TwinCAT Motion Designer Report

BECKHOFF

Project name: TwinCAT Motion Designer Project2

Customer

Company:
Name:
Department:
Street:
City:
Country:
Telephone:
Email:

Application engineer

Company:
Name:
Department:
Street:
City:
Country:
Telephone:
Email:

Project description

TwinCAT Motion Designer Project2

Exclusion

The interpretation of data contained in the report for servo axes is based on the basis data provided by you. Please check if these data are and were complete and correct before taking over of the results. The data have been entered in good faith into our software. For erroneous interpretations which are based on an incorrect or incomplete data base and subsequent product recommendations we cannot accept any liability. The calculated design of servo axes represents a non-binding recommendation. You are obliged to check whether the recommended design is suitable for your intended use.

Content

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DC link: DC link 1

Axis: Axis 1

Order code	qty	Product description
AX8108-0x00-0000	1	One Axis Module 8A, OCT
Motor-gearbox-combination		The following both positions will be mounted at Beckhoff and delivered as one unit.
AM8032-xExx-0000	1	Servomotor, 400 V AC (max. 480 V AC), M_0 = 2.37 Nm, I_0 = 2.95 A, n_n = 6000 min-1
AG2300-+SP060S-MF1-3-xC1-AM803x	1	Planetary gear unit, M_n = 17.00 Nm, M_b = 30.00 Nm, Backlash ≤ 4.00 arcmin, i = 3

DC link: DC link 1

- The needed effective infeed power (155.38 W) is bigger than the possible nominal infeed power (0.00 W) of the DC link.
- The needed peak infeed power (625.98 W) is bigger than the possible peak infeed power (0.00 W) of the DC link.

Axis: Axis 1

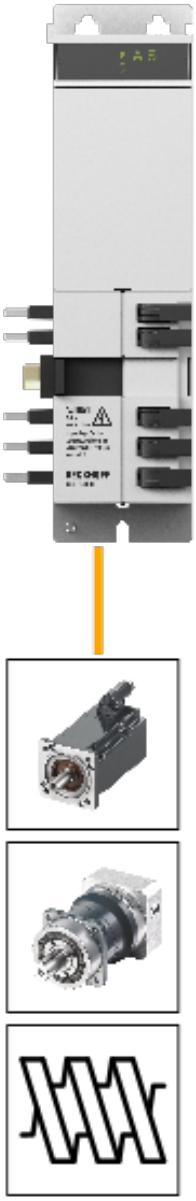
- Motor 'AM8032-xExx-0000' is not completely configured.
- Gearbox 'AG2300-+SP060S-MF1-3-xC1-AM803x' is not completely configured.
- Drive 'AX8108-0x00-0000' is not completely configured.
- No Motor cable selected for the connection of Drive 'AX8108-0x00-0000' and Motor 'AM8032-xExx-0000'.

DC link: DC link 1

Power supply type:	400 V, 3 phase
Chopper threshold	840 V

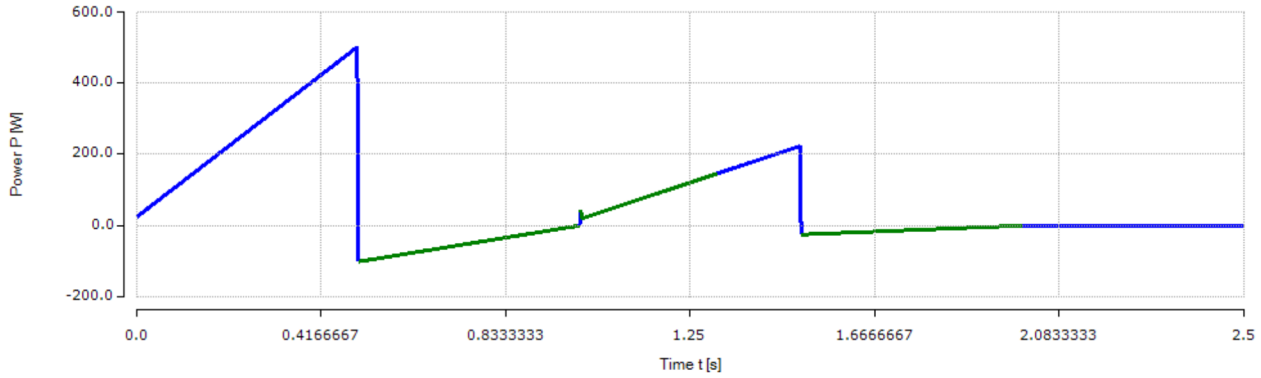
Drive: AX8108-0x00-0000

Axis: Axis 1	
Motor	AM8032-xExx-0000
Overall gear ratio	1*3 ≈ 3
Feed constant	1/(1*3)*(0.01*1000) ≈ 3.33333333333333 mm/rev
Max inertia	0,000324 kgm² = 3,24 kgcm²
Mean inertia	0,000324 kgm² = 3,24 kgcm²
Max speed	0,2 m/s = 200 mm/s
Max acceleration	0,4 m/s² = 400 mm/s²
Max jerk	∞ m/s³

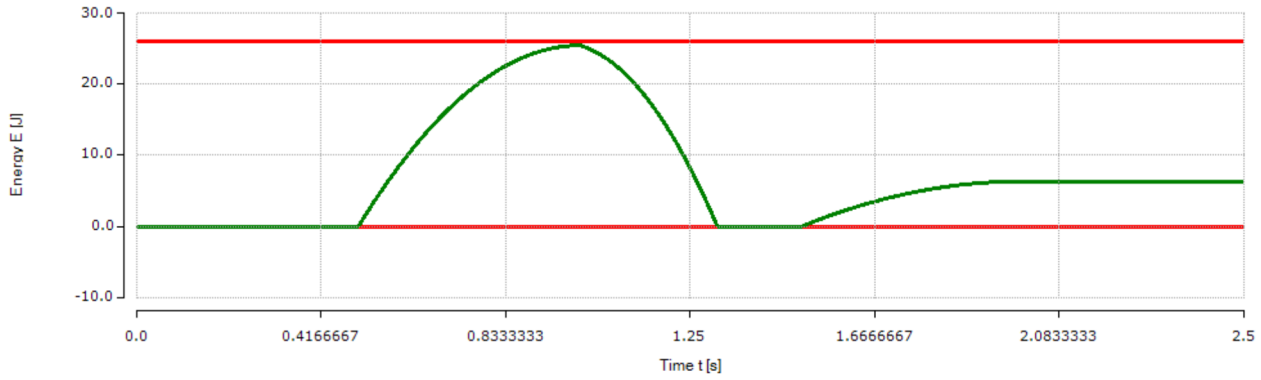


Power supply type: 400 V, 3 phase

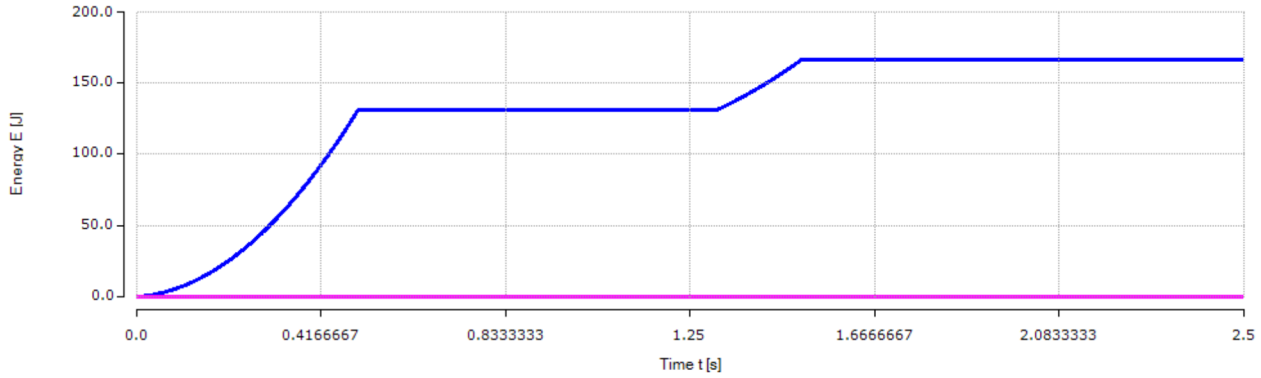
4.1. DC link power: DC link 1



Infeed module Capacitance



Boundaries capacitive energy Capacitive energy

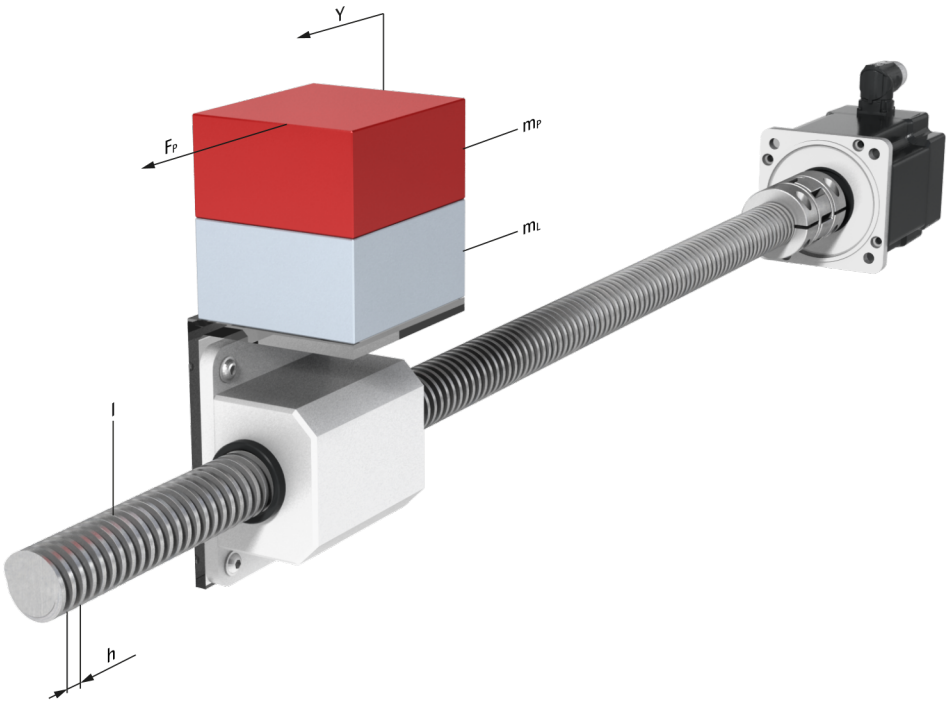


Infeed energy Bleeder energy

Nominal data	
Effective infeed power	0 W
Maximal infeed power	0 W
Effective braking power	0 W
Maximal braking power	0 W
Max. braking power w.r.t. duty cycle	0 W
Capacitance	135 µF
Storable energy	26 J

Application data	
Effective needed infeed power	66,5 W
Maximal needed infeed power	501 W
Infeed energy	166 J
Effective needed braking power	0 W
Maximal needed braking power	0 W
Brake resistance duty cycle	0
Brake energy	0 J

4.2. Axis: Axis 1



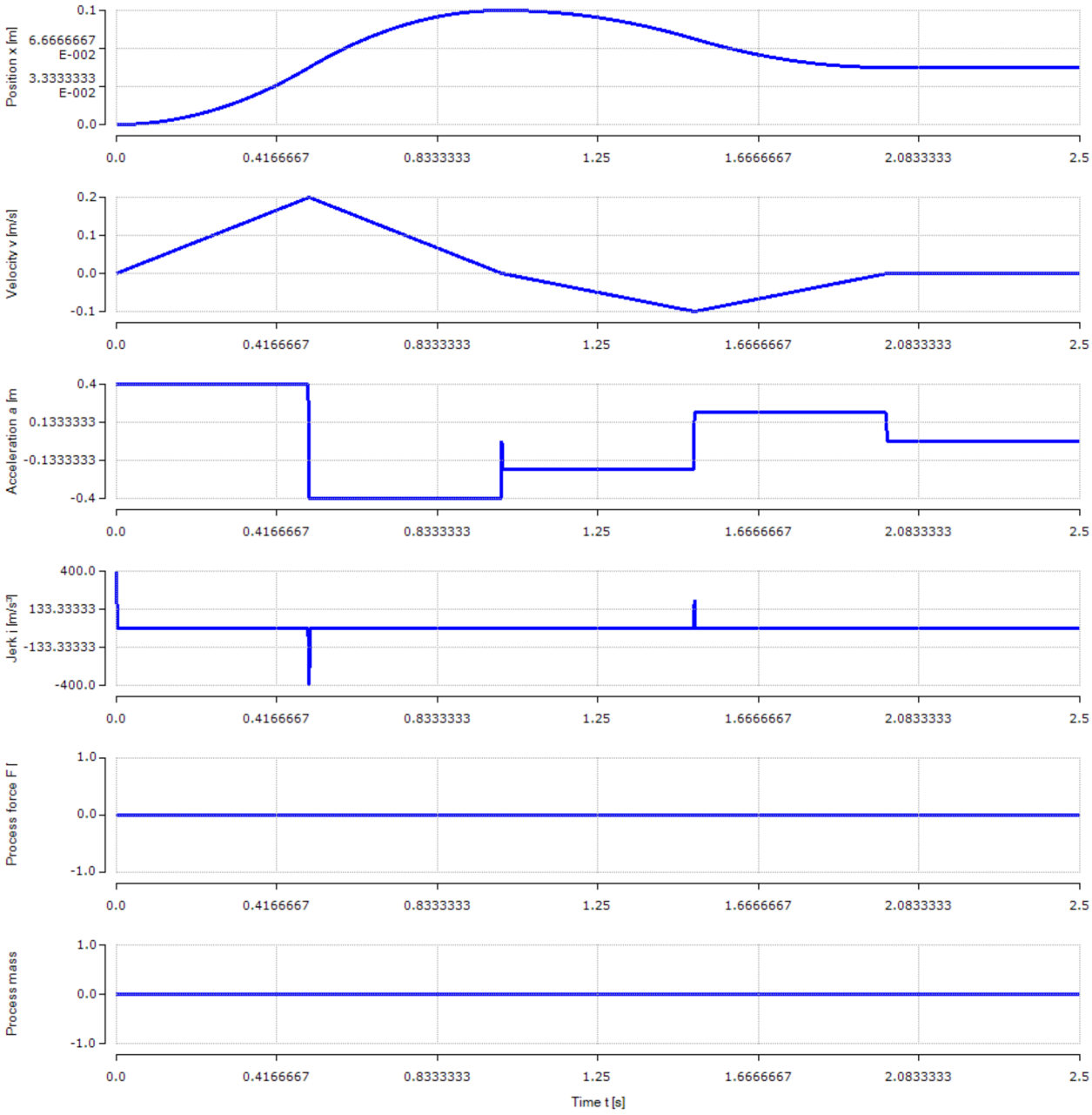
Mechanical data		
Thread lead	[h]	10 mm
Load mass	[m_L]	1000 kg
Efficiency	[η]	85 %

Mechanical data		
Inertia spindle	[I]	1,32 kgcm²
Friction coefficient	[μ]	0
Idle torque	[T_{idle}]	0,05 Nm

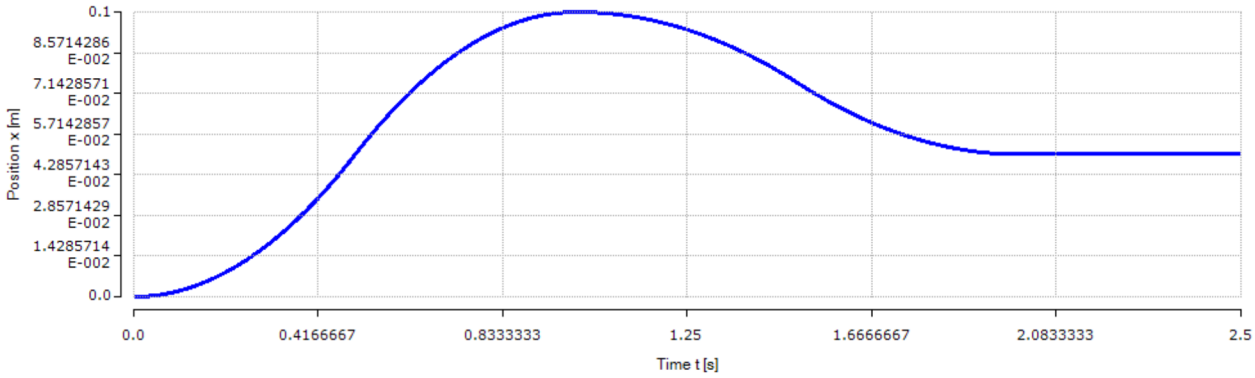
Application data		
Effective torque	[T_{eff}]	0,51 Nm
Mean speed	[ω_{avg}]	360 rpm
Mean power	[P_{eff}]	22,2 W
Mean inertia	[I_{eff}]	2,67 gm²

Application data		
Max torque	[T_{max}]	0,838 Nm
Max speed	[ω_{max}]	1200 rpm
Max power	[P_{max}]	105 W
Max inertia	[I_{max}]	2,67 gm²

4.2.1. Motion profile: Axis 1



4.2.1. Motion profile: Axis 1



1. Section: Motion section (Half rule)

Input parameter	
Positioning mode	Relative
Duration	1 s

Input parameter	
Position	100 mm

Resulting values	
Starting position	0 m
Max speed	200 mm/s
Max jerk	∞ m/s³

Resulting values	
Distance	100 mm
Max acceleration	400 mm/s²
Duration	1 s

2. Section: Motion section (Half rule)

Input parameter	
Positioning mode	Relative
Duration	1 s

Input parameter	
Position	-50 mm

Resulting values	
Starting position	100 mm
Max speed	100 mm/s
Max jerk	∞ m/s³

Resulting values	
Distance	-50 mm
Max acceleration	200 mm/s²
Duration	1 s

3. Section: Motion section (Half rule)

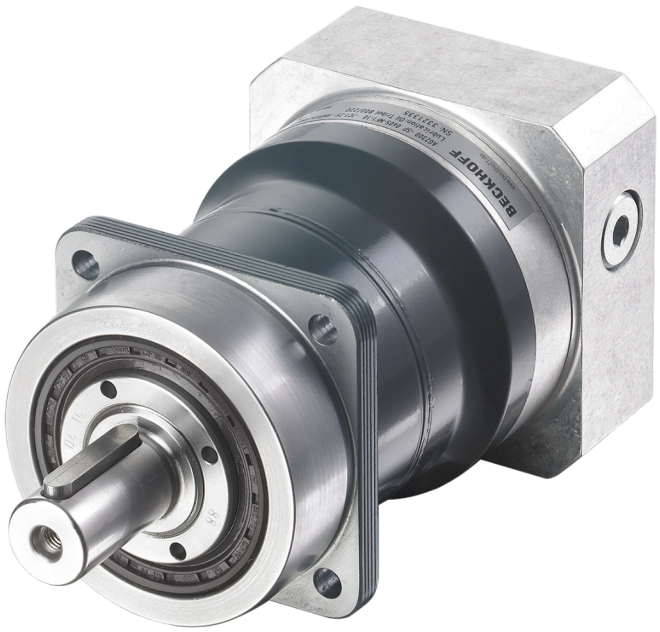
Input parameter	
Positioning mode	Relative
Duration	0,5 s

Input parameter	
Position	0 mm

Resulting values	
Starting position	50 mm
Max speed	0 m/s
Max jerk	∞ m/s³

Resulting values	
Distance	0 m
Max acceleration	0 m/s²
Duration	500 ms

4.2.2. Gearbox



AG2300-+SP060S-MF1-3-xC1-AM803x
Planetary gear unit, M_n = 17.00 Nm, M_b = 30.00 Nm, Backlash ≤ 4.00 arcmin, i = 3
Please note: the axial and radial load on the shaft is not considered.

Nominal data		
Protection class		IP 65
Number of stages	[Z]	1
Nominal output torque	[T_{2n}]	17 Nm
Emergency output torque	[T_{2emerg}]	80 Nm
Motor side inertia	[I_1]	280 gcm²
Maximal motor side speed	[ω_{1max}]	6000 rpm

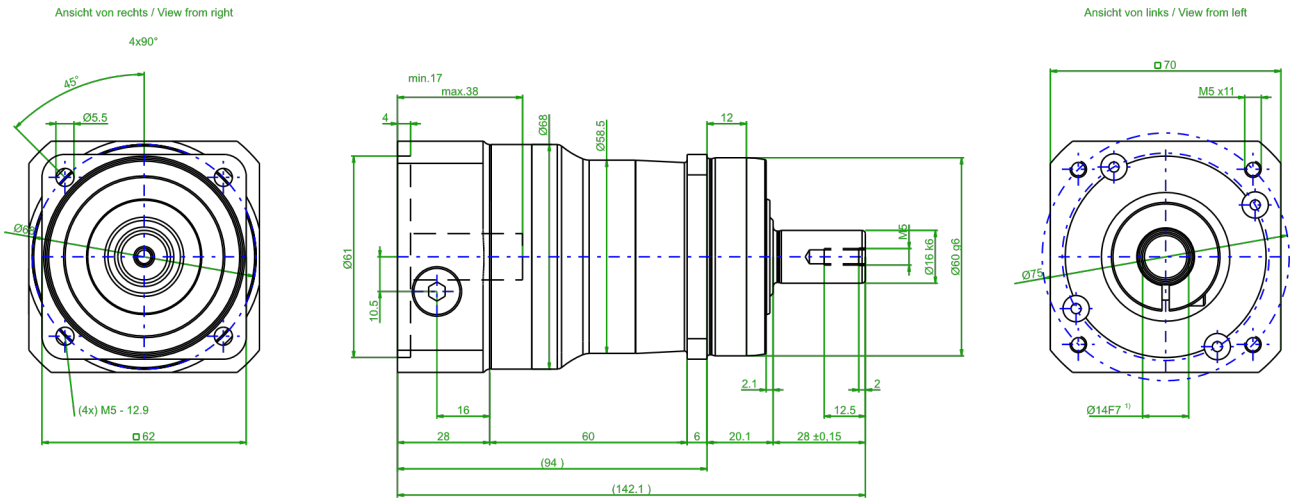
Nominal data		
Gear ratio	[i]	3
Efficiency	[η]	97 %
Maximal output torque	[T_{2max}]	30 Nm
Idle torque	[T_{012}]	0,9 Nm
Nominal motor side speed	[ω_{1nom}]	3300 rpm
Mass	[m]	1,9 kg

Application data		
Effective torque load side	[T_{eff}]	0,51 Nm
Mean speed	[ω_{avg}]	1080 rpm
Mean power	[P_{avg}]	75 W

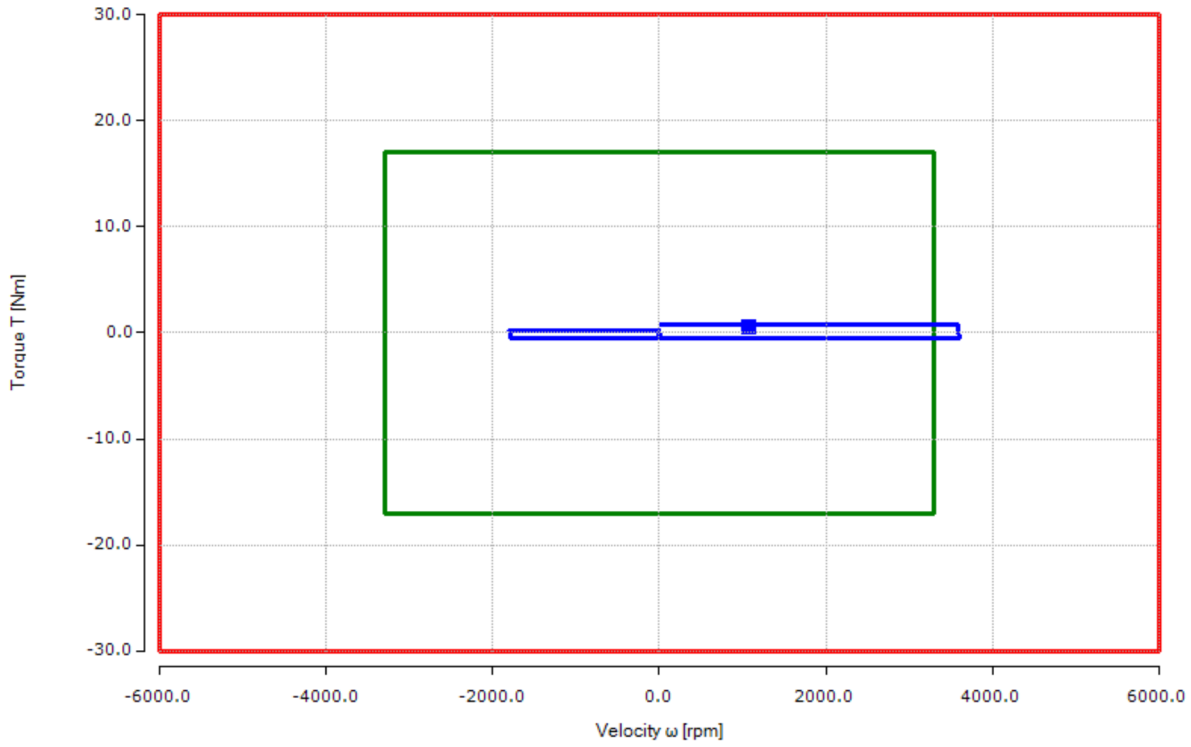
Application data		
Max torque load side	[T_{max}]	0,838 Nm
Max speed	[ω_{max}]	3600 rpm
Max power	[P_{max}]	454 W

Documentation
http://download.beckhoff.com/download/document/motion/ag2300_ba_en.pdf
Step model
http://download.beckhoff.com/download/technical_drawings/Drive_Technology/step/ag2300/ag2300-sp060s-mf1-i-1c1-f3.zip

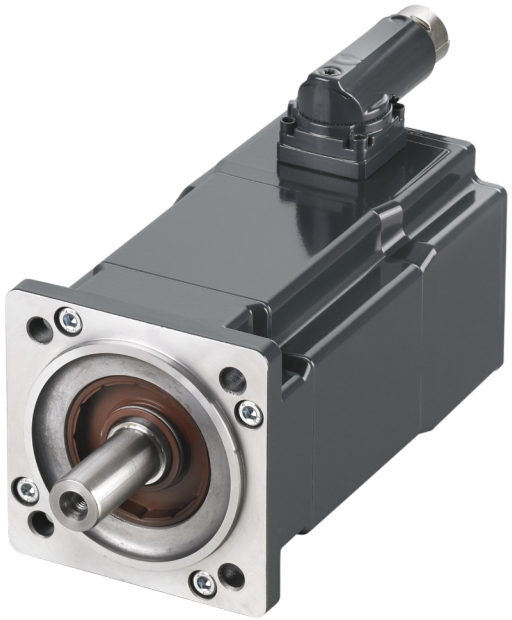
4.2.2. Gearbox



Dimension without tolerance ± 1 mm



- Maximal limit curve
- Nominal limit curve
- Application curve
- Effective application point



AM8032-xExx-0000
Servomotor, 400 V AC (max. 480 V AC), M_0 = 2.37 Nm, I_0 = 2.95 A, n_n = 6000 min-1
Please note: the axial and radial load on the shaft is not considered.

Nominal data		
Protection class without sealing ring		IP 54
Standstill torque	[T_0]	2,37 Nm
Rated torque @ 115 V AC	[T_{n115}]	2,34 Nm
Rated torque @ 230 V AC	[T_{n230}]	2,28 Nm
Rated torque @ 400 V AC	[T_{n400}]	2,2 Nm
Rated torque @ 480 V AC	[T_{n480}]	2,1 Nm
Standstill current	[I_0]	2,95 A
Torque constant	[K_e]	0,803 Nm/A
Number of pole pairs	[n_p]	4
Motor length without brake	[Y]	154 mm
Inertia with brake	[I]	921 gcm²
Motor mass with brake	[m]	2,8 kg

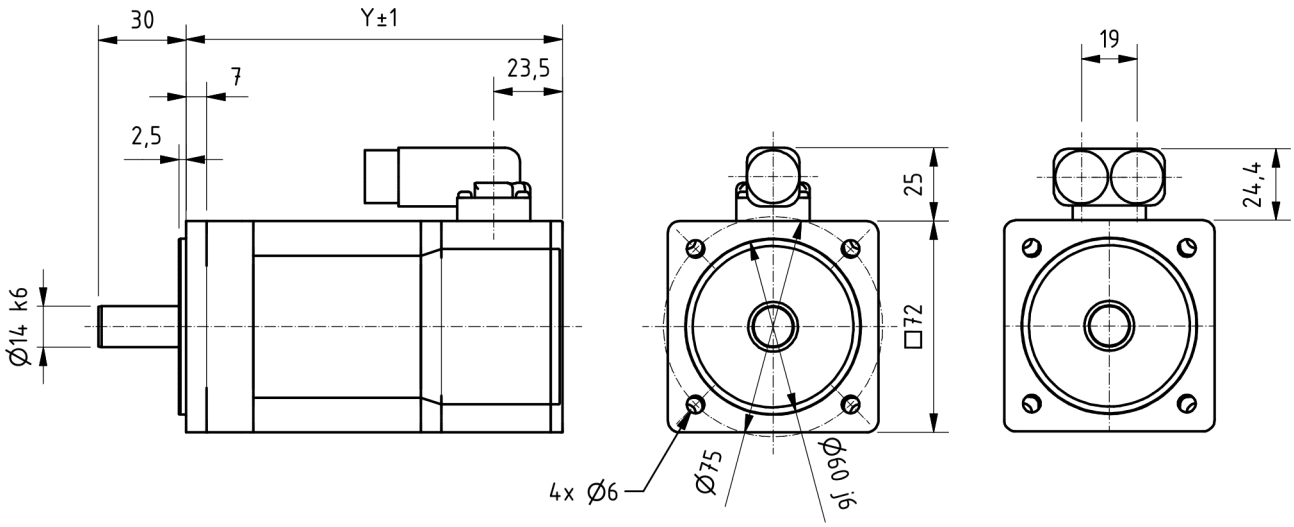
Nominal data		
Protection class with sealing ring		IP 65
Max torque	[T_{max}]	11,7 Nm
Rated speed @ 115 V AC	[ω_{n115}]	1400 rpm
Rated speed @ 230 V AC	[ω_{n230}]	3200 rpm
Rated speed @ 400 V AC	[ω_{n400}]	6000 rpm
Rated speed @ 480 V AC	[ω_{n480}]	6800 rpm
Peak current	[I_{max}]	17,2 A
Voltage constant	[K_v]	56 mV/rpm
Inertia without brake	[I]	842 gcm²
Motor mass without brake	[m]	2,4 kg
Motor length with brake	[Y]	194 mm
Holding brake torque	[T_{brake}]	2 Nm

Application data		
Effective torque	[T_{eff}]	0,761 Nm
Mean speed	[ω_{avg}]	1080 rpm
Mean power	[P_{avg}]	89,4 W
Mean inertia ratio	[λ_{avg}]	3,85

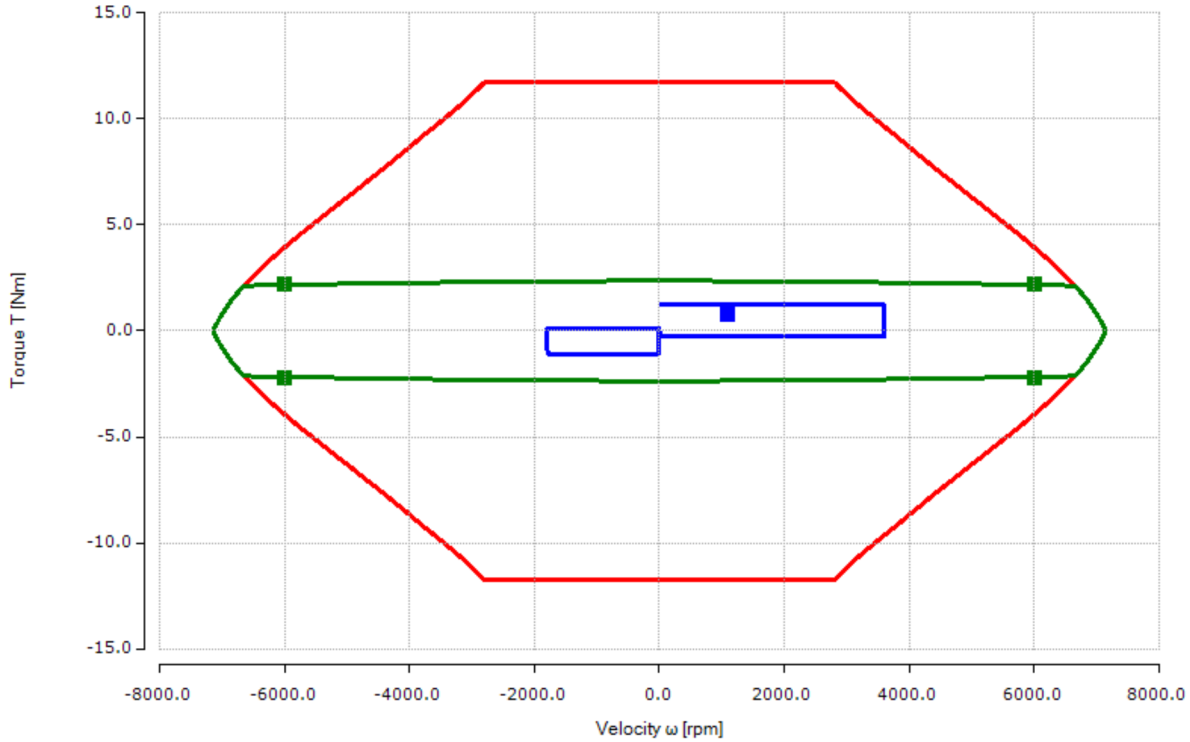
Application data		
Max torque	[T_{max}]	1,27 Nm
Max speed	[ω_{max}]	3600 rpm
Max power	[P_{max}]	501 W
Max inertia ratio	[λ_{max}]	3,85

Documentation
http://download.beckhoff.com/download/document/motion/am8000_am8500_ba_en.pdf
Step model
http://download.beckhoff.com/download/technical_drawings/Drive_Technology/step/AM80xx/AM8032-xx00_STP.zip

4.2.3. Motor



general tolerances according to DIN ISO 2768 mK



- Voltage boundary curve @ 400 V AC
- S1 characteristic curve
- Nominal point @ 400 V AC
- Application curve
- Effective application point

4.2.4. Drive

AX8108-0x00-0000
One Axis Module 8A, OCT

Nominal data	
Number of channels	1
Channel peak current	20 A

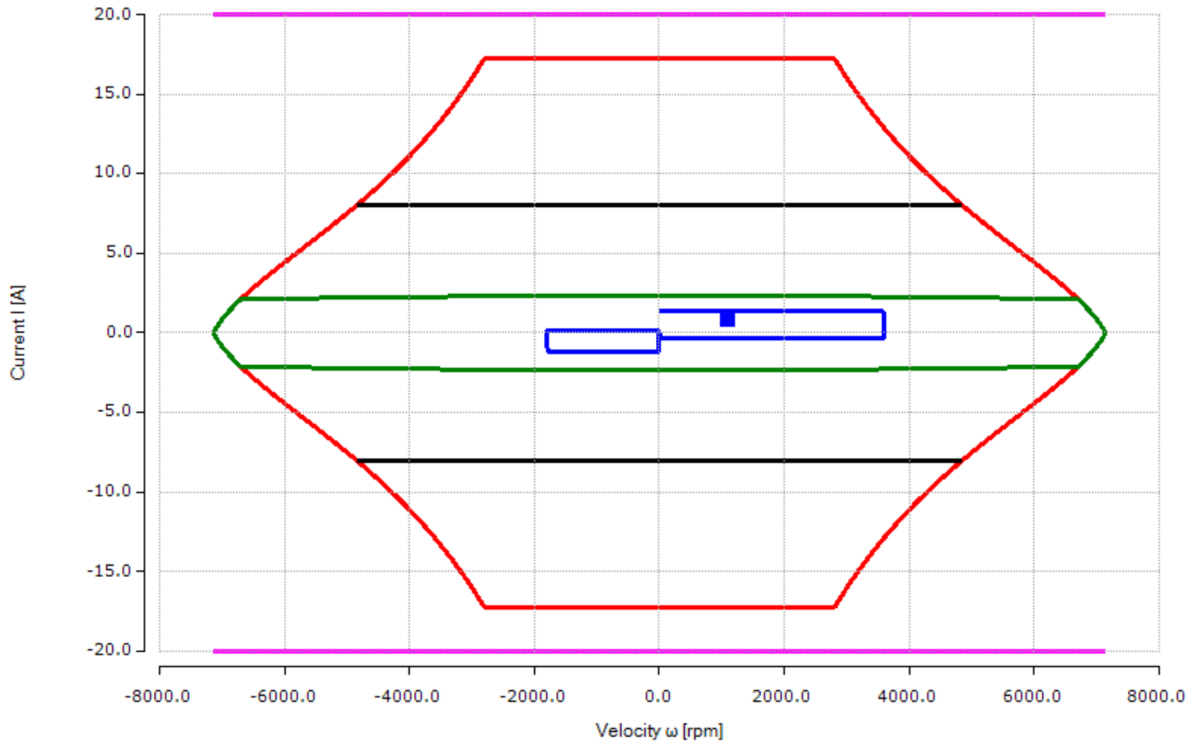
Nominal data	
Channel nominal current	8 A
Capacitance	135 µF

Application data		
Device nominal current	[ω_{d_eff}]	947 mA
Device average power	[P_{d_avg}]	89,4 W

Application data		
Device peak current	[ω_{d_max}]	1,58 A
Device peak power	[P_{d_max}]	501 W

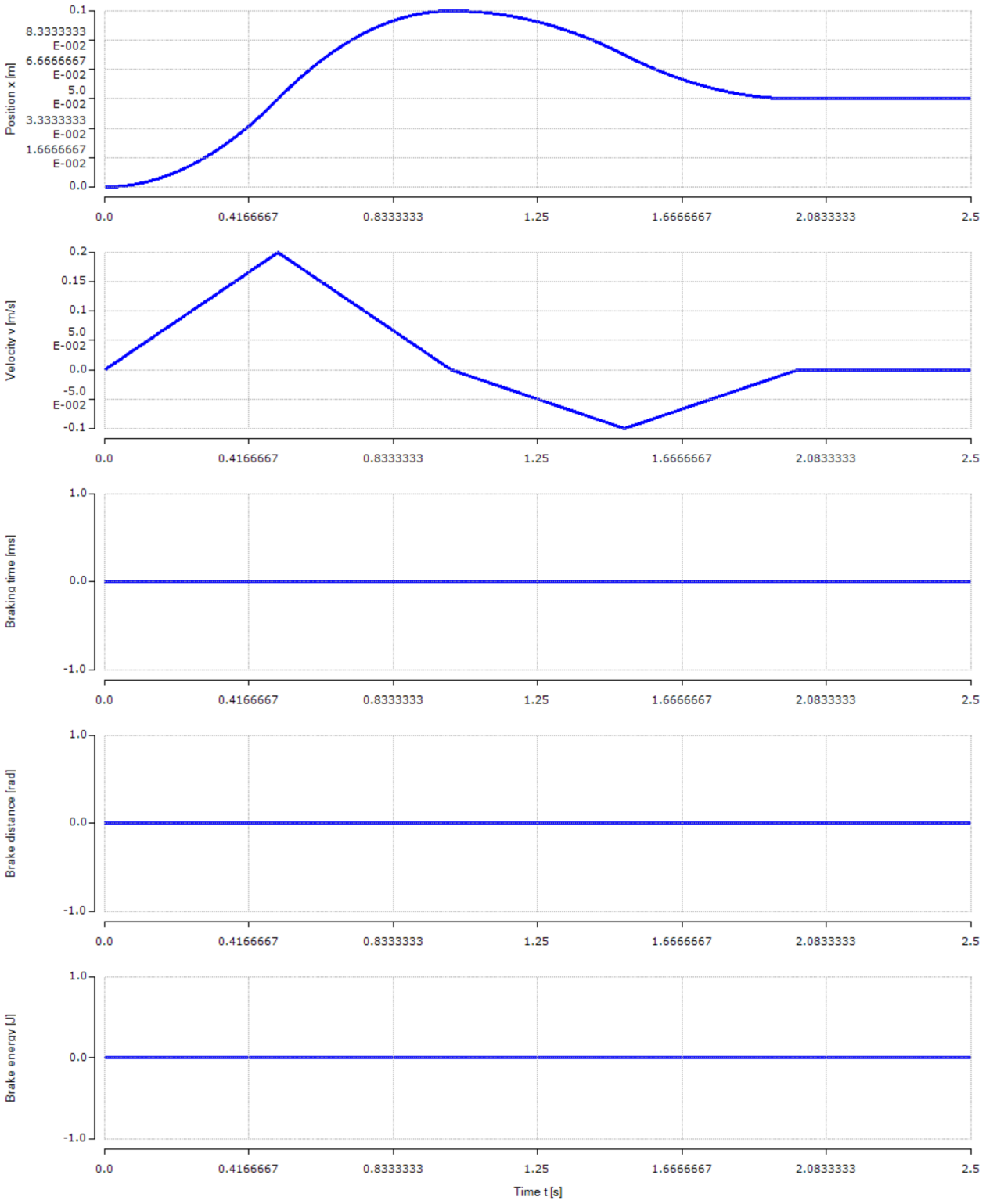
Documentation
http://download.beckhoff.com/download/document/motion/AX8000_Startup_en.pdf
Step model
http://download.beckhoff.com/download/Technical_Drawings/Drive_Technology/step/AX8000/ax8108_ax8118_ax8206_stp.zip
EPLAN Macros
http://www.beckhoff.de/default.asp?forms/eplan_macros/default.aspx?lg=de

4.2.4. Drive



- Voltage boundary curve
- Drive peak current
- S1 characteristic curve motor
- Application curve
- Drive nominal current
- Effective application point

4.2.5. Emergency brake investigation: Axis 1



– Emergency brake

Resulting values		
Emergency braking torque	[T_b]	0 Nm
Maximal braking distance load shaft	[θ_{bShaft}]	0 °
Braking time	[t_b]	0 s

Resulting values		
Maximal braking distance load	[x_b]	0 m
Maximal braking distance motor	[θ_{bMot}]	0 °
Maximal braking energy	[E_b]	0 J