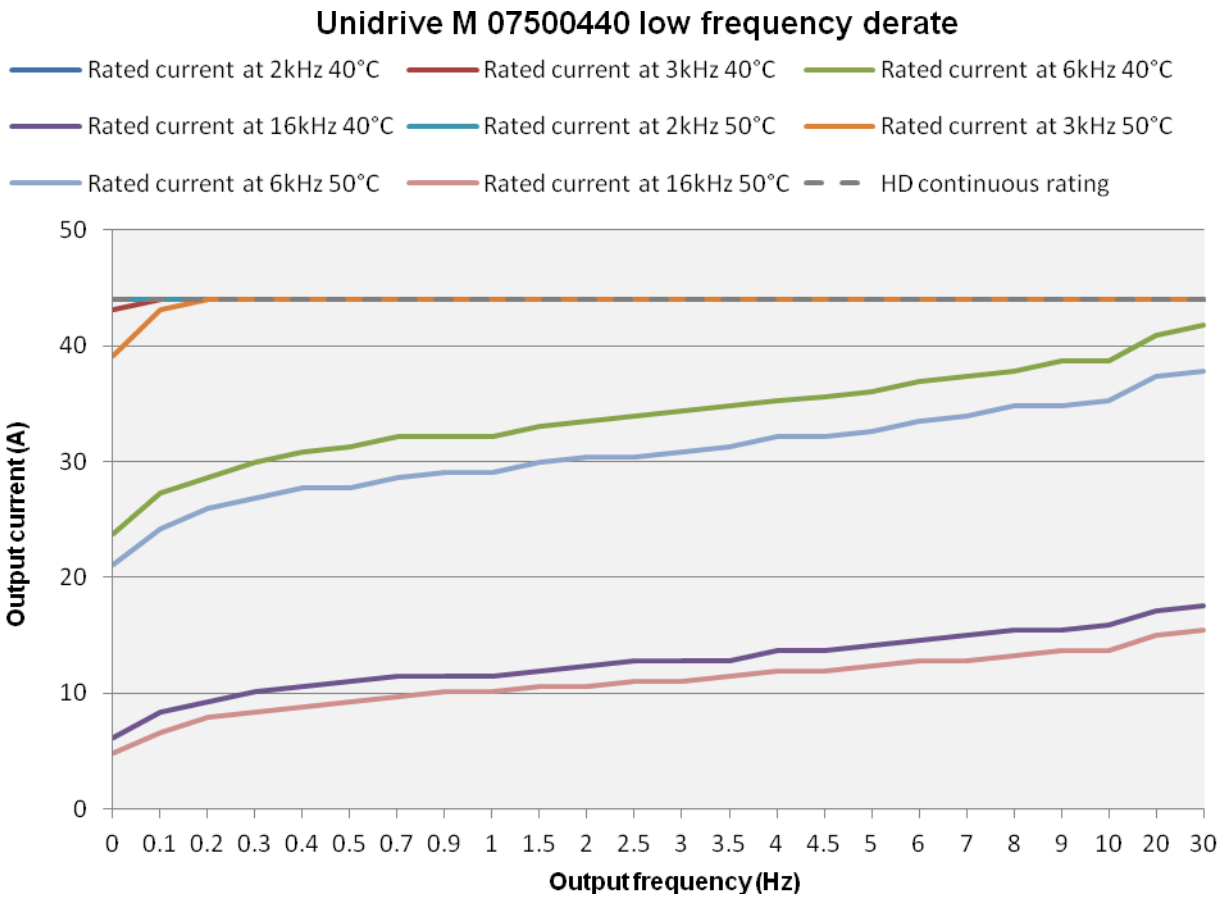

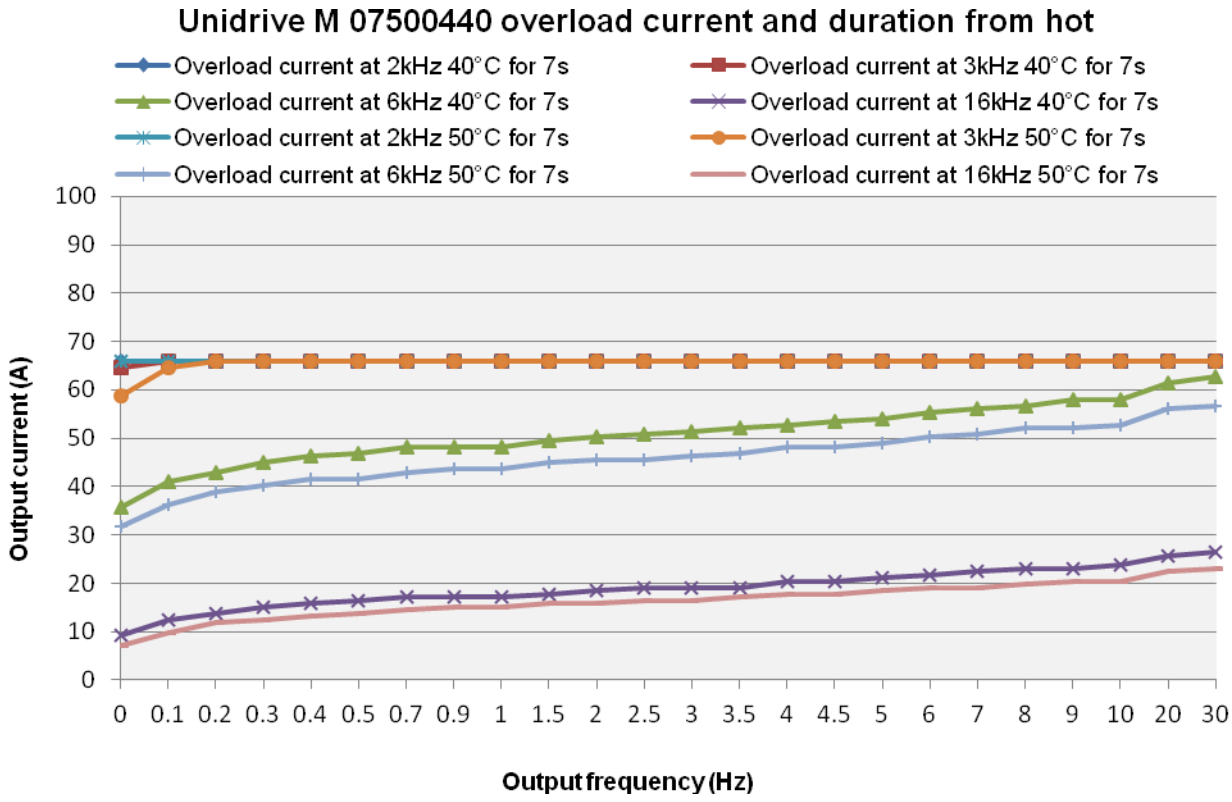

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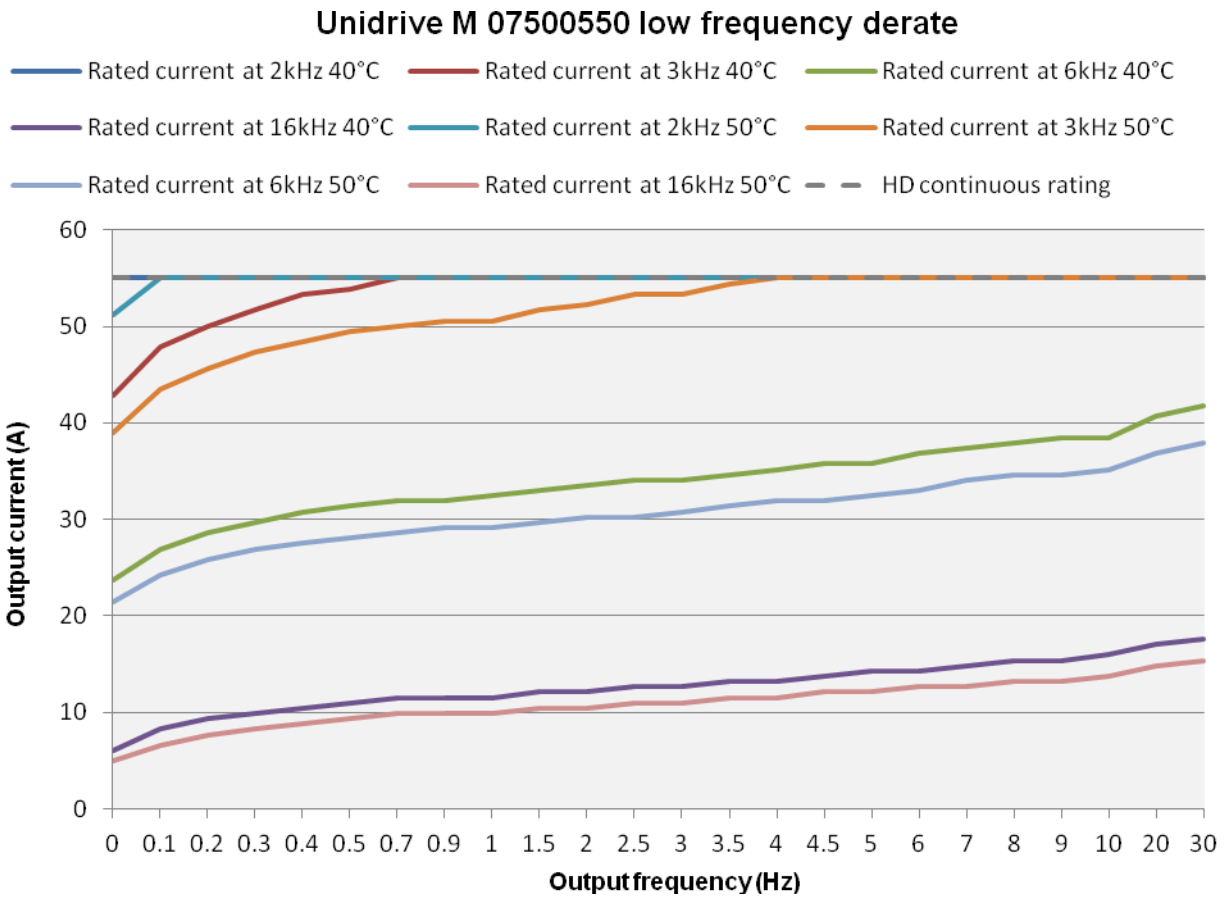

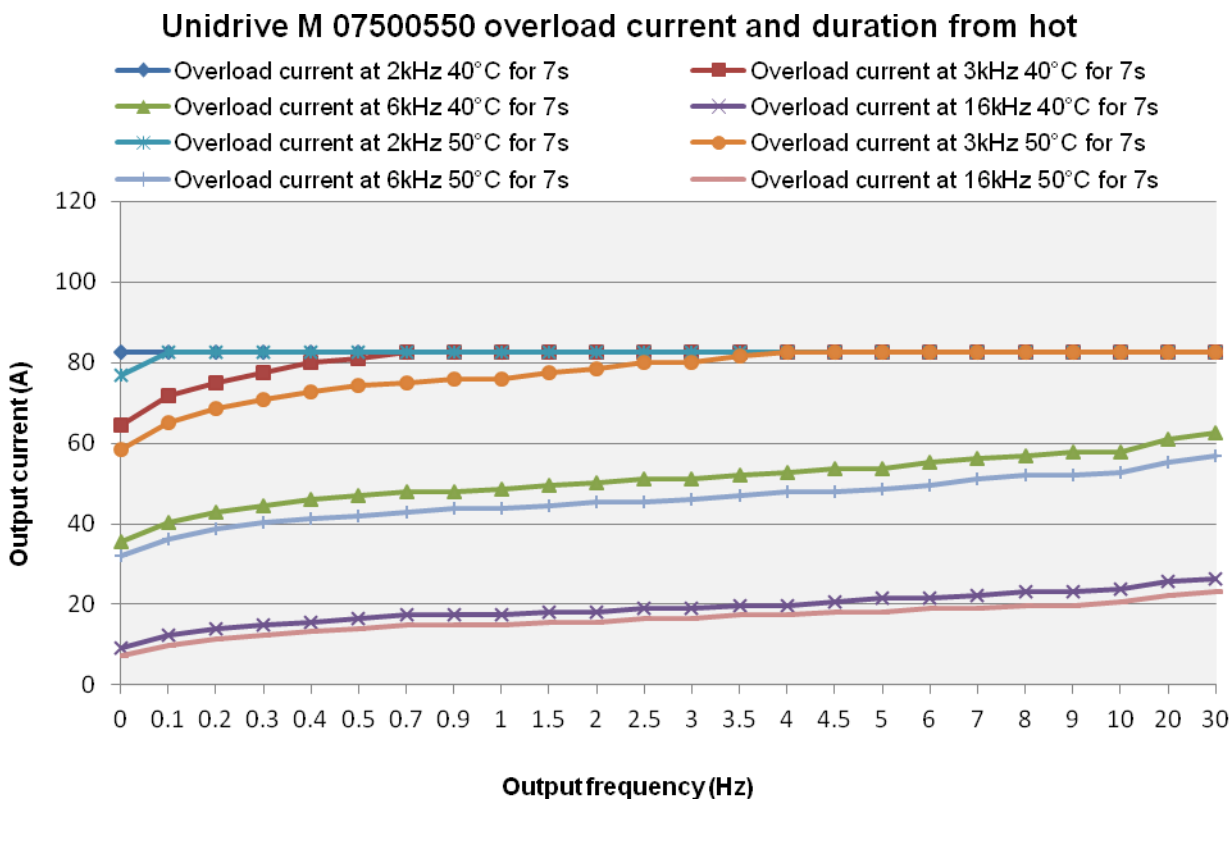

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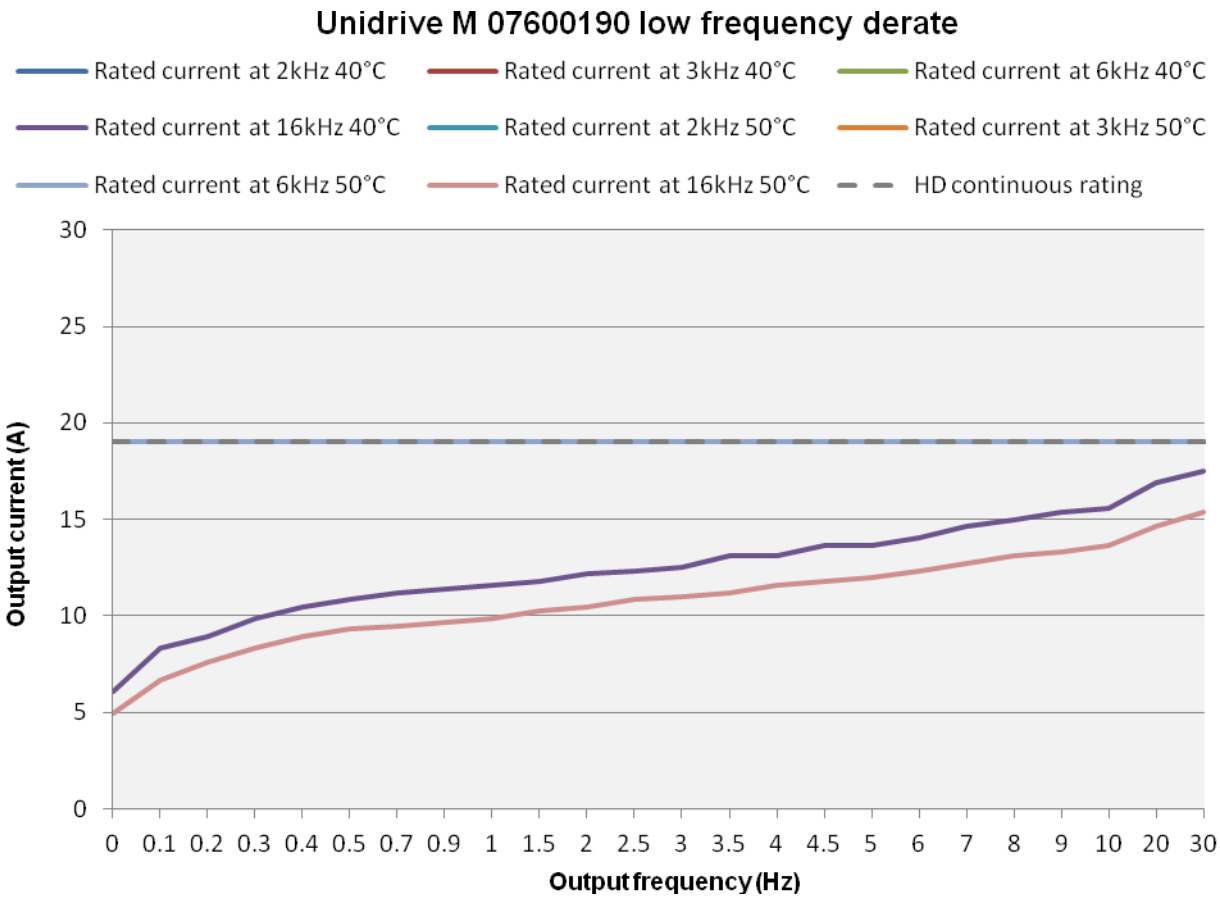

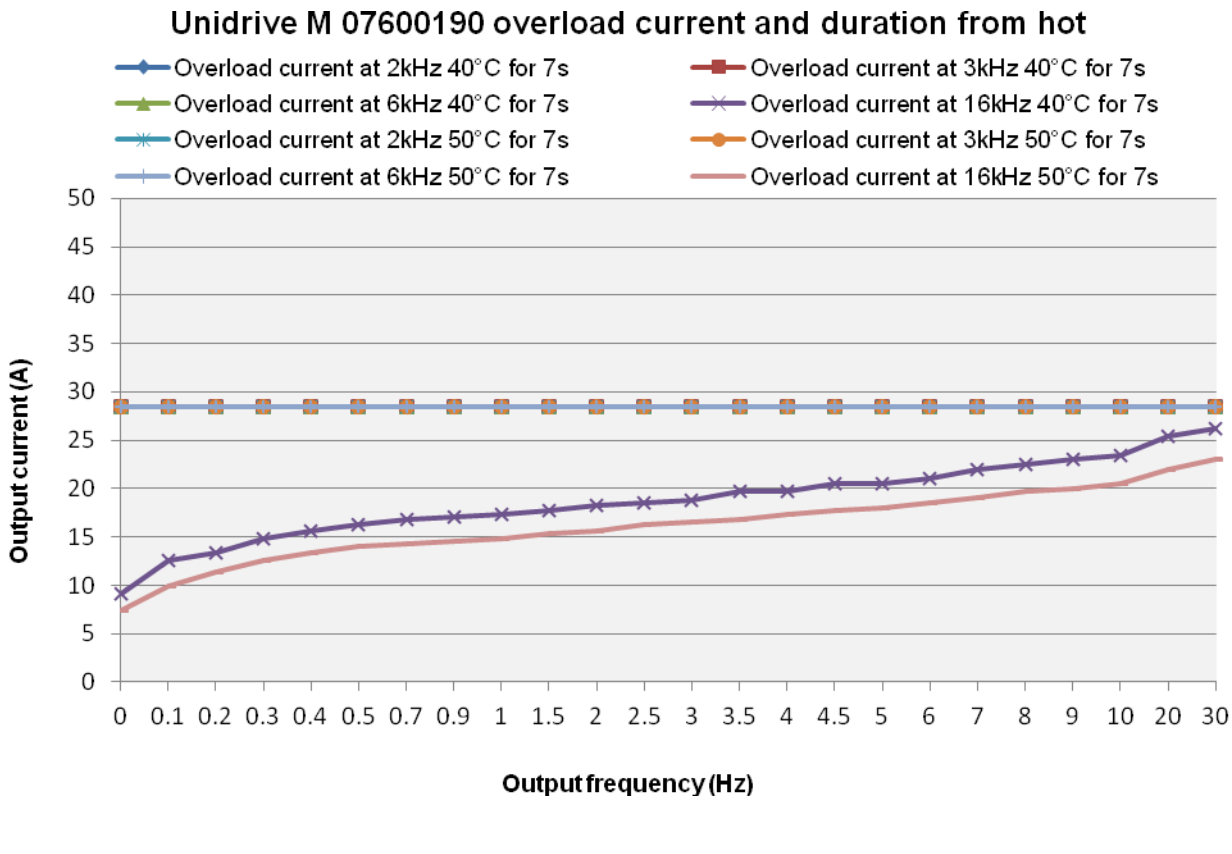

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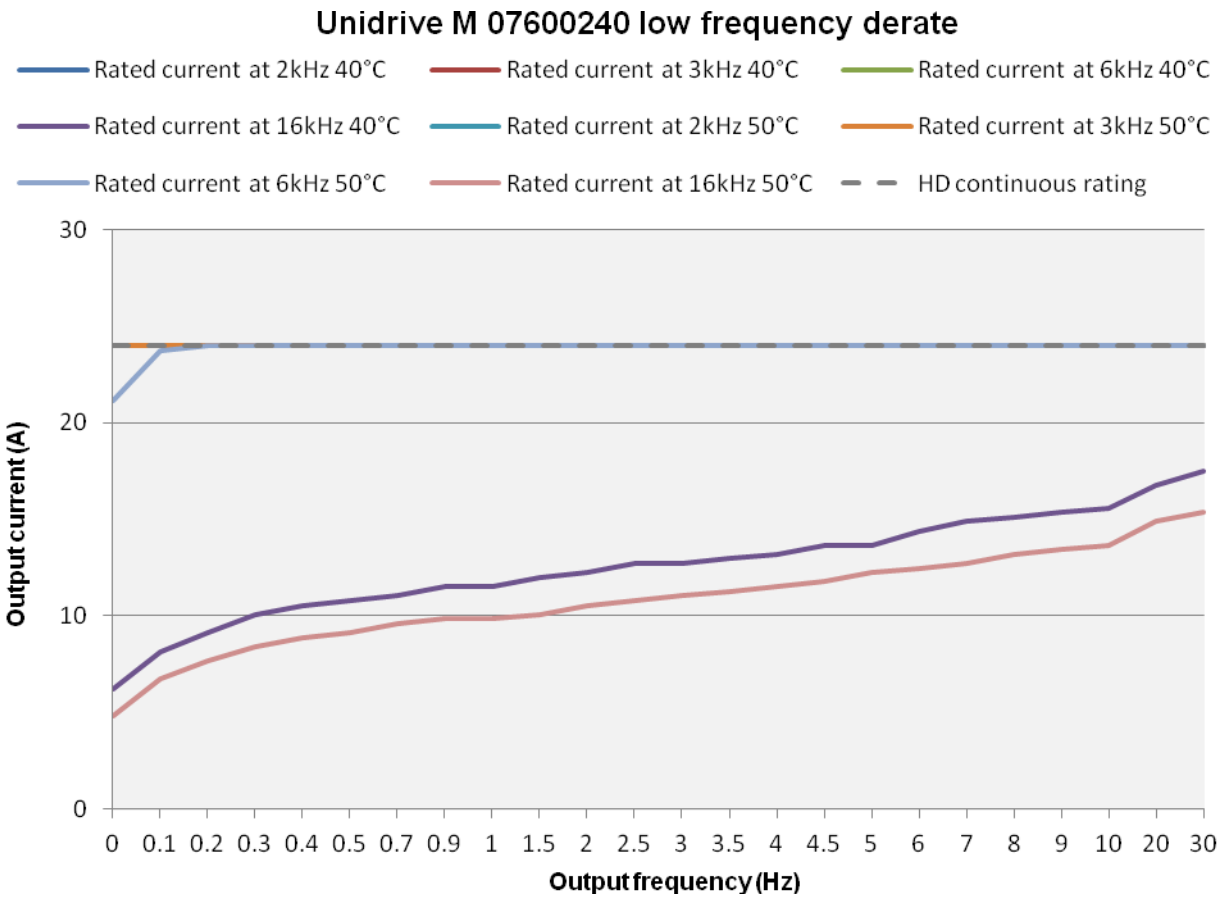

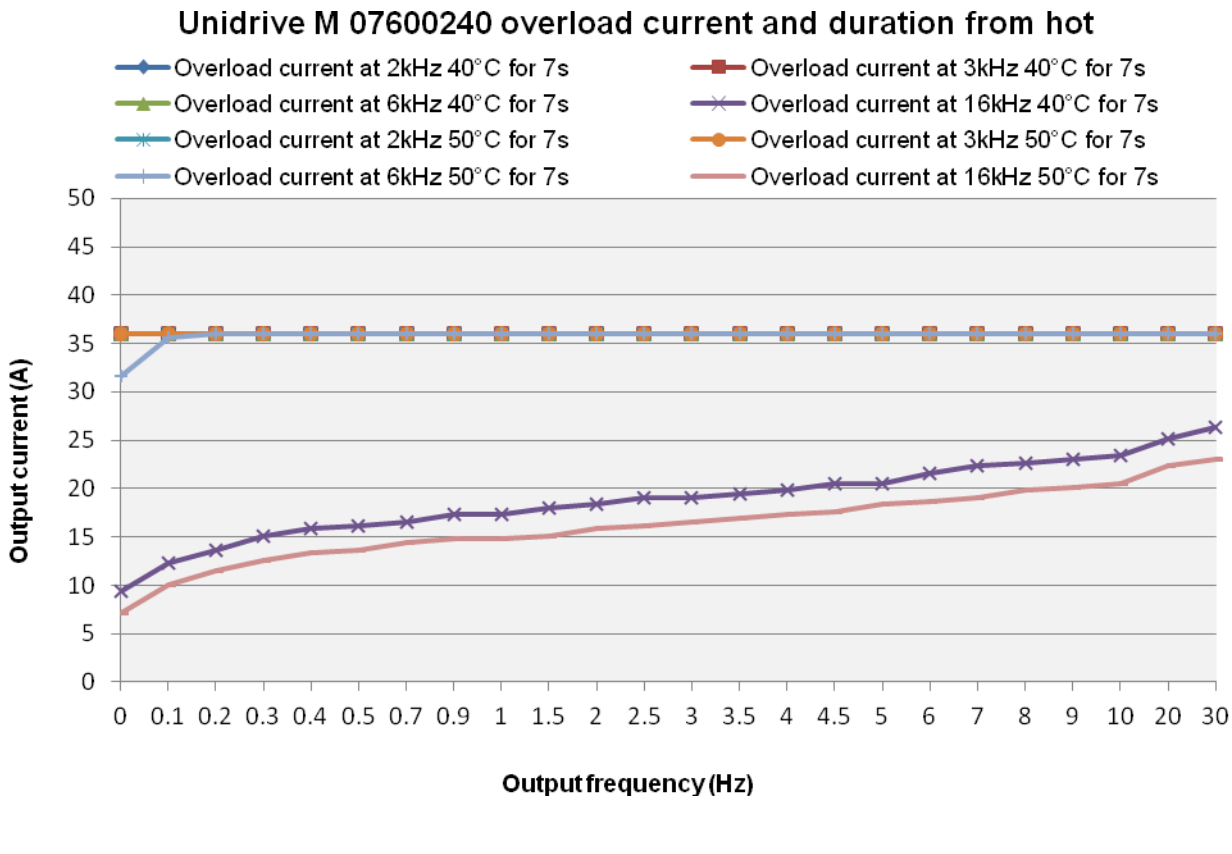

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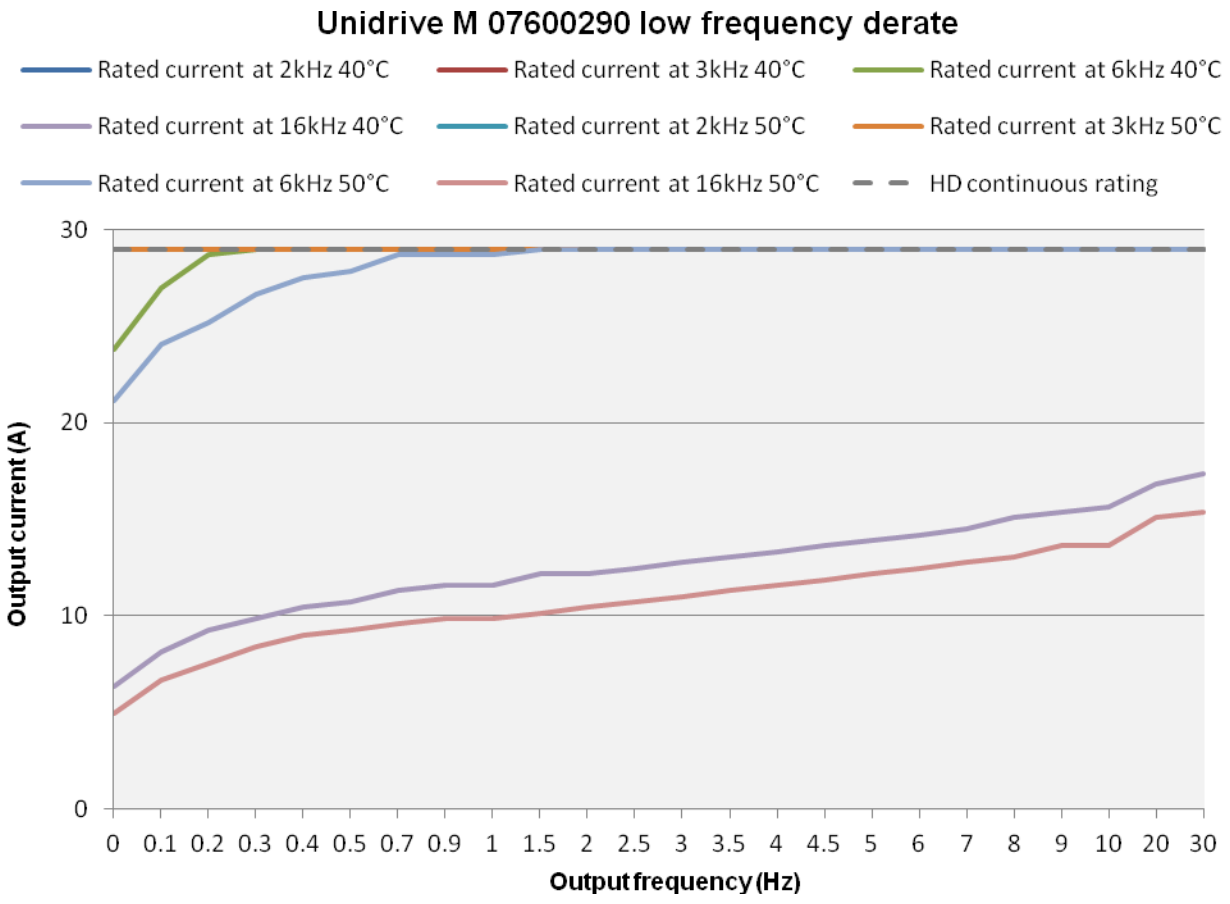

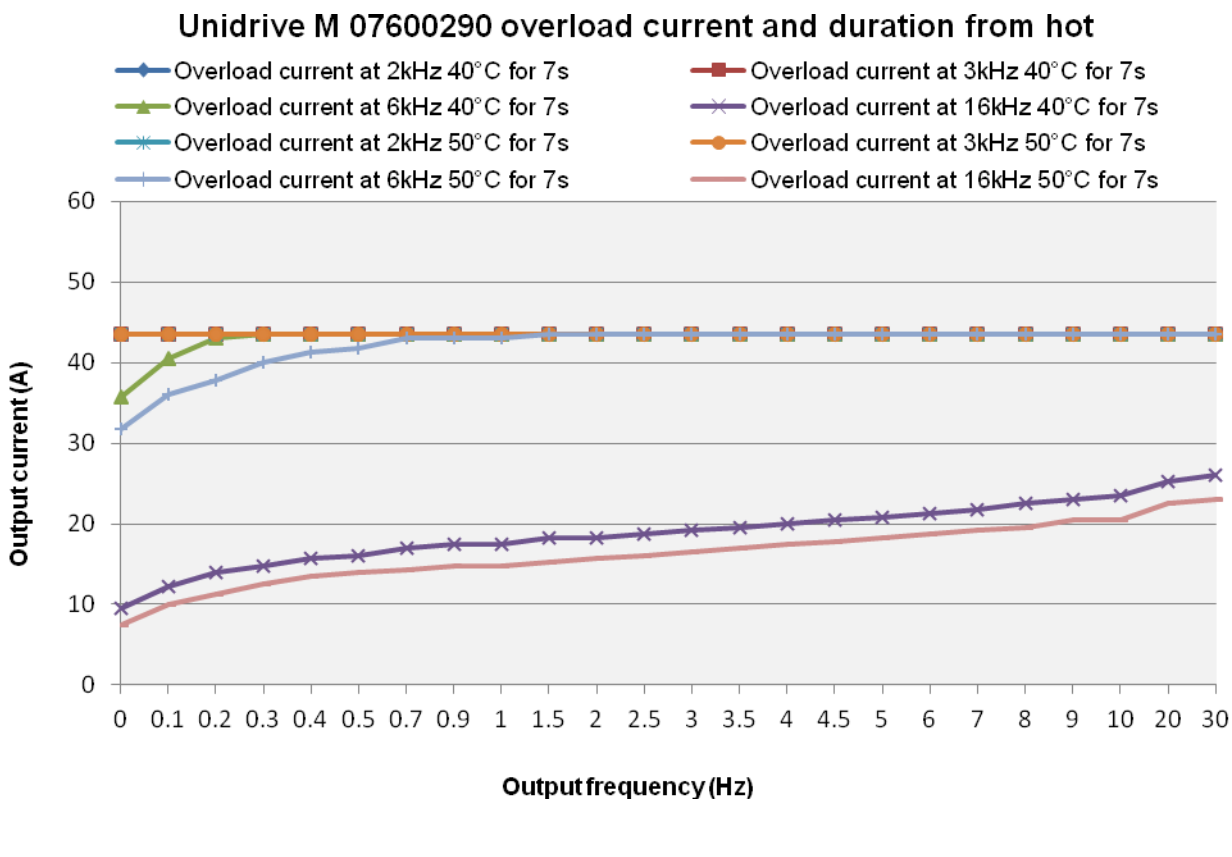

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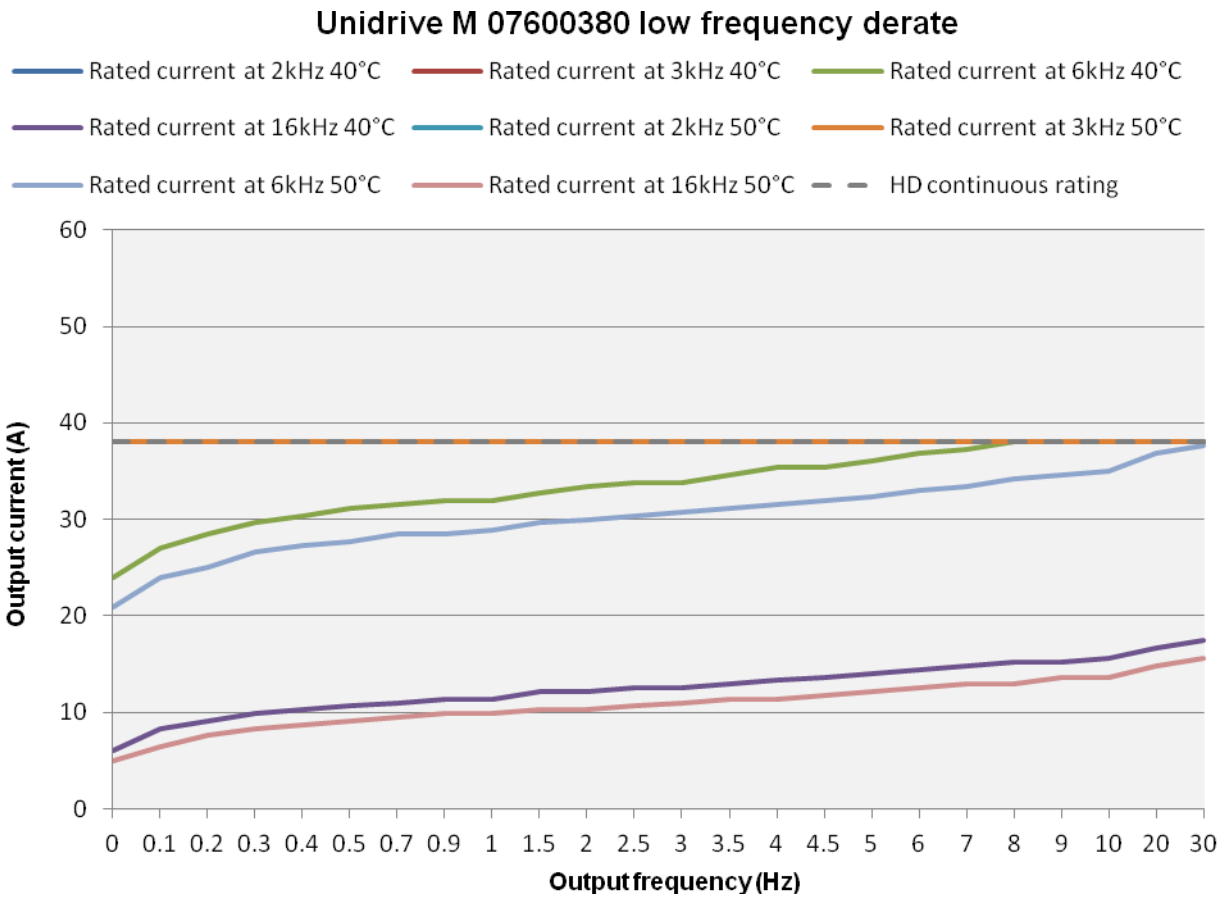

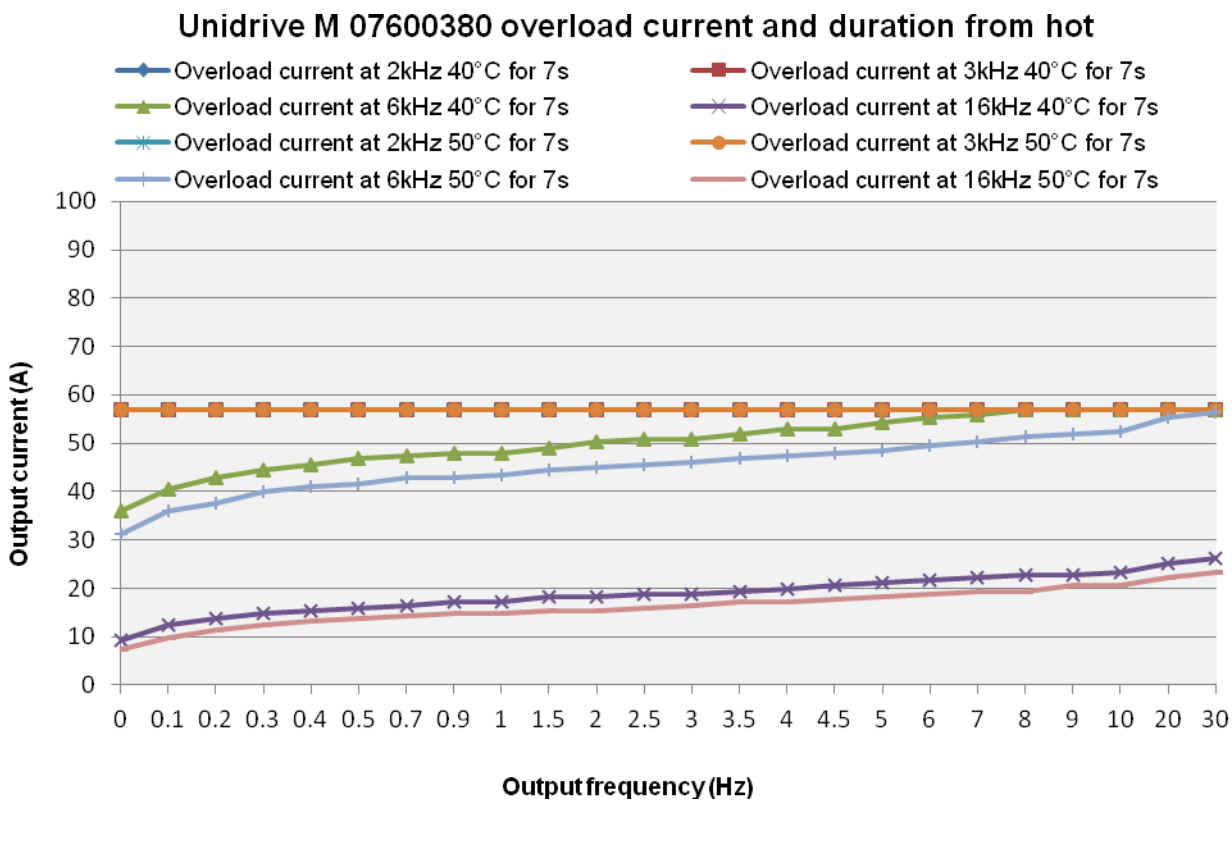

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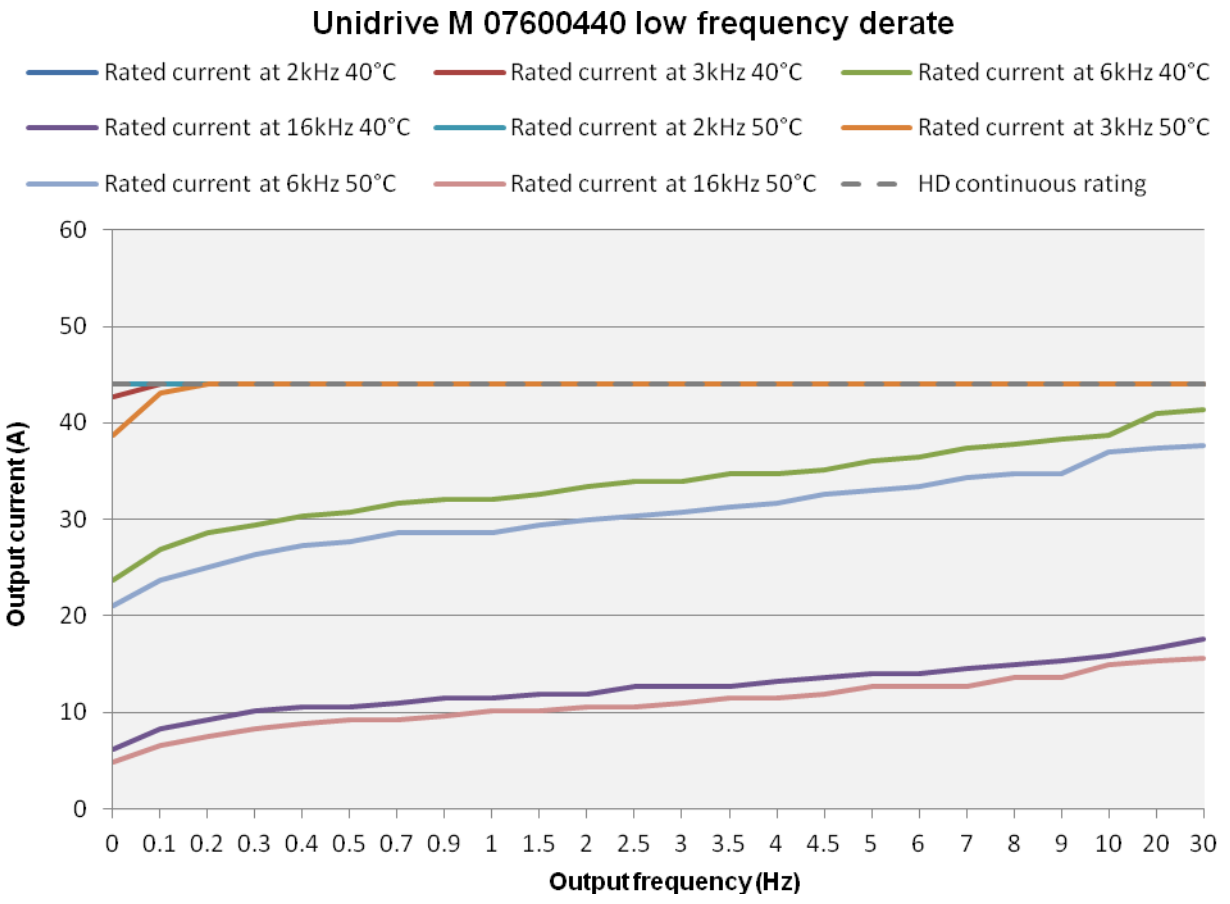

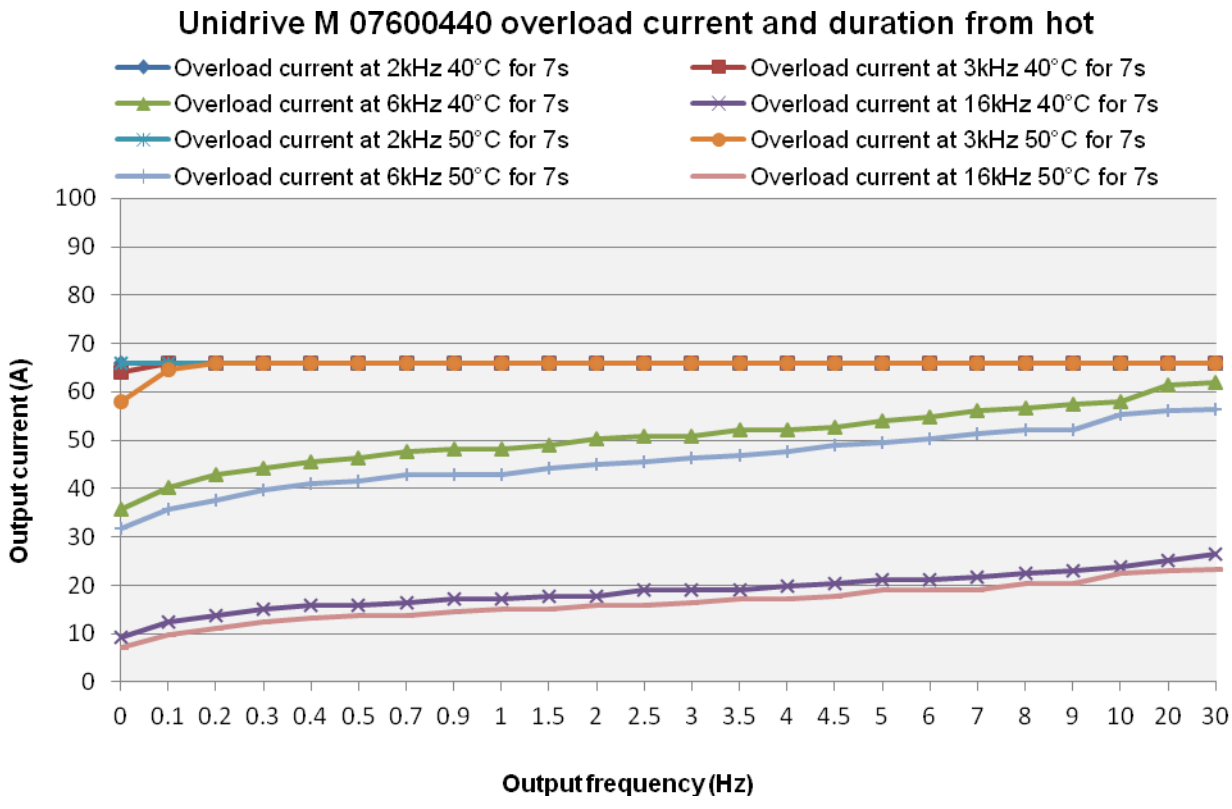

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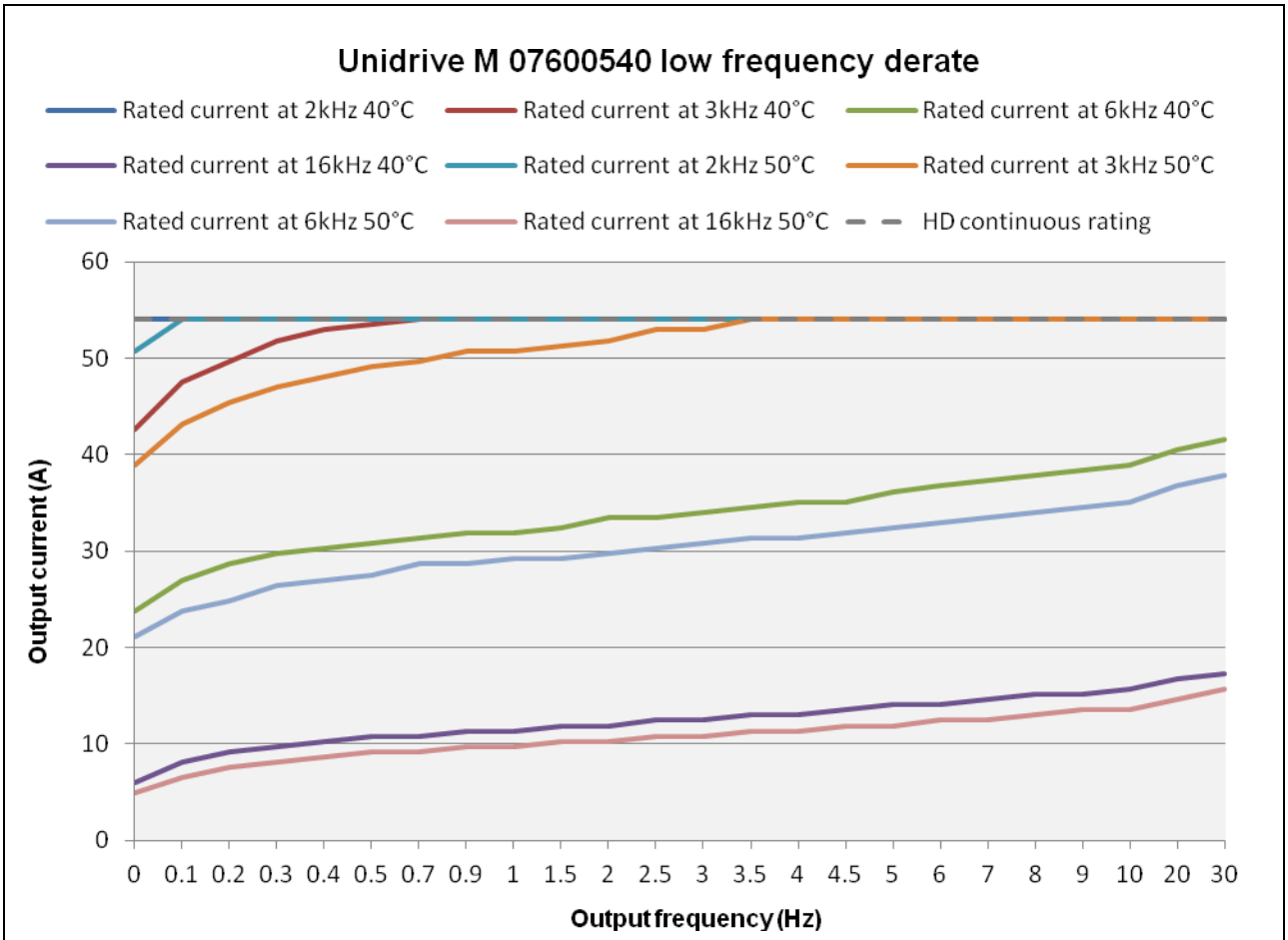

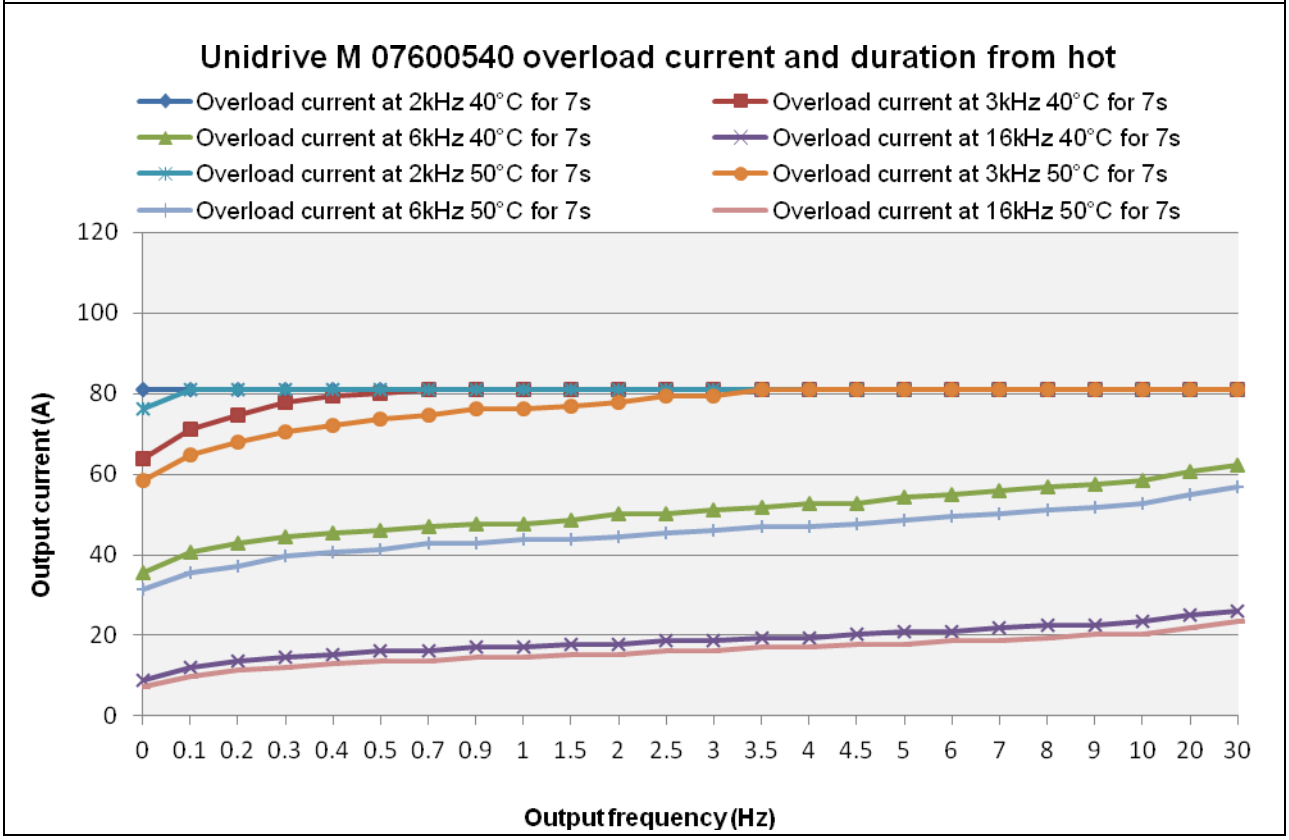

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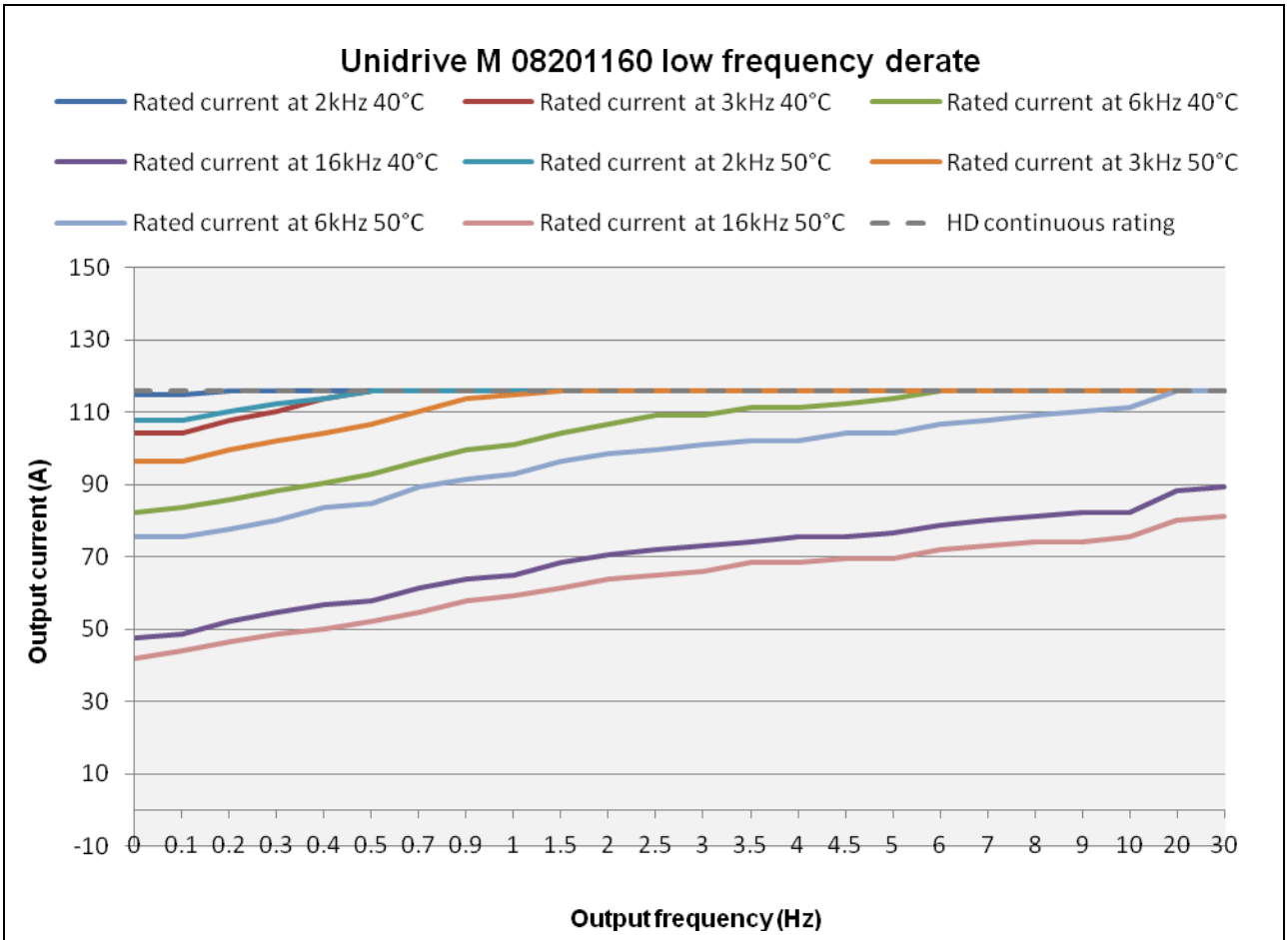

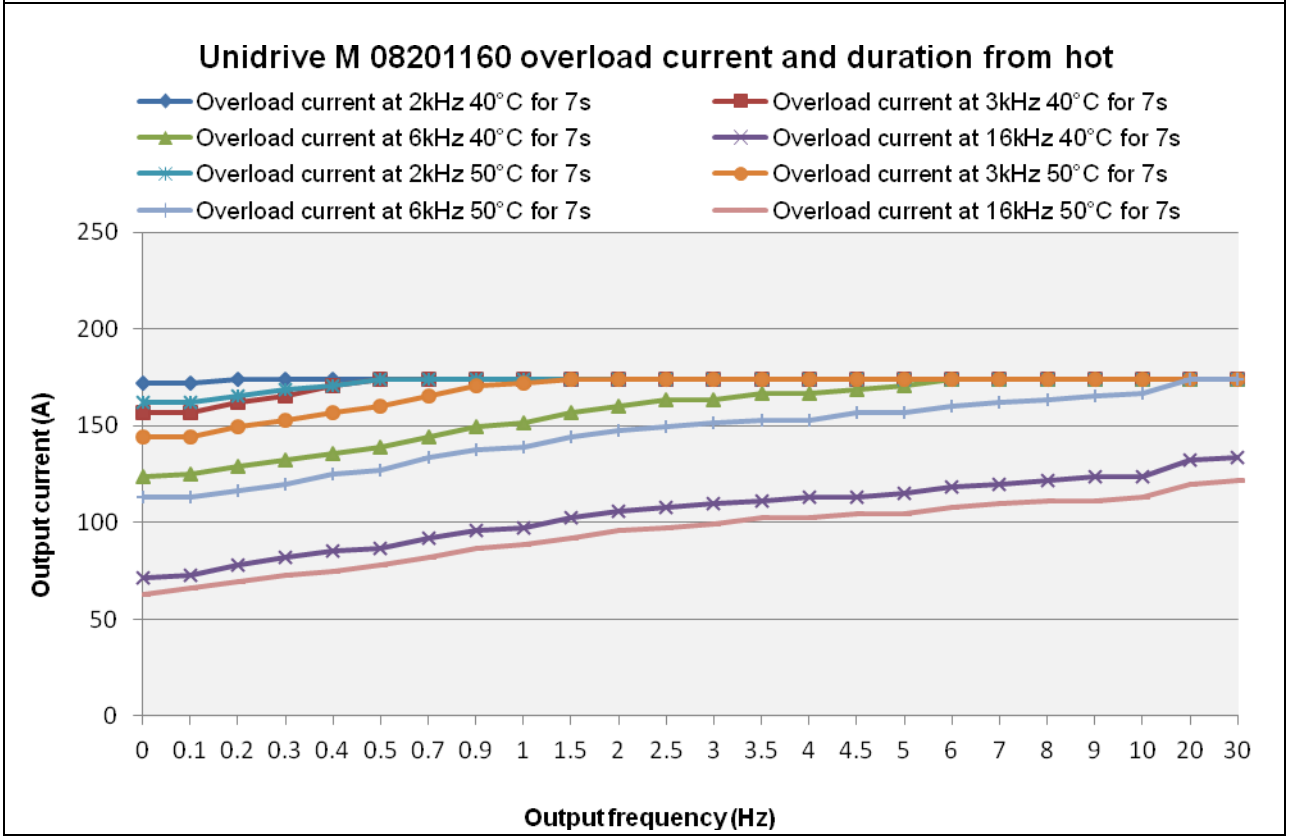

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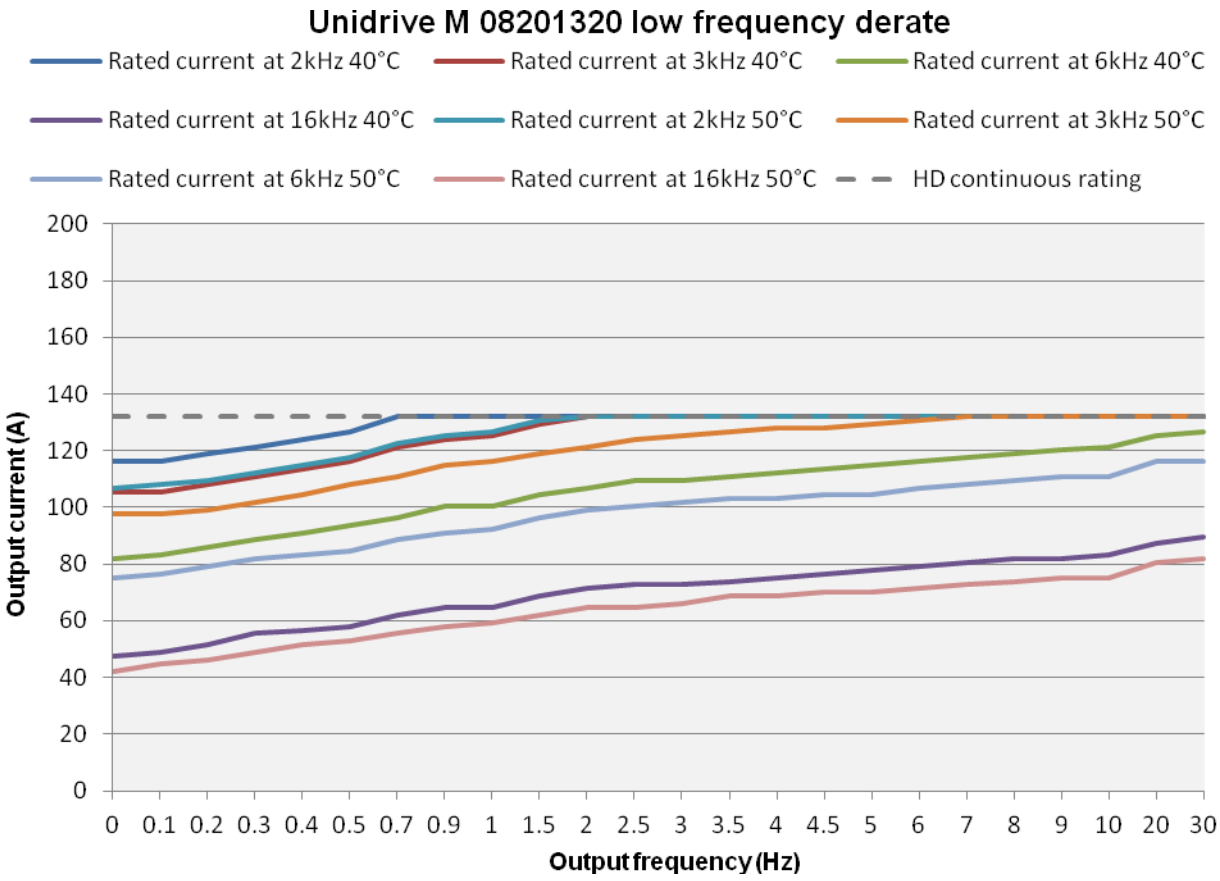

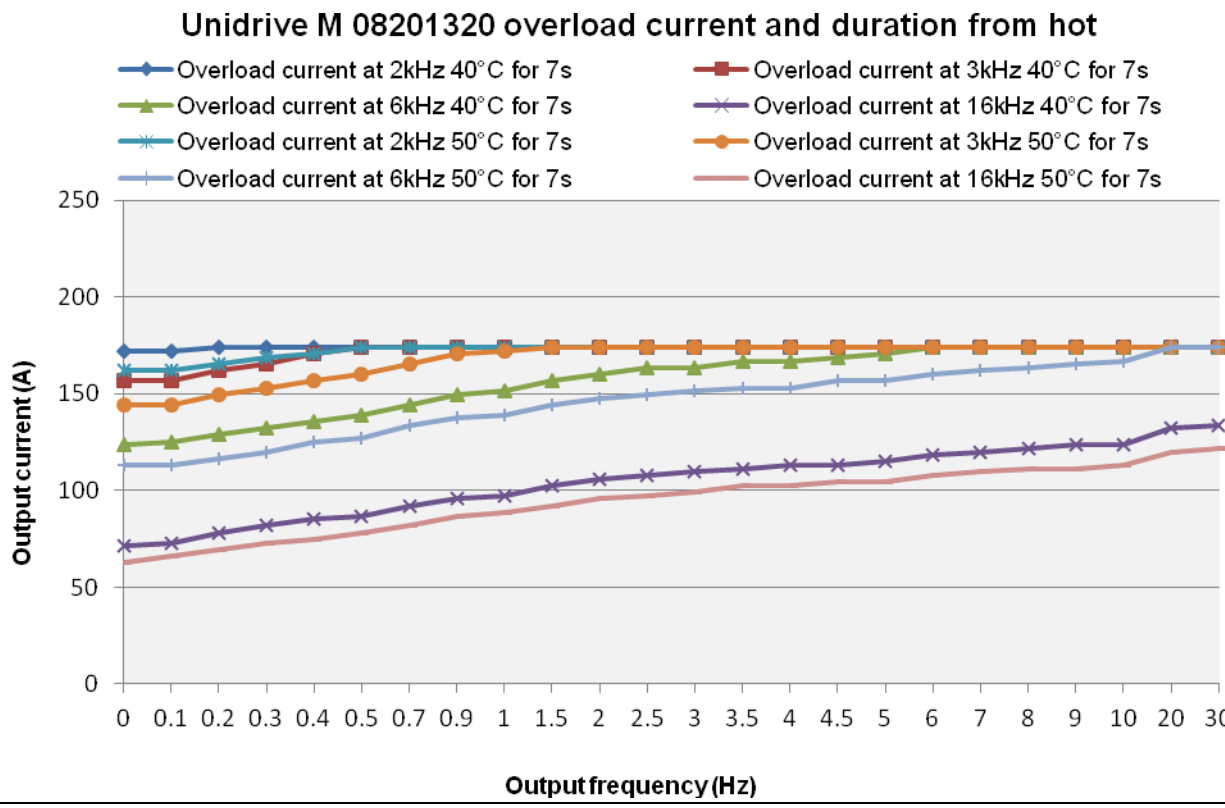

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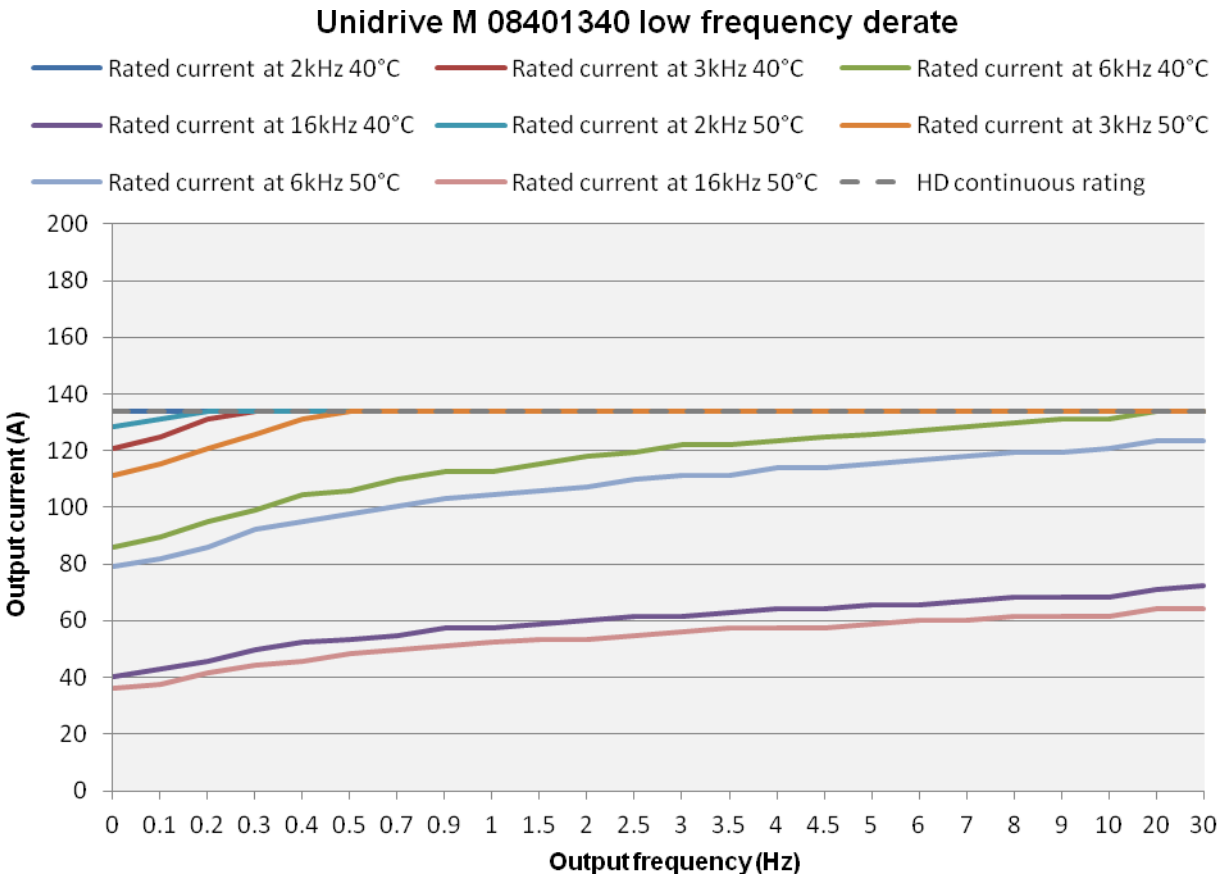

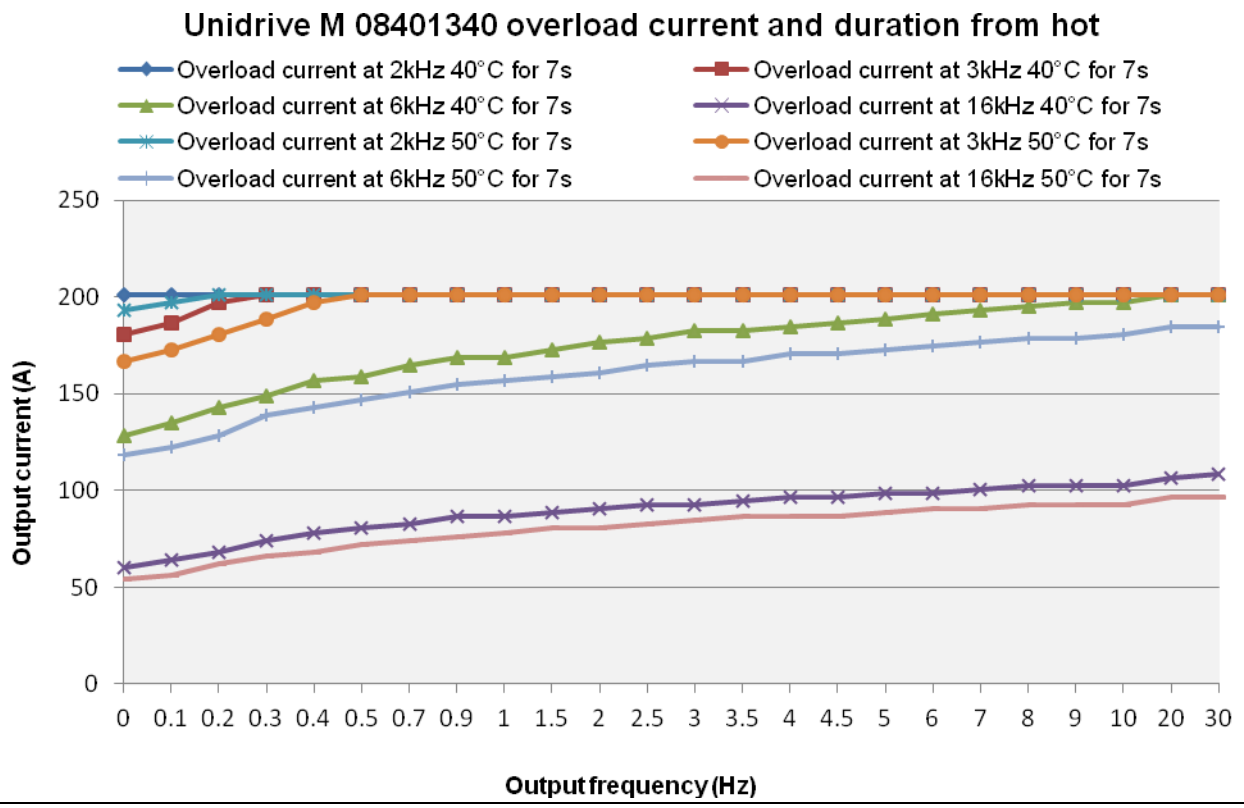

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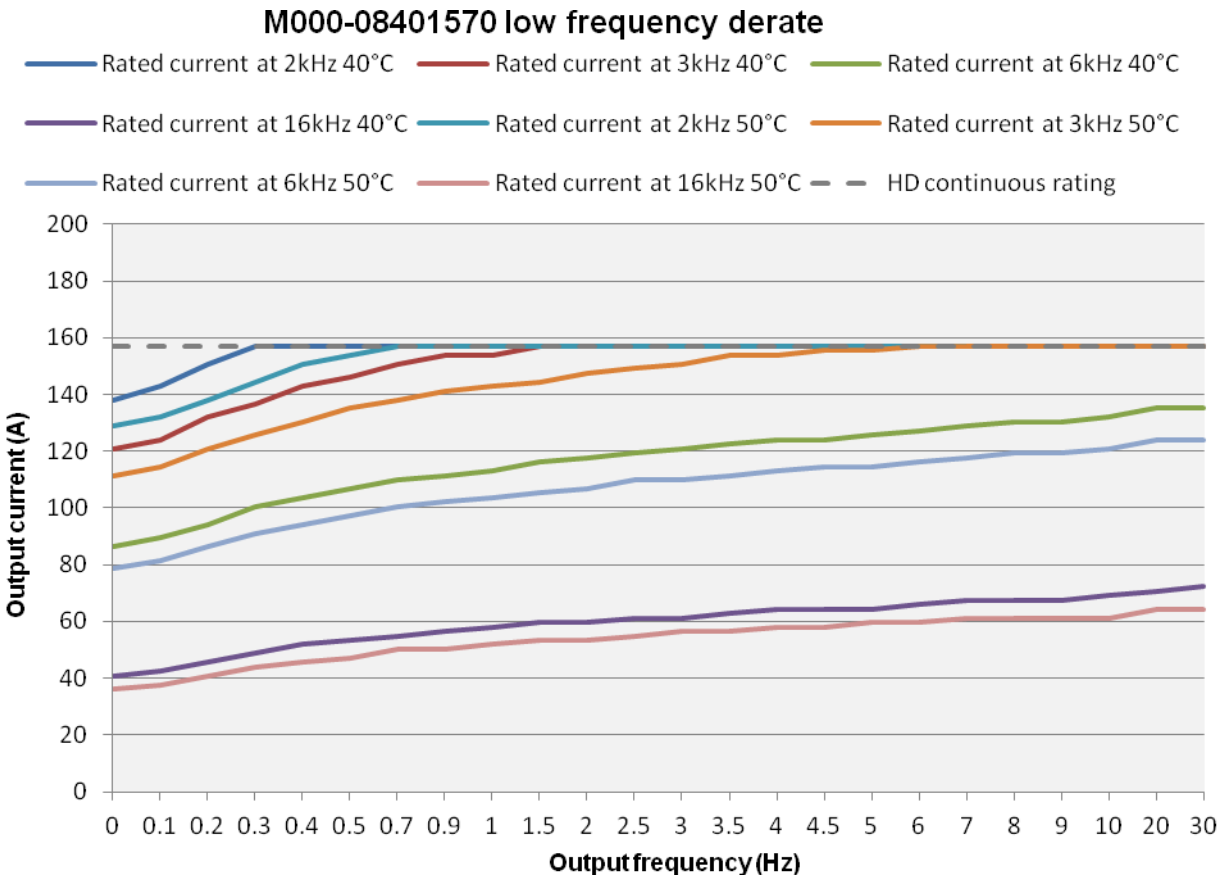

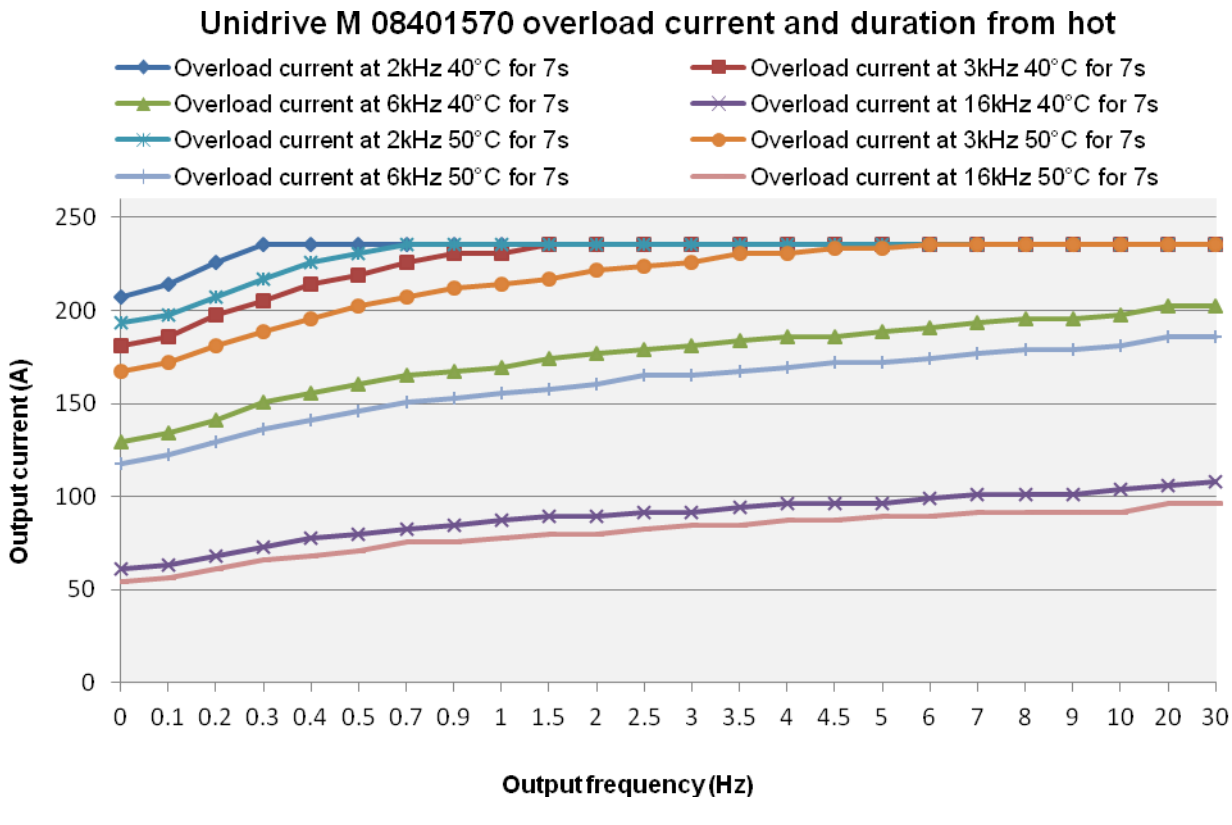

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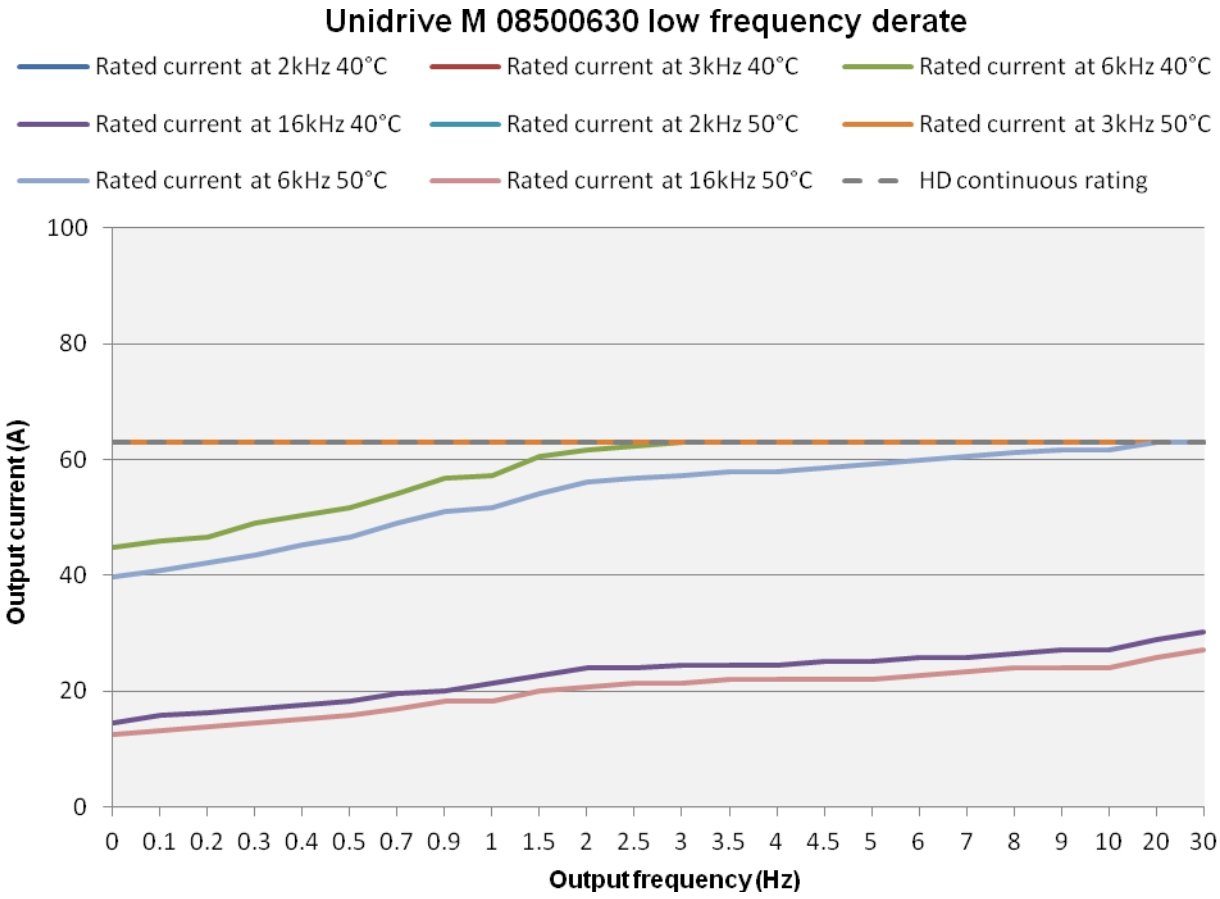

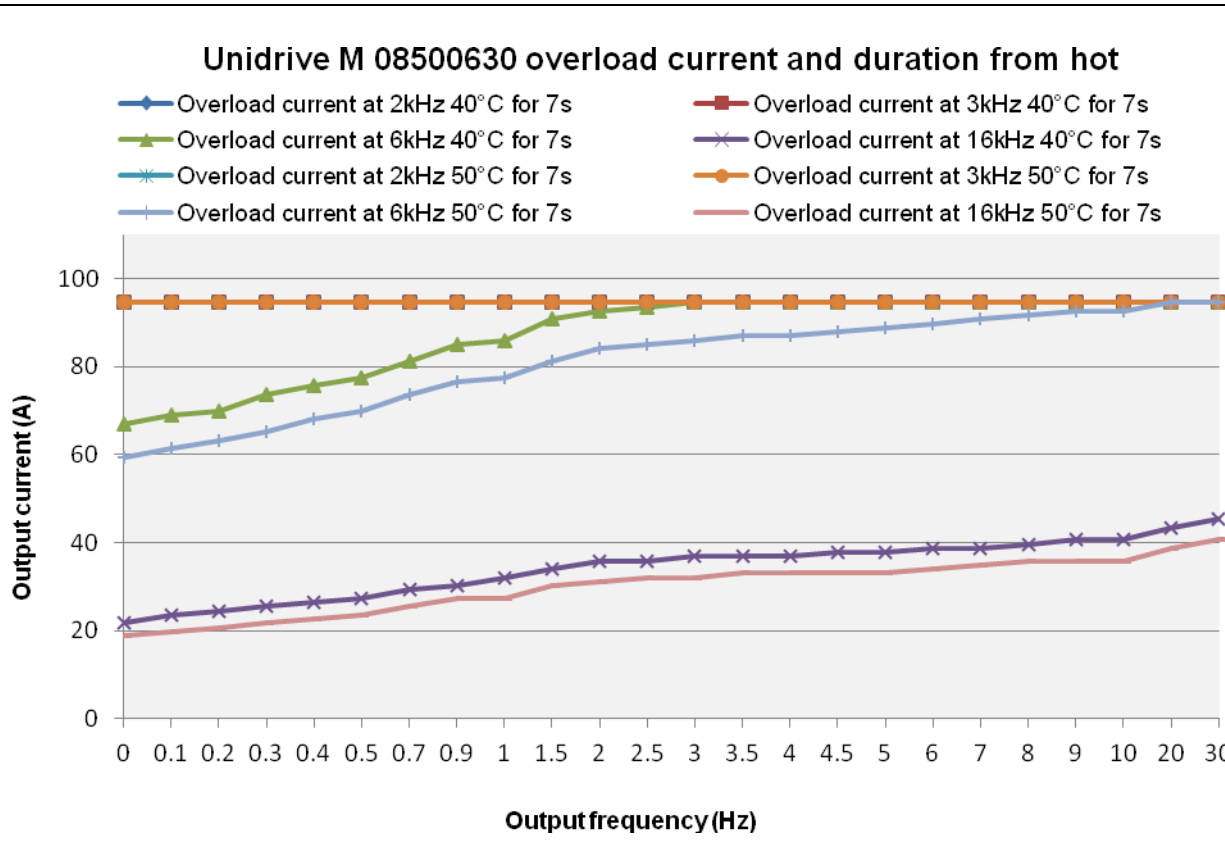

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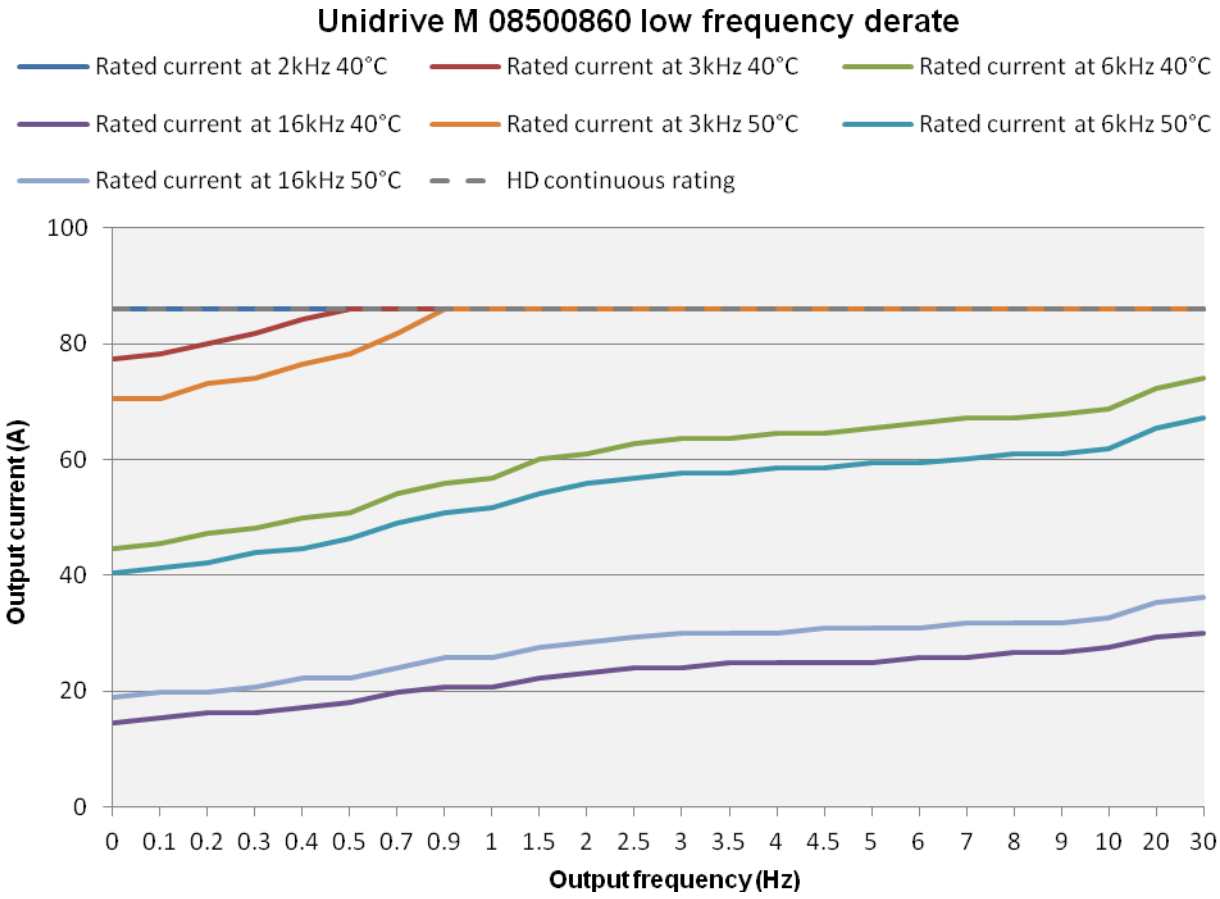

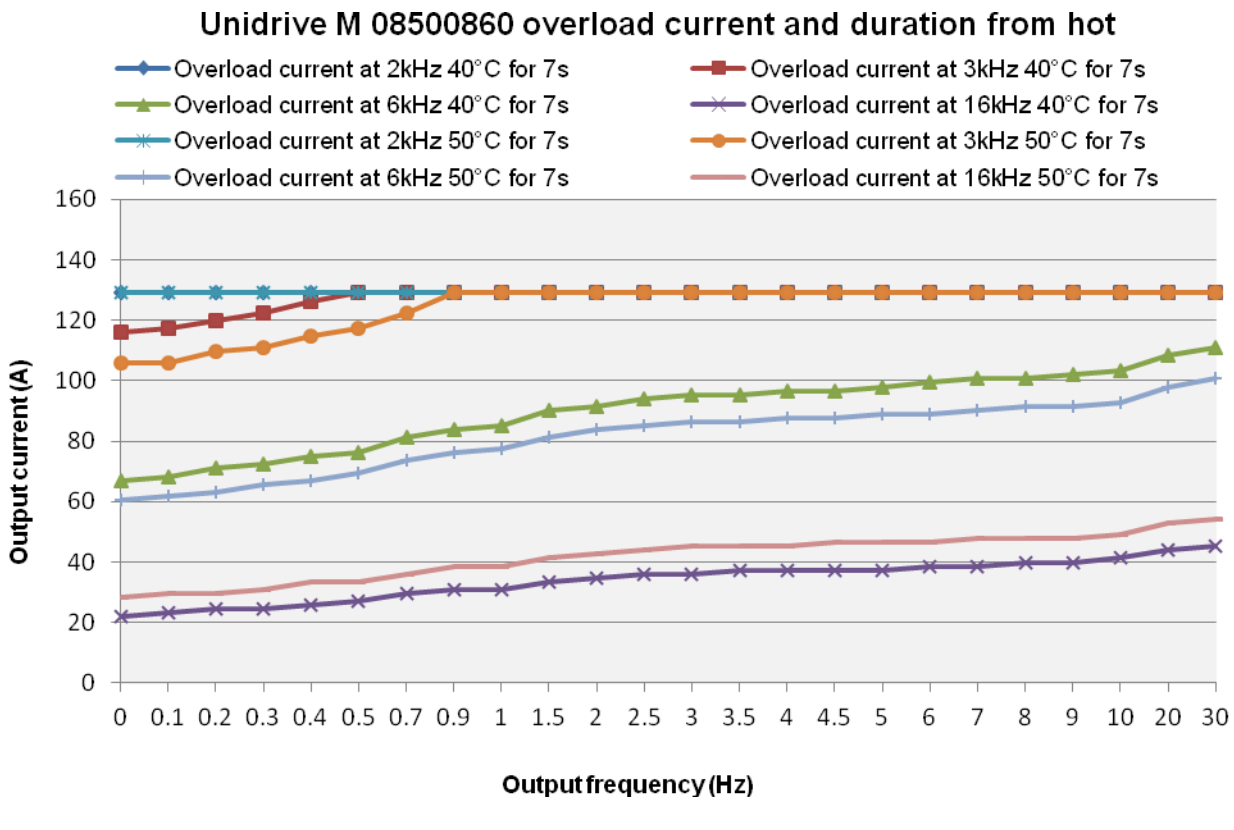

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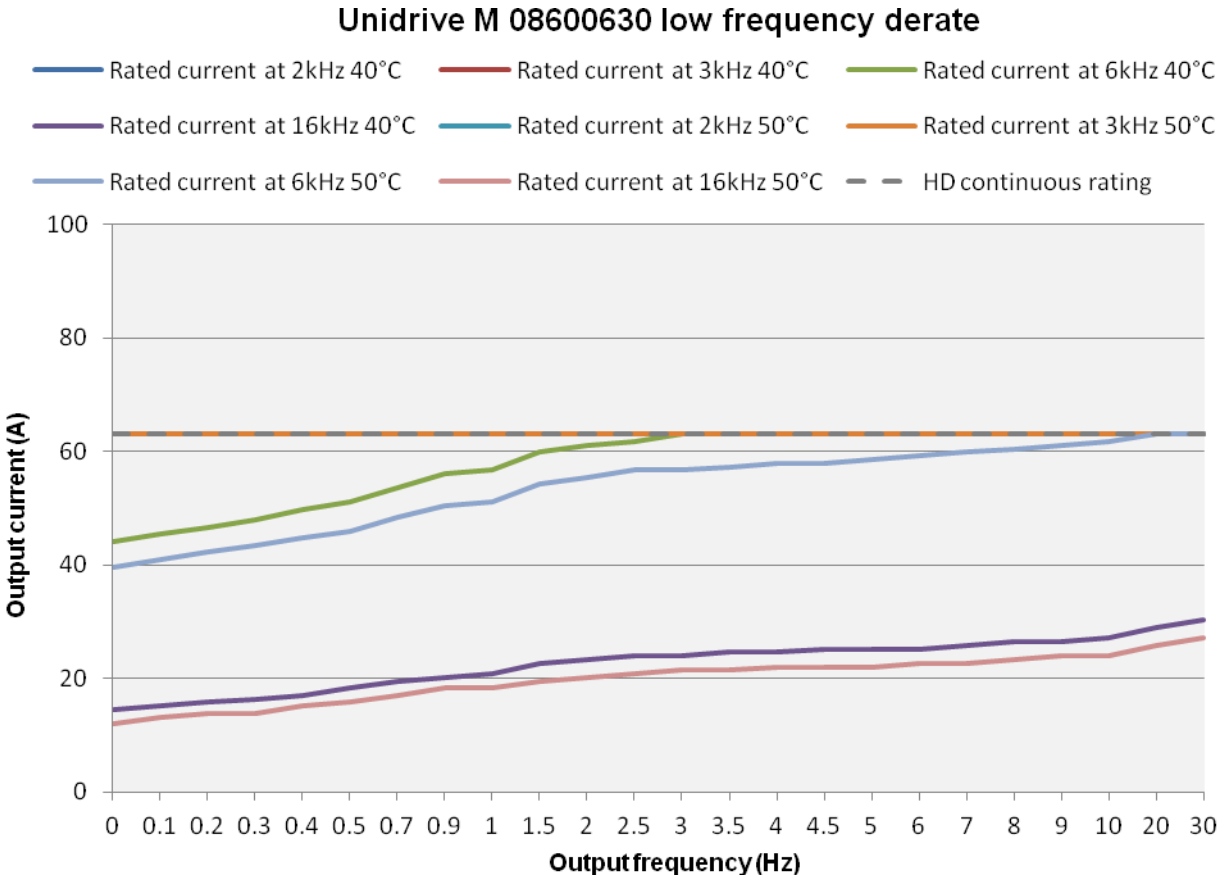

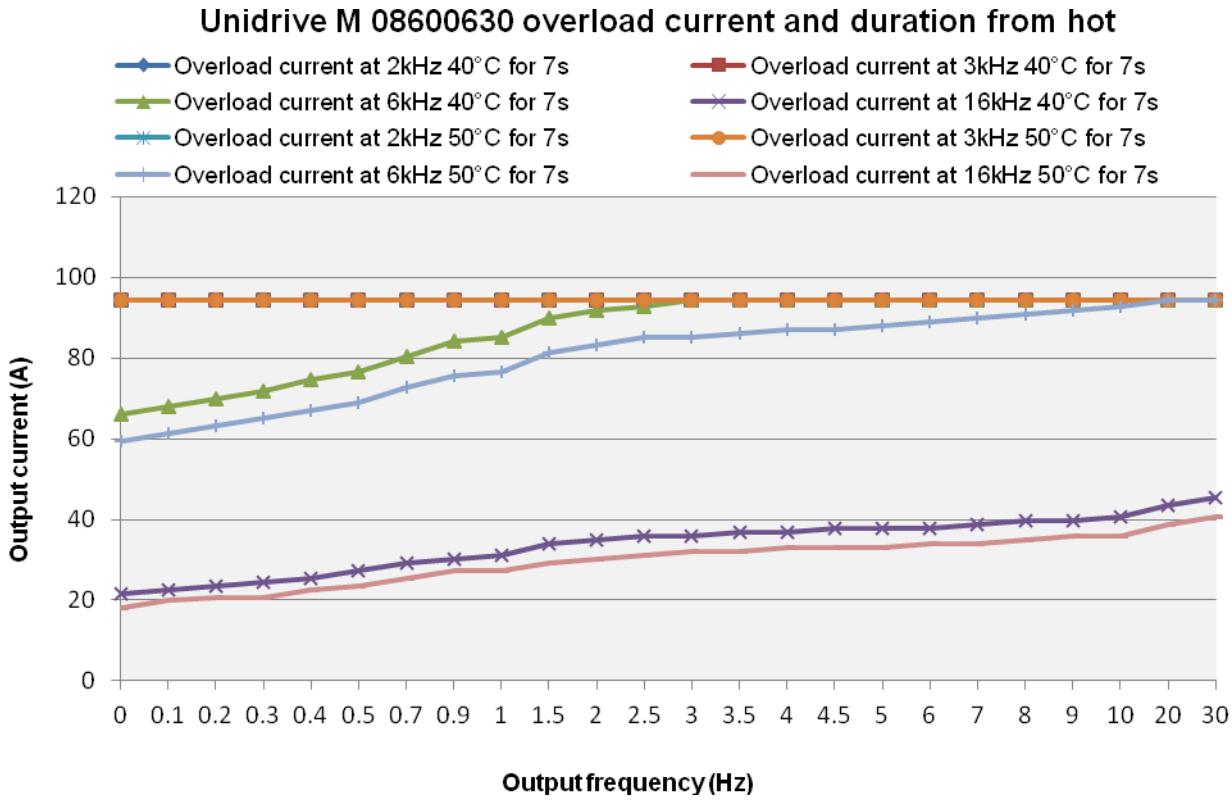

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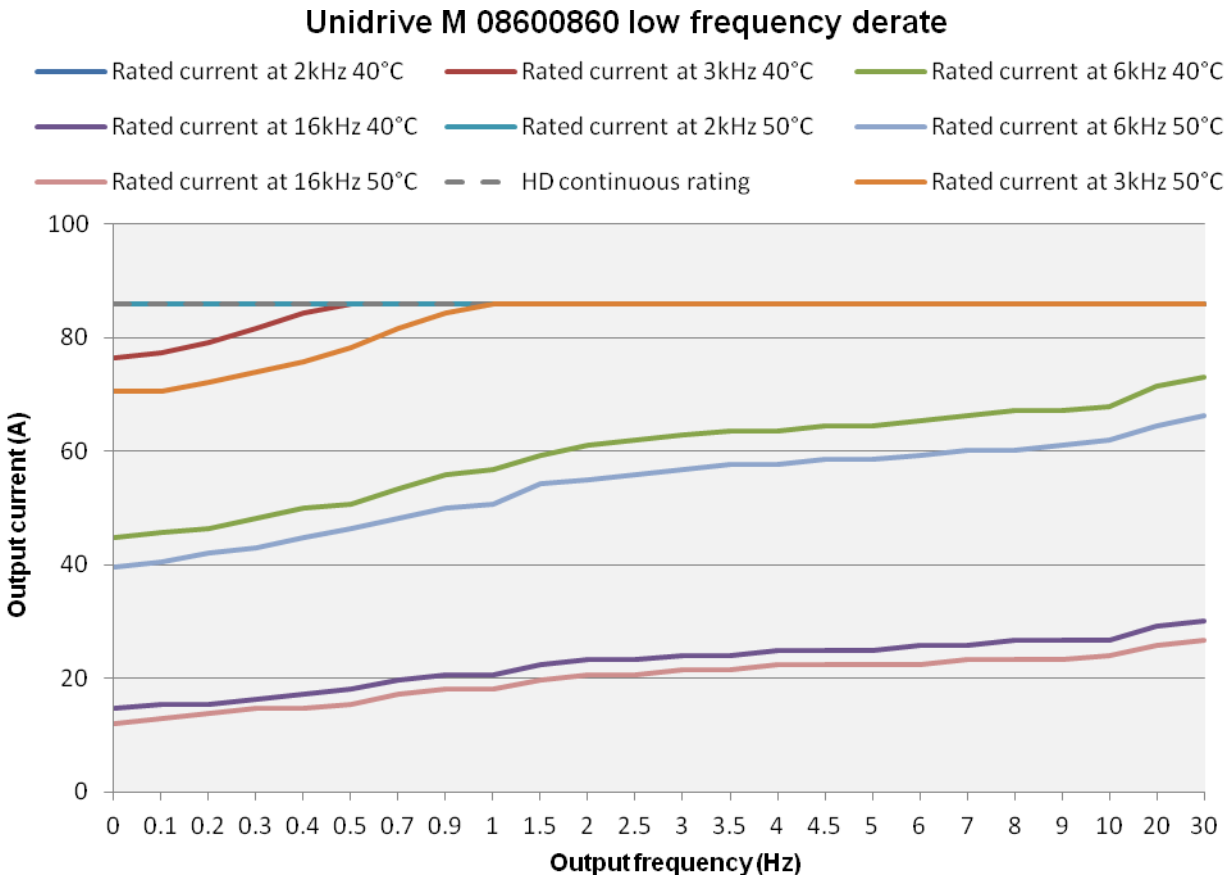

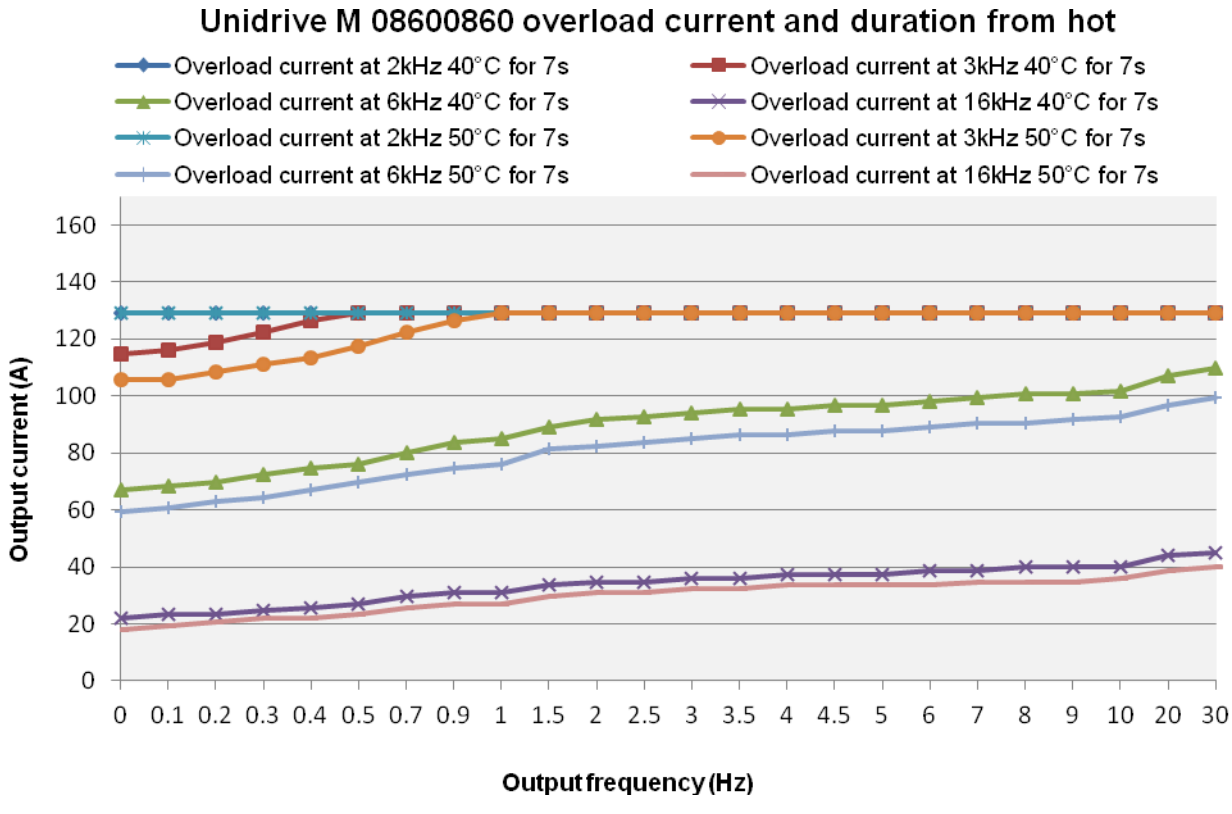

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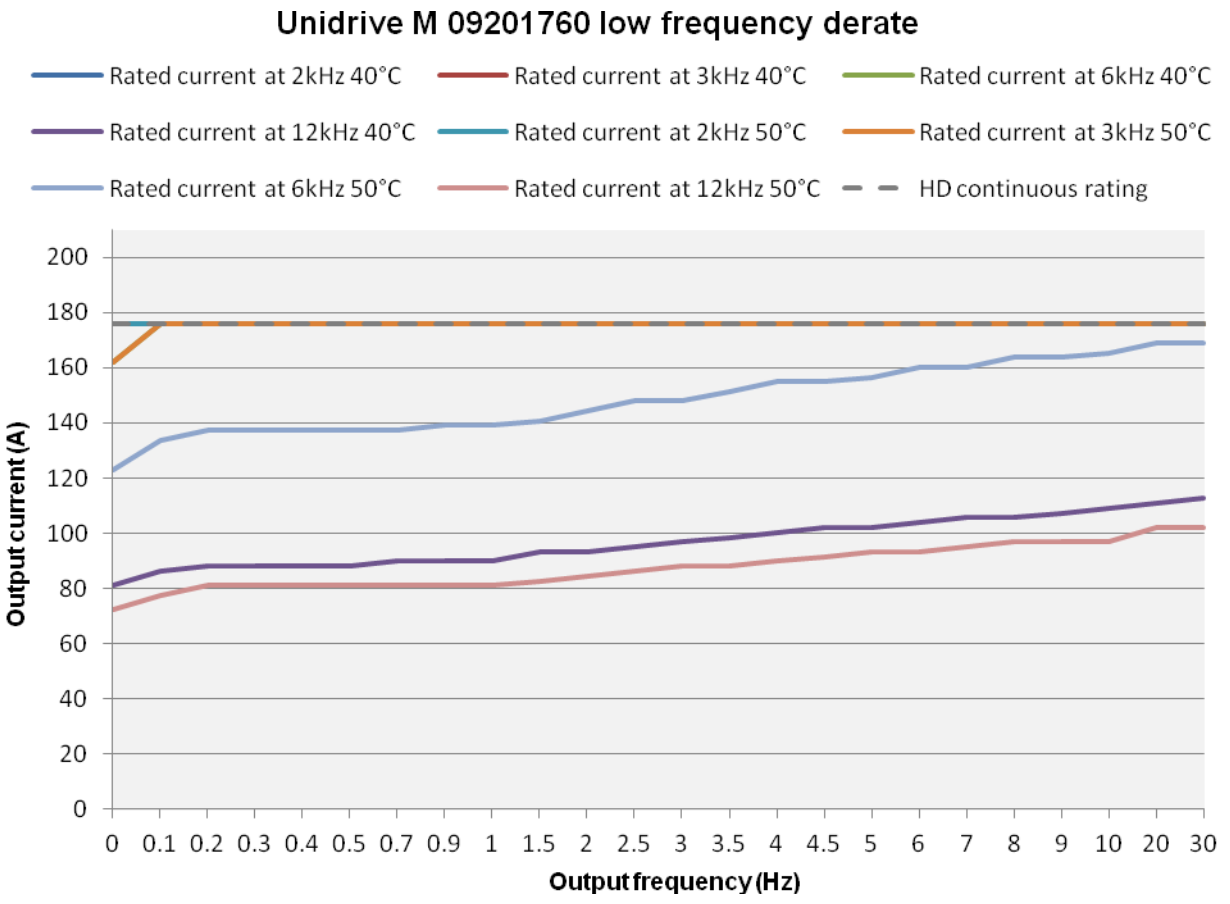

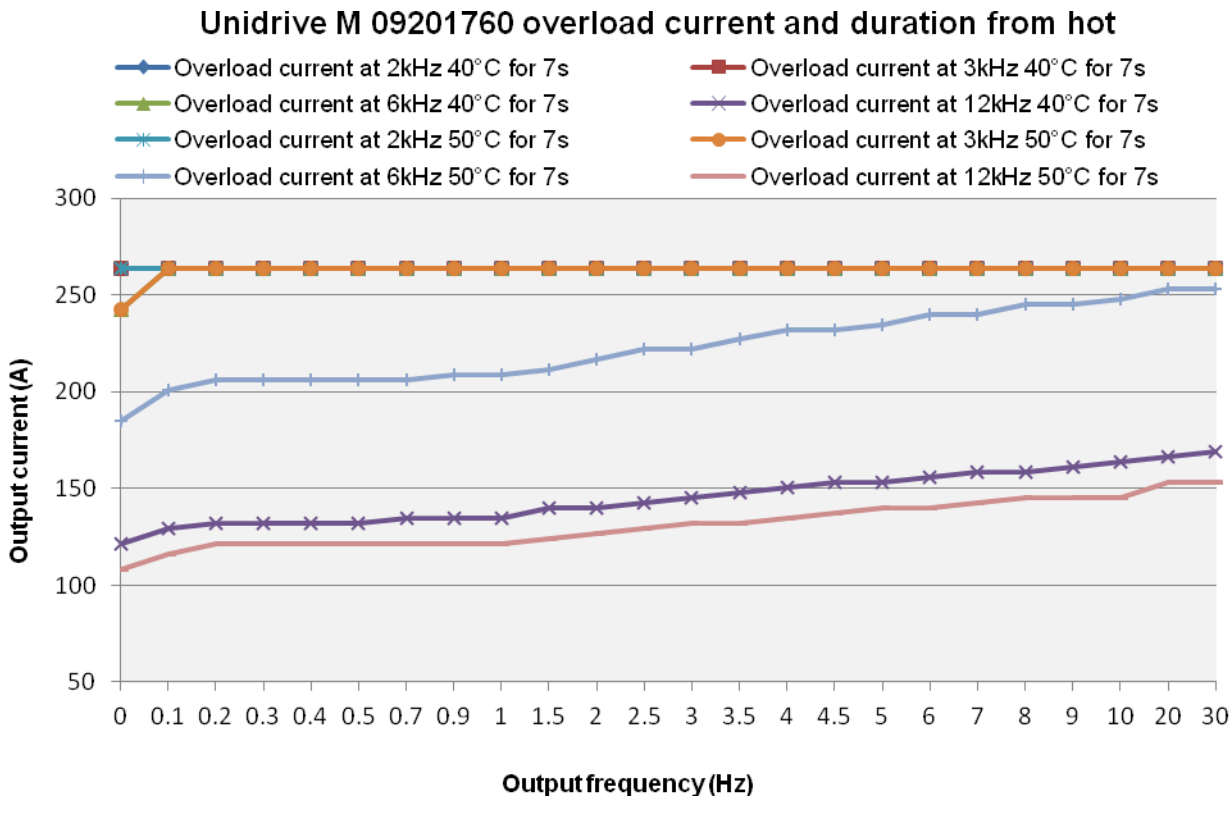

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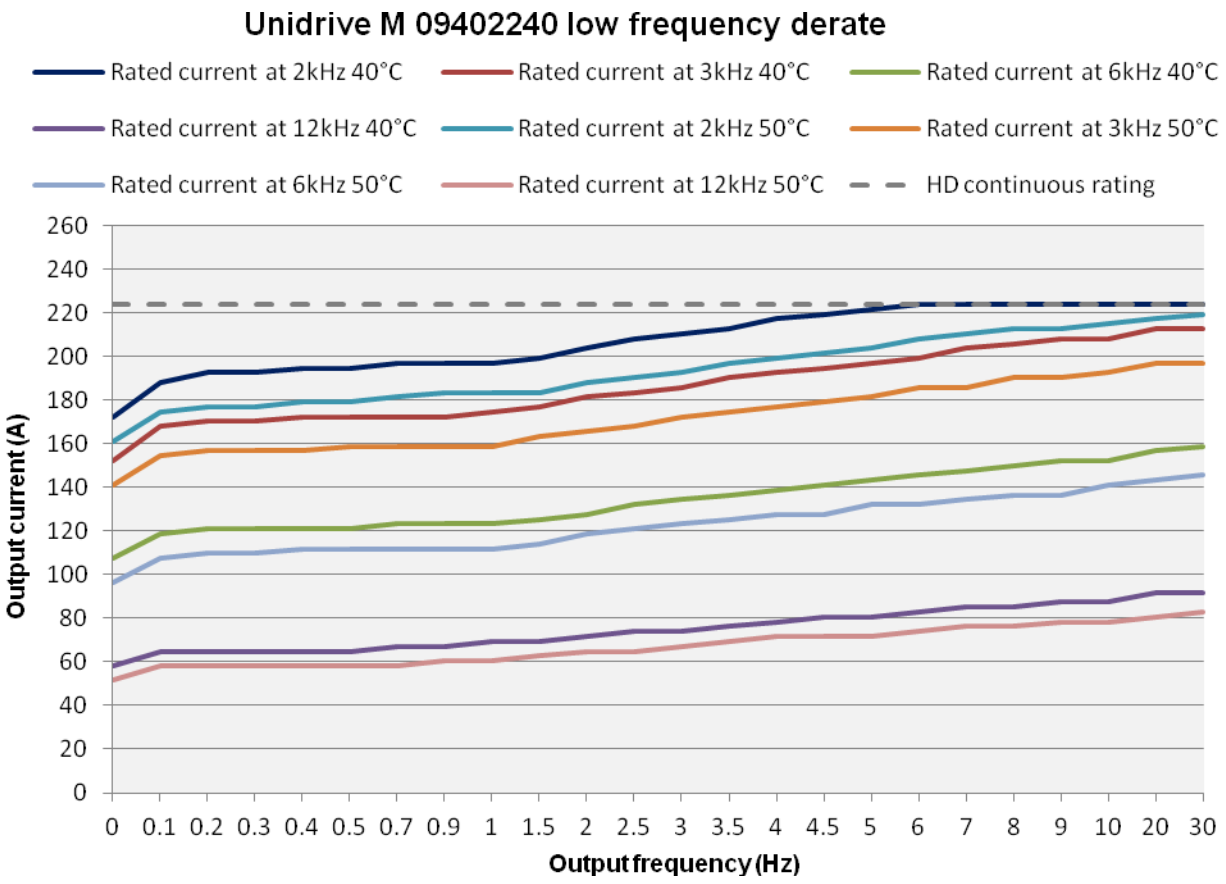

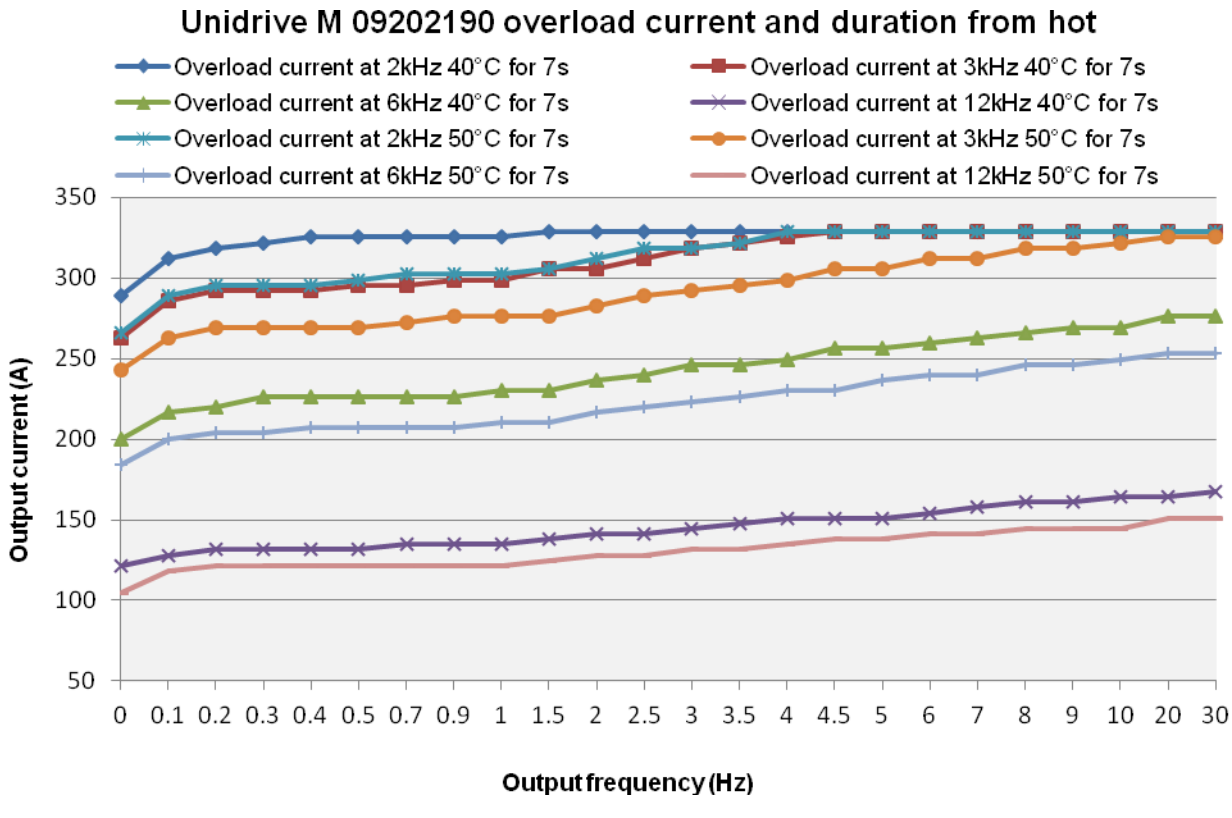

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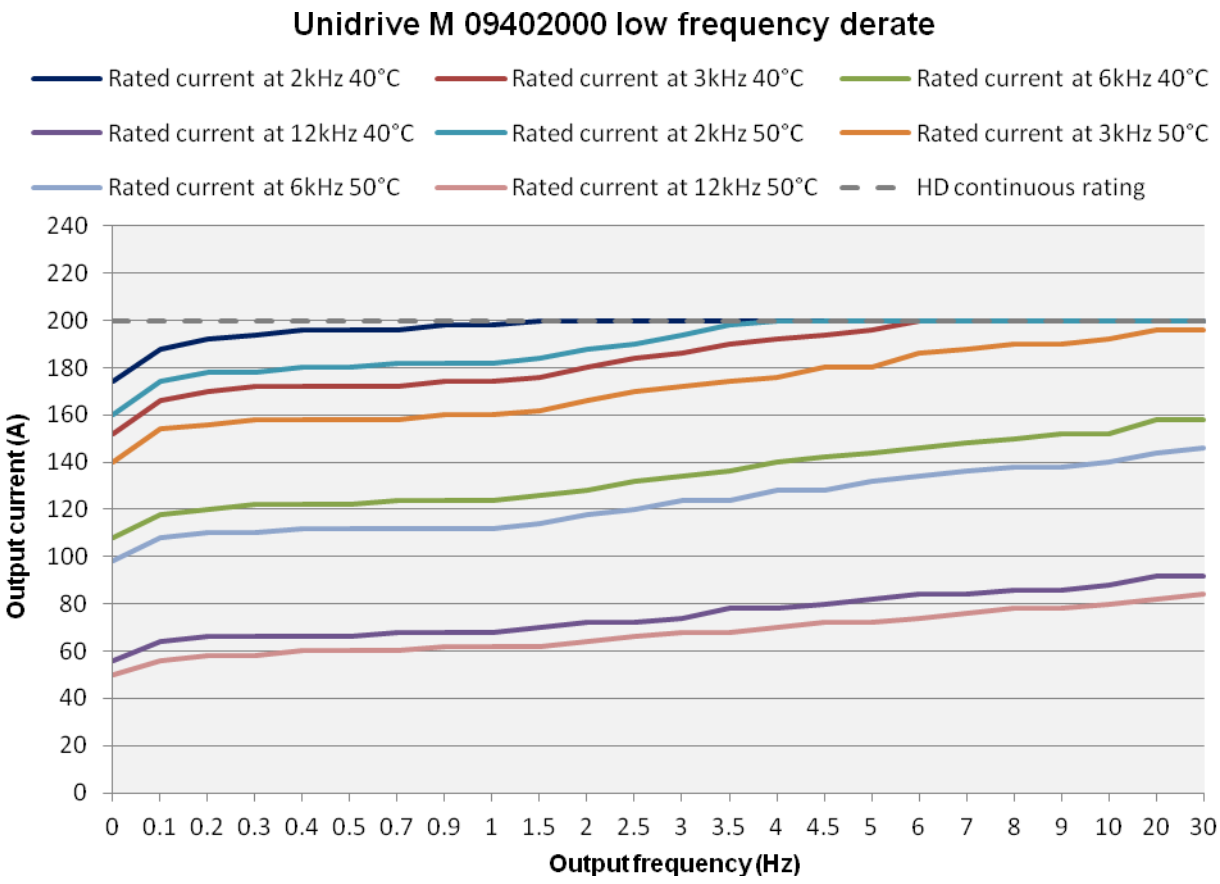

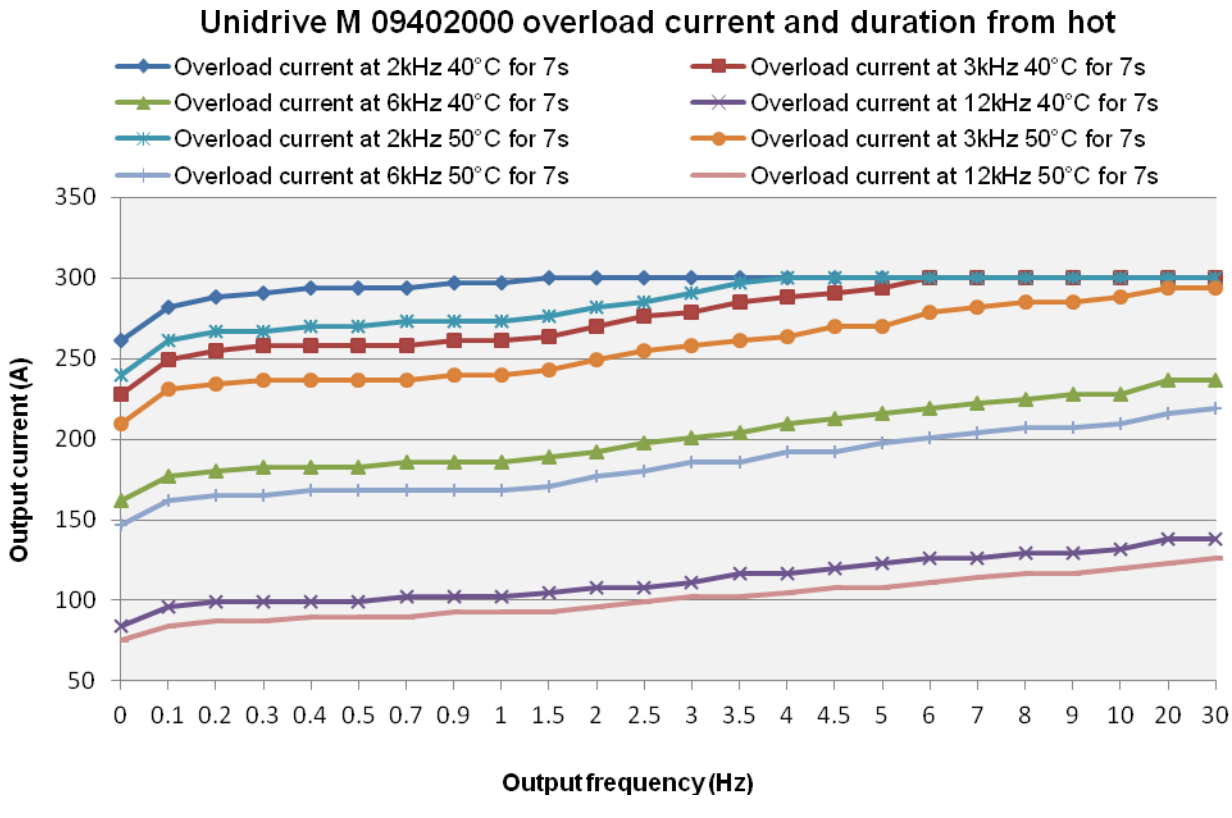

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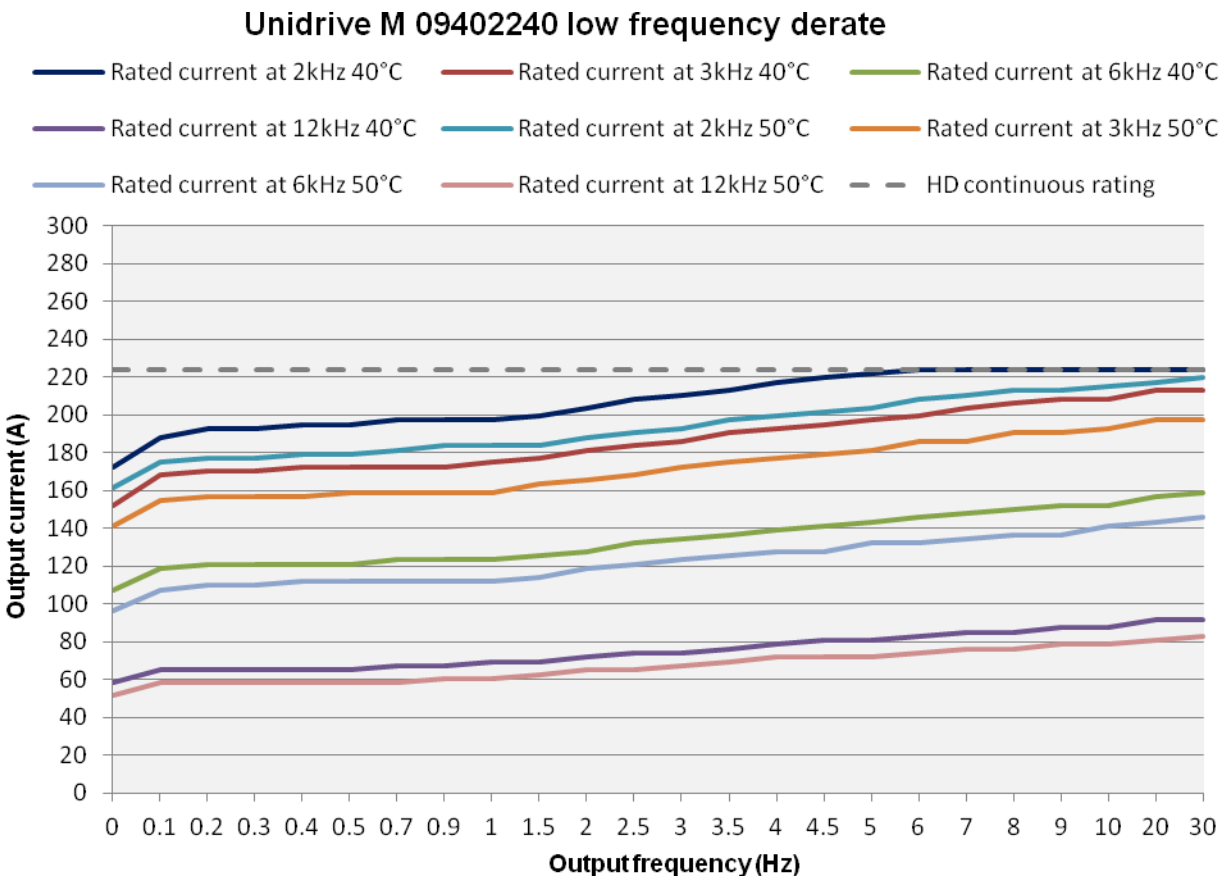

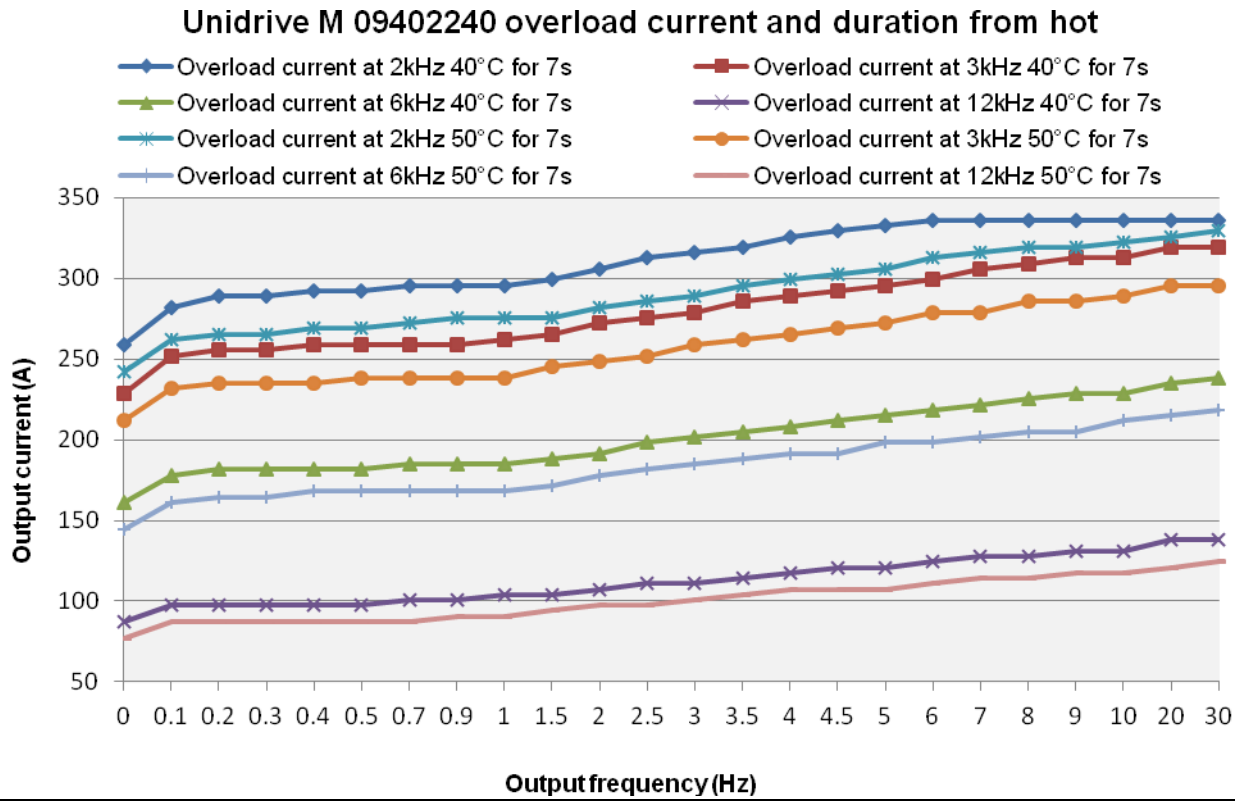

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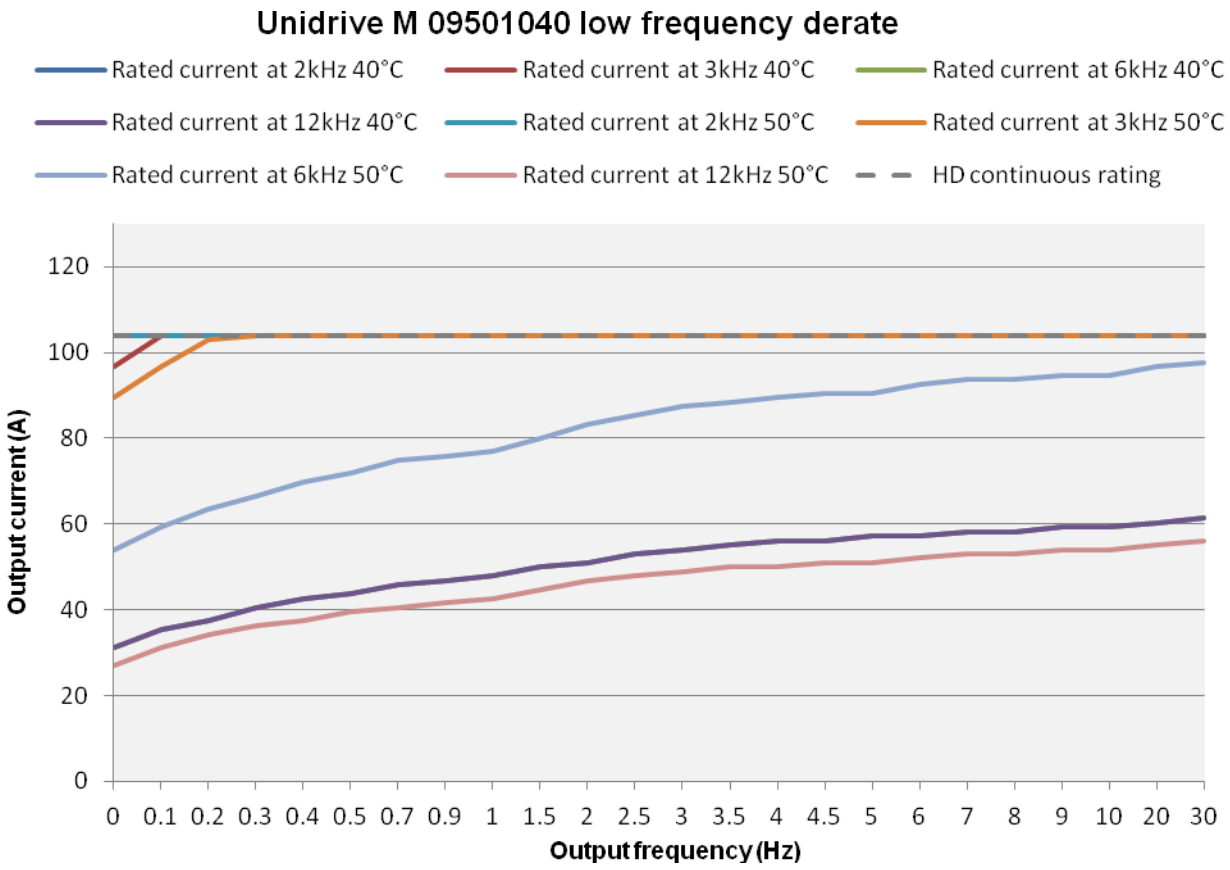

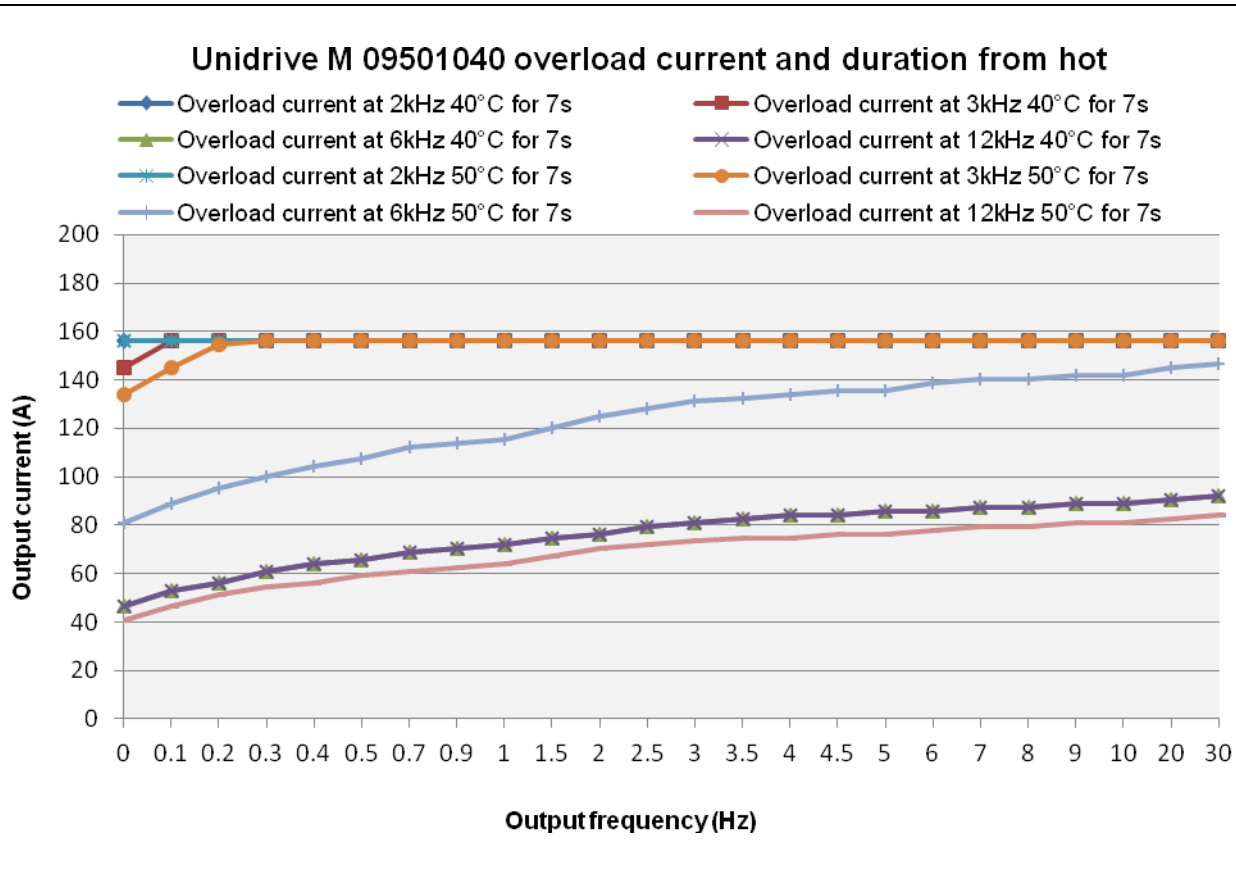

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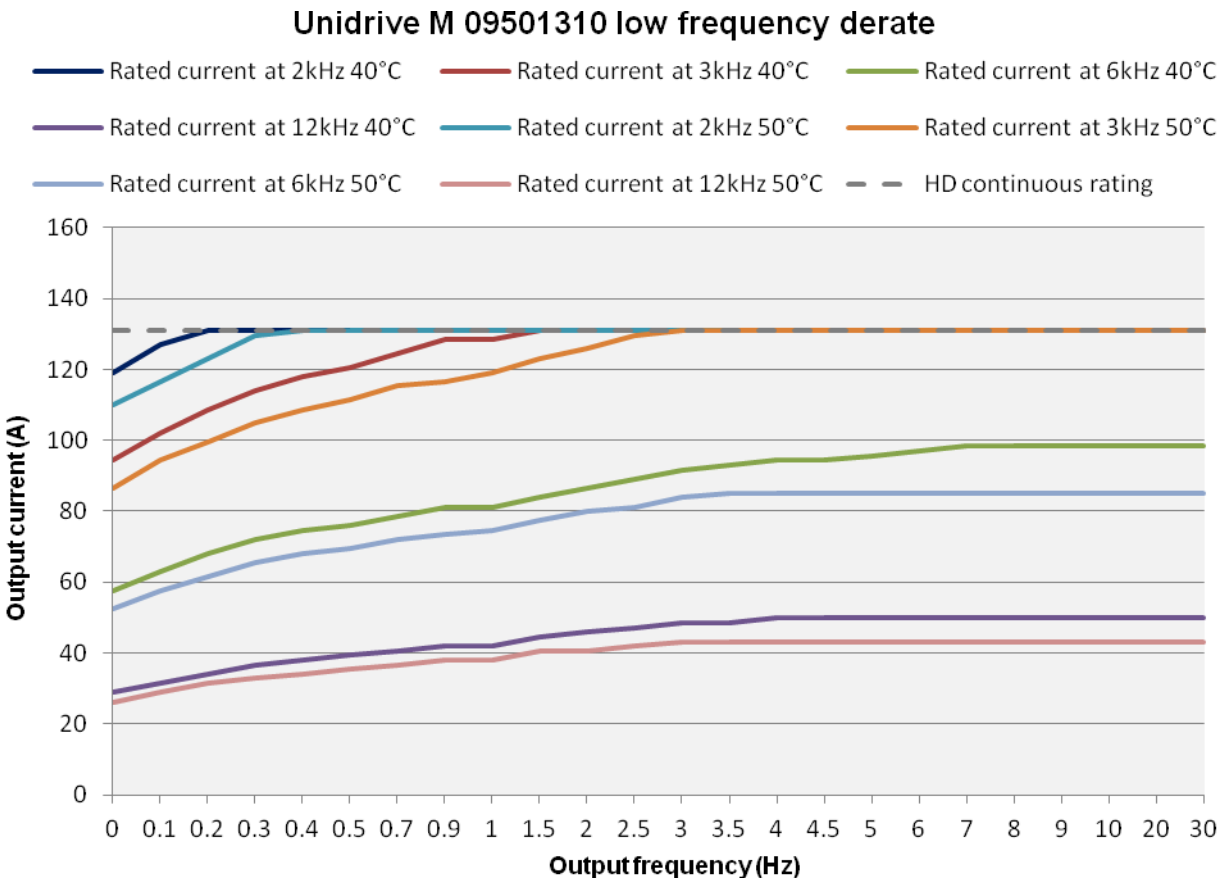

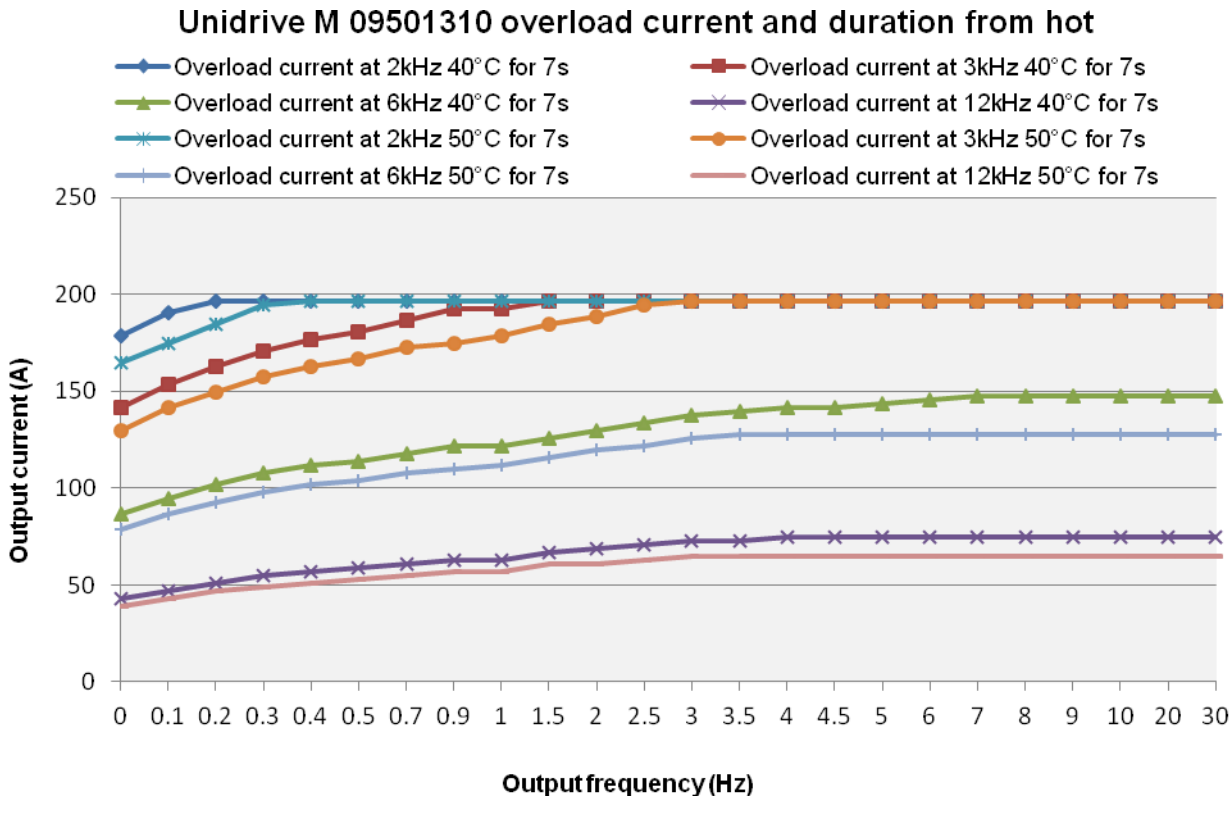

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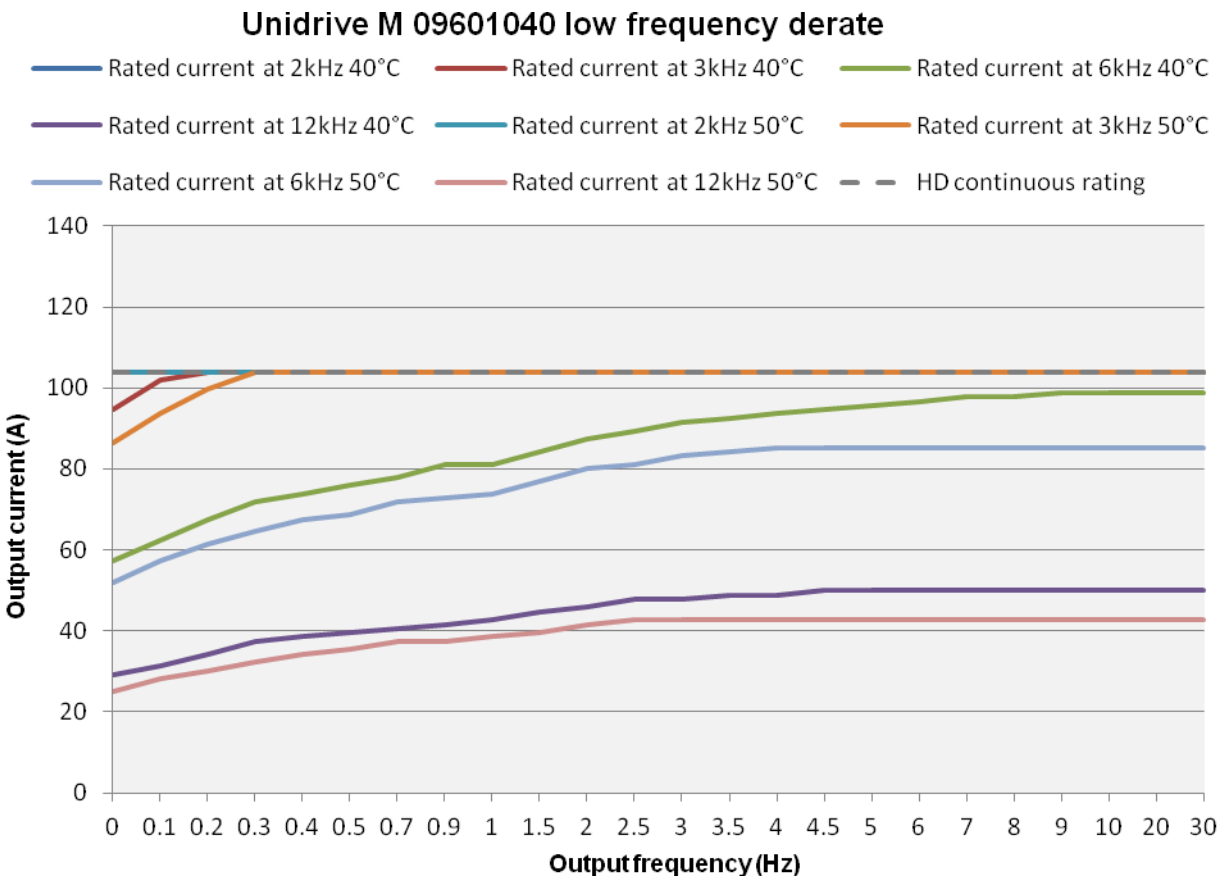

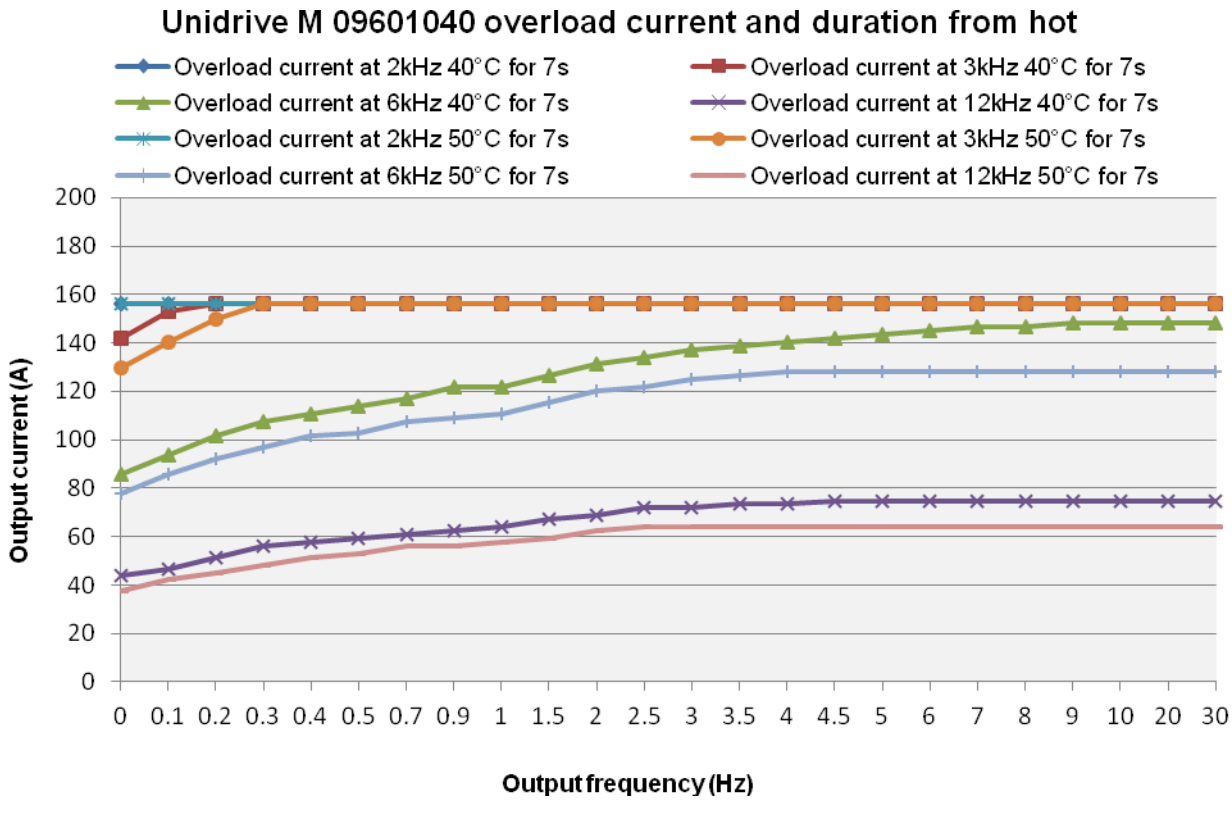

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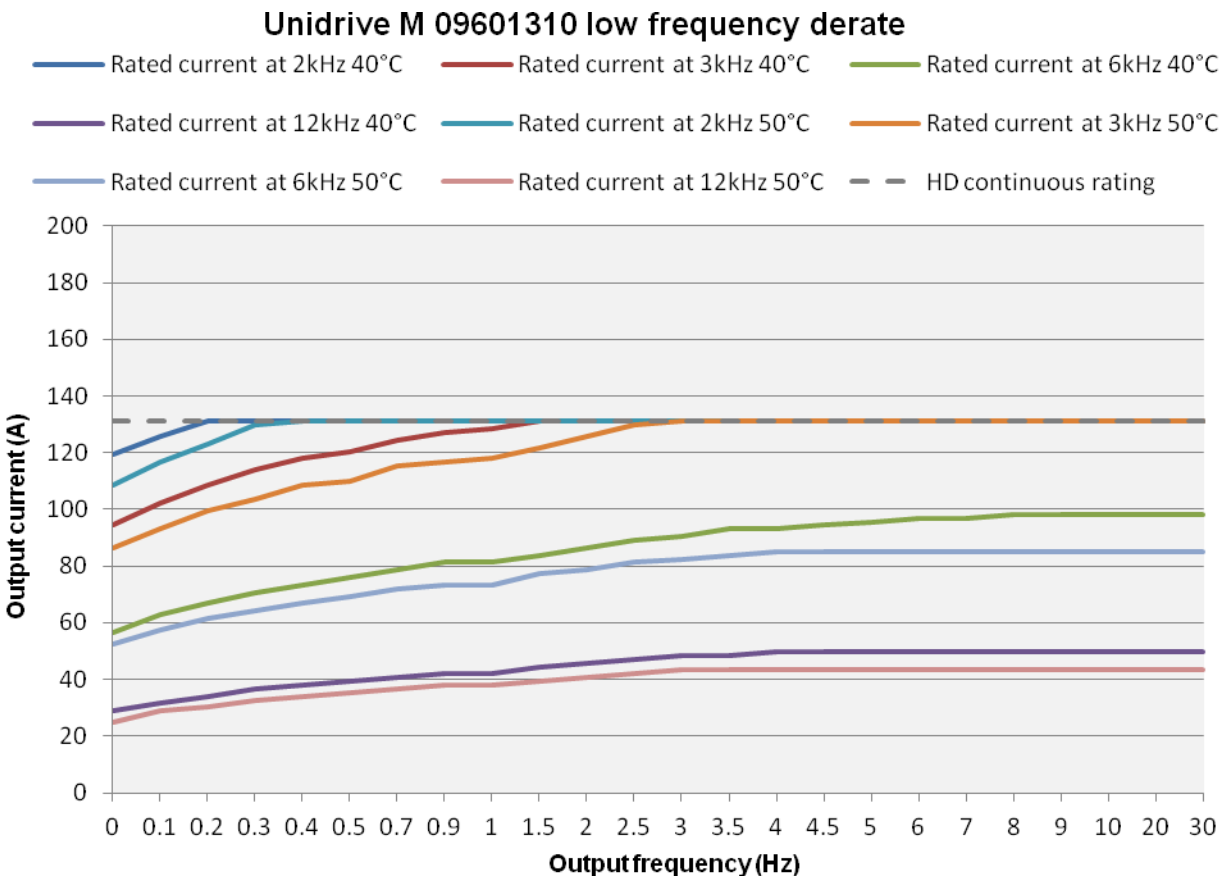

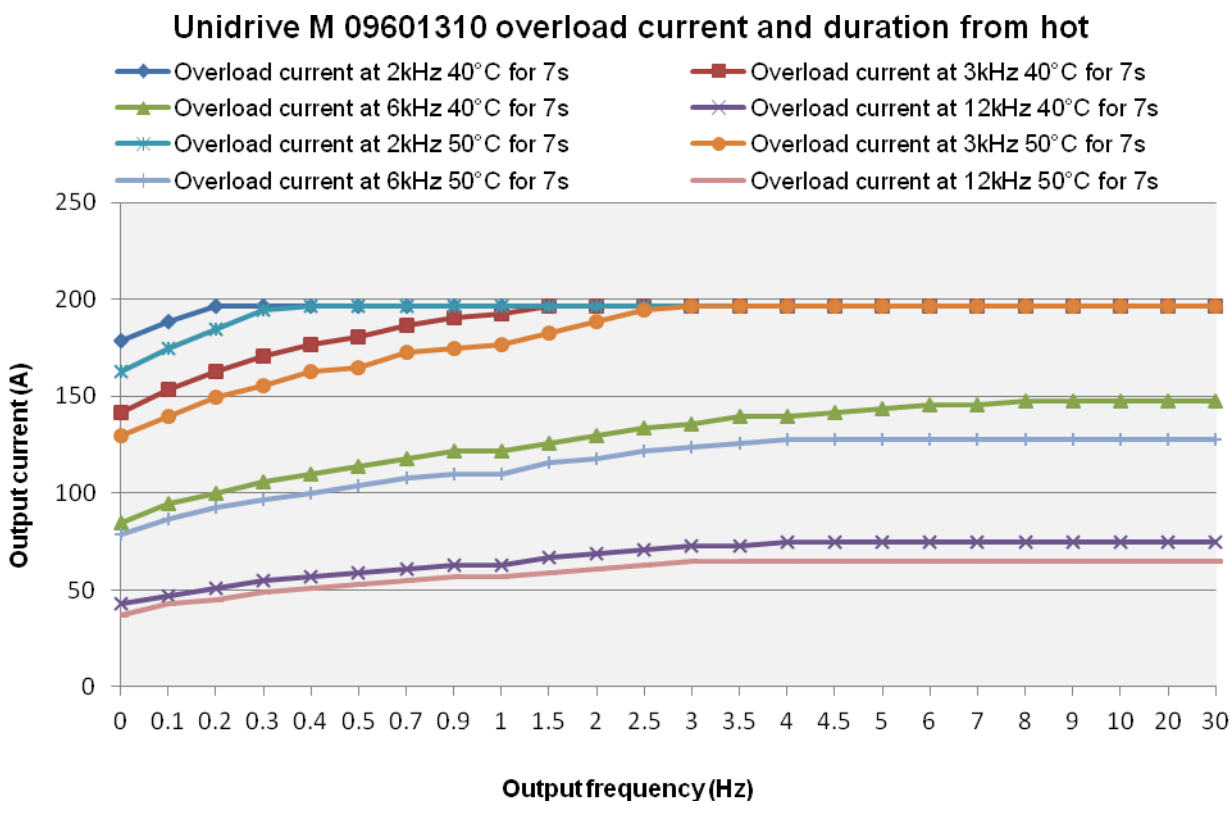

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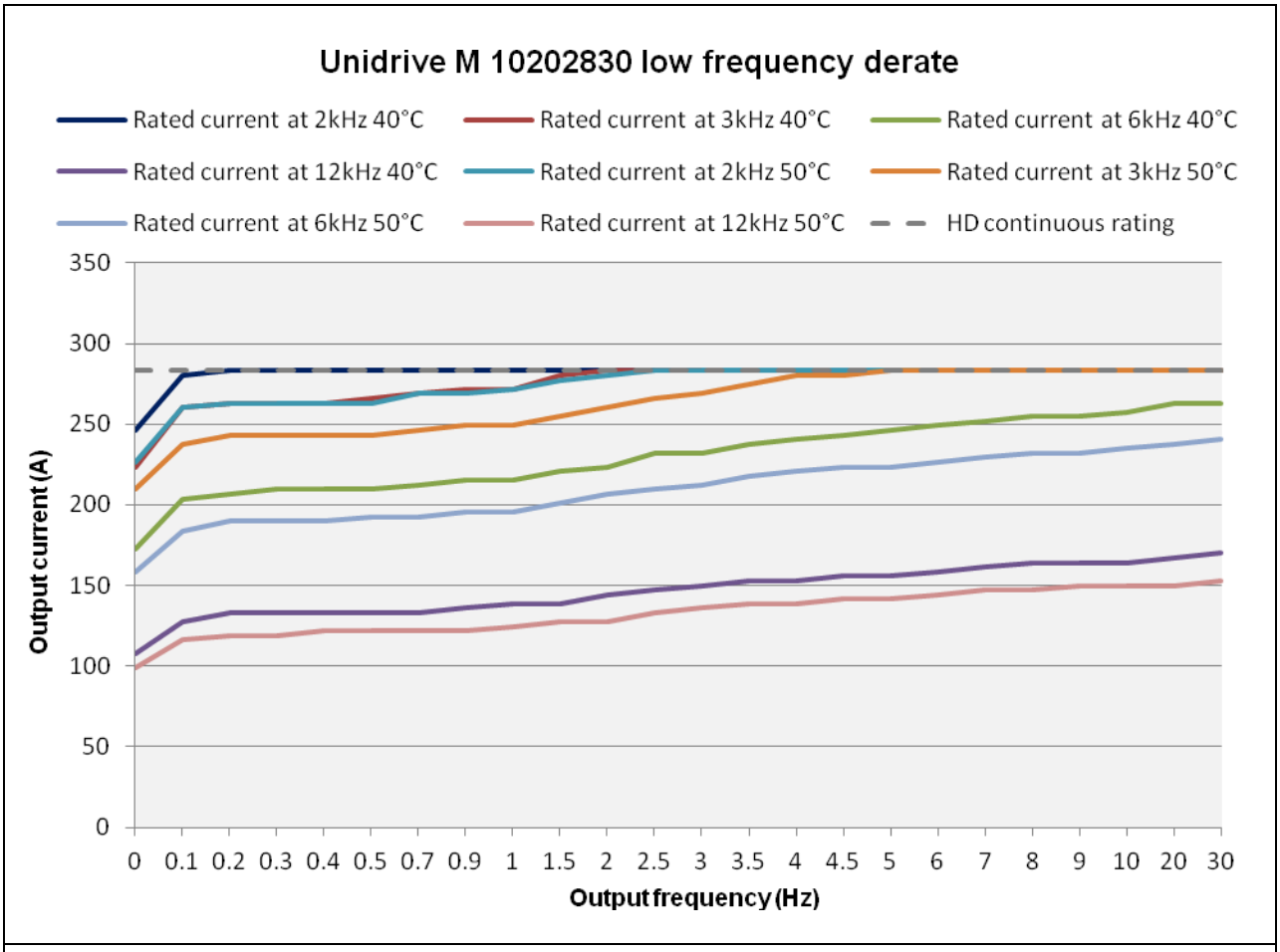

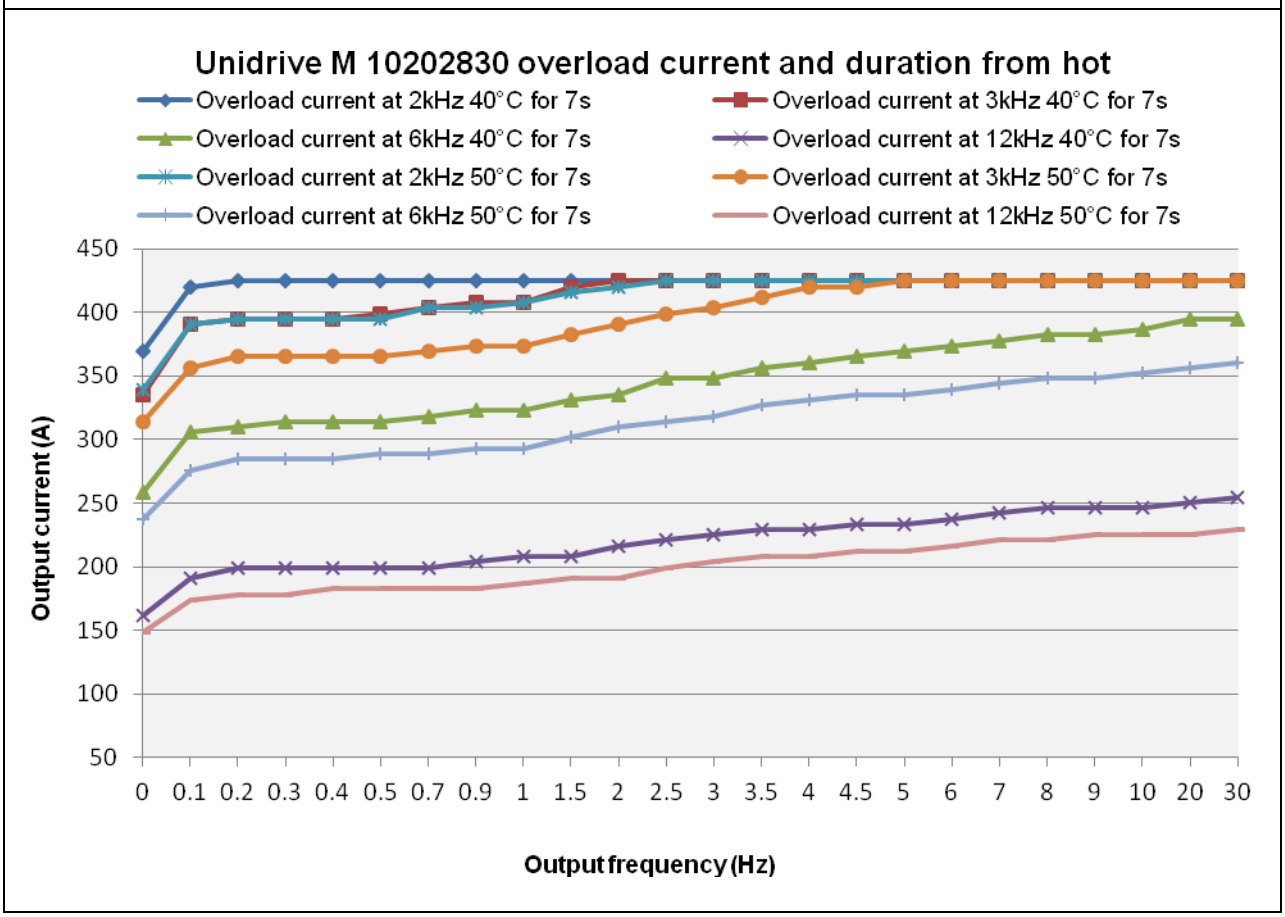

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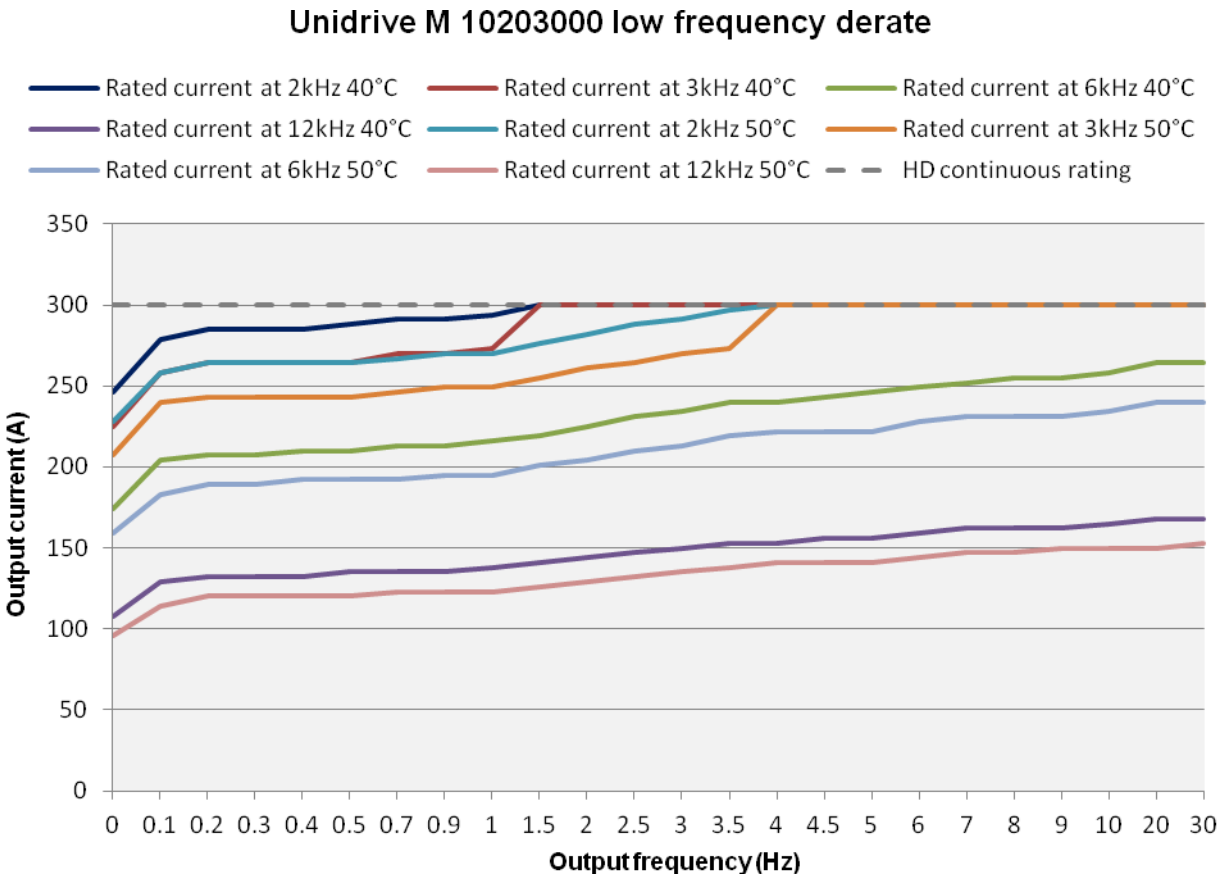

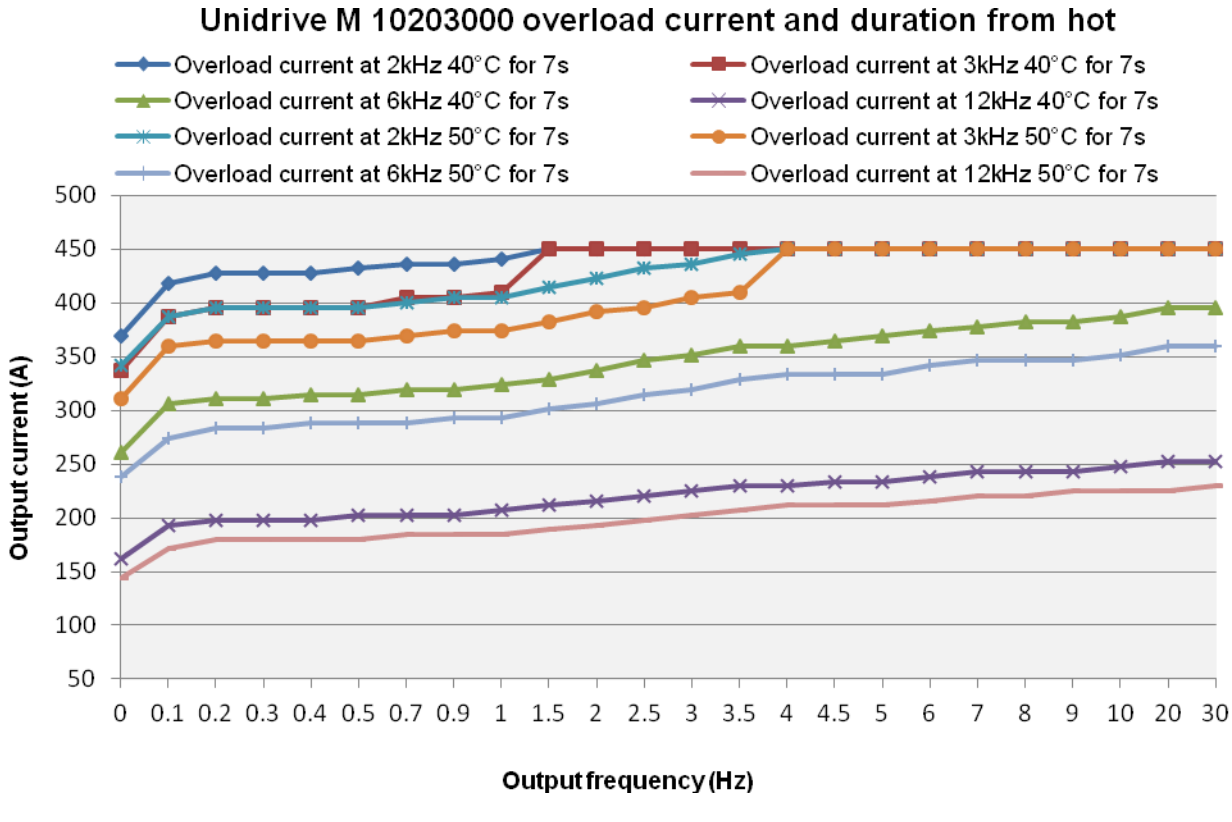

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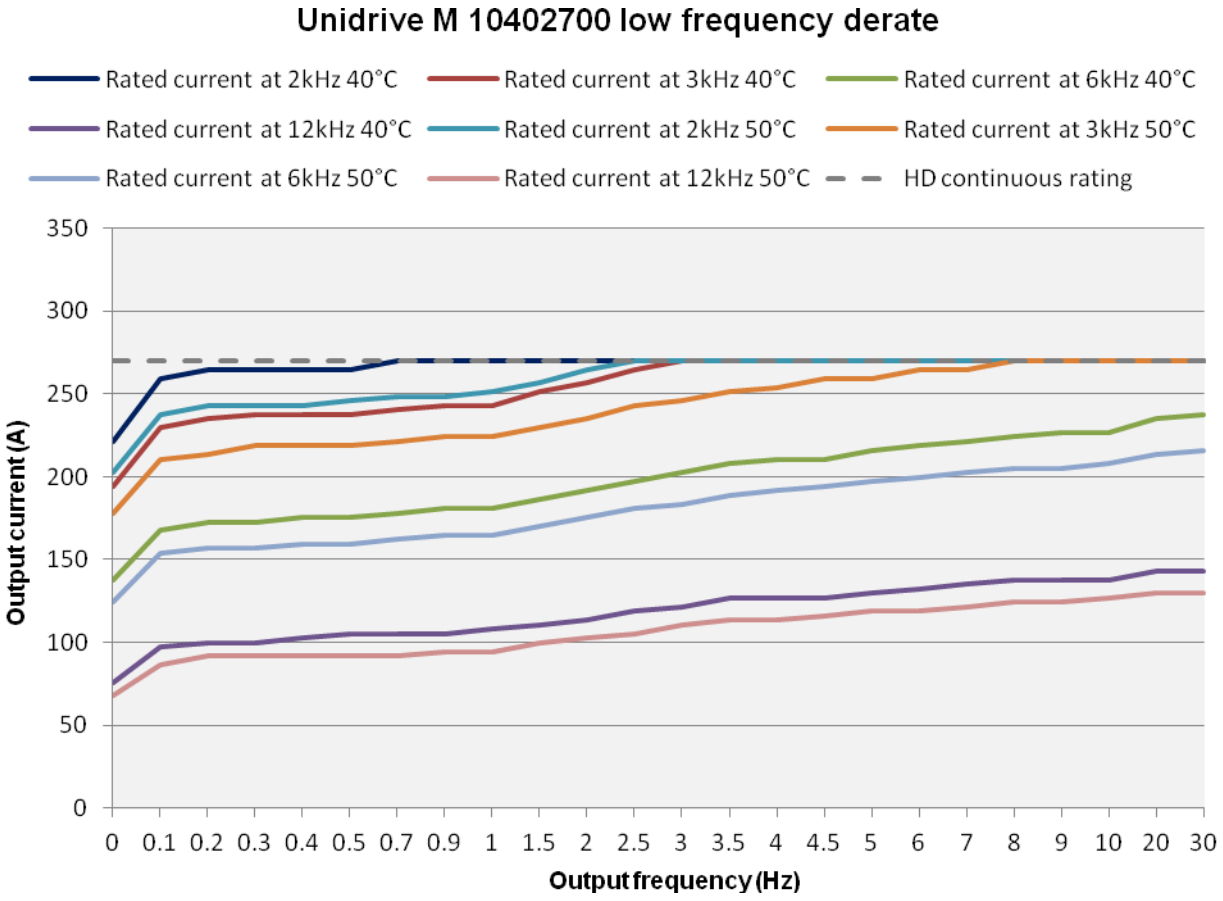

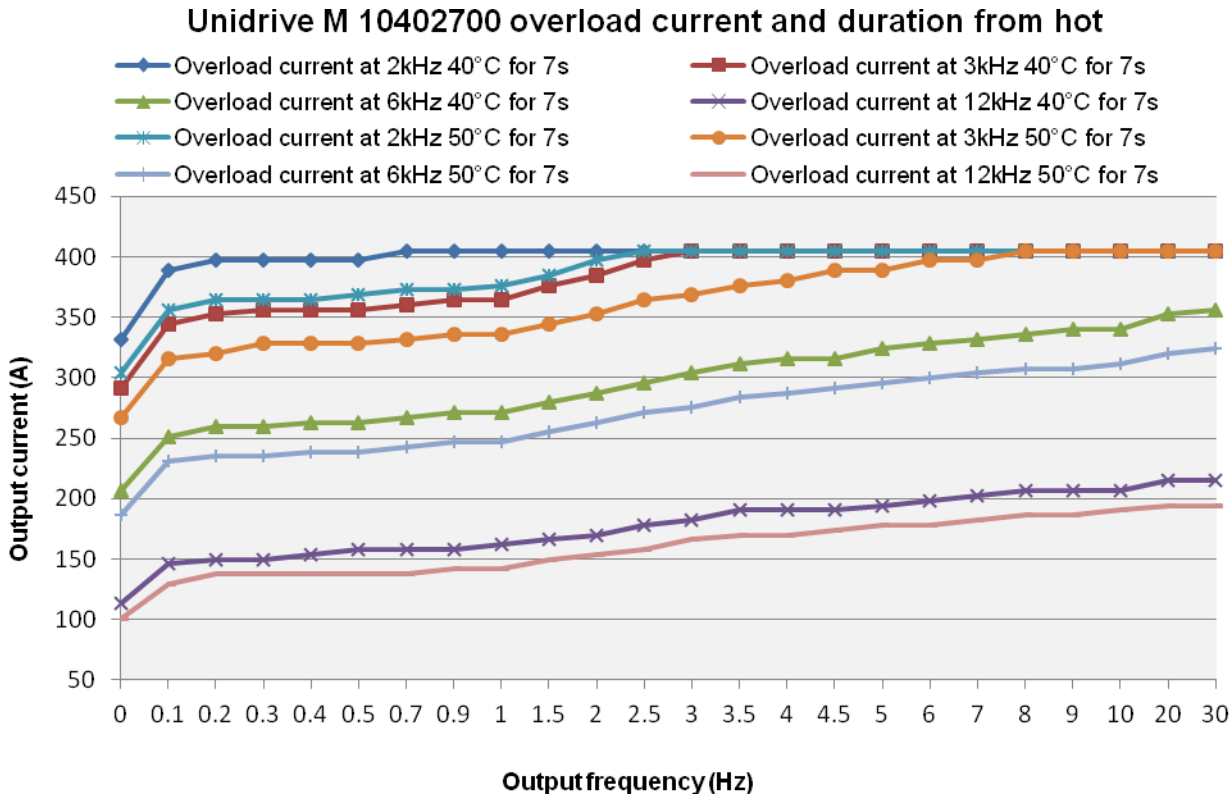

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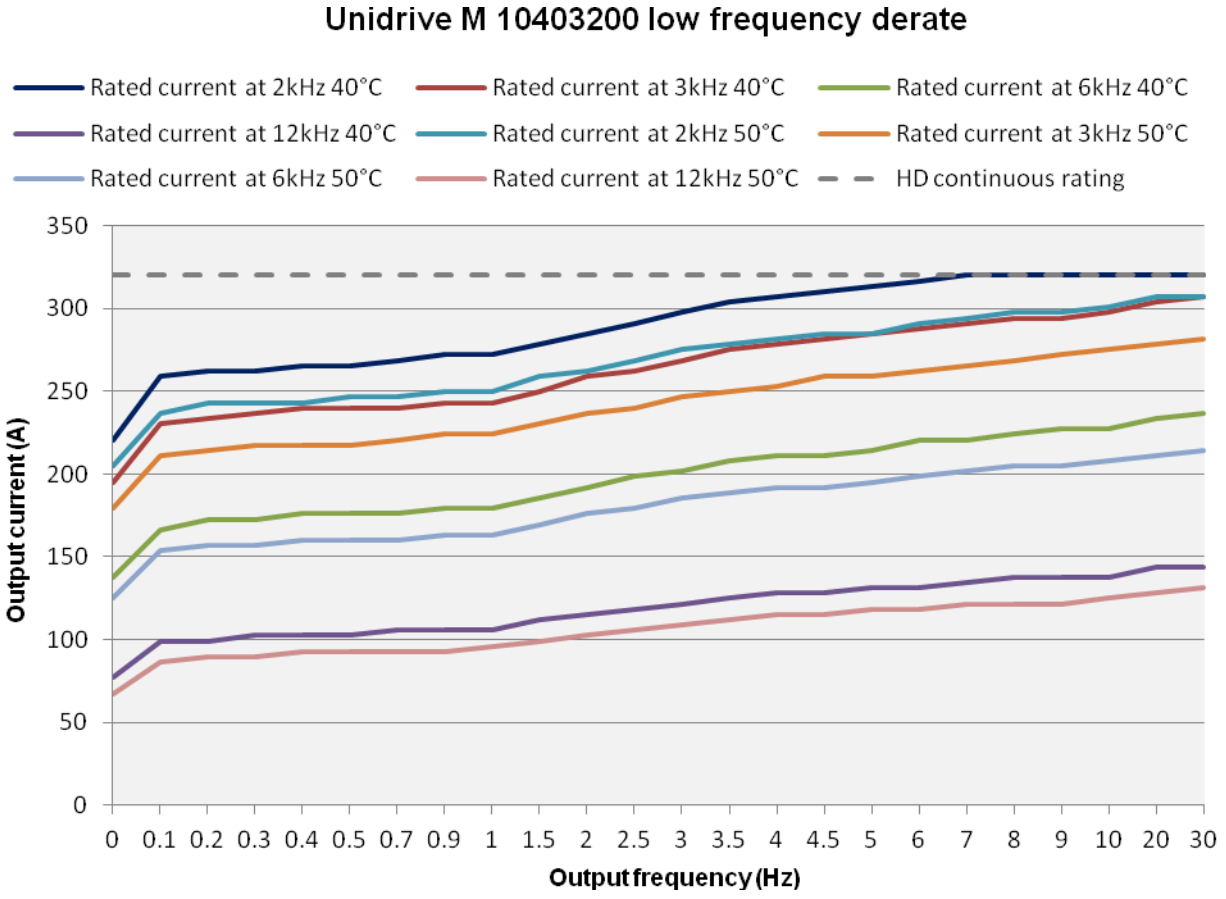

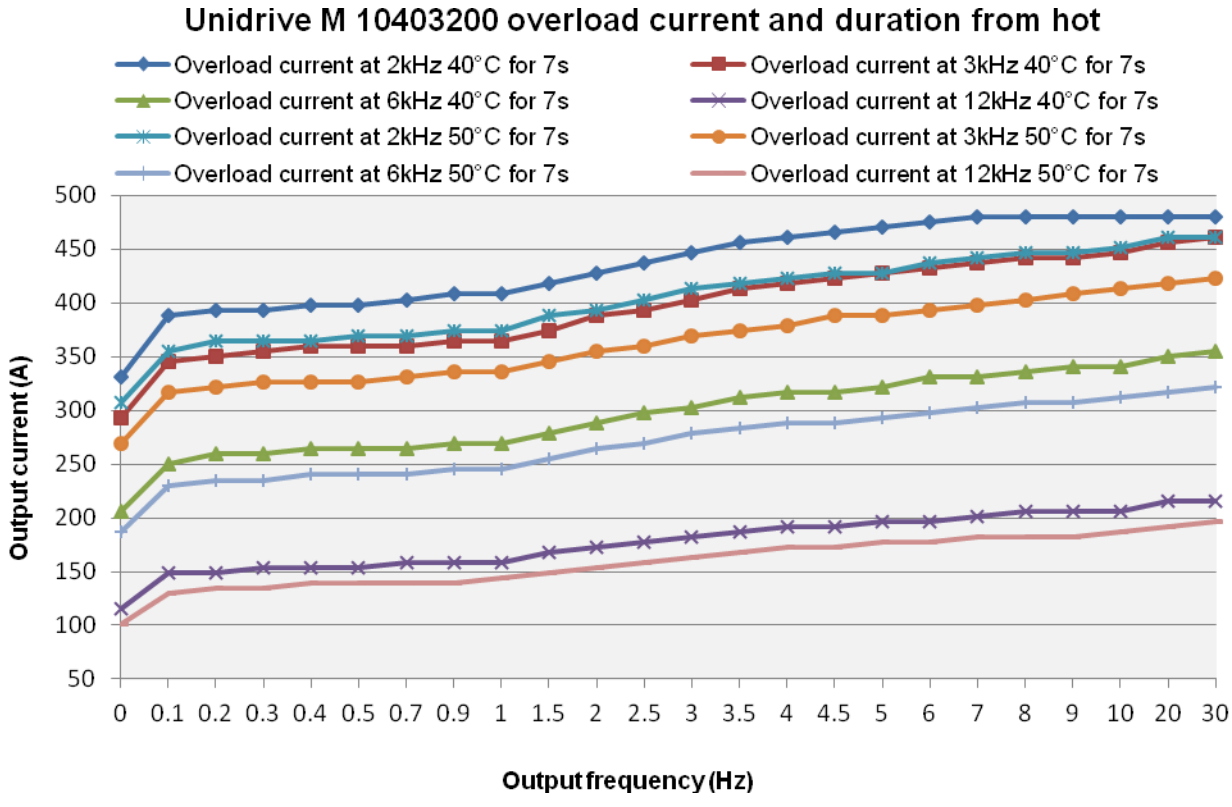

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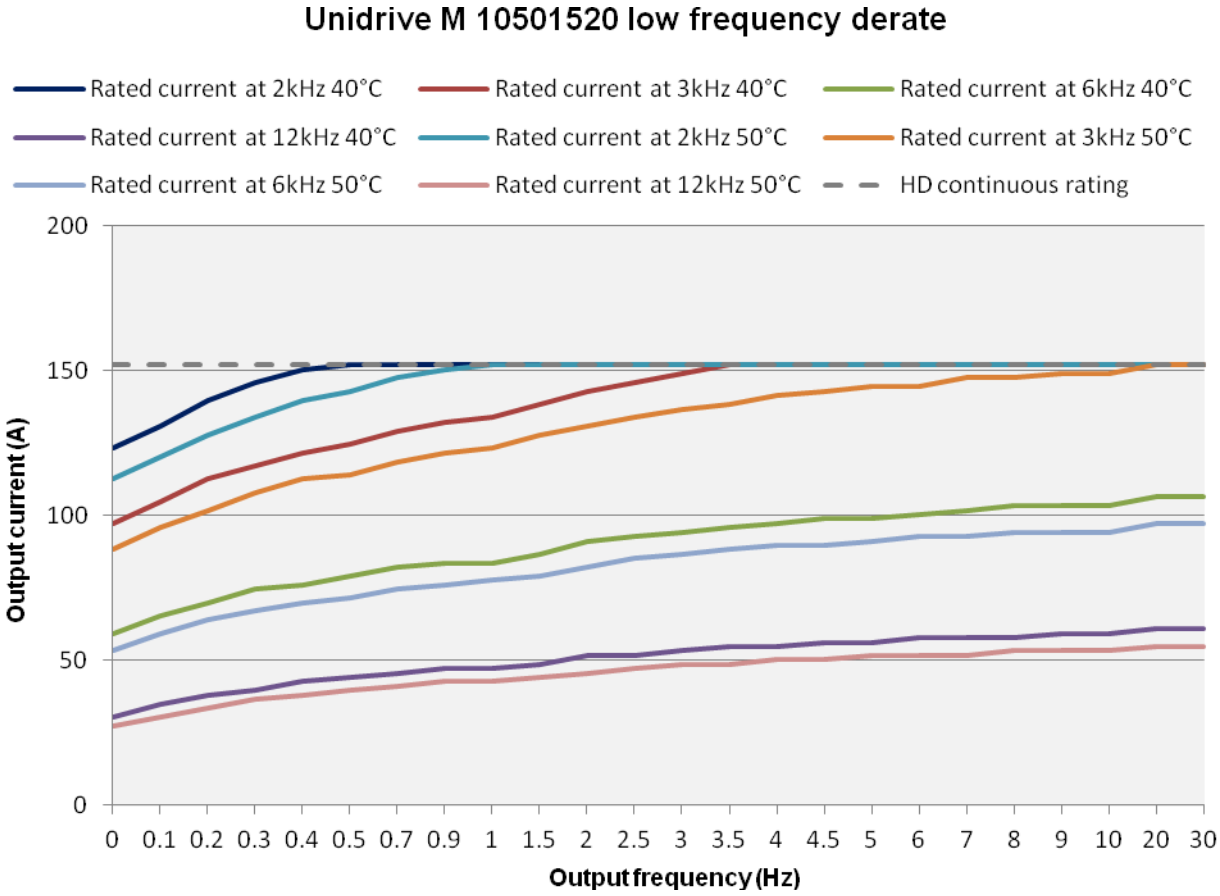

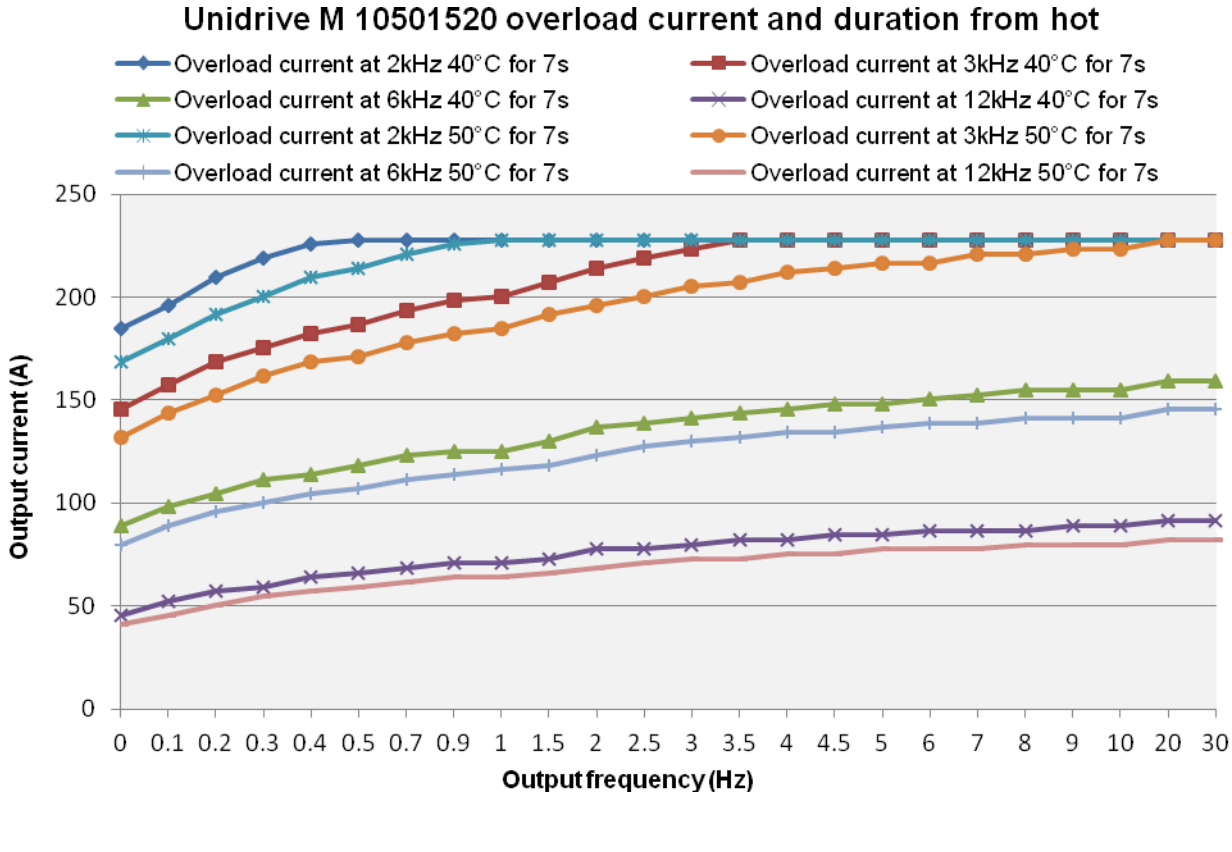

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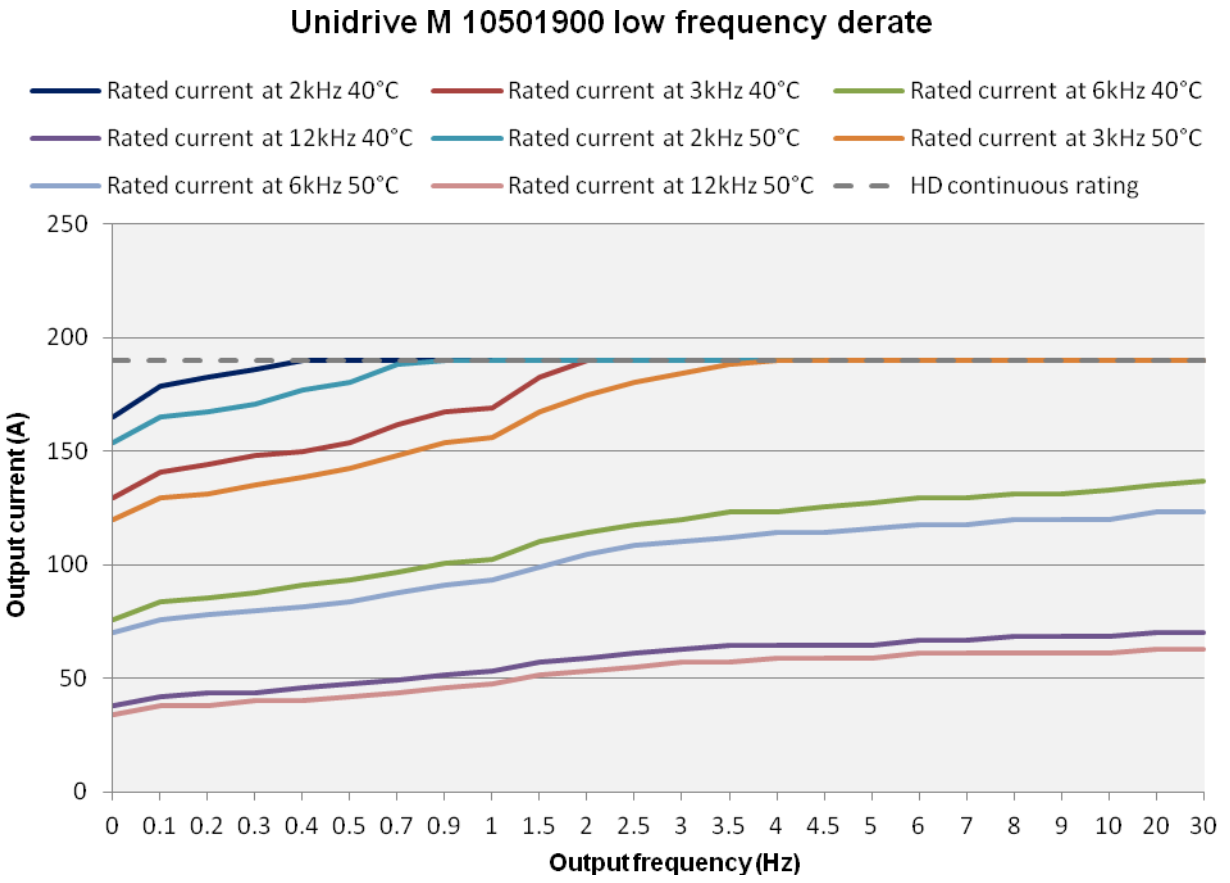

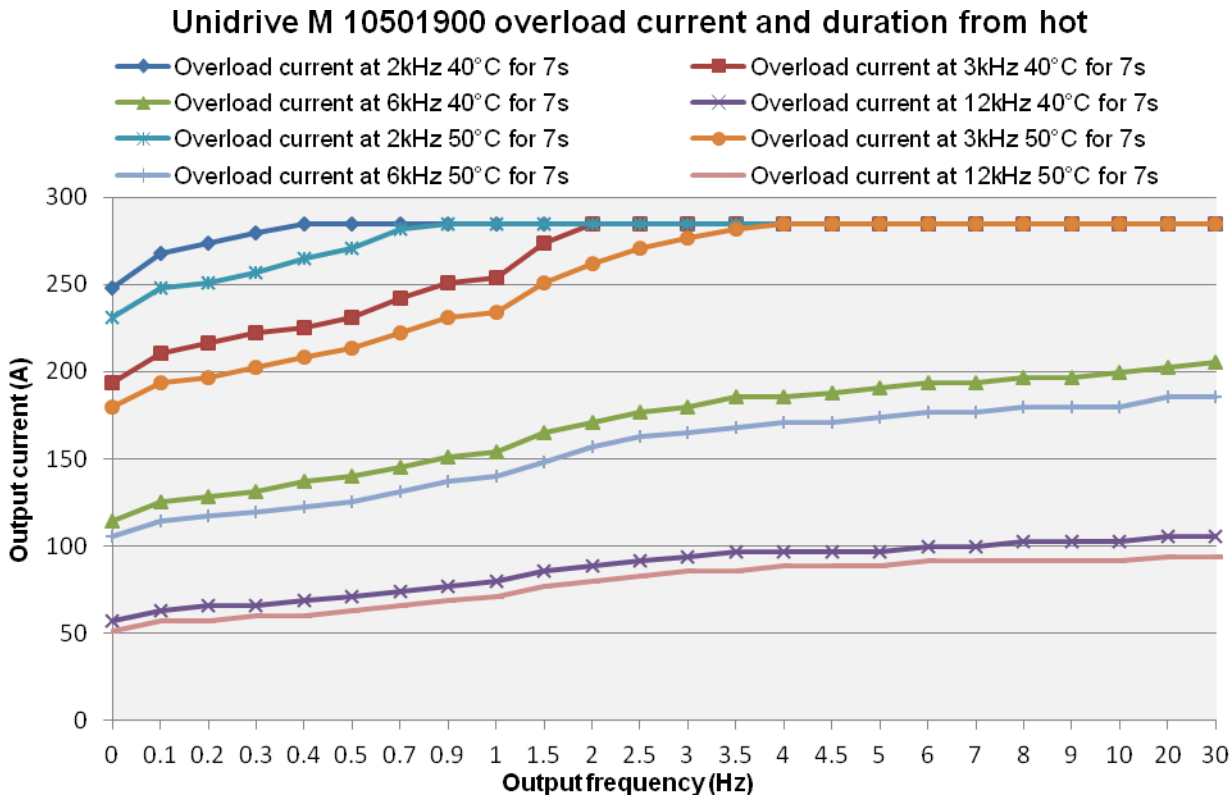

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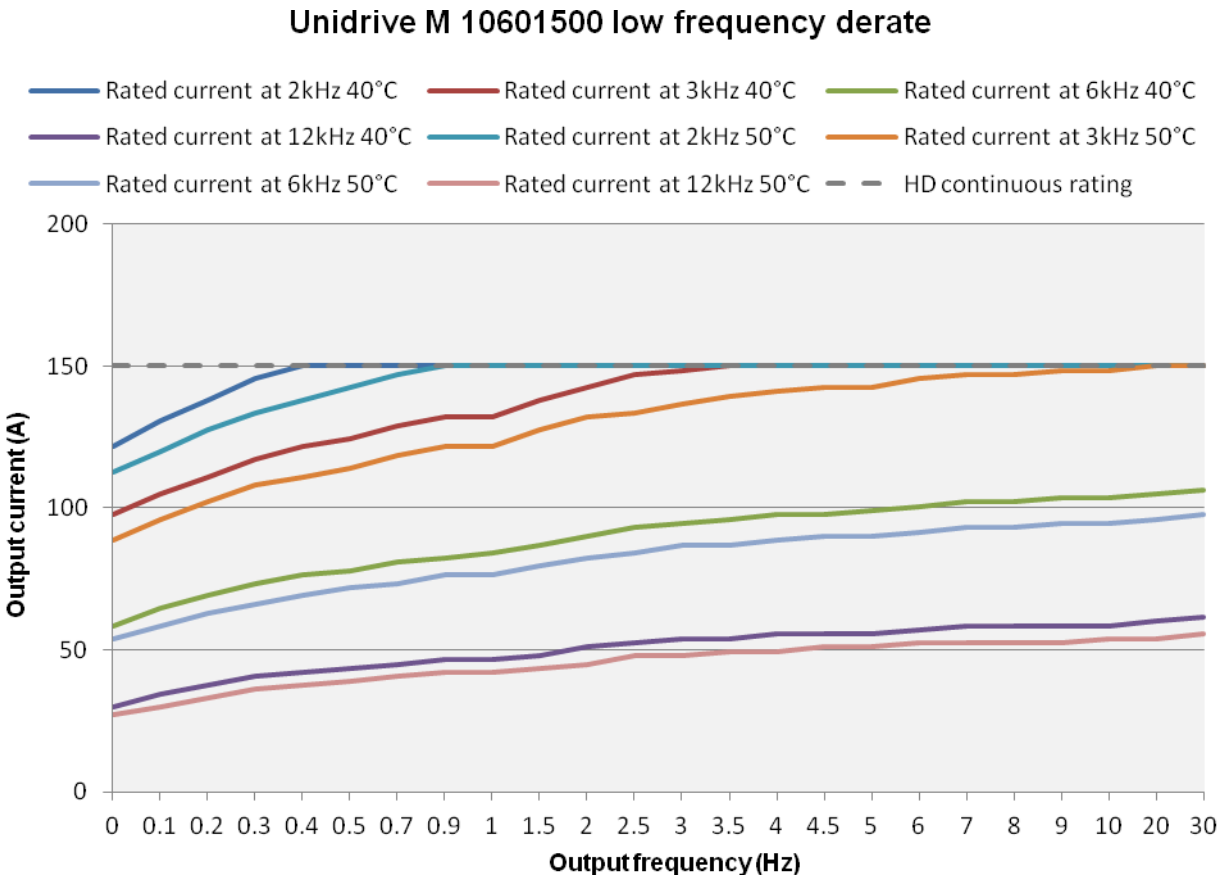

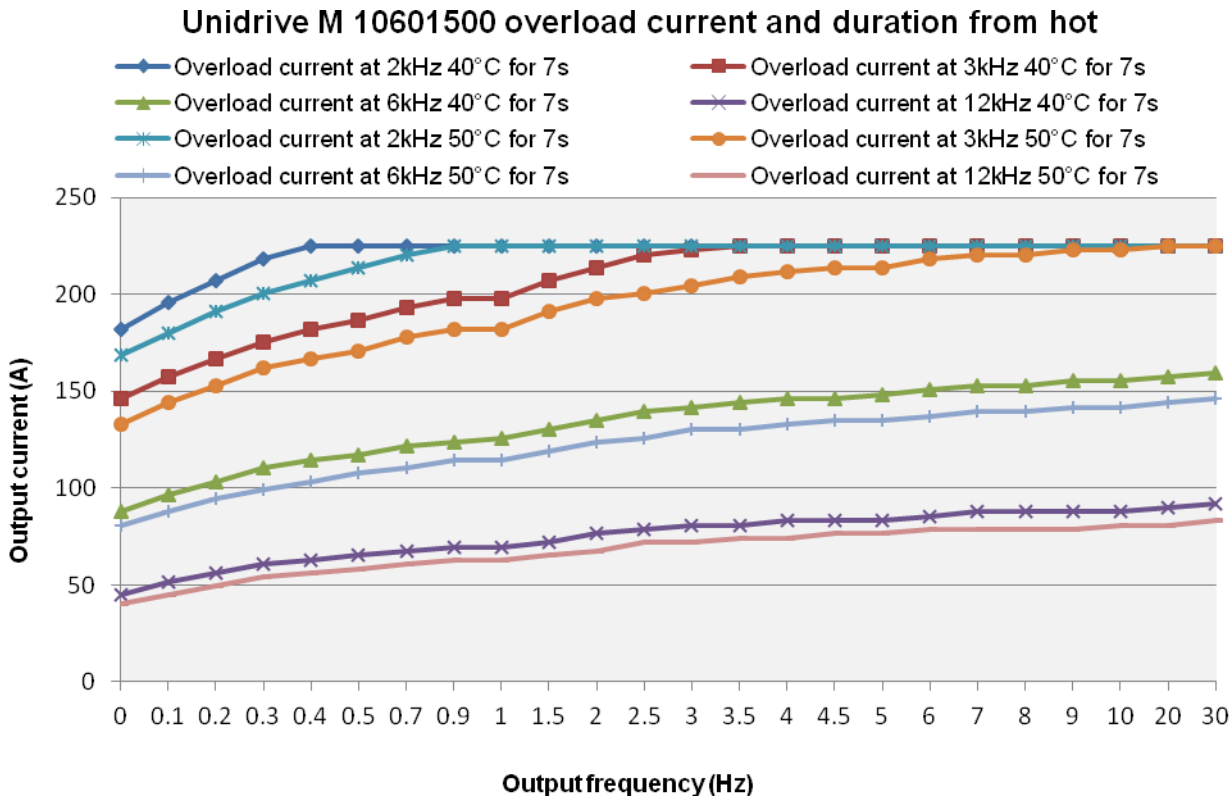

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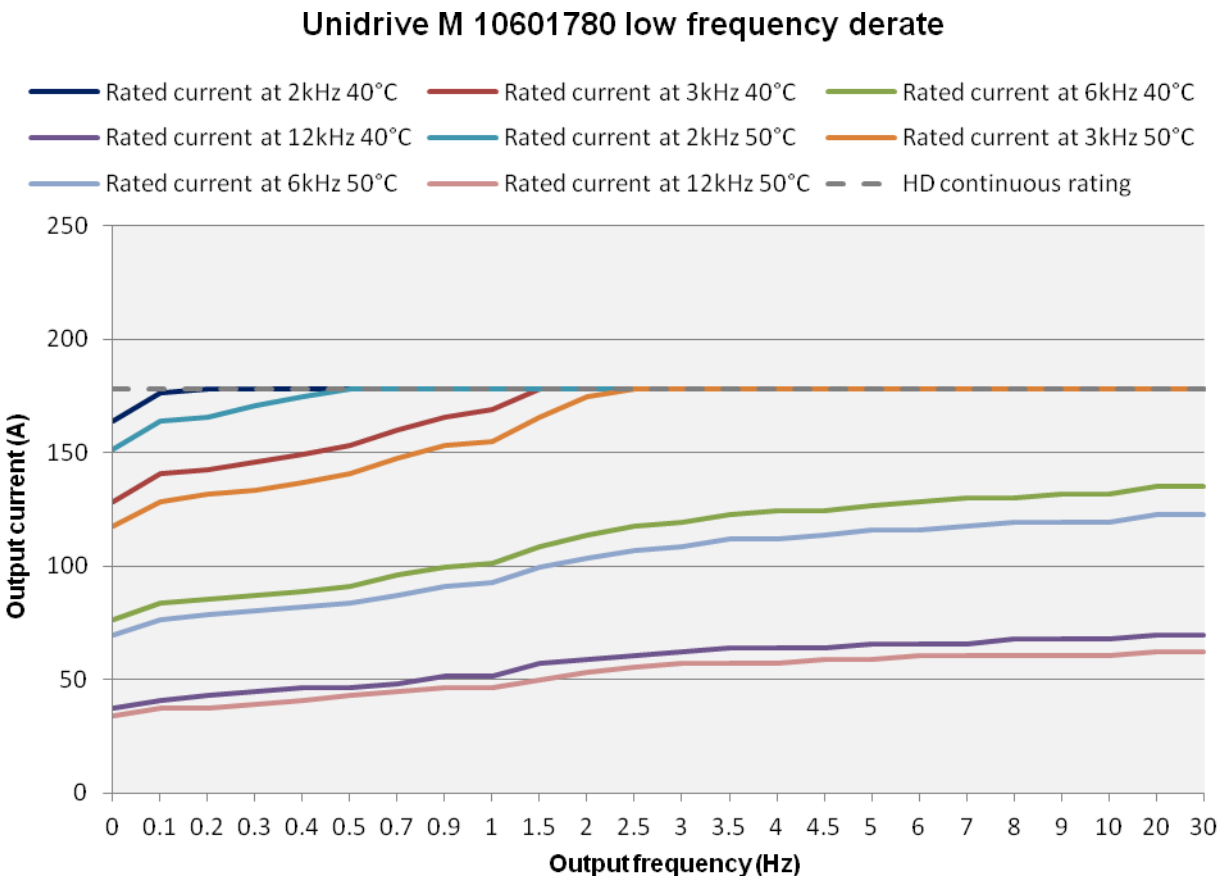

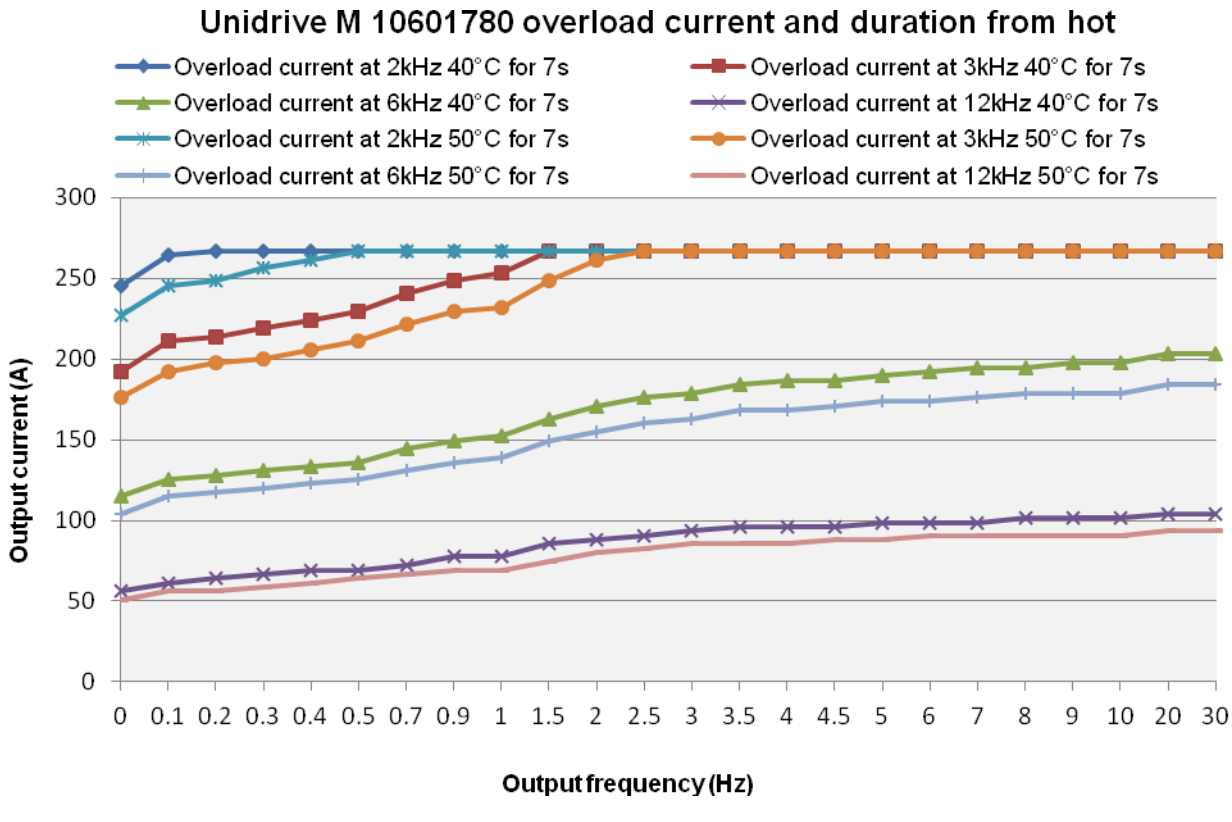

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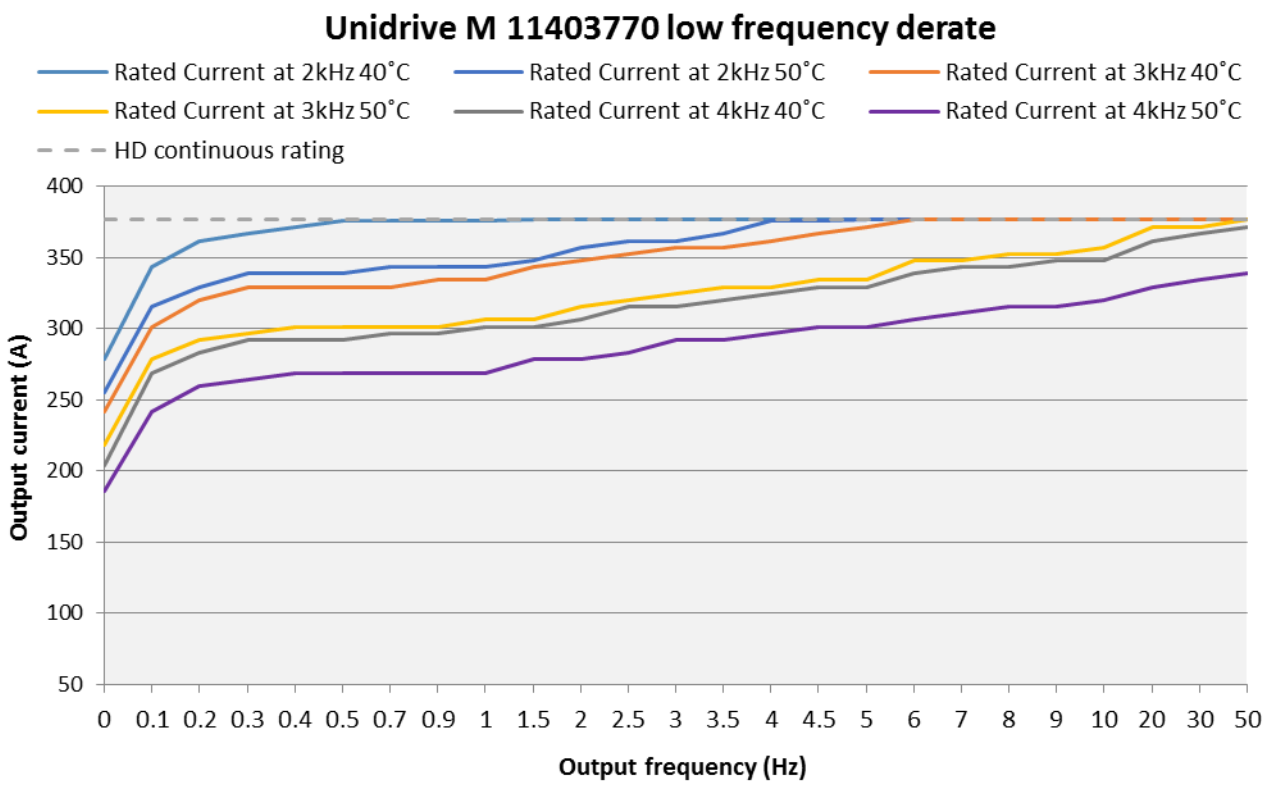

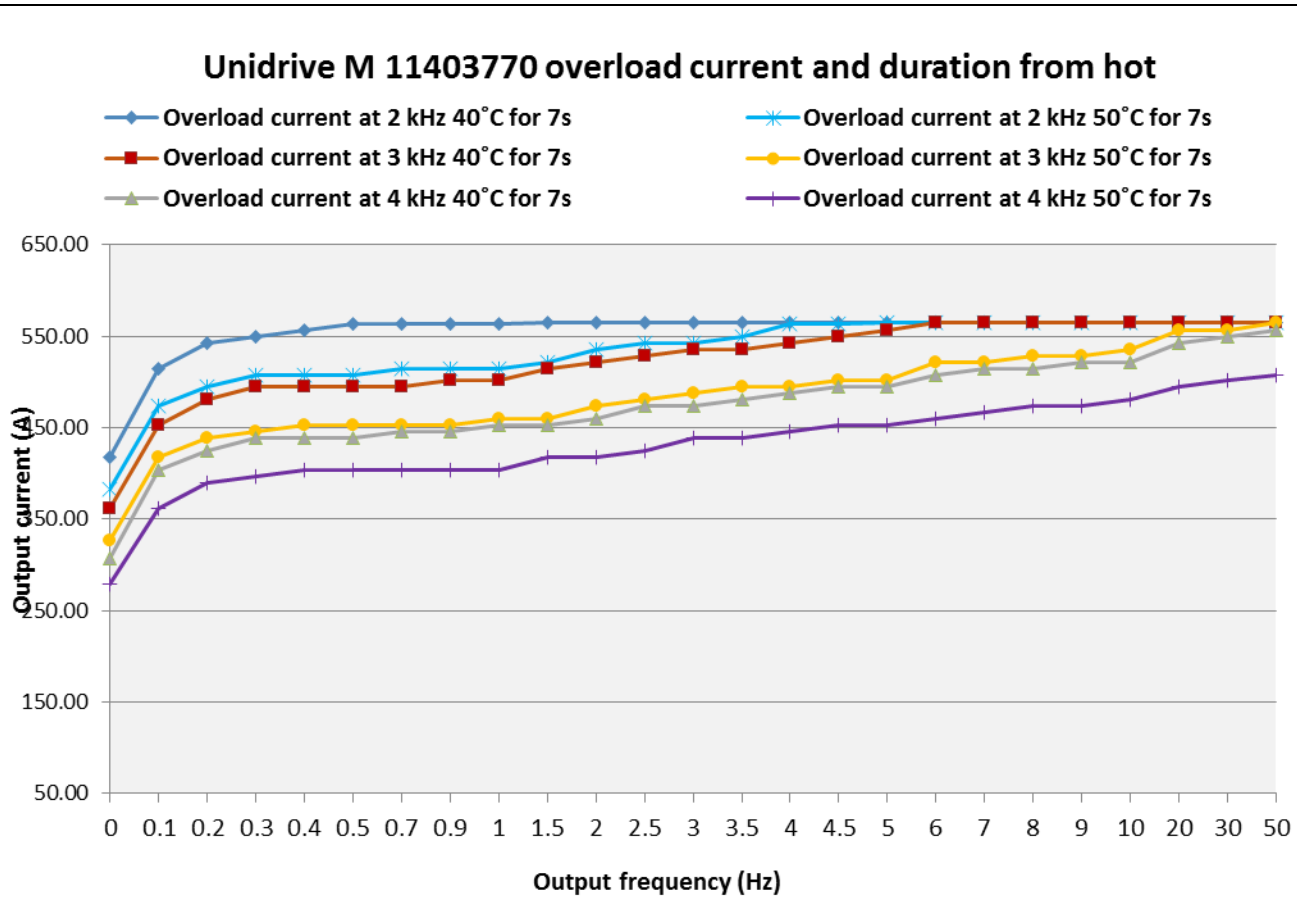

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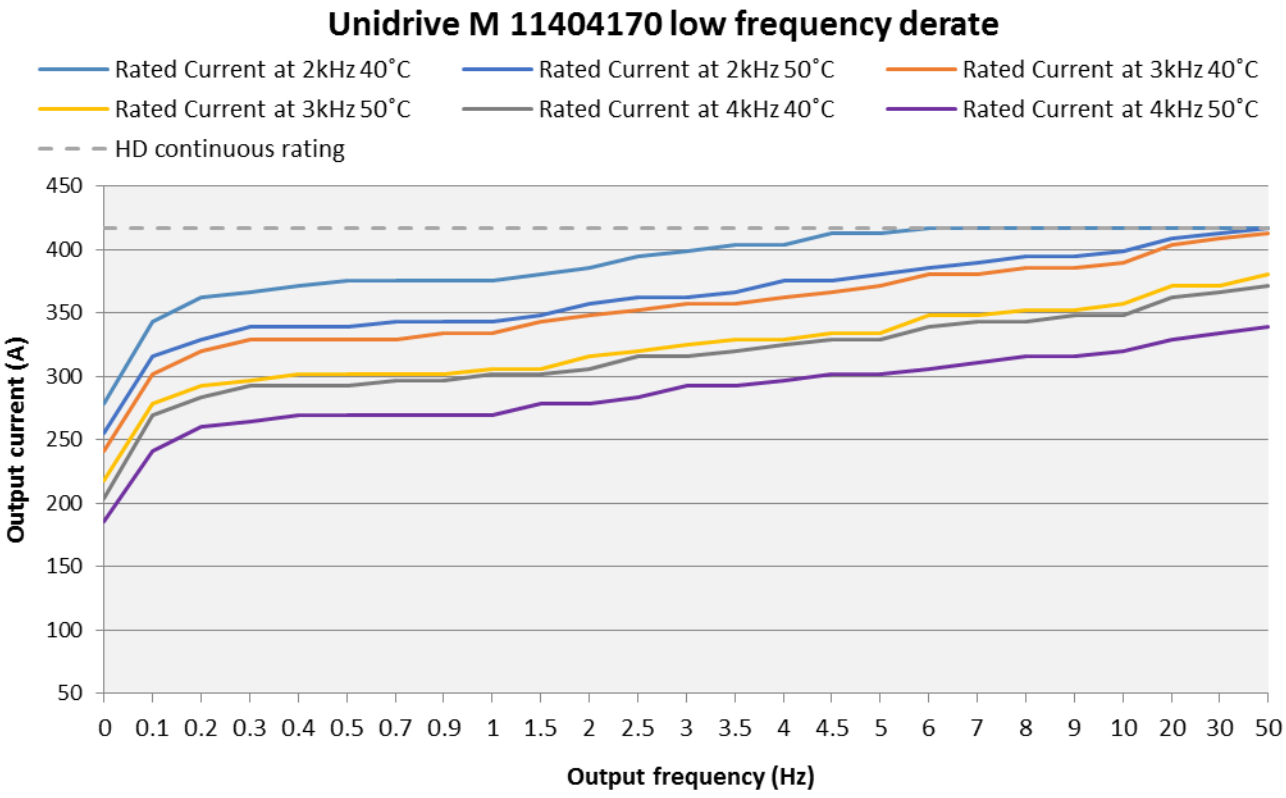

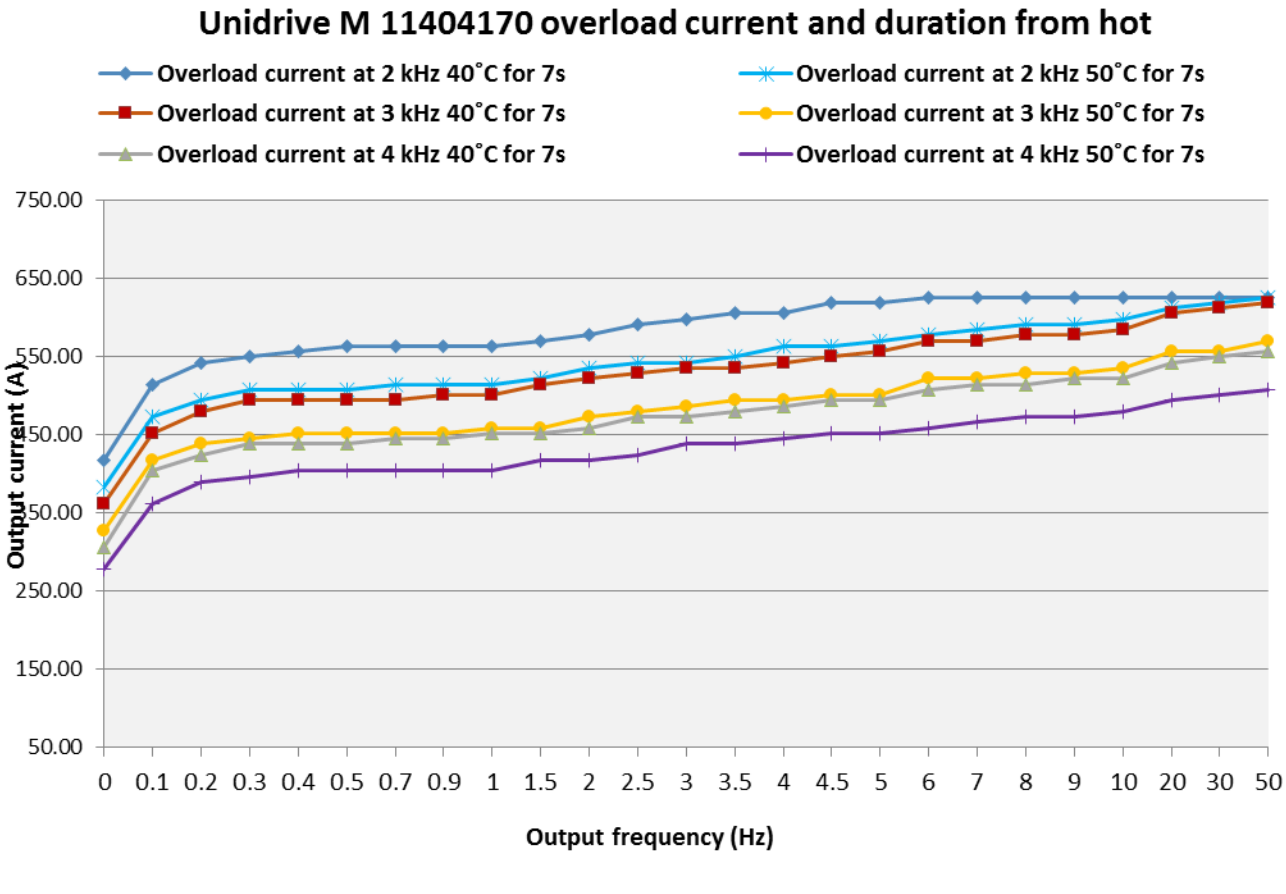

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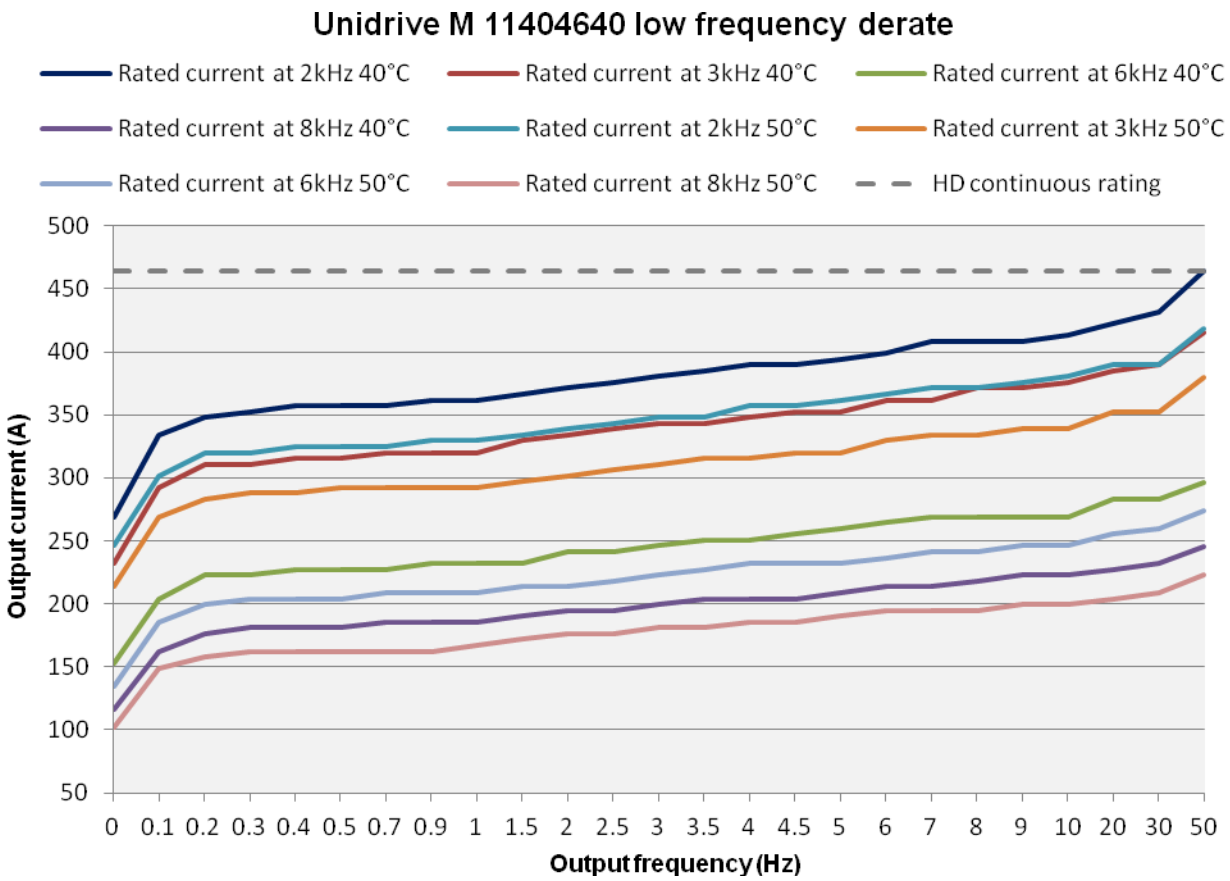

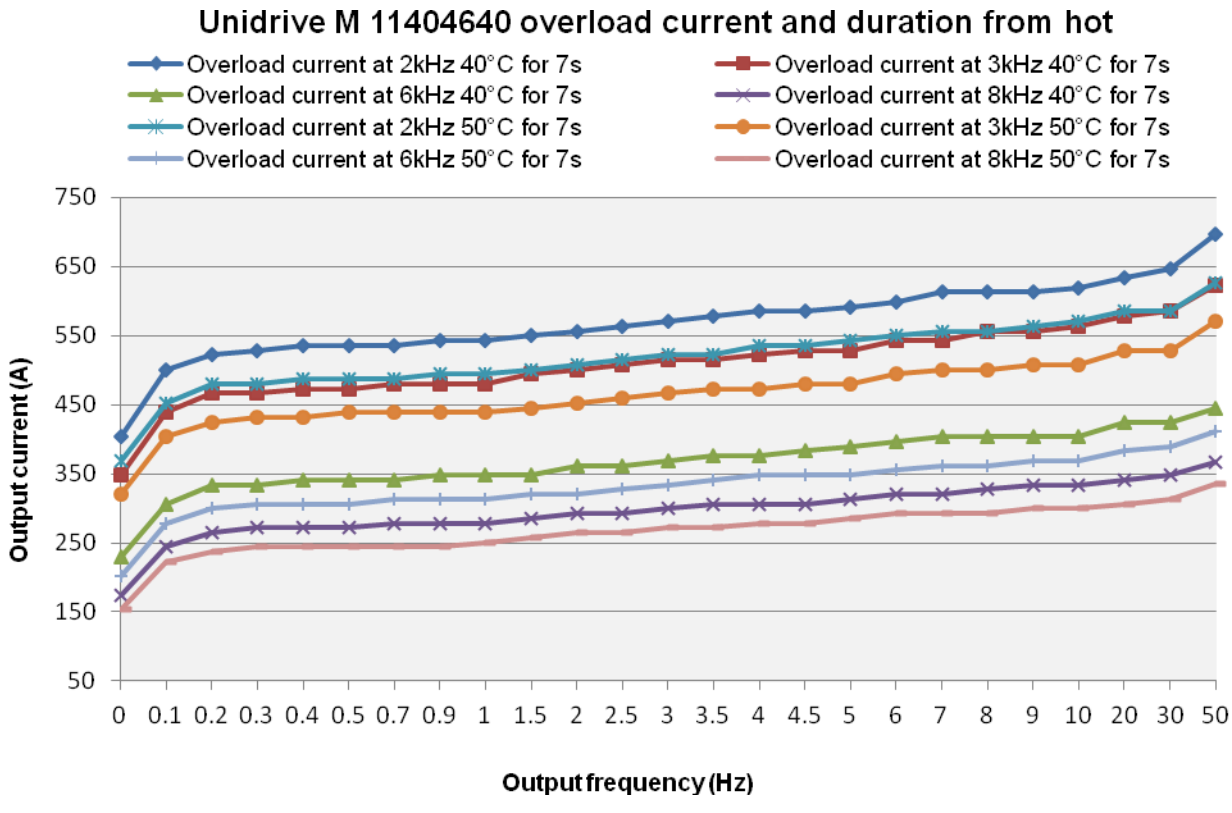

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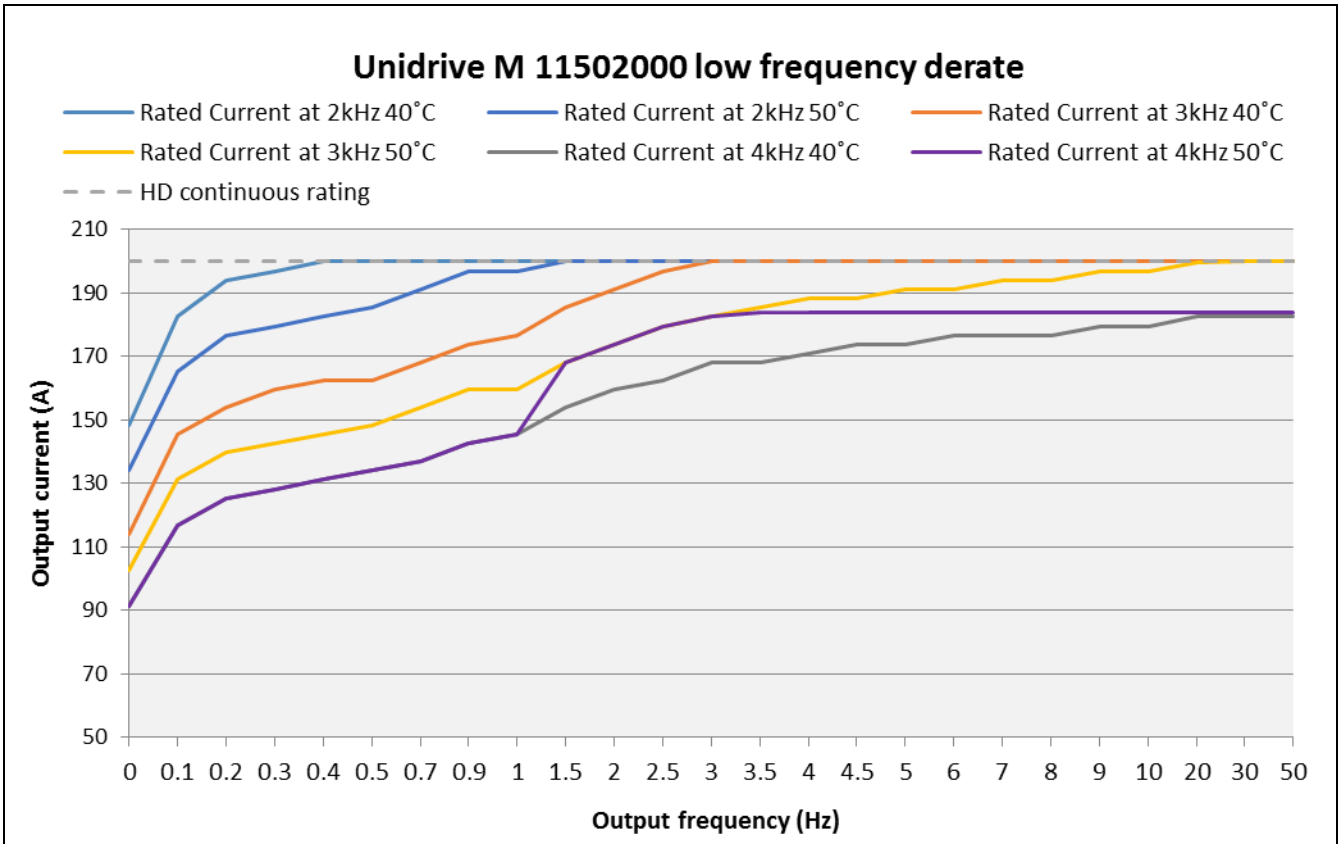

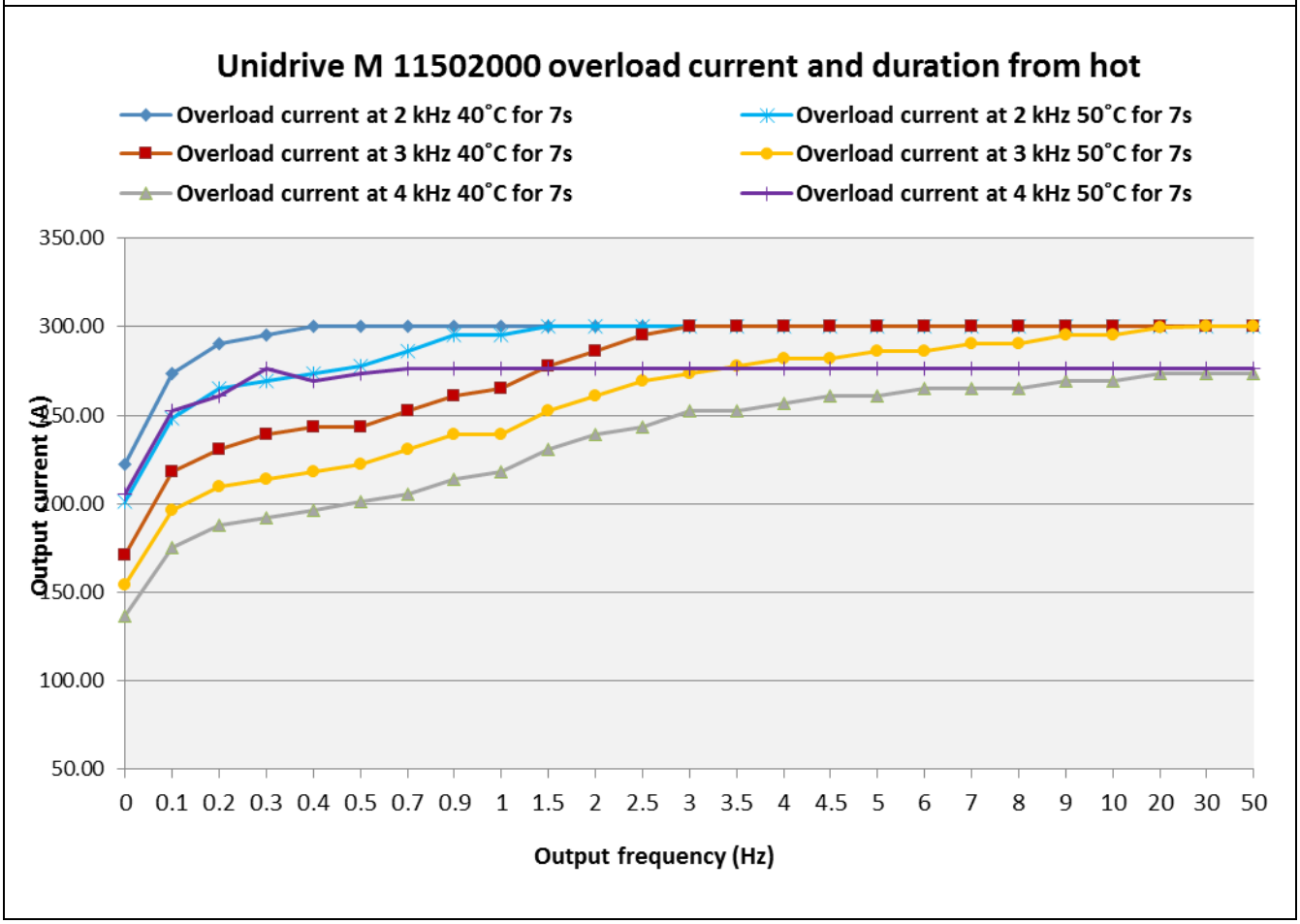

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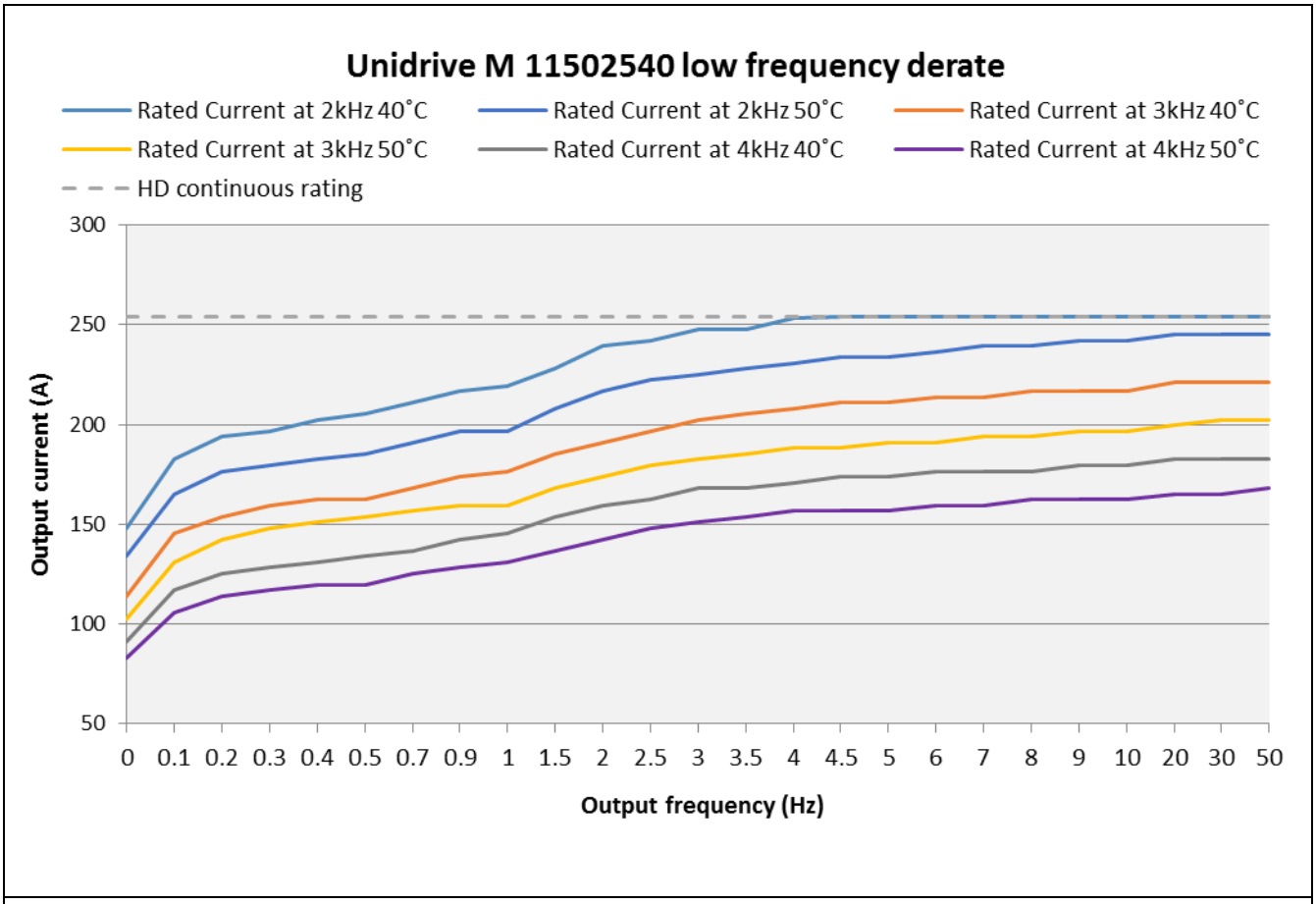

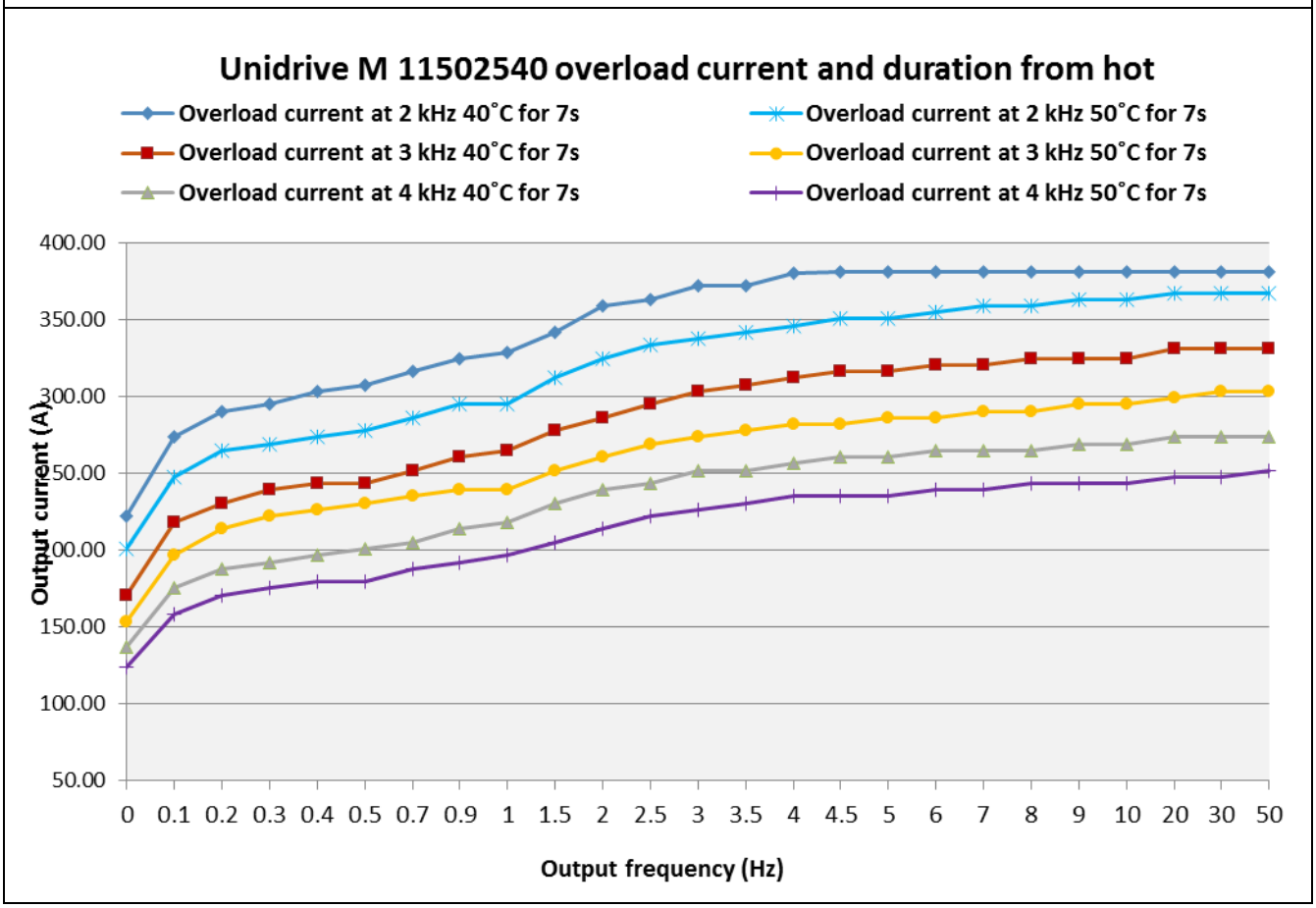

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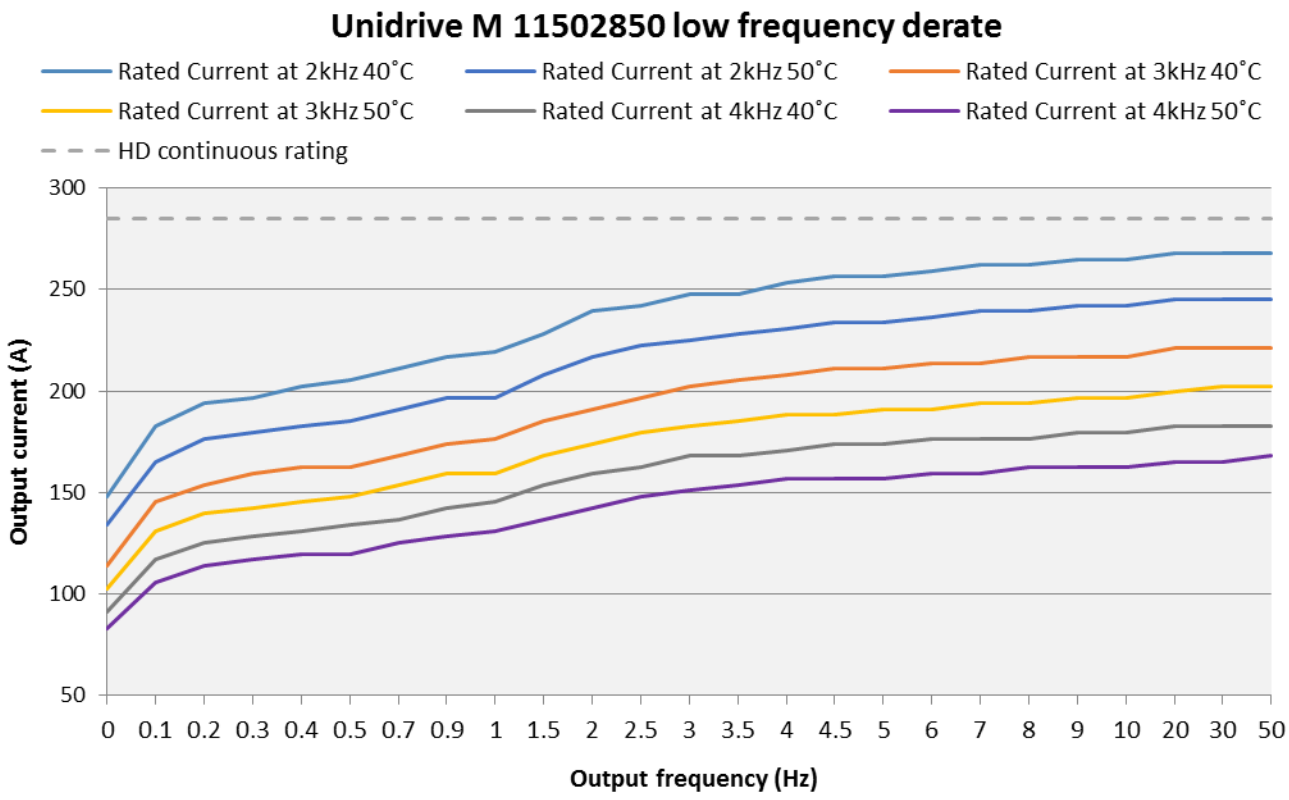

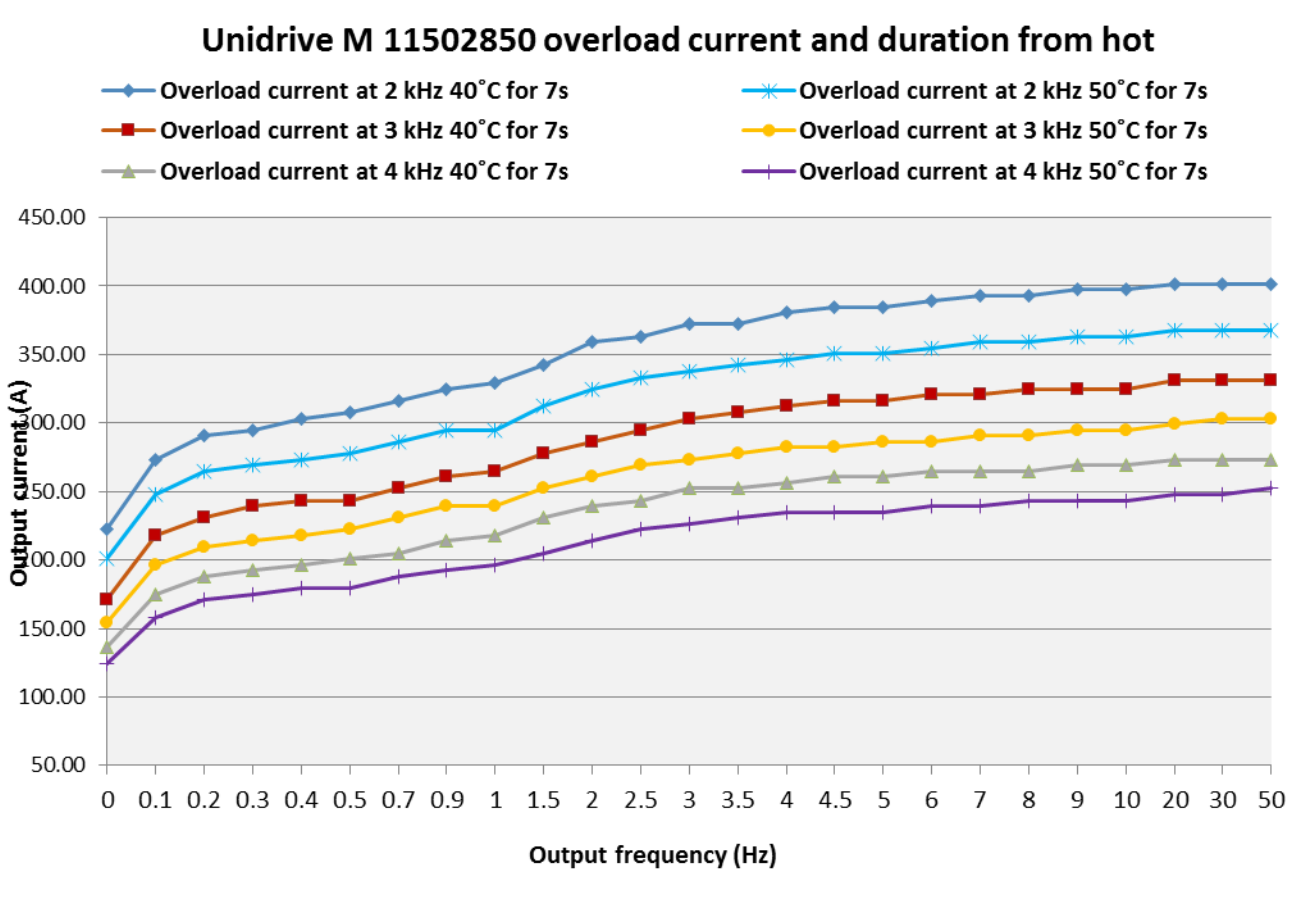

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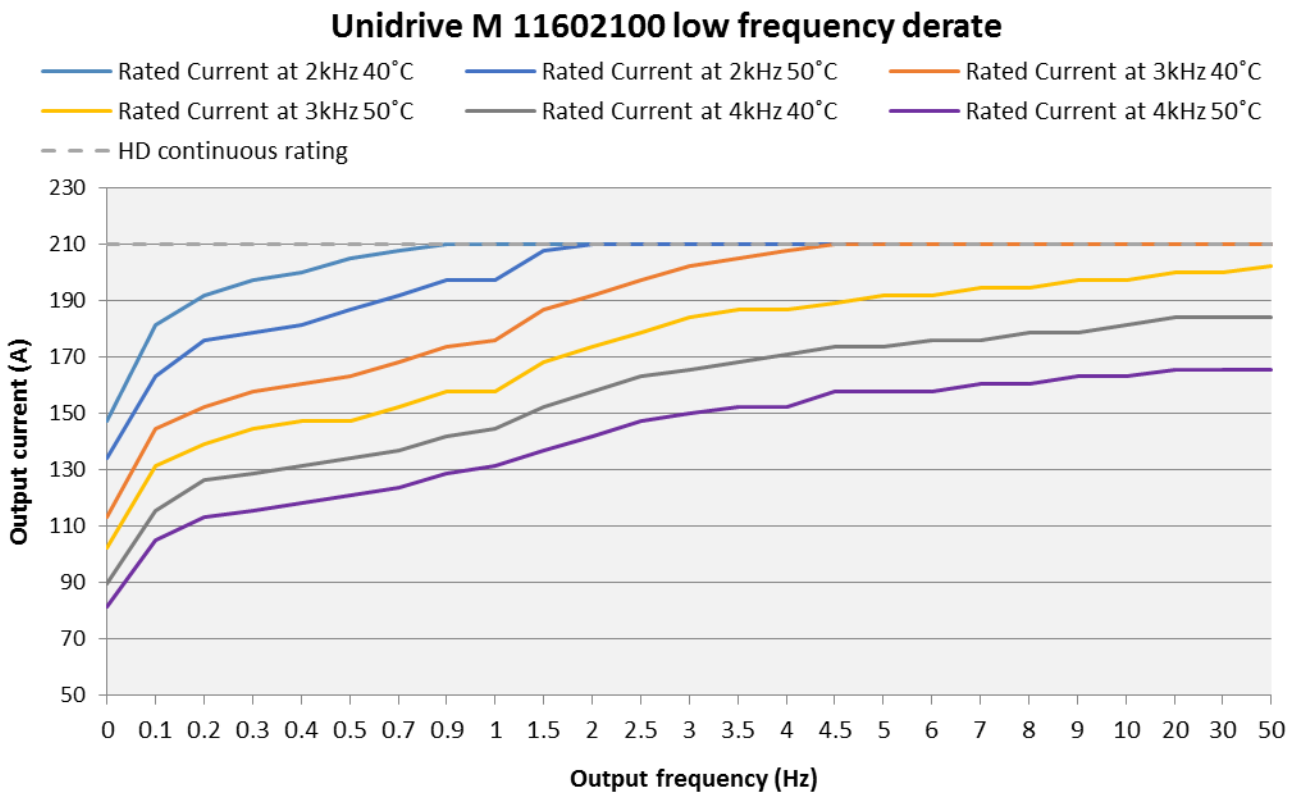

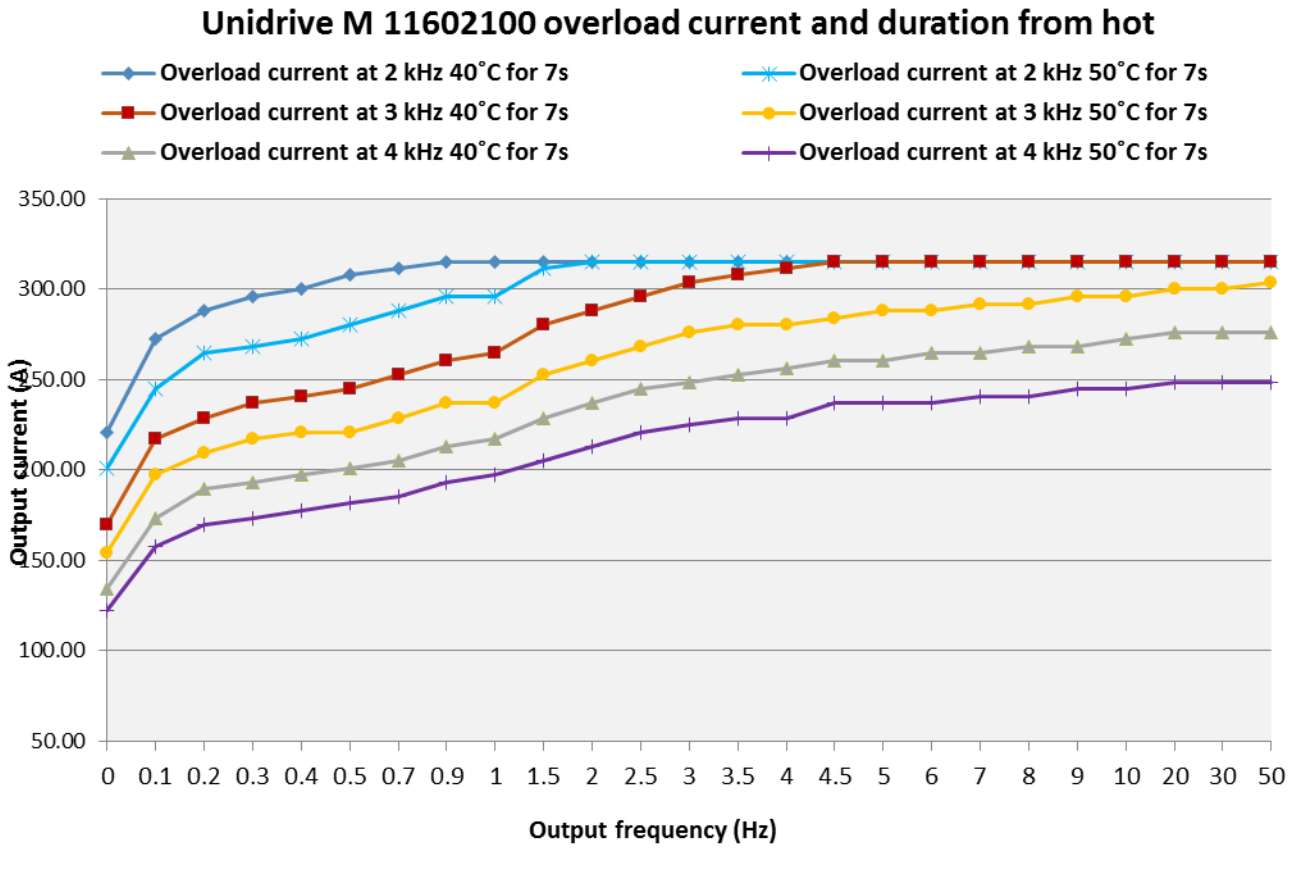

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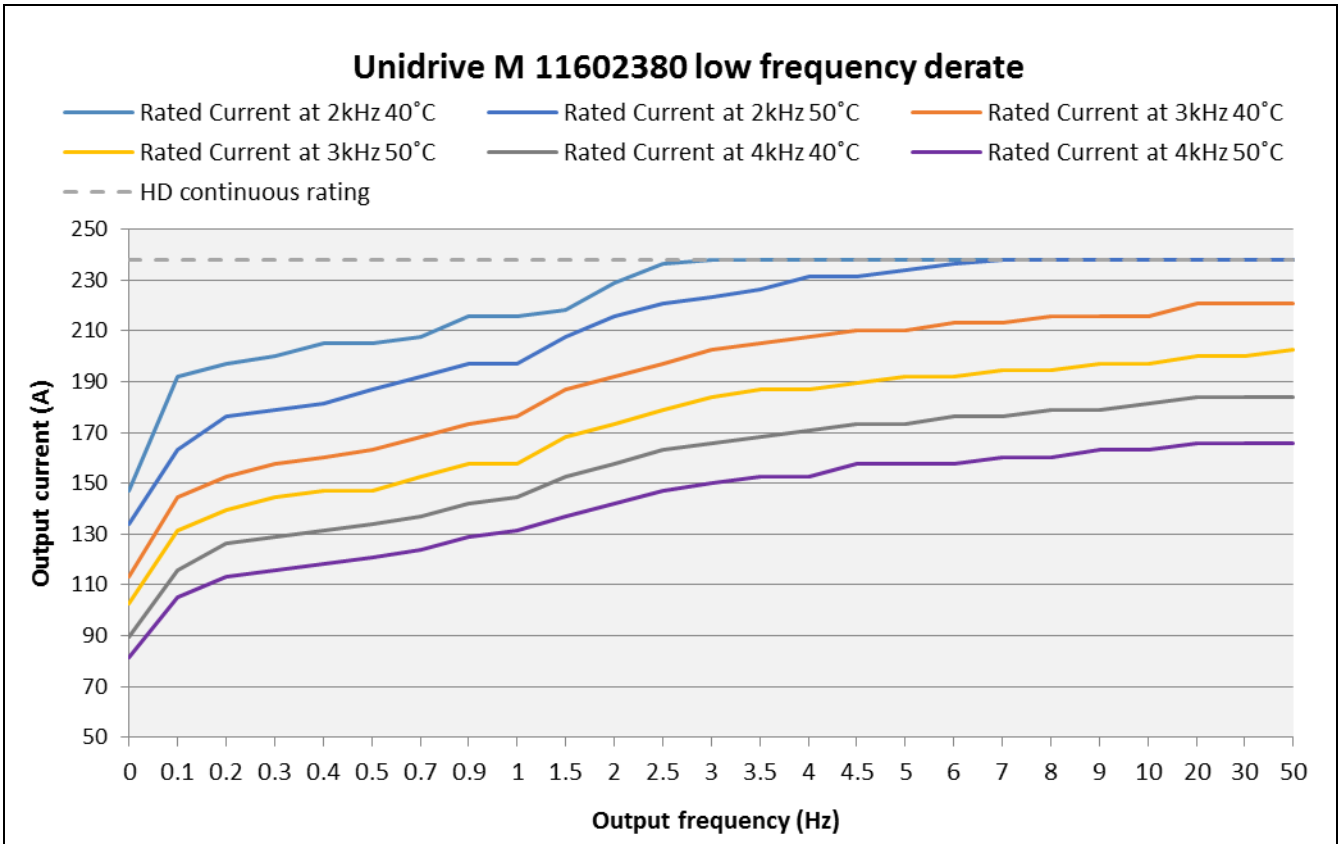

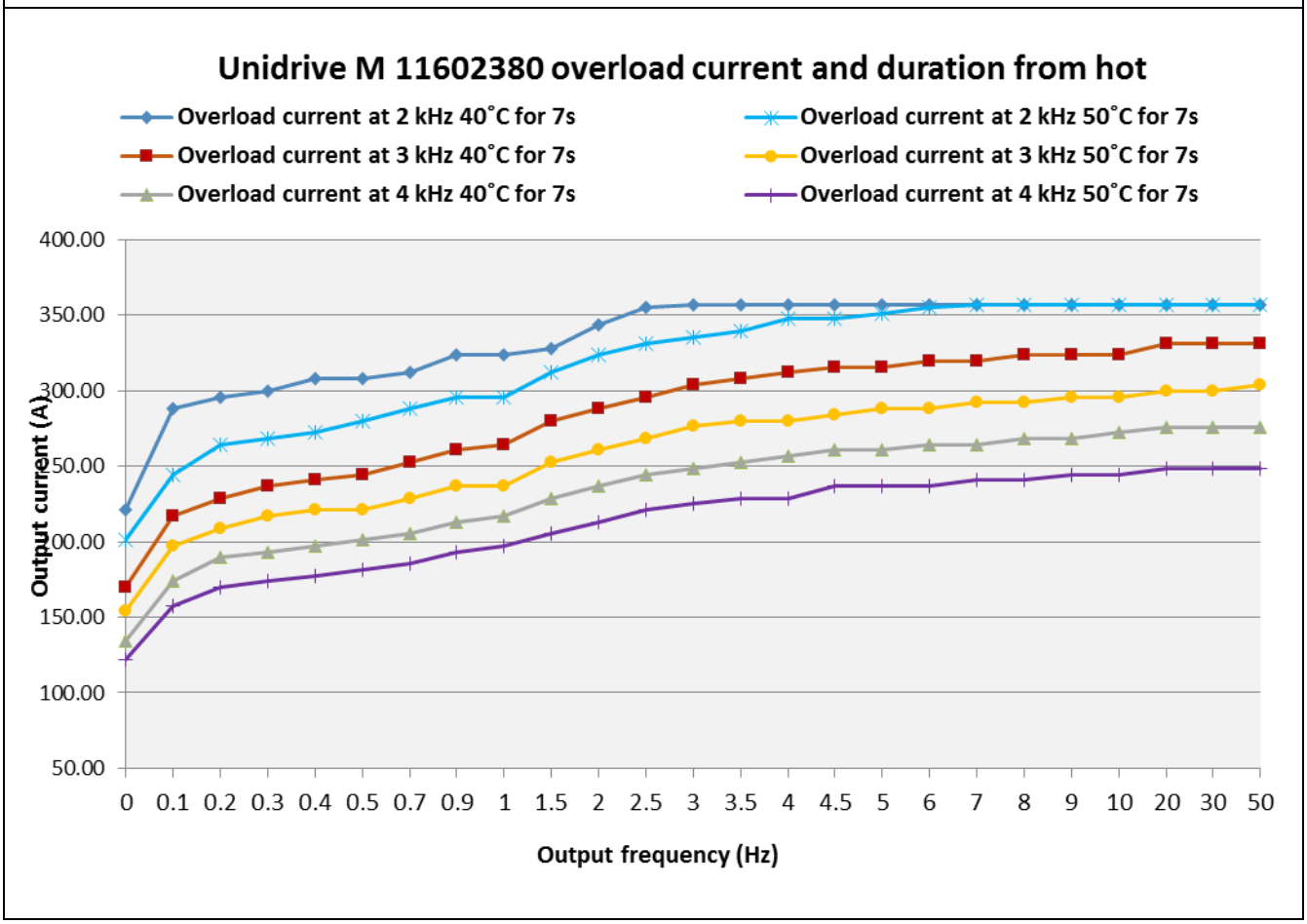

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