WEG ELECTRICAL EQUIPMENT S/A – AUTOMATION
WEG DRIVES & CONTROLS – AUTOMATION
R&D Motion Control

Test Plan
of
VVW HSRM Control

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Verified by:

Sumário

1 Objective

- Verify the functionality of the **VVW HSRM** control.
- Verify the motor's maximum current protection to prevent currents above the maximum allowed for the W23 Sync$^+$ motor.

2 Equipment

- 1 Inverter and 1 Test Motor:
  - Inverter Data: CFW500C16P0T4DB2H00G2 (version 'V14.32' revision 'r7157') [380-480V], 16 A (HD)
  - Motor Data: 380 V, 12.5 A, 4 poles, 60 Hz, 1800 RPM, 53.3 V/kRPM.
  - Electrical Parameters from the Motor Nameplate: [*Y*] $L_d = 33.37$ mH, $L_q = 146.51$ mH, $K_e = 53.0$ V/krpm [Cold]
- Monitoring of the motor and inverter's electrical and mechanical variables:
  - WPS.
  - 3 AC/DC Current Probe Tektronix.
  - 1 Fluke True RMS Multimeter with Filter.
  - Isolated Digital Oscilloscope RTH1004 ROHDE & SCHWARZ.
- 1 Dynamometer

- Before starting the tests, record the nameplate data of the motor to be tested (photo of the nameplate).

- During all tests, in case of failure, check: the current before it (pre-trigger) and the parameters related to the "current failure": P0049 and the history of the "last failure": P0050 to P0055.

3 Test Plan Results

3.1 Test - Motor Spin

Voltage generated by the motor at 1000 RPM (K_e initial and final)

	Expected	Measured	Unit
K_e Initial	53.3	53.0	V/kRPM
K_e Final	53.3	52.7	V/kRPM

Oriented StartUp

Parameter	Configuration	Unit
317	1	
202	10	
298	0	
296	1	
398	1	
400	380	V
401	12.5	A
431	4	Poles
402	1800	RPM
435	53	V/kRPM
404	13	
405	1024	
406	0	
407	0.83	

Segue a tradução em inglês do trecho solicitado:

Check and record the following parameters

Parameter	Configuration	Unit
100	20	s
101	20	s
133	6	Hz
134	60	Hz
135	18.7	A
136	2.0	%
142	100.0	%
143	66.7	%
144	33.3	%
145	60	Hz
146	40	Hz
147	20	Hz
156	13.7	A
157	12.5	A
158	10.4	A
470	175	%
471	0	ms

Set the Reference Speed

Parameter	Configuration	Unit
121	60.0	Hz

Registrar s formas de onda da corrente das 3 fases no osciloscópio e o Trend da corrente no WPS durante a aceleração, em regime permanente, e desaceleração.

Ín...	Vis...	Cor	Descrição	Tempo no cursor	Valor no Cursor	Valor atual	Unidade	Multiplicador	Mínimo	Máximo	Status
1	☑		Referência Velocidade	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	630.0	OK
2	☑		Velocidade de Saída	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	630.0	OK
3	☑		Corrente do Motor	31/12/1969 21:00:0...	0.0	3.0	A	0.1	0.0	3.465000000...	OK
4	☑		Tensão Barram.CC (Ud)	31/12/1969 21:00:0...	0.0	302.0	V	1.0	0.0	322.35	OK
5	☑		Frequência de Saída	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	630.0	OK
6	☑		Tensão de Saída	31/12/1969 21:00:0...	0.0	219.0	V	1.0	0.0	322.35	OK

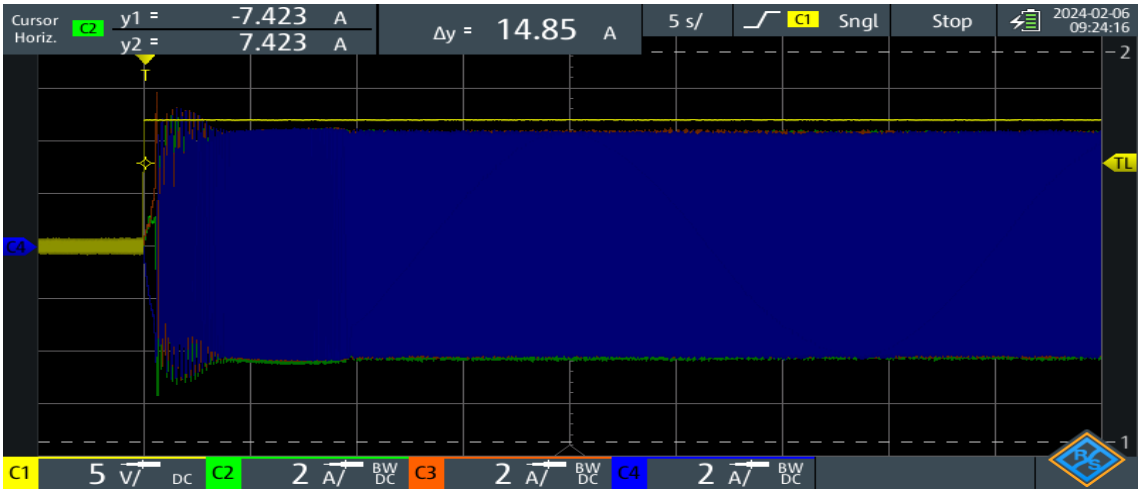


Figura 1: $P0100 = 10$ s. Acceleration and Steady State

Acceptance Criteria

[DEFINE] All parameters in item 3 must comply with the programming manual.

- Define factory setting of $P0454$.

[OK] During the tests for items 5 and 8, no failures should occur.

[OK] The voltage generated by the motor at the end of the test: K_e final $>$ 0.9 x K_e initial.

[OK] The instantaneous output current must not exceed 175% of the motor's rated current amplitude (1.75 x $P401$ x 1.41).

3.2 Test - Acceleration Ramp

1. Verify the Voltage Generated at 1000 RPM (K_e Initial and Final)

	Expected	Measured	Unit
K_e Initial	53.3		V
K_e Final	53.3		V

[2-3]. Configure $P0121$ and $P100$

Parameter	Configuration	Unit
100	[10.0-5.0-2.0]	s
121	60.0	Hz

5. Record the waveforms of the current in the 3 phases on the oscilloscope and the current trend in the WPS during acceleration.

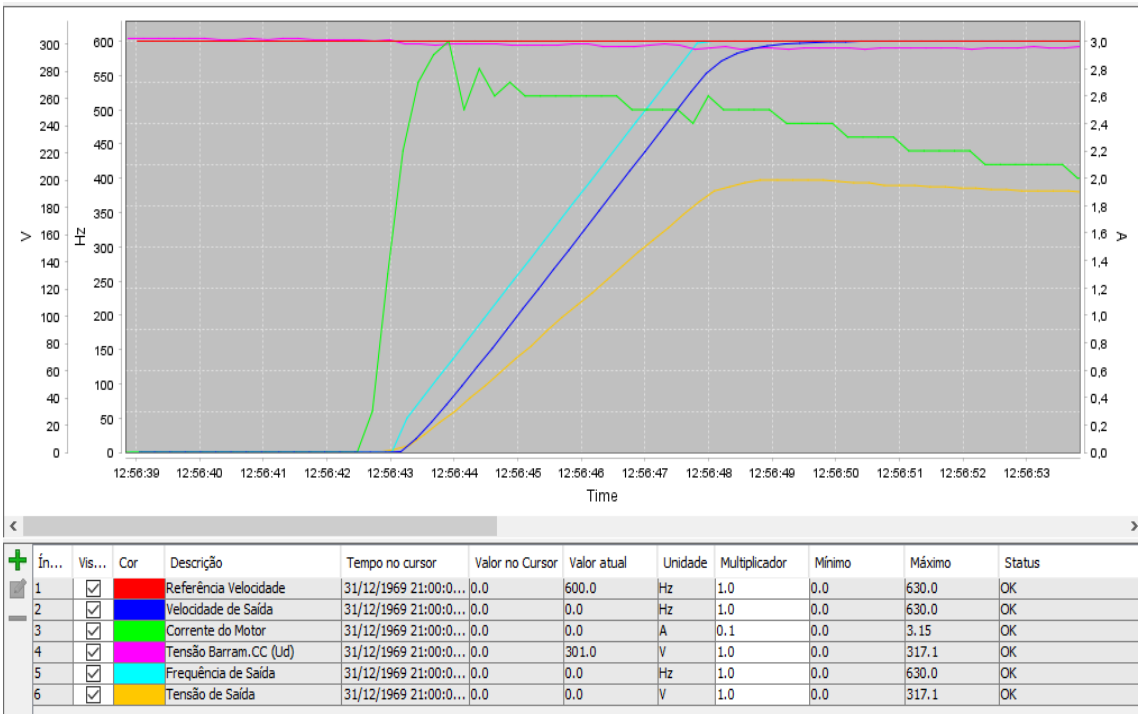
Acceptance Criteria

[OK] Fault F0073 may occur during the acceleration ramp.

- No fault occurred.

[OK] The voltage generated by the motor at the end of the test: K_e final $>$ 0.9 x K_e initial.

[OK] The instantaneous output current must not exceed 175% of the motor's nominal current amplitude (1.75 x $P401$ x 1.41).



Ín...	Vis...	Cor	Descrição	Tempo no cursor	Valor no Cursor	Valor atual	Unidade	Multiplicador	Mínimo	Máximo	Status
1	☑		Referência Velocidade	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	630.0	OK
2	☑		Velocidade de Saída	31/12/1969 21:00:0...	0.0	0.0	Hz	1.0	0.0	630.0	OK
3	☑		Corrente do Motor	31/12/1969 21:00:0...	0.0	0.0	A	0.1	0.0	3.15	OK
4	☑		Tensão Barram.CC (Ud)	31/12/1969 21:00:0...	0.0	301.0	V	1.0	0.0	317.1	OK
5	☑		Frequência de Saída	31/12/1969 21:00:0...	0.0	0.0	Hz	1.0	0.0	630.0	OK
6	☑		Tensão de Saída	31/12/1969 21:00:0...	0.0	0.0	V	1.0	0.0	317.1	OK

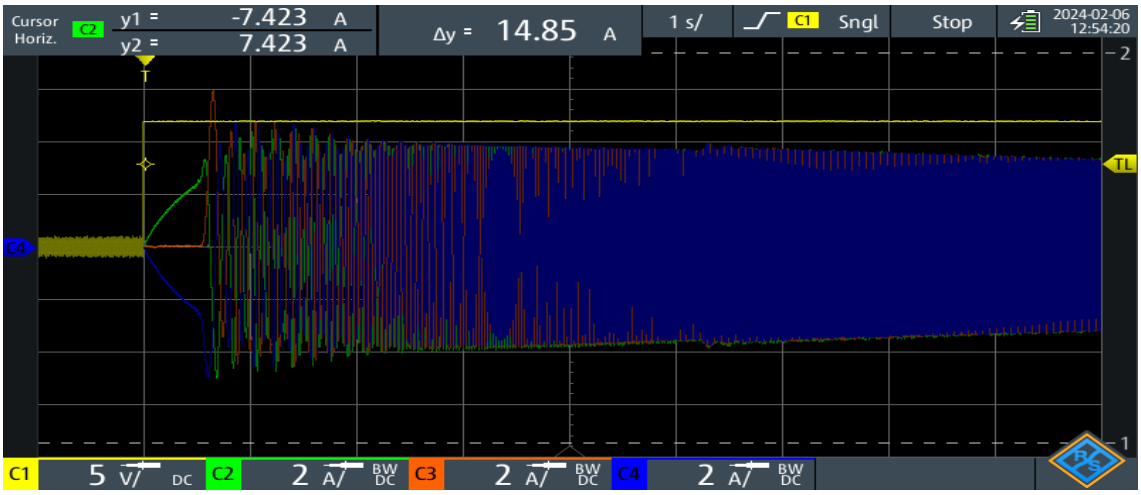
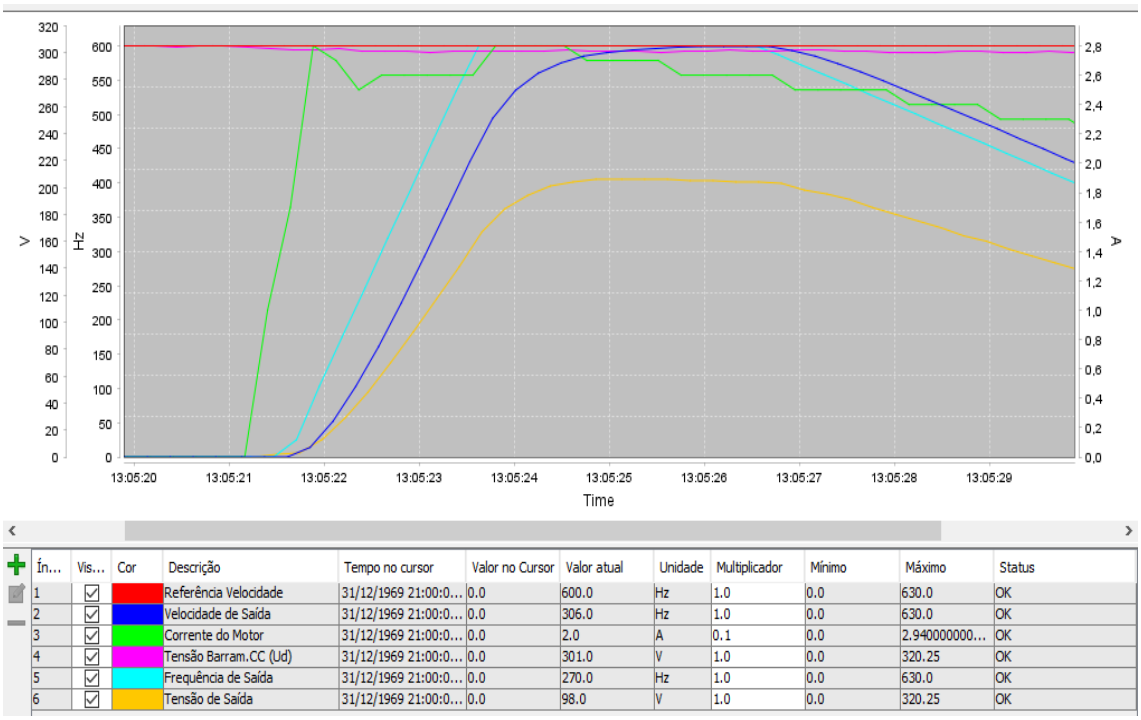


Figura 2: $P0100 = 5$ s. Acceleration

3.3 Test - Temperature Elevation

1. Verify the Voltage Generated at 1000 RPM (K_e Initial and Final)

	Expected	Measured	Unit
K_e Initial	53.3	52.5	V
K_e Final	53.3	47.5	V



Ín...	Vis...	Cor	Descrição	Tempo no cursor	Valor no Cursor	Valor atual	Unidade	Multiplicador	Mínimo	Máximo	Status
1	☑		Referência Velocidade	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	630.0	OK
2	☑		Velocidade de Saída	31/12/1969 21:00:0...	0.0	306.0	Hz	1.0	0.0	630.0	OK
3	☑		Corrente do Motor	31/12/1969 21:00:0...	0.0	2.0	A	0.1	0.0	2.940000000...	OK
4	☑		Tensão Barram.CC (Ud)	31/12/1969 21:00:0...	0.0	301.0	V	1.0	0.0	320.25	OK
5	☑		Frequência de Saída	31/12/1969 21:00:0...	0.0	270.0	Hz	1.0	0.0	630.0	OK
6	☑		Tensão de Saída	31/12/1969 21:00:0...	0.0	98.0	V	1.0	0.0	320.25	OK

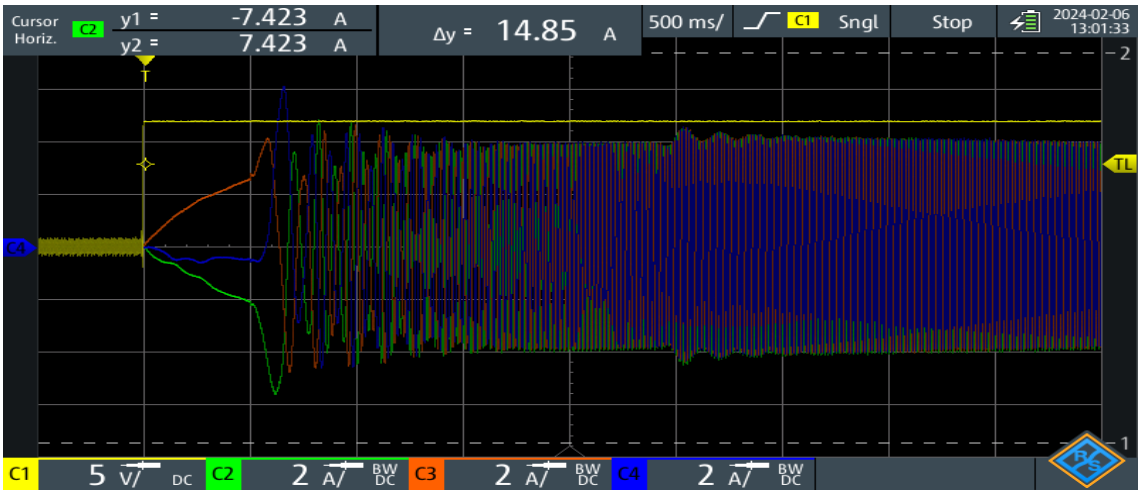


Figura 3: $P0100 = 2$ s. Acceleration

[2-3]. Configure $P0121$ and $P100$

Parameter	Configuration	Unit
100	20.0	s
121	60.0	Hz

[5-8]. Record the waveforms of the current in the 3 phases on the oscilloscope and the current Trend in the WPS.

Acceptance Criteria

[OK] No faults should occur.

[OK] The voltage generated by the motor at the end of the test: K_e final $>$ 0.85 x K_e initial.

[OK] The instantaneous output current must not exceed 175% of the motor's nominal current amplitude (1.75 x $P401$ x 1.41).

3.4 Test - Load Test

1. Verify the Voltage Generated at 1000 RPM (K_e Initial and Final)

	Expected	Measured	Unit
K_e Initial	53.3		V
K_e Final	53.3		V

[2-3]. Configure $P0121$ and $P100$

Parameter	Configuration	Unit
100	20.0	s
121	60.0	Hz

[5-7-9]. Record the waveforms of the current in the 3 phases on the oscilloscope and the current Trend in the WPS.

Acceptance Criteria

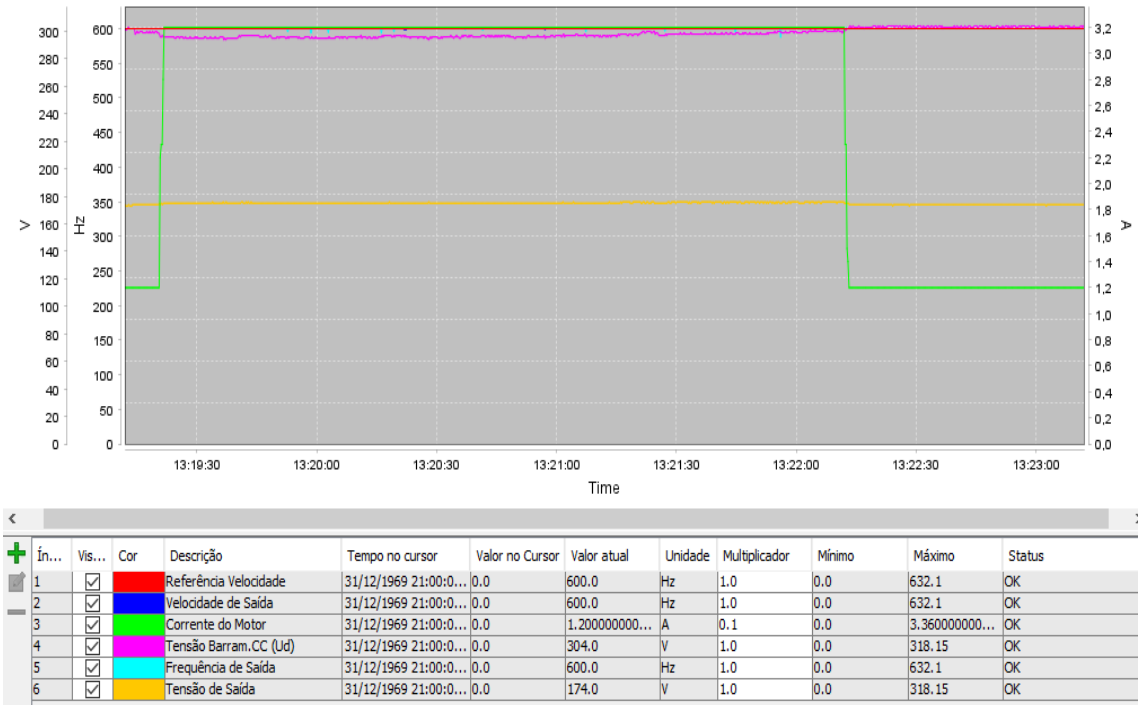
[OK] No faults should occur during the test of item 5.

[OK] Fault F0073 may occur during the tests of items 7 and 9.

- Fault F0073 occurred after surpassing the current limitation.

[OK] The voltage generated by the motor at the end of the test: K_e final $>$ 0.9 x K_e initial.

[OK] The instantaneous output current must not exceed 175% of the motor's nominal current amplitude (1.75 x $P401$ x 1.41).



Ín...	Vis...	Cor	Descrição	Tempo no cursor	Valor no Cursor	Valor atual	Unidade	Multiplicador	Mínimo	Máximo	Status
1	☑		Referência Velocidade	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	632.1	OK
2	☑		Velocidade de Saída	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	632.1	OK
3	☑		Corrente do Motor	31/12/1969 21:00:0...	0.0	1.200000000...	A	0.1	0.0	3.360000000...	OK
4	☑		Tensão Barram.CC (Ud)	31/12/1969 21:00:0...	0.0	304.0	V	1.0	0.0	318.15	OK
5	☑		Frequência de Saída	31/12/1969 21:00:0...	0.0	600.0	Hz	1.0	0.0	632.1	OK
6	☑		Tensão de Saída	31/12/1969 21:00:0...	0.0	174.0	V	1.0	0.0	318.15	OK

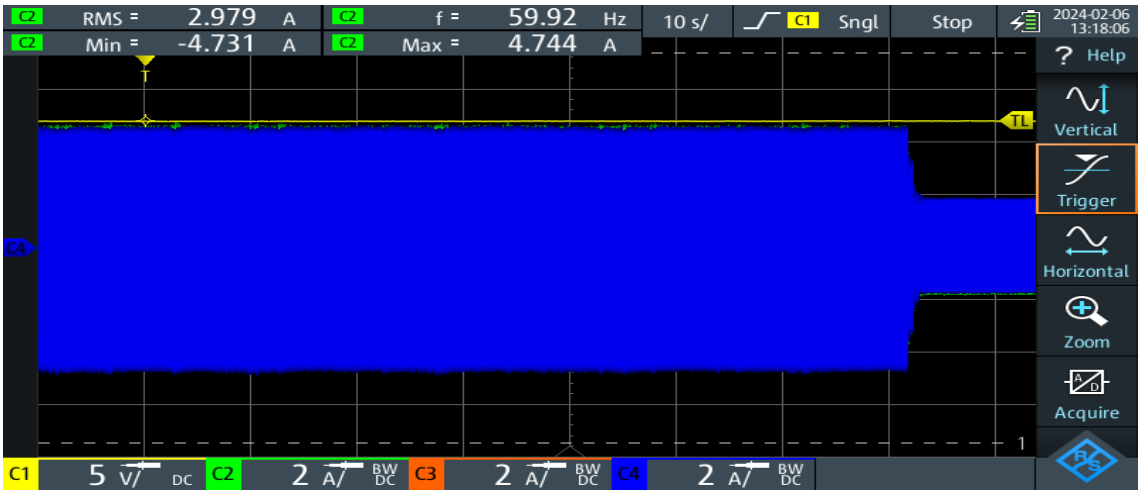
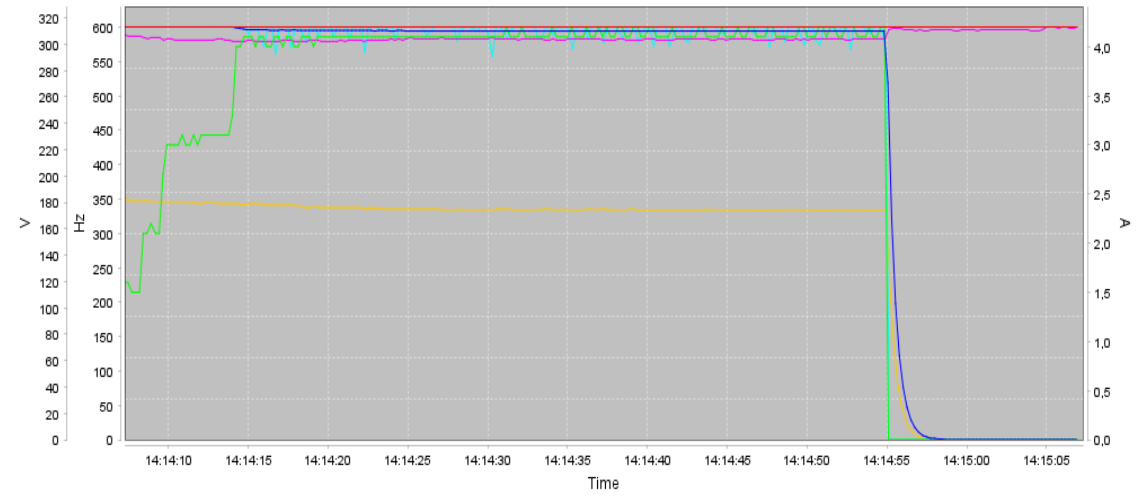


Figura 4: Nominal Load

3.5 Test - One Phase Disconnected from the Motor

1. Verify the Voltage Generated at 1000 RPM (K_e Initial and Final)

	Expected	Measured	Unit
K_e Initial	53.3		V
K_e Final	53.3		V



Ín...	Vis...	Cor	Descrição	Tempo no cursor	Valor no Cursor	Valor atual	Unidade	Multiplicador	Mínimo	Máximo	Status
1	☑		Referência Velocidade	06/2/2024 13:59:46...	0.0	600.0	Hz	1.0	0.0	630.0	OK
2	☑		Velocidade de Saída	06/2/2024 13:59:46...	0.0	0.0	Hz	1.0	0.0	630.0	OK
3	☑		Corrente do Motor	06/2/2024 13:59:46...	0.0	0.0	A	0.1	0.0	4.41	OK
4	☑		Tensão Barram.CC (Ud)	06/2/2024 13:59:46...	0.0	313.0	V	1.0	0.0	328.65	OK
5	☑		Frequência de Saída	06/2/2024 13:59:46...	0.0	0.0	Hz	1.0	0.0	630.0	OK
6	☑		Tensão de Saída	06/2/2024 13:59:46...	0.0	0.0	V	1.0	0.0	328.65	OK

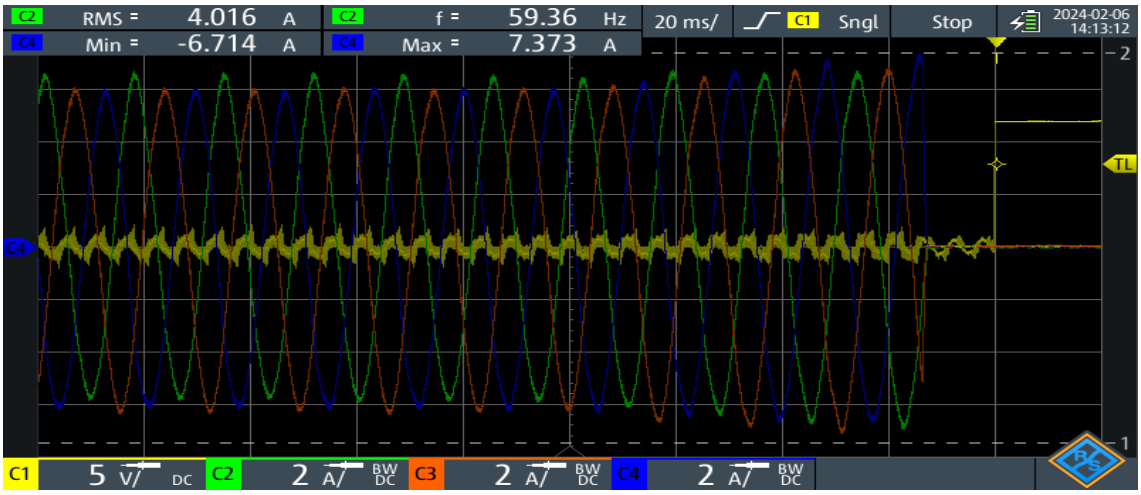


Figura 5: 150% of Nominal Load

[3-4]. Configure *P*0121 **and** *P*100

Parameter	Configuration	Unit
100	20.0	s
121	60.0	Hz

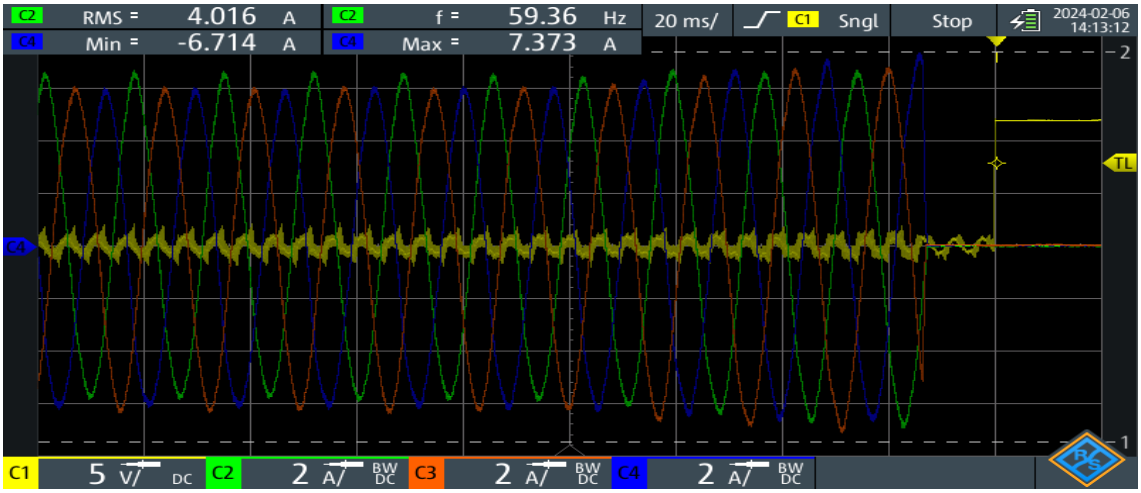


Figura 6: Phase U Current Disconnected

[2-8-10]. Record the waveforms of the current in the 3 phases on the oscilloscope and the current Trend in the WPS.

Acceptance Criteria

[OK] Fault F0073 or Fault F0076 must occur during the startup.

[OK] The voltage generated by the motor at the end of the test: K_e final $>$ 0.9 x K_e initial.

[OK] The instantaneous output current must not exceed 175% of the motor's nominal current amplitude (1.75 x $P401$ x 1.41).

4 Notes

5 Conclusion