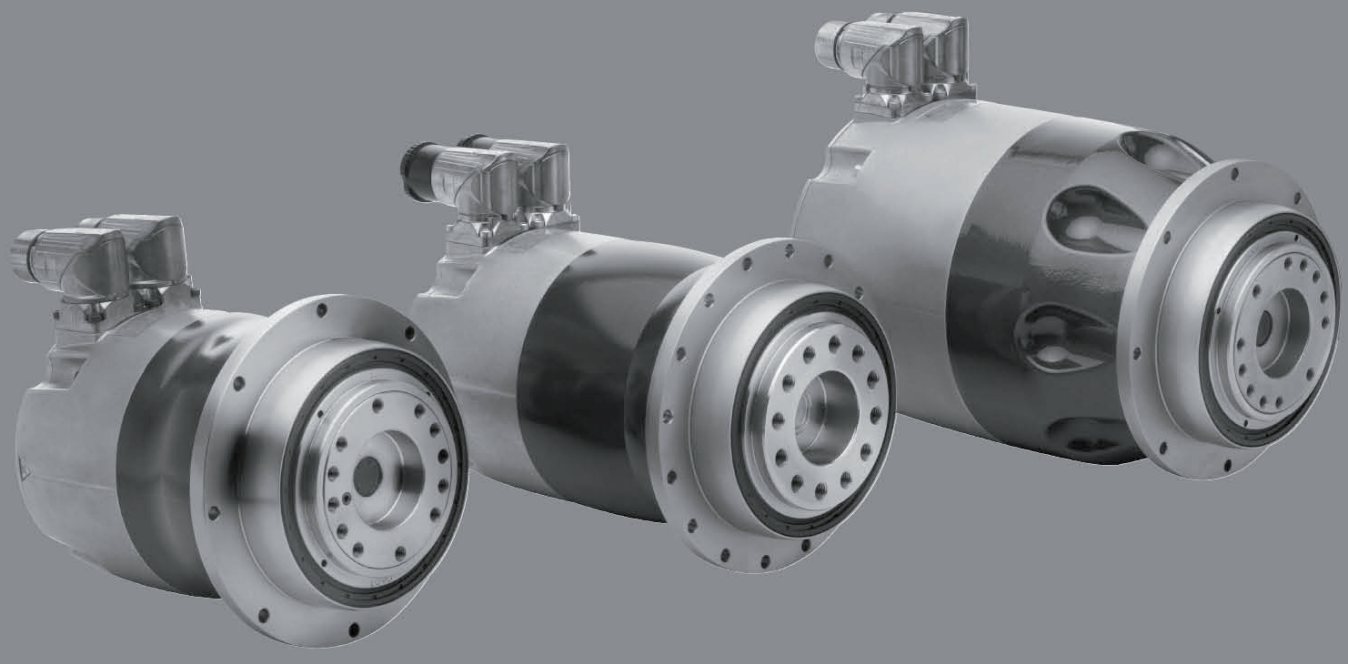
WITTENSTEIN | alpha

TPM+

Control Techniques UNIDRIVE SP

Quick Startup Guide



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Revision history

Revision	Date	Comment	Chapter
01	27th July 2012	First release	All
02	27th March 2017	Transition to Wittenstein alpha	All

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1 General Information

1.1 Description, designations

The AC servo actuator **TPM+** (hereafter referred to as servo actuator) is a combination of a low-backlash planetary gearhead and an AC servo motor.
The following manual contains the following points:

- Safety Instructions
- Parameter lists for the **TPM+** series
- Connection schematic for **TPM+**

1.2 Whom does this manual concern?

This manual concerns all persons who install, operate, or maintain this servo actuator.
They may only carry out work on the servo actuator, if they have read and understood this operating manual. Please pass the safety instructions on to other persons as well.

1.3 Which signs and symbols are referred to in this manual?

➲ An “action instruction”, which requires you to carry out an action.

∇ With a “check” you can specify whether the device is ready for the next work stage.

☺ A “usage tip” shows you an option of facilitating or improving operations.

The safety instructions symbols are described in section 2 “Safety”.

1.4 Exclusion of liability

WITTENSTEIN alpha is not liable for damages or injury caused by:

- Improper utilization of the servo actuator and the servo amplifier or
- Incorrect setting of operating parameters.

1.5 EC low-voltage directive / EMC regulations

The servo actuator has been constructed in accordance with EC directive 73/23/EEC. During installation and connection of the electrical components, the relevant regulations have to be observed (for example wire cross sections, fuse protection, etc.). Meeting all requirements for the entire system is the responsibility of the system's manufacturer.
You may only operate the equipment if you comply to the national EMC regulations (refer to the servo amplifier documentation for installation information pertaining to EMC) as they are defined for the given application.

1.6 Copyright

2 Safety

2.1 Intended use

The servo actuator is designed for industrial applications. Its purpose is to drive machines. Please refer to our catalogue or our Internet page for the maximum permitted speeds and torques: www.wittenstein-alpha.de

➲ Please consult our technical service if your servo actuator is more than a year old. In this way you receive valid data.

➲ Please be sure to read the documentation provided by the manufacturer of the servo actuator.

2.2 Improper use

Any use transgressing the above-named restrictions (especially higher torques and speeds) is not compliant with the regulations, and is thus prohibited.
The operation of the servo actuator is prohibited if:

- It was not installed according to regulations (for example fastening bolts).
- The servo actuator is very dirty, damaged or blocked.
- It is operated without lubricant.
- The cables are damaged or improperly connected.
- The operating parameters have not been set properly.

2.3 Safety Instructions

The following symbols are used in this manual to warn you of hazards:

DANGER!
This symbol warns you of danger of injury to yourself and others.

Attention
This symbol warns you of the risk of damage to the servo actuator.

Environment
This symbol warns of environmental pollution risk.

2.3.1 General safety instructions

Working on the servo actuator

DANGER!
Improperly executed work can lead to injury and damage.

➲ Always ensure that the servo actuator is only installed, maintained, and dismantled by trained technicians.

DANGER!

Current-flow through the body or arcing can lead to grave injury and death.

➲ Only perform tasks on the electrical system if you are:

- A trained electrician.
- A person trained in electro-technology, working under the supervision of a specialist electrician.

➲ Always adhere to the five safety rules for the de-energised state:

- De-energise.
- Secure against being turned on (for example by locking it).
- Ensure that de-energised state exists.
- Attach ground line and short-circuit the equipment.
- Cover and safeguard any live parts in the immediate vicinity.

DANGER!

Impurities spinning through the air can cause grave injury.

➲ Before putting the servo actuator into operation, check that there are no impurities or tools near it.

Maintenance

DANGER!

An unintentional start of the machine during maintenance work can lead to serious accidents.

➲ Ensure that no one can start the machine while you are working on it.

DANGER!

Even only briefly running the machine during maintenance work can lead to accidents if the safety devices are not operating.

➲ Check that all safety devices have been mounted and are activated.

Wiring

DANGER!

Incorrect wiring can lead to injuries and damage.

➲ Only use power and signal cables recommended by WITTENSTEIN alpha.

➲ Do not cut off power and signal cables, and do not insert extensions.

➲ Make sure that the U-U, V-V and W-W motor phases are correctly connected.

➲ Make sure that the motor encoder interface of the servo controller is compatible to the servo actuator.

➲ Observe the prescribed voltage for the brakes (usually 24 V DC) and the polarity.

3 Type plate information – identification

➲ The technical specifications can be found on your servo actuator's type plate according to the following scheme.

3.1 Identification plate, designation

The following specifications can be found on the identification plate:

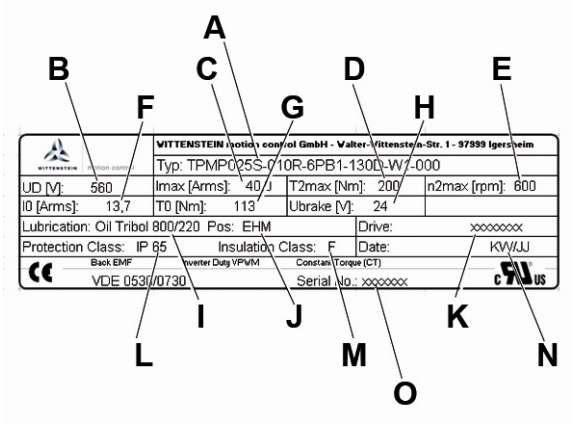
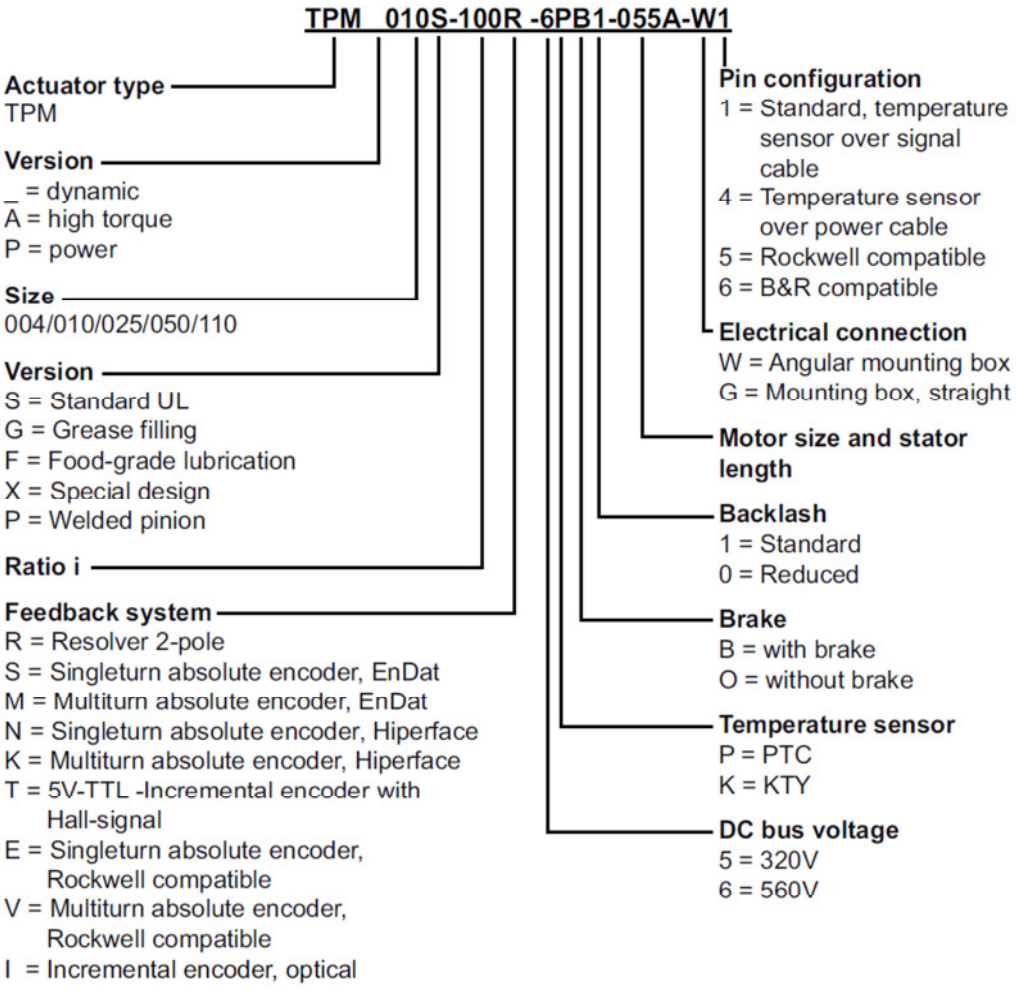


Bild 4.2

A	Ordering code
B	DC-Bus voltage
C	Maximum current
D	Maximum torque at gear output
E	Maximum gear output speed
F	Continuous stall current
G	Continuous stall torque at gear output
H	Brake voltage
I	Lubricant
J	Mounting position
K	For use with drive
L	Type of protection
M	Insulation class
N	Manufacturing date
O	Serial number



4 Setting the parameters

The tables in chapter 4 contain all of the parameters that are required for the initial start-up of a **TPM+** servo actuator from WITTENSTEIN alpha at a servo drive **Control Techniques Unidrive SP**.
When the servo actuator and the servo drive are properly connected, these parameters guarantee that the servo actuator can be operated at idle with speed control.
Based on these default settings, you can optimize the dynamics of the speed controller depending on the application.

Follow the details of the type plate.
Data for combinations not shown here are available on demand.

4.1 TPM+ motor feedback Resolver

The parameter of the motor feedback has to be entered before connecting the motor. Wrong parameters can damage the motor feedback or the drive.

Parameter	Function	Unit	TPM 004S	TPM 010S	TPM 025S	TPM 050S	TPM 110S
03.26	Speed feedback selector		Slot 1, Slot 2 oder Slot 3 abhängig von Steckplatz SM-Resolver				
03.40	Drive encoder error detection level		0	0	0	0	0
xx.10	Äquivalente Geberstriche pro Umdrehung		1024	1024	1024	1024	1024
xx.13	Resolver excitation		1 (2:1)	1 (2:1)	1 (2:1)	1 (2:1)	1 (2:1)
xx.15	Resolver poles		2Pole (0)	2Pole (0)	2Pole (0)	2Pole (0)	2Pole (0)
00.43	Encoder phase angle	°	180	180	180	180	180

4.2 TPM+ motor feedback Heidenhain EnDat

The parameter of the motor feedback has to be entered before connecting the motor. Wrong parameters can damage the motor feedback or the drive.

Parameter	Function	Unit	TPM 004S	TPM 010S	TPM 025S	TPM 050S	TPM 110S
03.26	Speed feedback selector		drv (0)				
03.36	Drive encoder supply voltage		5V	5V	5V	5V	5V
03.38	Drive encoder type		SC.EnDat	SC.EnDat	SC.EnDat	SC.EnDat	SC.EnDat
03.41	Drive encoder auto-configuration		EIN (1)	EIN (1)	EIN (1)	EIN (1)	EIN (1)
00.43	Encoder phase angle	°	180	180	180	180	180

4.3 TPM+ motor feedback Sick-Stegmann Hiperface

The parameter of the motor feedback has to be entered before connecting the motor. Wrong parameters can damage the motor feedback or the drive.

Parameter	Function	Unit	TPM 004S	TPM 010S	TPM 025S	TPM 050S	TPM 110S
03.26	Speed feedback selector		drv (0)				
03.36	Drive encoder supply voltage		8V	8V	8V	8V	8V
03.38	Drive encoder type		SC.Hiper	SC.Hiper	SC.Hiper	SC.Hiper	SC.Hiper
03.41	Drive encoder auto-configuration		EIN (1)	EIN (1)	EIN (1)	EIN (1)	EIN (1)
00.43	Encoder phase angle	°	120	120	120	120	120

4.4 Parameter TPM+ Dynamic 004 560V

Par.	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,001	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,1	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	1,10	0,80
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	60	62
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	4400	5800
5.17	Stator resistance	Ohm	28,20	37,40
5.24	Transient inductance (Ls)	mH	33,30	30,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,70	0,47
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	0,21	0,23	291	291
21	0,20	0,23	238	291
31	0,20	0,22	203	291
61	0,12	0,14	172	300
64	0,11	0,13	164	300
91	0,12	0,14	116	300

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.5 Parameter TPM+ Dynamic 010 560V

Par.	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,002	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,2	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	1,30	0,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	86	78
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	4000	5500
5.17	Stator resistance	Ohm	21,30	40,00
5.24	Transient inductance (Ls)	mH	22,80	30,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,97	0,78
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	0,32	0,34	400	400
21	0,32	0,34	400	400
31	0,32	0,34	360	400
61	0,17	0,19	243	333
64	0,17	0,19	232	333
91	0,17	0,19	161	333

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.6 Parameter TPM+ Dynamic 025 560V

Par.	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,014	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,4	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	5,70	1,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	148	127
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	3500	4500
5.17	Stator resistance	Ohm	2,20	13,50
5.24	Transient inductance (Ls)	mH	6,00	18,90
5.32	Motor torque per amp, Kt	Nm/Arms	0,98	1,02
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	2,16	2,35	298	298
21	2,16	2,35	298	298
31	2,17	2,36	247	298
61	0,77	0,96	313	316
64	0,76	0,95	296	316
91	0,76	0,95	198	316

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.7 Parameter TPM+ Dynamic 050 560V

Par.	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,063	0,018
0.08	Speed controller integral gain (Ki1)	1/rad	6,3	1,8
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	13,70	3,80
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	5000	5000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	320
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2500	3500
5.17	Stator resistance	Ohm	0,45	4,00
5.24	Transient inductance (Ls)	mH	3,00	11,10
5.32	Motor torque per amp, Kt	Nm/Arms	1,00	0,97
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	9,07	10,07	292	292
21	9,07	10,07	250	292
31	8,94	9,93	215	292
61	2,51	3,51	316	316
64	2,49	3,49	316	316
91	2,49	3,49	222	316

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.8 Parameter TPM+ Dynamic 110 560V

Par.	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,086	0,063
0.08	Speed controller integral gain (Ki1)	1/rad	8,6	6,3
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	16,70	13,70
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	5000	5000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	400
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2000	2600
5.17	Stator resistance	Ohm	0,32	0,45
5.24	Transient inductance (Ls)	mH	2,40	3,00
5.32	Motor torque per amp, Kt	Nm/Arms	1,00	1,00
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	13,14	14,14	419	419
21	13,14	14,14	419	419
31	12,84	13,84	419	419
61	8,89	9,88	219	292
64	8,83	9,83	207	292
91	8,83	9,83	132	292

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.9 Parameter TPM+ Dynamic 004 320V

Par.	Description	Unit	i=16-31 320 VDC	i=61-91 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,001	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,1	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	1,90	1,40
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	20	21
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	4400	5800
5.17	Stator resistance	Ohm	9,40	12,50
5.24	Transient inductance (Ls)	mH	11,10	10,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,40	0,27
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	0,21	0,23	474	474
21	0,20	0,23	474	474
31	0,20	0,22	426	474
61	0,12	0,14	276	377
64	0,11	0,13	184	377
91	0,12	0,14	263	377

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.10 Parameter TPM+ Dynamic 010 320V

Par.	Description	Unit	i=16-31 320 VDC	i=61-91 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,002	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,2	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	2,20	1,60
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	29	25
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	4000	5500
5.17	Stator resistance	Ohm	7,10	13,30
5.24	Transient inductance (Ls)	mH	7,33	10,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,56	0,45
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	0,32	0,34	400	400
21	0,32	0,34	400	400
31	0,32	0,34	360	400
61	0,17	0,19	238	325
64	0,17	0,19	159	325
91	0,17	0,19	227	325

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.11 Parameter TPM+ Dynamic 025 320V

Par.	Description	Unit	i=16-31 320 VDC	i=61-91 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,014	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,4	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	9,90	3,30
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	49	42
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	3500	4500
5.17	Stator resistance	Ohm	0,73	4,50
5.24	Transient inductance (Ls)	mH	2,00	6,30
5.32	Motor torque per amp, Kt	Nm/Arms	0,56	0,59
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	2,16	2,35	297	297
21	2,16	2,35	297	297
31	2,17	2,36	246	297
61	0,77	0,96	312	315
64	0,76	0,95	296	315
91	0,76	0,95	198	315

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.12 Parameter TPM+ Dynamic 050 320V

Par.	Description	Unit	i=16-31 320 VDC	i=61-91 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,063	0,018
0.08	Speed controller integral gain (Ki1)	1/rad	6,3	1,8
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	23,70	6,60
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	5000	5000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	137	106
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2500	3500
5.17	Stator resistance	Ohm	0,13	1,33
5.24	Transient inductance (Ls)	mH	1,00	3,70
5.32	Motor torque per amp, Kt	Nm/Arms	0,58	0,56
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	9,07	10,07	295	295
21	9,07	10,07	253	295
31	8,94	9,93	217	295
61	2,51	3,51	318	318
64	2,49	3,49	318	318
91	2,49	3,49	223	318

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.13 Parameter TPM+ Dynamic 110 320V

Par.	Description	Unit	i=16-31 320 VDC	i=61-91 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,086	0,063
0.08	Speed controller integral gain (Ki1)	1/rad	8,6	6,3
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	16,70	23,70
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	3700	5000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	137
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2000	2600
5.17	Stator resistance	Ohm	0,32	0,13
5.24	Transient inductance (Ls)	mH	2,40	1,00
5.32	Motor torque per amp, Kt	Nm/Arms	1,00	0,58
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
16	13,14	14,14	419	419
21	13,14	14,14	419	419
31	12,84	13,84	419	419
61	8,89	9,88	221	295
64	8,83	9,83	208	295
91	8,83	9,83	132	295

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.14 Parameter TPM+ Power 004 560V

Par.	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,002	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,2	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	1,60	1,00
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	59	62
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	3000	4400
5.17	Stator resistance	Ohm	21,30	40,00
5.24	Transient inductance (Ls)	mH	22,80	30,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,97	0,78
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	0,39	0,41	333	333
5	0,36	0,38	333	333
7	0,33	0,35	333	333
10	0,31	0,34	230	333
16	0,32	0,34	282	333
20	0,31	0,34	225	333
25	0,31	0,34	179	333
28	0,31	0,33	157	333
35	0,31	0,33	123	333
40	0,16	0,18	205	300
50	0,16	0,18	165	300
70	0,16	0,18	117	300
100	0,16	0,18	61	300

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.15 Parameter TPM+ Power 010 560V

Par.	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,014	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,4	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	5,40	1,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	166	132
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2600	3500
5.17	Stator resistance	Ohm	2,20	13,50
5.24	Transient inductance (Ls)	mH	6,00	18,90
5.32	Motor torque per amp, Kt	Nm/Arms	0,98	1,02
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	2,38	2,57	315	315
5	2,22	2,41	315	315
7	2,08	2,27	315	315
10	2,00	2,19	226	315
16	2,02	2,21	213	315
20	1,99	2,18	166	315
25	1,98	2,17	128	315
28	1,96	2,15	111	315
35	1,96	2,14	87	315
40	0,72	0,91	250	323
50	0,72	0,91	201	323
70	0,72	0,91	146	323
100	0,72	0,91	82	323

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.16 Parameter TPM+ Power 025 560V

Par.	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,063	0,018
0.08	Speed controller integral gain (Ki1)	1/rad	6,3	1,8
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	13,70	4,00
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	287
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1500	2800
5.17	Stator resistance	Ohm	0,45	4,00
5.24	Transient inductance (Ls)	mH	3,00	11,10
5.32	Motor torque per amp, Kt	Nm/Arms	1,00	0,97
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	9,98	10,98	292	292
5	9,50	10,50	292	292
7	9,07	10,07	292	292
10	8,84	9,84	197	292
16	8,94	9,94	218	292
20	8,83	9,82	168	292
25	8,81	9,80	143	292
28	8,72	9,72	112	292
35	8,71	9,71	95	292
40	2,48	3,48	300	300
50	2,48	3,48	299	300
70	2,48	3,47	178	300
100	2,47	3,47	93	300

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.17 Parameter TPM+ Power 050 560V

Par.	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,16	0,045
0.08	Speed controller integral gain (Ki1)	1/rad	16	4,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	19,00	7,50
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	5000	5000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	322
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1200	2500
5.17	Stator resistance	Ohm	0,27	1,81
5.24	Transient inductance (Ls)	mH	2,10	5,10
5.32	Motor torque per amp, Kt	Nm/Arms	1,19	0,91
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	26,42	28,22	334	334
5	24,80	26,60	334	334
7	23,34	25,14	289	334
10	22,54	24,34	202	334
16	23,07	24,87	279	334
20	22,61	24,41	219	334
25	22,55	24,35	172	334
28	22,20	24,00	151	334
35	22,17	23,97	117	334
40	6,3	8,1	440	440
50	6,28	8,08	433	440
70	6,27	8,07	265	440
100	6,26	8,06	110	440

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.18 Parameter TPM+ Power 110 560V

Par.	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,833	0,436
0.08	Speed controller integral gain (Ki1)	1/rad	83,3	43,6
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	38,60	21,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4200	4500
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	400
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	600	1400
5.17	Stator resistance	Ohm	0,08	0,25
5.24	Transient inductance (Ls)	mH	0,90	1,90
5.32	Motor torque per amp, Kt	Nm/Arms	1,09	1,08
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	141,73	158,73	259	259
5	131,91	148,91	259	259
7	123,00	140,00	259	259
10	118,12	135,12	162	259
16	116,99	133,99	259	259
20	116,70	133,70	239	259
25	116,30	133,30	189	259
28	115,05	132,05	167	259
35	114,85	131,85	131	259
40	60,23	77,23	210	228
50	60,13	77,13	166	228
70	60,04	77,04	115	228
100	59,99	76,99	71	228

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.19 Parameter TPM+ Power 004 320V

Par.	Description	Unit	i=4-35 320 VDC	i=40-100 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,002	0,001
0.08	Speed controller integral gain (Ki1)	1/rad	0,2	0,1
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	8	8
0.46	Motor rated current	Arms	2,70	1,70
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	20	21
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	3000	4400
5.17	Stator resistance	Ohm	7,10	13,30
5.24	Transient inductance (Ls)	mH	7,33	10,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,56	0,45
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	0,39	0,41	1088	1088
5	0,36	0,38	1088	1088
7	0,33	0,35	1088	1088
10	0,31	0,34	781	1088
16	0,32	0,34	738	1088
20	0,31	0,34	573	1088
25	0,31	0,34	442	1088
28	0,31	0,33	383	1088
35	0,31	0,33	302	1088
40	0,16	0,18	466	600
50	0,16	0,18	374	600
70	0,16	0,18	272	600
100	0,16	0,18	152	600

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.20 Parameter TPM+ Power 010 320V

Par.	Description	Unit	i=4-35 320 VDC	i=40-100 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,014	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,4	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	9,40	3,20
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	55	44
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2600	3500
5.17	Stator resistance	Ohm	0,73	4,50
5.24	Transient inductance (Ls)	mH	2,00	6,30
5.32	Motor torque per amp, Kt	Nm/Arms	0,56	0,59
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	2,38	2,57	314	314
5	2,22	2,41	314	314
7	2,08	2,27	314	314
10	2,00	2,19	225	314
16	2,02	2,21	213	314
20	1,99	2,18	165	314
25	1,98	2,17	128	314
28	1,96	2,15	111	314
35	1,96	2,14	87	314
40	0,72	0,91	251	323
50	0,72	0,91	201	323
70	0,72	0,91	146	323
100	0,72	0,91	82	323

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.21 Parameter TPM+ Power 025 320V

Par.	Description	Unit	i=4-35 320 VDC	i=40-100 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,063	0,018
0.08	Speed controller integral gain (Ki1)	1/rad	6,3	1,8
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	23,70	6,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	6000	6000
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	137	96
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1500	2800
5.17	Stator resistance	Ohm	0,13	1,33
5.24	Transient inductance (Ls)	mH	1,00	3,70
5.32	Motor torque per amp, Kt	Nm/Arms	0,58	0,56
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
4	9,98	10,98	295	295
5	9,50	10,50	295	295
7	9,07	10,07	295	295
10	8,84	9,84	198	295
16	8,94	9,94	220	295
20	8,83	9,82	170	295
25	8,81	9,80	143	295
28	8,72	9,72	112	295
35	8,71	9,71	95	295
40	2,48	3,48	303	303
50	2,48	3,48	302	303
70	2,48	3,47	179	303
100	2,47	3,47	93	175

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.22 Parameter TPM+ High Torque 010 560V

Par.	Description	Unit	i=22-110 560 VDC	i=154-220 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,015	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,5	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	5,00	1,90
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4850	4850
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	196	124
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2500	4500
5.17	Stator resistance	Ohm	2,36	15,70
5.24	Transient inductance (Ls)	mH	6,00	18,90
5.32	Motor torque per amp, Kt	Nm/Arms	0,83	0,82
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	2,06	2,25	301	341
27,5	2,03	2,22	239	341
38,5	2,01	2,20	169	341
55	1,99	2,18	116	341
66	-	-	-	-
88	2,01	2,20	73	341
110	2,00	2,19	59	341
154	0,68	0,87	112	312
220	0,67	0,86	81	312

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.23 Parameter TPM+ High Torque 025 560V

Par.	Description	Unit	i=22-55 560 VDC	i=66-220 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,064	0,014
0.08	Speed controller integral gain (Ki1)	1/rad	6,4	1,4
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	13,10	5,80
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4850	4850
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	145
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1500	2400
5.17	Stator resistance	Ohm	0,47	2,36
5.24	Transient inductance (Ls)	mH	3,00	6,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,98	0,83
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	9,01	10,00	255	306
27,5	8,83	9,83	200	306
38,5	8,74	9,74	136	306
55	8,69	9,69	90	306
66	2,03	2,22	181	295
88	1,96	2,15	136	295
110	1,93	2,12	108	295
154	1,91	2,10	77	295
220	1,89	2,08	54	295

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.24 Parameter TPM+ High Torque 050 560V

Par.	Description	Unit	i=22-55 560 VDC	i=66-220 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,162	0,064
0.08	Speed controller integral gain (Ki1)	1/rad	16,2	6,4
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	17,90	12,60
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4500	4850
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	400	400
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1000	1500
5.17	Stator resistance	Ohm	0,29	0,47
5.24	Transient inductance (Ls)	mH	2,10	3,00
5.32	Motor torque per amp, Kt	Nm/Arms	1,21	1,00
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	23,80	25,60	268	354
27,5	23,35	25,15	208	354
38,5	22,99	24,79	140	354
55	22,81	24,61	92	354
66	9,23	10,22	144	317
88	9,04	10,03	100	317
110	8,84	9,83	80	317
154	8,74	9,74	57	317
220	8,69	9,69	40	317

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.25 Parameter TPM+ High Torque 110 560V

Par.	Description	Unit	i=22-55 560 VDC	i=66-88 560 VDC	i=110-220 560 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	1,564	0,786	0,162
0.08	Speed controller integral gain (Ki1)	1/rad	156,4	78,6	16,2
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1		
0.39 1	Current controller Ki gain	-	See note 1		
0.41	Maximum switching frequency	kHz	16	16	16
0.42	Number of motor poles	-	12	12	12
0.46	Motor rated current	Arms	tbd	40,80	20,50
0.48	Operating mode selector	-	SERVO	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4150	4150	4500
4.05	Motoring current limit	%	See table below		
4.06	Regen current limit	%	See table below		
4.07	Symmetrical current limit	%	See table below		
4.15	Thermal time constant	s	400	400	361
4.16	Thermal protection mode	-	1 or 0 depending on application		
5.08	Rated Speed	RPM	600	800	1500
5.17	Stator resistance	Ohm	0,05	0,08	0,29
5.24	Transient inductance (Ls)	mH	0,67	0,90	2,10
5.32	Motor torque per amp, Kt	Nm/Arms	1,17	1,09	1,19
7.15	T8 analogue input 3 mode	-	th	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	220,37	236,87	tbd	tbd
27,5	218,91	235,41	tbd	tbd
38,5	217,63	234,13	tbd	tbd
55	216,94	233,44	tbd	tbd
66	111,82	128,82	99	245
88	108,24	125,24	75	245
110	22,86	24,66	112	310
154	22,48	24,28	77	310
220	22,25	24,05	54	310

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.26 Parameter TPM+ High Torque 010 320V

Par.	Description	Unit	i=22-110 320 VDC	i=154-220 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,015	0,005
0.08	Speed controller integral gain (Ki1)	1/rad	1,5	0,5
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	8,60	3,30
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4850	4850
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	65	41
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	2500	4500
5.17	Stator resistance	Ohm	0,81	5,23
5.24	Transient inductance (Ls)	mH	2,00	6,30
5.32	Motor torque per amp, Kt	Nm/Arms	0,48	0,47
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	2,06	2,25	301	340
27,5	2,03	2,22	239	340
38,5	2,01	2,20	169	340
55	1,99	2,18	116	340
66	-	-	-	-
88	2,01	2,20	73	340
110	2,00	2,19	59	340
154	0,68	0,87	112	312
220	0,67	0,86	81	312

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

4.27 Parameter TPM+ High Torque 025 320V

Par.	Description	Unit	i=22-55 320 VDC	i=66-220 320 VDC
0.07	Speed controller proportional gain (Kp1)	1/rad s-1	0,064	0,014
0.08	Speed controller integral gain (Ki1)	1/rad	6,4	1,4
0.09	Speed controller differential feedback gain (Kd1)	s	0,00	0,00
0.38 1	Current controller Kp gain	-	See note 1	
0.39 1	Current controller Ki gain	-	See note 1	
0.41	Maximum switching frequency	kHz	16	16
0.42	Number of motor poles	-	12	12
0.46	Motor rated current	Arms	22,70	10,00
0.48	Operating mode selector	-	SERVO	SERVO
1.06	Maximum reference clamp	RPM	4850	4850
4.05	Motoring current limit	%	See table below	
4.06	Regen current limit	%	See table below	
4.07	Symmetrical current limit	%	See table below	
4.15	Thermal time constant	s	151	48
4.16	Thermal protection mode	-	1 or 0 depending on application	
5.08	Rated Speed	RPM	1500	2400
5.17	Stator resistance	Ohm	0,16	0,81
5.24	Transient inductance (Ls)	mH	1,00	2,00
5.32	Motor torque per amp, Kt	Nm/Arms	0,56	0,48
7.15	T8 analogue input 3 mode	-	th	th

[1] Automatic calculation by setting #0.40 to 6 after input of R and L in #5.17 and 5.24

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$I_{max\ stat}$ [% of static motor current][2]	$I_{max\ dyn}$ [% of static motor current][3]
22	9,01	10,00	257	309
27,5	8,83	9,83	201	309
38,5	8,74	9,74	136	309
55	8,69	9,69	90	309
66	2,03	2,22	181	295
88	1,96	2,15	136	295
110	1,93	2,12	108	295
154	1,91	2,10	77	295
220	1,89	2,08	54	295

[2] Static maximum motorcurrent: Use this maximum current to protect the gear reducer from overload and to reduce the torque safely to T2B.

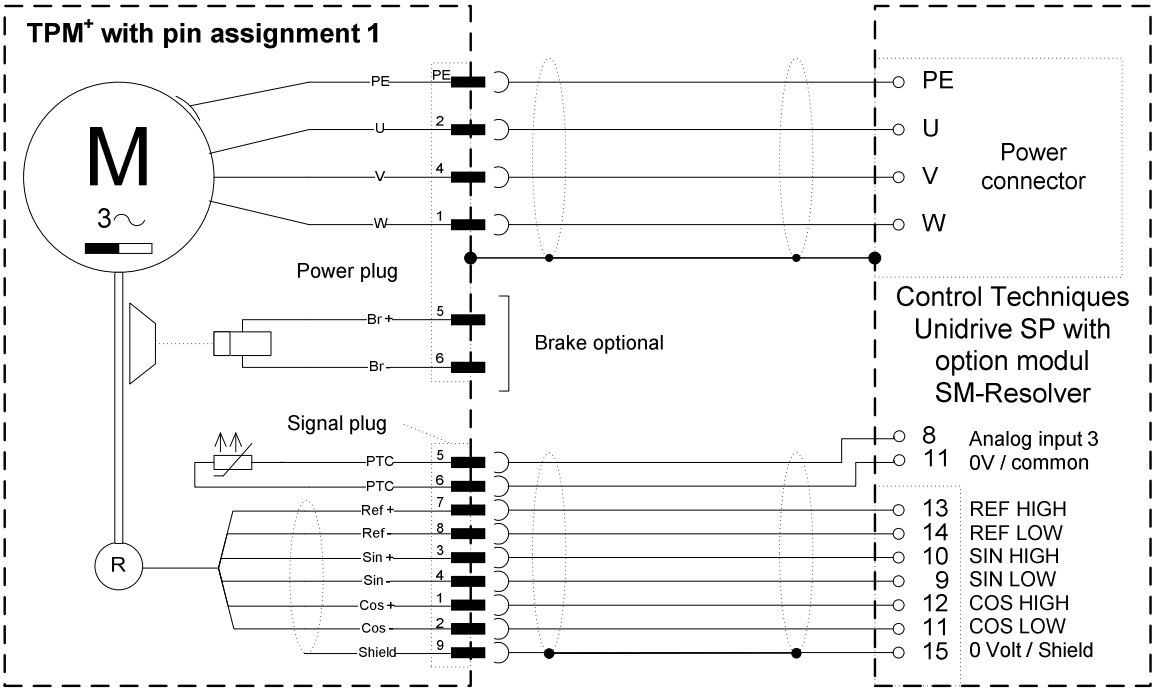
[3] Dynamic maximum motorcurrent: For dynamic applications the maximum current can be increased to this value in dependency of the mass moment of inertia relation. We recommend a detailed calculation with Cymex.

5 Connection schematic TPM+

➲ Detailed information on cable design and the type of shielding can be found in the documentation from the servo drive manufacturer.

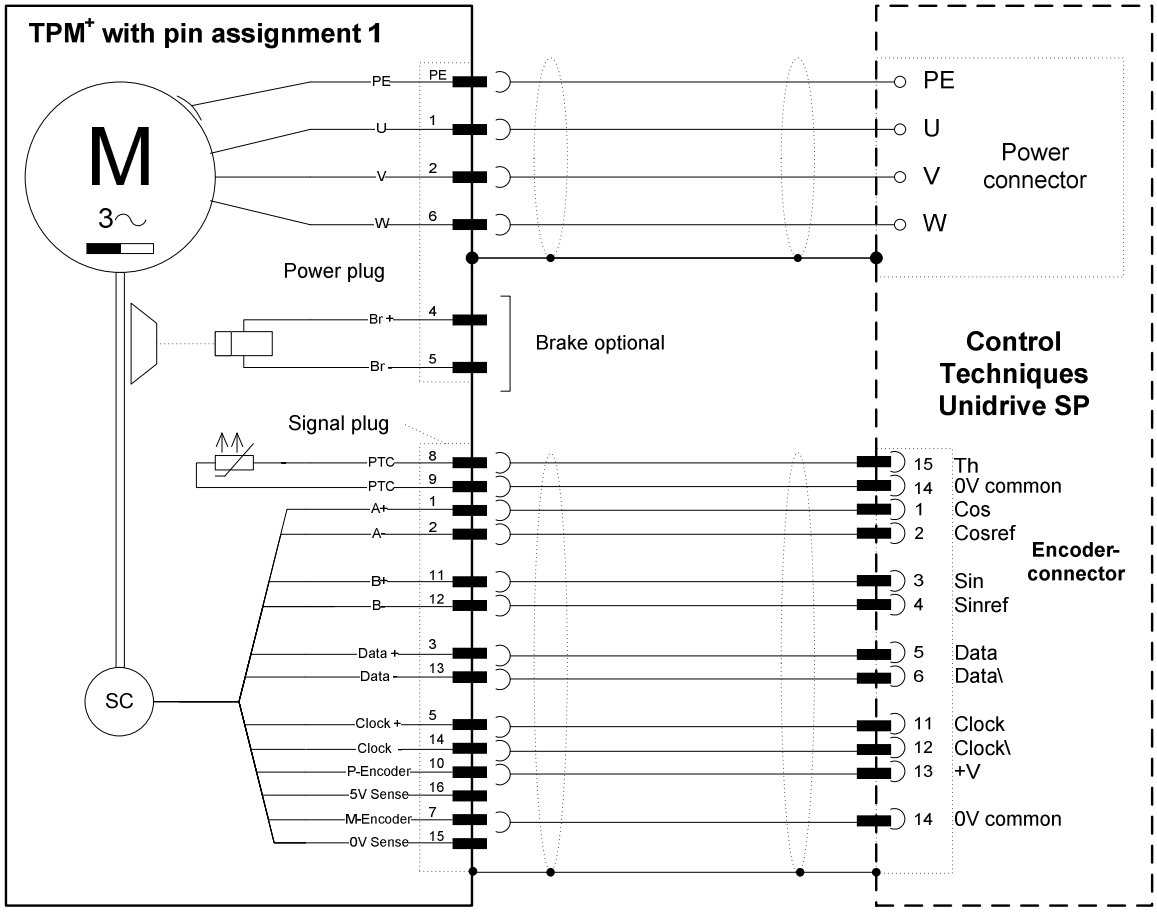
5.1 TPM+ with resolver

WITTENSTEIN alpha offers pre-manufactured and drag chain compatible cablesets for this servo drive. Please take the required order informations from the TPM+ catalogue.



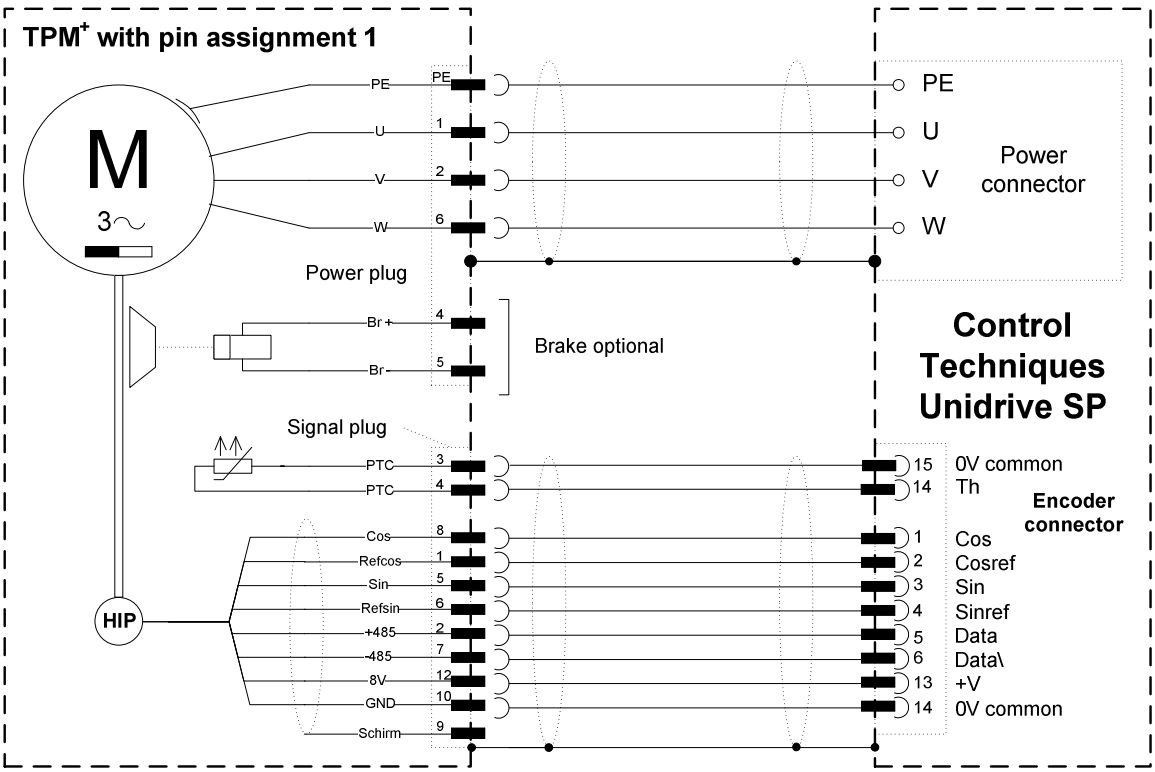
5.2 TPM+ with absolute encoder Heidenhain EnDat ECN1113 / EQN 1125

WITTENSTEIN alpha offers pre-manufactured and drag chain compatible cablesets for this servo drive. Please take the required order informations from the TPM+ catalogue.



5.3 TPM+ with absolute encoder Stegmann SKS 36 / SKM 36

WITTENSTEIN alpha offers pre-manufactured and drag chain compatible cablesets for this servo drive. Please take the required order informations from the TPM+ catalogue.



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