TPM⁺

Siemens MASTERDRIVE MC

Quick Startup Guide
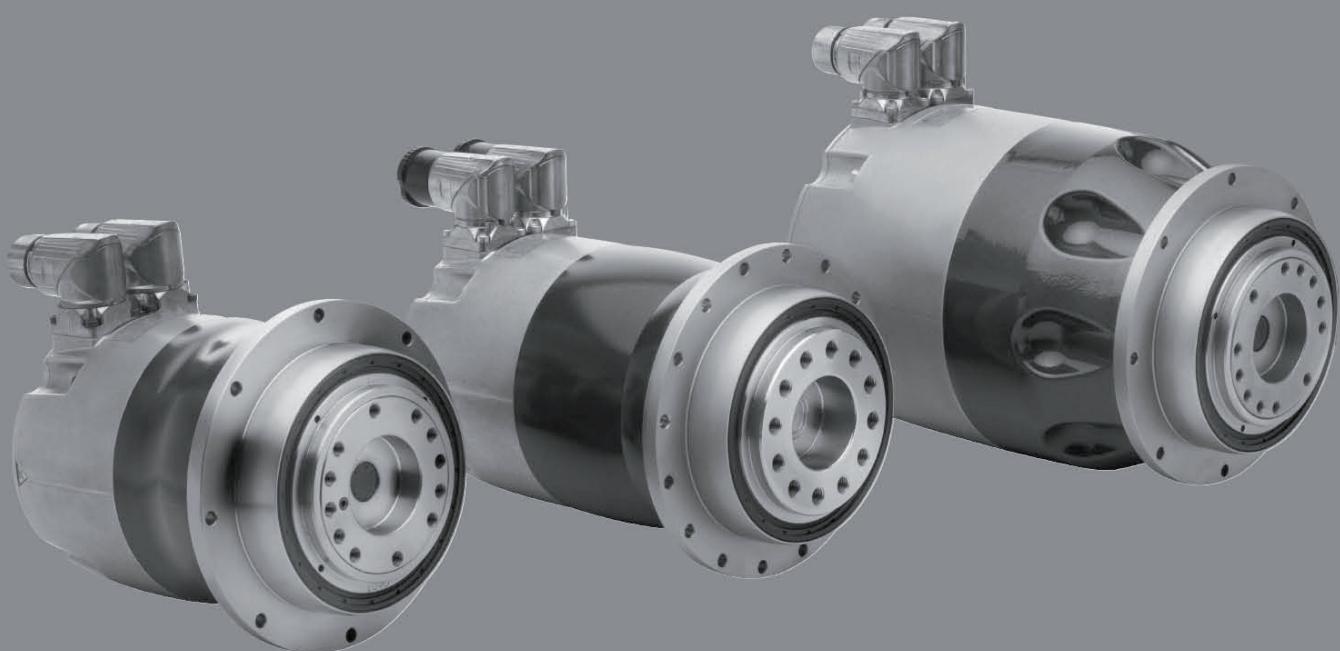
Revision history

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

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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:
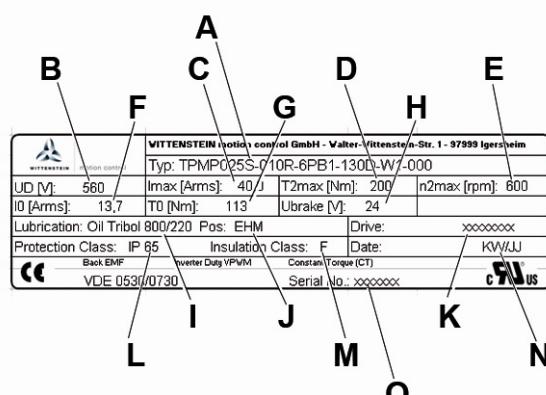
Bild 4.2

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

TPM 010S-100R -6PB1-055A-W1

Actuator type
TPM

Version
_ = dynamic
A = high torque
P = power

Size
004/010/025/050/110

Version
S = Standard UL
G = Grease filling
F = Food-grade lubrication
X = Special design
P = Welded pinion

Ratio i

Feedback system
R = Resolver 2-pole
S = Singleturn absolute encoder, EnDat
M = Multiturn absolute encoder, EnDat
N = Singleturn absolute encoder, Hiperface
K = Multiturn absolute encoder, Hiperface
T = 5V-TTL -Incremental encoder with Hall-signal
E = Singleturn absolute encoder, Rockwell compatible
V = Multiturn absolute encoder, Rockwell compatible
I = Incremental encoder, optical

Pin configuration
1 = Standard, temperature sensor over signal cable
4 = Temperature sensor over power cable
5 = Rockwell compatible
6 = B&R compatible

Electrical connection
W = Angular mounting box
G = Mounting box, straight

Motor size and stator length

Backlash
1 = Standard
0 = Reduced

Brake
B = with brake
O = without brake

Temperature sensor
P = PTC
K = KTY

DC bus voltage
5 = 320V
6 = 560V

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 **Siemens Masterdrive MC**.
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   Parameterization of motor feedback Resolver

Resolver		
P130	2-pole Resolver SBR	1
P132	Angle offset	0

4.2   Parameterization of motor feedback EnDat

EnDat		
P130	SinCos Single-Multiturn Heidenhain	4
P132	Angle offset EnDat	0
P136	Encoder pulse	9 (512 pulses)
P147 [1]	Select Multiturn	
	Singleturn ECN1113	9
	Multiturn EQN1125	8

[1] In case of using firmware revisions < 2.4 the setup of the encoders ECN1113 and EQN1125 cannot be done with the parameter P147. The setup of the encoder has to be done manually with the following parameters:
ECN1113: P147=0, P148.001=9, P148.002=0, P149.001=0x101, P149.002=0x13
EQN1125: P147=0, P148.001=9, P148.002=12, P149.001=0x101, P149.002=0x25

4.3   Parameterization of motor feedback ERN1185

ERN1185		
P130	Inkremental encoder ERN1185	3
P132	Angle offset ERN1185	0
P136	Encoder pulse	11 (2048 pulses)

4.4 Parameter TPM+ Dynamic 004 560V

Code	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	1,10	0,80
P109	Motor Pole Pairs	-	4	4
P113	Motor Rated Torque	Nm	0,70	0,40
P120	Main Field Induc	mH	16,65	15,00
P121	Stator resist	mOhm	14100	18700
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	400	400
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
16	0,21	0,23	2,00	3,20	2,00	3,20
21	0,20	0,23	1,60	2,60	2,00	3,20
31	0,20	0,22	1,40	2,20	2,00	3,20
61	0,12	0,14	0,60	1,40	1,00	2,40
64	0,11	0,13	0,60	1,30	1,00	2,40
91	0,12	0,14	0,40	0,90	1,00	2,40

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

[4] 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

Code	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	1,30	0,90
P109	Motor Pole Pairs	-	4	4
P113	Motor Rated Torque	Nm	1,20	0,70
P120	Main Field Induc	mH	11,40	15,00
P121	Stator resist	mOhm	10650	20000
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	400	400
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
16	0,32	0,34	3,80	5,20	3,80	5,20
21	0,32	0,34	3,80	5,20	3,80	5,20
31	0,32	0,34	3,50	4,70	3,80	5,20
61	0,17	0,19	1,40	2,20	1,90	3,00
64	0,17	0,19	1,40	2,10	1,90	3,00
91	0,17	0,19	1,00	1,50	1,90	3,00

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

[4] 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

Code	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	5,70	1,90
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	5,50	1,90
P120	Main Field Induc	mH	3,00	9,45
P121	Stator resist	mOhm	1099	6750
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	600	600
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [A_{rms}][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [A_{rms}][4]
16	2,16	2,35	12,10	17,00	12,10	17,00
21	2,16	2,35	12,10	17,00	12,10	17,00
31	2,17	2,36	10,40	14,10	12,10	17,00
61	0,77	0,96	4,40	5,90	4,40	6,00
64	0,76	0,95	4,20	5,60	4,40	6,00
91	0,76	0,95	3,00	3,80	4,40	6,00

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

[4] 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

Code	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	13,70	3,80
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	13,50	3,60
P120	Main Field Induc	mH	1,50	5,55
P121	Stator resist	mOhm	223	2000
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	500	500
P353	Ref Speed [2]	rpm	5000	5000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
16	9,07	10,07	28,90	40,00	28,90	40,00
21	9,07	10,07	25,50	34,30	28,90	40,00
31	8,94	9,93	22,70	29,40	28,90	40,00
61	2,51	3,51	7,80	12,00	7,80	12,00
64	2,49	3,49	7,80	12,00	7,80	12,00
91	2,49	3,49	6,00	8,40	7,80	12,00

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

[4] 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

Code	Description	Unit	i=16-31 560 VDC	i=61-91 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	16,70	13,70
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	16,40	13,50
P120	Main Field Induc	mH	1,20	1,50
P121	Stator resist	mOhm	162	223
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	500	500
P353	Ref Speed [2]	rpm	5000	5000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [A$_{rms}$][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [A$_{rms}$][4]
16	13,14	14,14	43,90	70,00	43,90	70,00
21	13,14	14,14	43,90	70,00	43,90	70,00
31	12,84	13,84	43,90	70,00	43,90	70,00
61	8,89	9,88	23,00	30,00	28,90	40,00
64	8,83	9,83	22,00	28,30	28,90	40,00
91	8,83	9,83	16,00	18,00	28,90	40,00

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

[4] 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+ Power 004 560V

Code	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	1,60	1,00
P109	Motor Pole Pairs	-	4	4
P113	Motor Rated Torque	Nm	1,20	0,70
P120	Main Field Induc	mH	11,40	15,00
P121	Stator resist	mOhm	10650	20000
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	400	400
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
4	0,39	0,41	3,80	5,20	3,80	5,20
5	0,36	0,38	3,80	5,20	3,80	5,20
7	0,33	0,35	3,80	5,20	3,80	5,20
10	0,31	0,34	2,70	3,60	3,80	5,20
16	0,32	0,34	3,20	4,40	3,80	5,20
20	0,31	0,34	2,60	3,50	3,80	5,20
25	0,31	0,34	2,10	2,80	3,80	5,20
28	0,31	0,33	1,90	2,50	3,80	5,20
35	0,31	0,33	1,50	1,90	3,80	5,20
40	0,16	0,18	1,30	2,10	1,90	3,00
50	0,16	0,18	1,10	1,70	1,90	3,00
70	0,16	0,18	0,80	1,20	1,90	3,00
100	0,16	0,18	0,4	0,60	1,90	3,00

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

[4] 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.

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4.10 Parameter TPM+ Power 010 560V

Code	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	5,40	1,90
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	4,50	1,40
P120	Main Field Induc	mH	3,00	9,45
P121	Stator resist	mOhm	1099	6750
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	600	600
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
4	2,38	2,57	12,10	17,00	12,10	17,00
5	2,22	2,41	12,10	17,00	12,10	17,00
7	2,08	2,27	12,10	17,00	12,10	17,00
10	2,00	2,19	9,00	12,20	12,10	17,00
16	2,02	2,21	8,50	11,50	12,10	17,00
20	1,99	2,18	6,80	8,90	12,10	17,00
25	1,98	2,17	5,50	6,90	12,10	17,00
28	1,96	2,15	4,90	6,00	12,10	17,00
35	1,96	2,14	3,90	4,70	12,10	17,00
40	0,72	0,91	3,40	4,70	4,40	6,00
50	0,72	0,91	2,80	3,70	4,40	6,00
70	0,72	0,91	2,00	2,70	4,40	6,00
100	0,72	0,91	1,1	1,50	4,40	6,00

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

[4] 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+ Power 025 560V

Code	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	13,70	4,00
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	11,70	3,00
P120	Main Field Induc	mH	1,50	5,55
P121	Stator resist	mOhm	223	2000
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	600	600
P353	Ref Speed [2]	rpm	6000	6000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
4	9,98	10,98	28,90	40,00	28,90	40,00
5	9,50	10,50	28,90	40,00	28,90	40,00
7	9,07	10,07	28,90	40,00	28,90	40,00
10	8,84	9,84	20,40	27,00	28,90	40,00
16	8,94	9,94	22,30	29,90	28,90	40,00
20	8,83	9,82	17,80	23,10	28,90	40,00
25	8,81	9,80	15,50	19,50	28,90	40,00
28	8,72	9,72	12,70	15,30	28,90	40,00
35	8,71	9,71	11,10	13,00	28,90	40,00
40	2,48	3,48	7,80	12,00	7,80	12,00
50	2,48	3,48	7,80	12,00	7,80	12,00
70	2,48	3,47	4,90	7,10	7,80	12,00
100	2,47	3,47	2,8	3,70	7,80	12,00

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

[4] 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+ Power 050 560V

Code	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	19,00	7,50
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	19,30	5,40
P120	Main Field Induc	mH	1,05	2,55
P121	Stator resist	mOhm	135	905
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	500	500
P353	Ref Speed [2]	rpm	5000	5000
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
4	26,42	28,22	56,60	63,50	56,60	63,50
5	24,80	26,60	56,60	63,50	56,60	63,50
7	23,34	25,14	49,40	54,90	56,60	63,50
10	22,54	24,34	35,60	38,40	56,60	63,50
16	23,07	24,87	47,90	53,10	56,60	63,50
20	22,61	24,41	38,30	41,70	56,60	63,50
25	22,55	24,35	30,70	32,60	56,60	63,50
28	22,20	24,00	27,40	28,60	56,60	63,50
35	22,17	23,97	22,00	22,20	56,60	63,50
40	6,3	8,1	15,60	33,00	15,60	33,00
50	6,28	8,08	15,40	32,50	15,60	33,00
70	6,27	8,07	10,40	19,90	15,60	33,00
100	6,26	8,06	5,7	8,30	15,60	33,00

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

[4] 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.

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4.13 **Parameter TPM+ Power 110 560V**

Code	Description	Unit	i=4-35 560 VDC	i=40-100 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	38,60	21,90
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	36,90	20,70
P120	Main Field Induc	mH	0,45	0,95
P121	Stator resist	mOhm	42	125
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	420	450
P353	Ref Speed [2]	rpm	4200	4500
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
4	141,73	158,73	88,00	100,00	88,00	100,00
5	131,91	148,91	88,00	100,00	88,00	100,00
7	123,00	140,00	88,00	100,00	88,00	100,00
10	118,12	135,12	56,80	62,60	88,00	100,00
16	116,99	133,99	88,00	100,00	88,00	100,00
20	116,70	133,70	81,70	92,40	88,00	100,00
25	116,30	133,30	65,50	72,90	88,00	100,00
28	115,05	132,05	58,40	64,40	88,00	100,00
35	114,85	131,85	46,80	50,50	88,00	100,00
40	60,23	77,23	40,90	46,00	44,20	50,00
50	60,13	77,13	32,80	36,30	44,20	50,00
70	60,04	77,04	23,60	25,30	44,20	50,00
100	59,99	76,99	14,6	15,50	44,20	50,00

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

[4] 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.

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4.14 **Parameter TPM+ High Torque 010 560V**

Code	Description	Unit	i=22-110 560 VDC	i=154-220 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	5,00	1,90
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	3,80	1,40
P120	Main Field Induc	mH	3,00	9,45
P121	Stator resist	mOhm	1180	7850
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	485	485
P353	Ref Speed [2]	rpm	4850	4850
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [A_{rms}][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [A_{rms}][4]
22	2,06	2,25	10,60	15,00	12,00	17,00
27,5	2,03	2,22	8,50	11,90	12,00	17,00
38,5	2,01	2,20	6,10	8,40	12,00	17,00
55	1,99	2,18	4,30	5,80	12,00	17,00
66	-	-	-	-	-	-
88	2,01	2,20	2,80	3,70	12,00	17,00
110	2,00	2,19	2,20	3,00	12,00	17,00
154	0,68	0,87	1,60	2,20	4,40	6,00
220	0,67	0,86	1,20	1,60	4,40	6,00

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

[4] 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+ High Torque 025 560V

Code	Description	Unit	i=22-55 560 VDC	i=66-220 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	13,10	5,80
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	10,90	4,20
P120	Main Field Induc	mH	1,50	3,00
P121	Stator resist	mOhm	235	1180
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	485	485
P353	Ref Speed [2]	rpm	4850	4850
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\,stat}$ [Nm][3]	$I_{max\,stat}$ [Arms][3]	$T_{max\,dyn}$ [Nm][4]	$I_{max\,dyn}$ [Arms][4]
22	9,01	10,00	24,50	33,40	28,90	40,00
27,5	8,83	9,83	19,60	26,10	28,90	40,00
38,5	8,74	9,74	14,00	17,80	28,90	40,00
55	8,69	9,69	9,80	11,80	28,90	40,00
66	2,03	2,22	7,40	10,50	12,00	17,00
88	1,96	2,15	5,60	7,80	12,00	17,00
110	1,93	2,12	4,50	6,20	12,00	17,00
154	1,91	2,10	3,20	4,40	12,00	17,00
220	1,89	2,08	2,30	3,10	12,00	17,00

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

[4] 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+ High Torque 050 560V

Code	Description	Unit	i=22-55 560 VDC	i=66-220 560 VDC
P060	Menu Select	-	5	5
P071	Line Volts	Vrms	400	400
P095	Select Mot Type	-	3	3
P102	Motor Rated Amps	Arms	17,90	12,60
P109	Motor Pole Pairs	-	6	6
P113	Motor Rated Torque	Nm	19,30	11,10
P120	Main Field Induc	mH	1,05	1,50
P121	Stator resist	mOhm	144	235
P128	Max Current	Arms	See table below	
P130	Parameter motor feedback see chapter motor feedback data			
P131	Select TmpSensor	-	1	
P290	Select V/f, I-Reg	-	0	
P296	Dynamic I-Reg	-	0	
P340	SamplingFreq	kHz	10	
P350	Ref Amps [1]	Arms	See table below	
P351	Ref Volts	Vrms	400	400
P352	Ref Frequency [2]	Hz	450	485
P353	Ref Speed [2]	rpm	4500	4850
P354	Ref Torque [1]	Nm	See table below	
P452	n (max,FWDSpeed) [2]	%	100	100
P453	n (max,REVSpeed) [2]	%	100	100
P060	Return Menu Select		1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
22	23,80	25,60	44,00	48,10	56,60	63,50
27,5	23,35	25,15	35,20	37,30	56,60	63,50
38,5	22,99	24,79	25,10	25,10	56,60	63,50
55	22,81	24,61	17,60	16,40	56,60	63,50
66	9,23	10,22	14,70	18,20	28,90	40,00
88	9,04	10,03	11,10	12,50	28,90	40,00
110	8,84	9,83	8,90	10,10	28,90	40,00
154	8,74	9,74	6,30	7,20	28,90	40,00
220	8,69	9,69	4,40	5,00	28,90	40,00

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

[4] 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+ High Torque 110 560V

Code	Description	Unit	i=22-55 560 VDC	i=66-88 560 VDC	i=110-220 560 VDC
P060	Menu Select	-	5	5	5
P071	Line Volts	Vrms	400	400	400
P095	Select Mot Type	-	3	3	3
P102	Motor Rated Amps	Arms	tbd	40,80	20,50
P109	Motor Pole Pairs	-	6	6	6
P113	Motor Rated Torque	Nm	tbd	40,40	22,20
P120	Main Field Induc	mH	0,34	0,45	1,05
P121	Stator resist	mOhm	24	42	145
P128	Max Current	Arms	See table below		
P130	Parameter motor feedback see chapter motor feedback data				
P131	Select TmpSensor	-	1		
P290	Select V/f, I-Reg	-	0		
P296	Dynamic I-Reg	-	0		
P340	SamplingFreq	kHz	10		
P350	Ref Amps [1]	Arms	See table below		
P351	Ref Volts	Vrms	400	400	400
P352	Ref Frequency [2]	Hz	415	415	450
P353	Ref Speed [2]	rpm	4150	4150	4500
P354	Ref Torque [1]	Nm	See table below		
P452	n (max,FWDSpeed) [2]	%	100	100	100
P453	n (max,REVSpeed) [2]	%	100	100	100
P060	Return Menu Select		1	1	1

[1] The Ref values for current / torque are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

[2] The Ref values for frequency / speed are set to maximum. Continuous operation is not possible with this setting. Please adjust according to your application.

Ratio	Motor inertia w/o brake[kgcm²]	Motor inertia with brake[kgcm²]	$T_{max\ stat}$ [Nm][3]	$I_{max\ stat}$ [Arms][3]	$T_{max\ dyn}$ [Nm][4]	$I_{max\ dyn}$ [Arms][4]
22	220,37	236,87	tbd	tbd	tbd	tbd
27,5	218,91	235,41	tbd	tbd	tbd	tbd
38,5	217,63	234,13	tbd	tbd	tbd	tbd
55	216,94	233,44	tbd	tbd	tbd	tbd
66	111,82	128,82	40,00	40,50	88,00	100,00
88	108,24	125,24	30,10	30,40	88,00	100,00
110	22,86	24,66	24,20	23,00	56,60	63,50
154	22,48	24,28	17,20	15,90	56,60	63,50
220	22,25	24,05	12,10	11,20	56,60	63,50

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

[4] 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.

| Revision: 02 | 4091-D032123 | Date: 27th March 2017 |
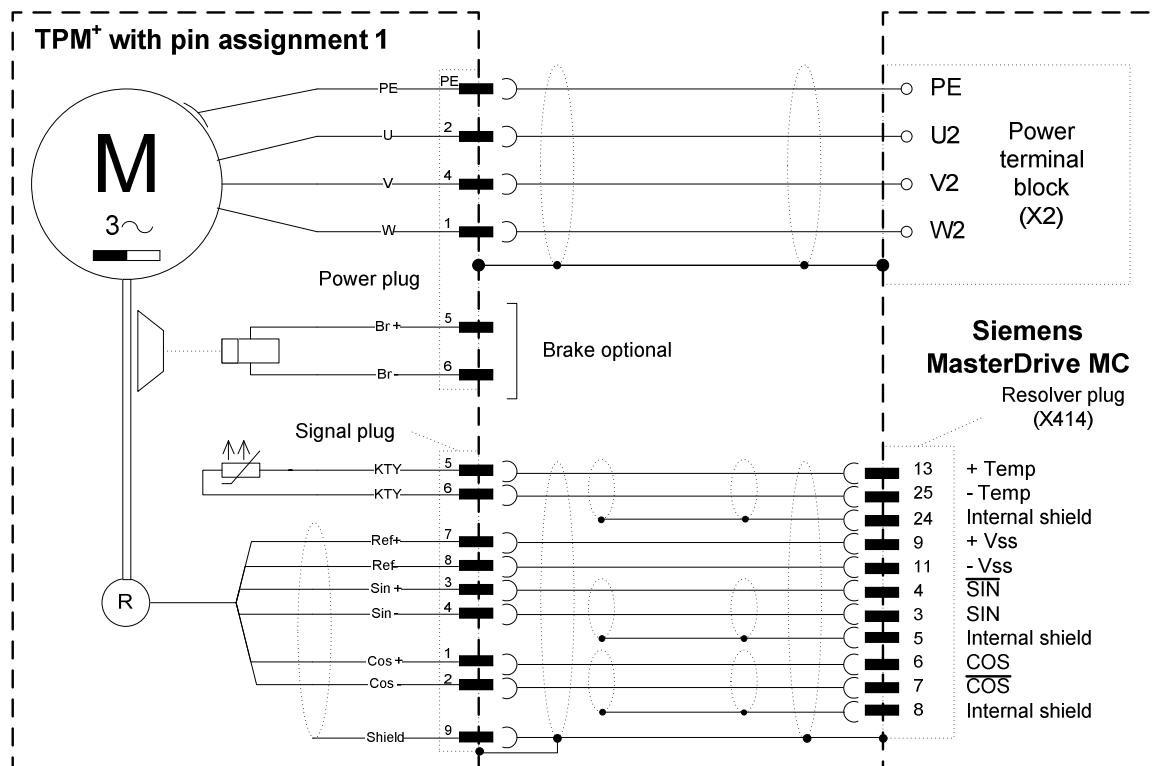
5.2 TPM⁺ with absolute encoder Heidenhain EnDat ECN1113 / EQN 1125

WITTENSTEIN alpha offers pre-manufactured and drag chain compatible cablesets for this servo drive. Please take the required order informations from the TPM+ catalogue.
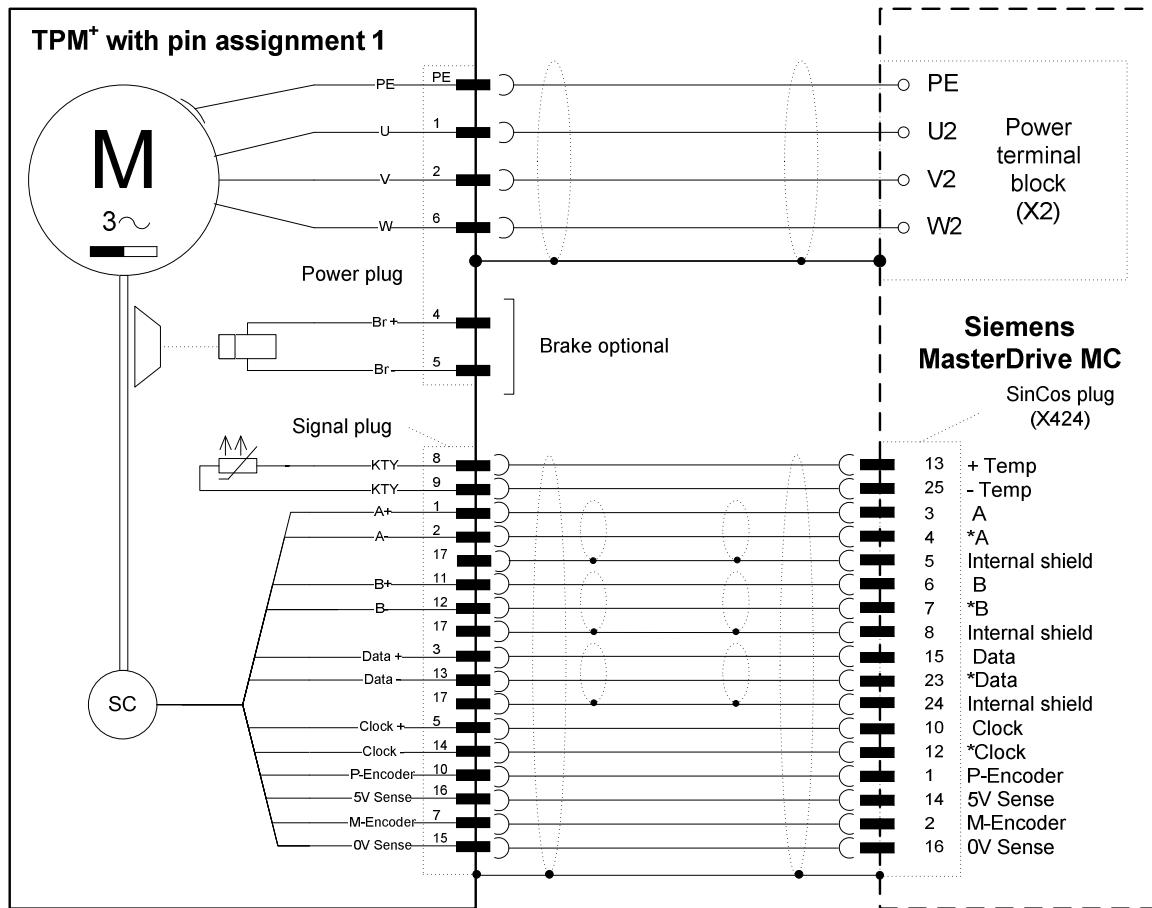
5.3　TPM⁺ with incremental encoder Heidenhain ERN 1185
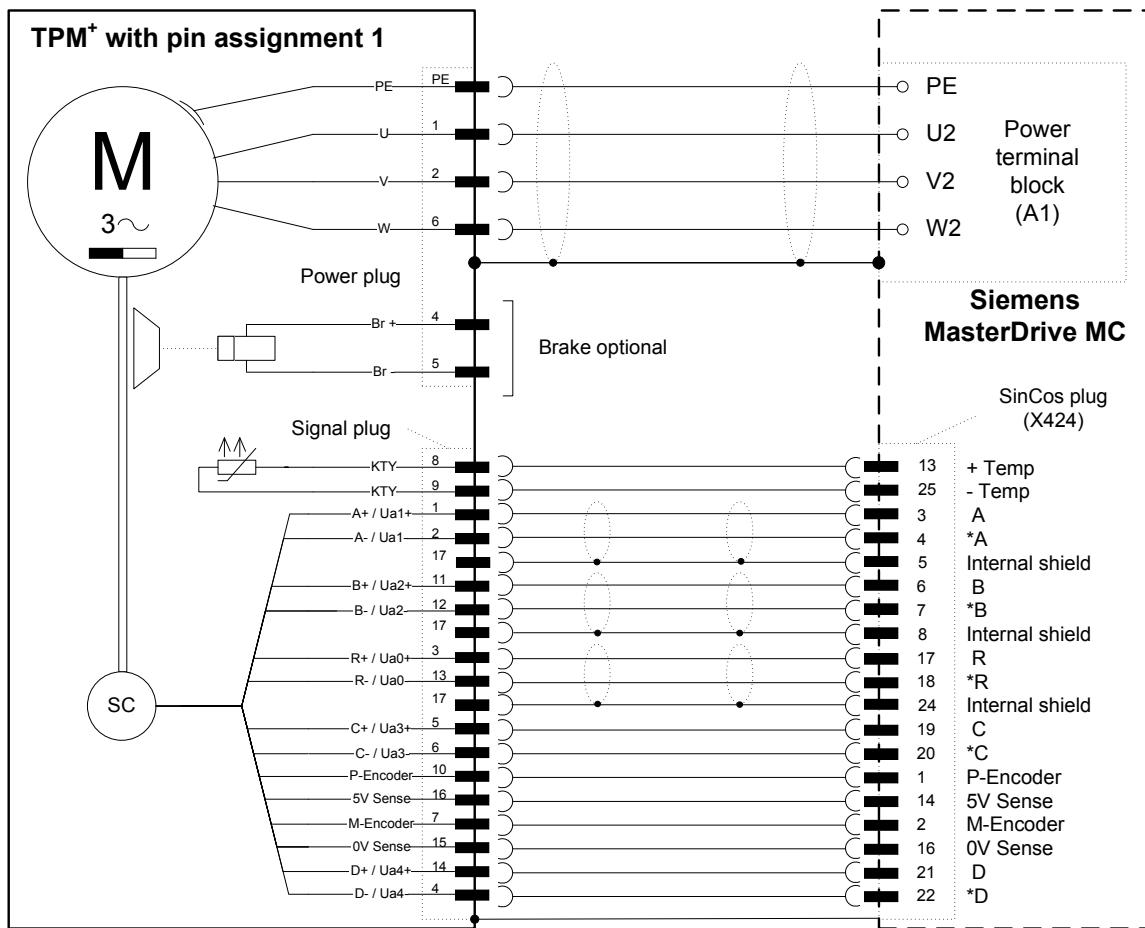
WITTENSTEIN alpha offers pre-manufactured and drag chain compatible cablesets for this servo drive. Please take the required order informations from the TPM+ catalogue.

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