WITTENSTEIN motion control

Quick Startup Guide

TPM(A) 004 – 110

SIEMENS SINAMICS S120

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Modification History

Document Designation	Version	Date	Note
4091_D012565_01.doc	1.0	7. July 2006	First edition
4091_D012565_02.doc	1.1	10. October 2006	SMC module added
4091_D012565_03.doc	1.2	13. Dec. 2006	Correction mass moment of inertia

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1 General Information and Safety Instructions

This guide serves as an aid during start-up and inspection of TPM motor gear units with servo amplifiers. It contains the following points:

- Parameter lists for the TPM series
- Connection schematic for TPM
- Assignment table TPM – Servo amplifier - cable set

Please be sure to carefully read through this document before starting up the TPM and also be sure to read the documentation provided by the manufacturer of the servo amplifier.

WITTENSTEIN motion control will not be held liable for the consequences of the improper, negligent, or incorrect installation or setting of the servo amplifier's operating parameters.

All of the installation, operation, and safety information provided in the servo amplifier documentation is to be observed.

Observe all of the national safety regulations and guidelines of the country where the device is being used. All transportation, installation, start-up, and service work is to be performed by qualified technicians. Qualified technicians are those who are completely familiar with the assembly, installation, and operating procedures, as well as all warnings and safety measures in accordance with the country-specific regulations. Furthermore, they are trained, instructed, and authorised to set the electrical circuits and other devices into operation in accordance with safety regulations.

The drives are intended to be installed in machines being used in commercial applications. 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.

Note: All of the product brand names which appear in this Quick Start Guide are trademarks of the relevant companies. If the ® and/or ™ symbols are omitted, this does imply that the name is a free brand name.

2 Parameter list TPM(A) ⇔ SimoDrive 611 U/D

Please select the input parameters corresponding to the nameplate values of your TPM.

TPM 010–091 M–600 K–BP 1–015 IF STD

Size
TPM 004 / 010 / 025 / 050 / 110
TPMA 025 / 050 / 110

Ratio
21 / 31 / 61 / 91 (TPM)
110 / 154 / 220 (TPMA)

Motor encoder
R = Resolver
S = Singleturn Heidenhain EnDat®
M = Multiturn Heidenhain EnDat®
N = Singleturn Stegmann Hiperface®
K = Multiturn Stegmann Hiperface®
I = Heidenhain incremental encoder

Intermediate voltage
320
600

Temperature sensor
P = PTC STM 160 in accordance with DIN 44081 / 44082
N = NTC
K = KTY 84-130

Brake
BP = Permanent magnetic brake
OH = Without brake

Clearance specification
1 = Standard < 3 arcmin (TPM 004: < 5 arcmin)
0 = Reduced < 1 arcmin (TPM 004: < 3 arcmin)

Stator length

Standard
IF = industry standard
UL = UL recognised file E220160

Plug form
STD = angle
SEG = straight
XXX = custom

3 Parameter lists TPM / TPMA at Sinamics S120

The following table contains all of the parameters that are required for the initial start-up of a TPM motor-gear unit from WITTENSTEIN motion control together with a Siemens SimoDrive. When the TPM and the servo amplifier are properly connected, these parameters guarantee that the TPM can be operated without load with speed control. Based on these default settings, the dynamics of the speed controller can be optimised depending on the application.
Data for combinations not shown here are available on demand. The parameters can be entered directly with help of the Starter Software and the Drive Navigator.

3.1 Parameter list TPM 004 – 110 i= 21, 31 ⇔ Sinamics S120

Ratio 21							
Code	**Description**	**Unit**	**TPM 004**	**TPM 010**	**TPM 025**	**TPM 050**	**TPM 110**
p305	Rated motor current	Arms	0,7	1,1	3,1	5,6	9,7
p311	Rated motor speed	1/min	6000	6450	3400	2700	1980
p314	Motor pole pair number		4	4	6	6	6
p316	Motor torque constant	Nm/Arms	0,67	0,83	1,16	0,91	1,51
p322	Maximum motor speed	1/min	7000	7000	6000	5000	4326
p323	Maximum motor current	Aeff	2,4	5,0	10,6	41,7	26,2
p338	Motor limit current	Aeff	2,4	5,0	10,6	41,7	26,2
p341	Motor moment of inertia (without brake)	kgm²	0,00002	0,00004	0,00025	0,00095	0,00137
p341	Motor moment of inertia (with brake)	kgm²	0,00002	0,00005	0,00026	0,00097	0,00154
p350	Motor stator resistance	Ohm	23,70	9,65	1,90	0,18	0,36
p356	Motor stator leakage inductance	mH	15,30	10,20	5,00	1,20	2,70
p312	Rated motor torque	Nm	0,48	0,94	3,3	6,6	12,8
p317	Motor voltage constant	Volt	40.7	50.4	70.3	54.8	91.1
p318	Motor stall current	Arms	1,5	1,7	8,7	23,9	18
p319	Motor stall torque	Nm	0,58	1,1	5	13,6	17,7
Ratio 31							
Code	**Description**	**Unit**	**TPM 004**	**TPM 010**	**TPM 025**	**TPM 050**	**TPM 110**
p305	Rated motor current	Arms	0,7	1,1	3,1	5,6	9,7
p311	Rated motor speed	1/min	6000	6450	3387	2700	2310
p314	Motor pole pair number		4	4	6	6	6
p316	Motor torque constant	Nm/Arms	0,67	0,83	1,16	0,91	1,51
p322	Maximum motor speed	1/min	7000	7000	6000	5000	4326
p323	Maximum motor current	Aeff	2,0	5,0	8,9	36,4	26,2
p338	Motor limit current	Aeff	2,0	5,0	8,9	36,4	26,2
p341	Motor moment of inertia (without brake)	kgm²	0,00002	0,00004	0,00024	0,00094	0,00131
p341	Motor moment of inertia (with brake)	kgm²	0,00002	0,00005	0,00025	0,00096	0,00149
p350	Motor stator resistance	Ohm	23,70	9,65	1,90	0,18	0,36
p356	Motor stator leakage inductance	mH	15,30	10,20	5,00	1,20	2,70
p312	Rated motor torque	Nm	0,48	0,94	3,3	6,6	12,8
p317	Motor voltage constant	Volt	40.7	50.4	70.3	54.8	91.1
p318	Motor stall current	Arms	1,5	1,7	8,7	23,9	18
p319	Motor stall torque	Nm	0,58	1,1	5	13,6	17,7

3.2 Parameter list TPM 004 – 110 i= 61, 91 ⇔ Sinamics S120

Ratio 61							
Code	**Description**	**Unit**	**TPM 004**	**TPM 010**	**TPM 025**	**TPM 050**	**TPM 110**
p305	Rated motor current	Arms	0,5	0,7	1,8	2,6	5,6
p311	Rated motor speed	1/min	6000	6450	3720	4562	2700
p314	Motor pole pair number		4	4	6	6	6
p316	Motor torque constant	Nm/Arms	0,45	0,77	0,76	1,02	0,91
p322	Maximum motor speed	1/min	7000	7000	6000	5000	4500
p323	Maximum motor current	Aeff	1,2	2,4	7,0	13,7	37,0
p338	Motor limit current	Aeff	1,2	2,4	7,0	13,7	37,0
p341	Motor moment of inertia (without brake)	kgm²	0,00001	0,00002	0,00009	0,00023	0,00099
p341	Motor moment of inertia (with brake)	kgm²	0,00002	0,00003	0,00010	0,00026	0,00117
p350	Motor stator resistance	Ohm	30,55	22,10	4,60	2,25	0,18
p356	Motor stator leakage inductance	mH	13,80	15,30	6,30	6,30	1,20
p312	Rated motor torque	Nm	0,21	0,51	1,3	2,5	4,9
p317	Motor voltage constant	Volt	27,40	46,65	45,91	61,46	54,80
p318	Motor stall current	Arms	0,6	0,8	2,3	3,6	15,3
p319	Motor stall torque	Nm	0,267	0,6	1,7	3,5	13,6
Ratio 91							
Code	**Description**	**Unit**	**TPM 004**	**TPM 010**	**TPM 025**	**TPM 050**	**TPM 110**
p305	Rated motor current	Arms	0,5	0,7	1,8	2,6	5,6
p311	Rated motor speed	1/min	6000	6450	4960	4562	3300
p314	Motor pole pair number		4	4	6	6	6
p316	Motor torque constant	Nm/Arms	0,45	0,77	0,76	1,02	0,91
p322	Maximum motor speed	1/min	7000	7000	6000	5000	4500
p323	Maximum motor current	Aeff	0,8	1,5	4,7	9,7	23,8
p338	Motor limit current	Aeff	0,8	1,5	4,7	9,7	23,8
p341	Motor moment of inertia (without brake)	kgm²	0,00001	0,00002	0,00009	0,00023	0,00099
p341	Motor moment of inertia (with brake)	kgm²	0,00002	0,00003	0,00010	0,00026	0,00116
p350	Motor stator resistance	Ohm	30,55	22,10	4,60	2,25	0,18
p356	Motor stator leakage inductance	mH	13,80	15,30	6,30	6,30	1,20
p312	Rated motor torque	Nm	0,21	0,51	1,3	2,5	4,9
p317	Motor voltage constant	Volt	27,40	46,65	45,91	61,46	54,80
p318	Motor stall current	Arms	0,6	0,8	2,3	3,6	15,3
p319	Motor stall torque	Nm	0,267	0,6	1,7	3,5	13,6

3.3 Parameter list TPMA 025 – 110 i= 110, 154, 220 ⇔ Sinamics S120

Ratios 110, 154, 200					
Code	**Description**	**Unit**	**TPM 025**	**TPM 050**	**TPM 110**
p305	Rated motor current	Arms	1,8	2,6	5,6
p311	Rated motor speed	1/min	3720	4562	2700
p314	Motor pole pair number		6	6	6
p316	Motor torque constant	Nm/Arms	0,76	1,02	0,91
p322	Maximum motor speed	1/min	6000	5000	4500
p323	Maximum motor current (i= 110)	Aeff	7,0	13,7	41,4
p323	Maximum motor current (i= 154)	Aeff	5,4	11,2	28,7
p323	Maximum motor current (i= 220)	Aeff	3,6	7,0	19,2
p338	Motor limit current (i= 110)	Aeff	7,0	13,7	41,4
p338	Motor limit current (i= 154)	Aeff	5,4	11,2	28,7
p338	Motor limit current (i= 220)	Aeff	3,6	7,0	19,2
p341	Motor moment of inertia (without brake, i= 110)	kgm²	0,00009	0,00024	0,00103
p341	Motor moment of inertia (with brake, i= 110)	kgm²	0,00010	0,00027	0,00121
p341	Motor moment of inertia (without brake, i= 154)	kgm²	0,00009	0,00024	0,00100
p341	Motor moment of inertia (with brake, i= 154)	kgm²	0,00010	0,00026	0,00118
p341	Motor moment of inertia (without brake, i= 220)	kgm²	0,00009	0,00023	0,00098
p341	Motor moment of inertia (with brake, i= 220)	kgm²	0,00010	0,00025	0,00116
p350	Motor stator resistance	Ohm	4,60	2,25	0,18
p356	Motor stator leakage inductance	mH	6,30	6,30	1,20
p312	Rated motor torque	Nm	1,3	2,5	4,9
p317	Motor voltage constant	Volt	45,91	61,46	54,80
p318	Motor stall current	Aeff	2,3	3,6	15,3
p319	Motor stall torque	Nm	1,7	3,5	13,6

4 Parameterisation Measuring system / encoder

Make following settings in the "**Measuring System / Encoder**" dialog as they apply to your version of the TPM – drive.

4.1 TPM(A) with resolver

Inversion of Actual Speed Value:	NO
No. Pole Pairs / Speed:	1

4.2 TPM(A) with Multi-turn or Single-turn Heidenhain

Encoder type:	ABSOLUTE EnDat	
Inversion of Actual Speed Value:	NO	
Pulses Per Revolution:	TPM 004:	512
	TPM 010 – TPM 110:	2048
	TPMA 025 – TPMA110:	2048

4.3 TPM(A) with incremental encoder Heidenhain ERN1387 / ERN 1185

Encoder type:	Incremental – one zero mark
Inversion of Actual Speed Value:	NO
Commutation Information:	Coarse synchronisation with C/D track
Pulses Per Revolution:	2048

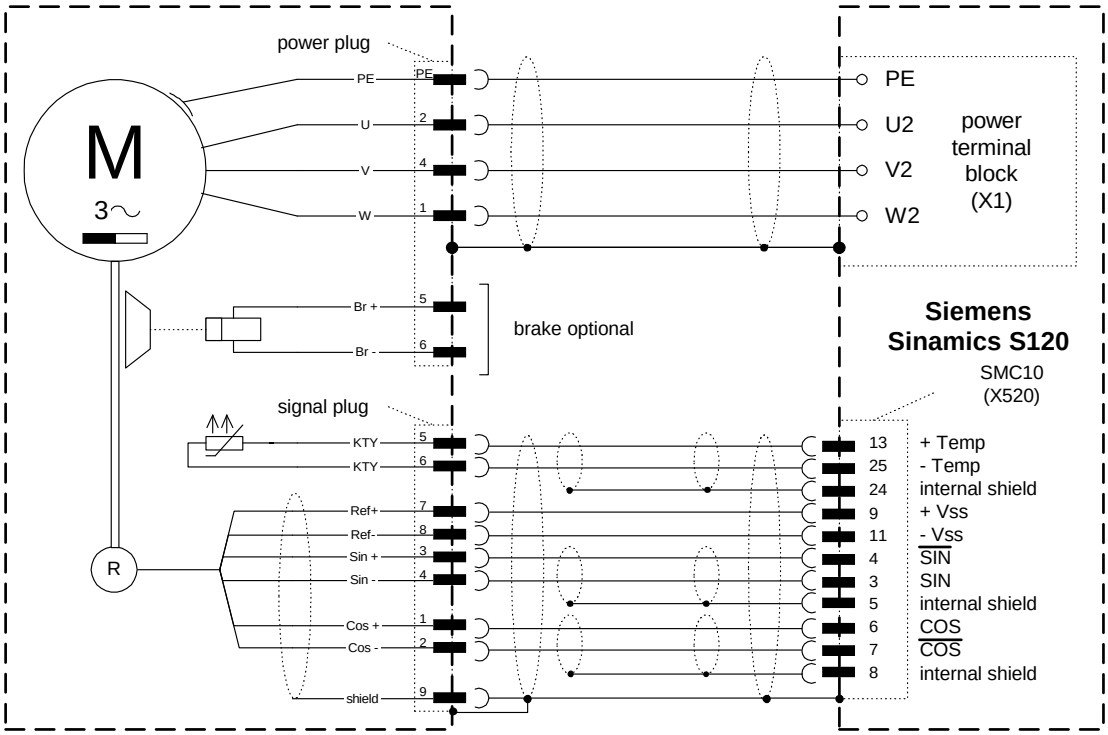
5 Connection schematic TPM(A) ⇔ Sinamics S120

For detailed information about cable design and screening the documentation of the drive manufacturer has to be consulted.
For the connection of the power cable at X1 a special connector is necessary, which is not in the scope of delivery of the Sinamics S120.
The connector has to be ordered separately from Siemens under the order number 6SL3162-2MA00-0AA0. See Fig. 2.
For the connection of the motor feedback to the Siemens DRIVE-CLiQ bus the module SMC10 for Resolver or SMC20 for absolute or incremental feedback is necessary. This modules can be ordered from Siemens under the order number 6SL3055-0AA00-5AA0 (SMC10) or 6SL3055-0AA00-5BA1 (SMC20). See Fig. 1.

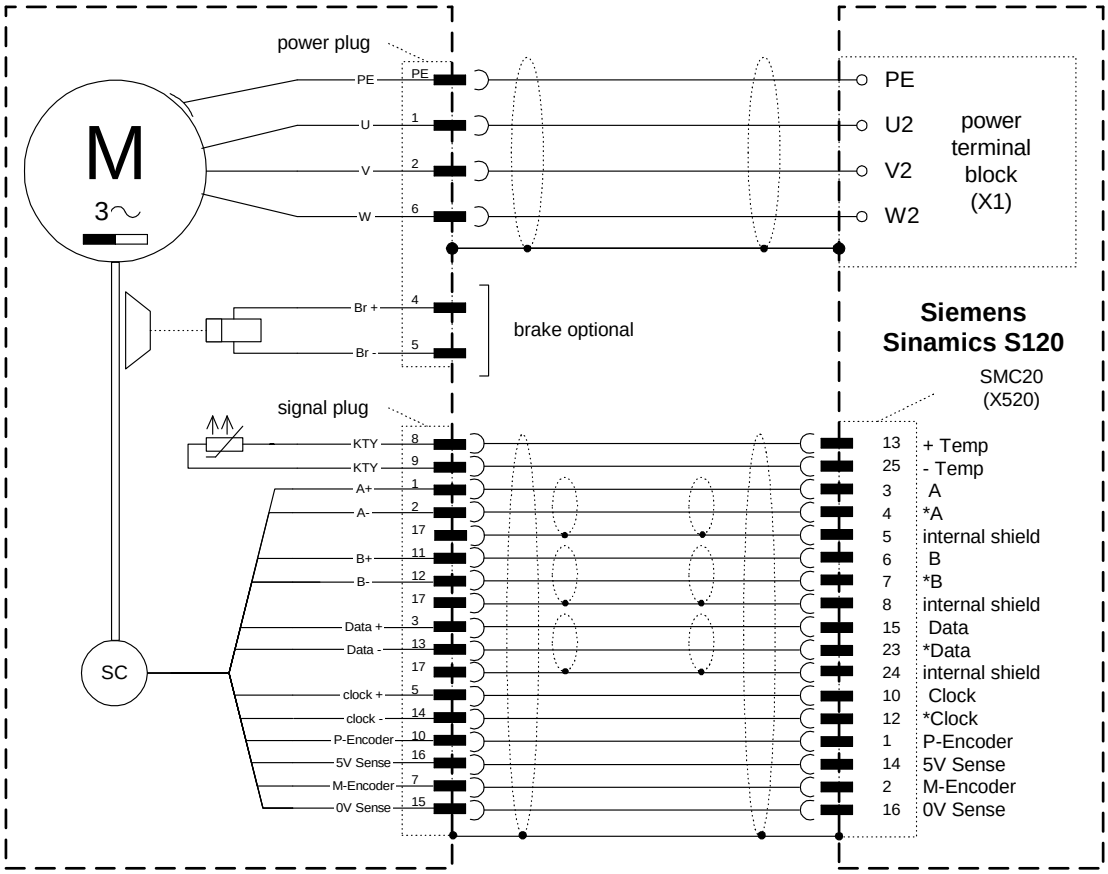
Fig. 1

Fig. 2

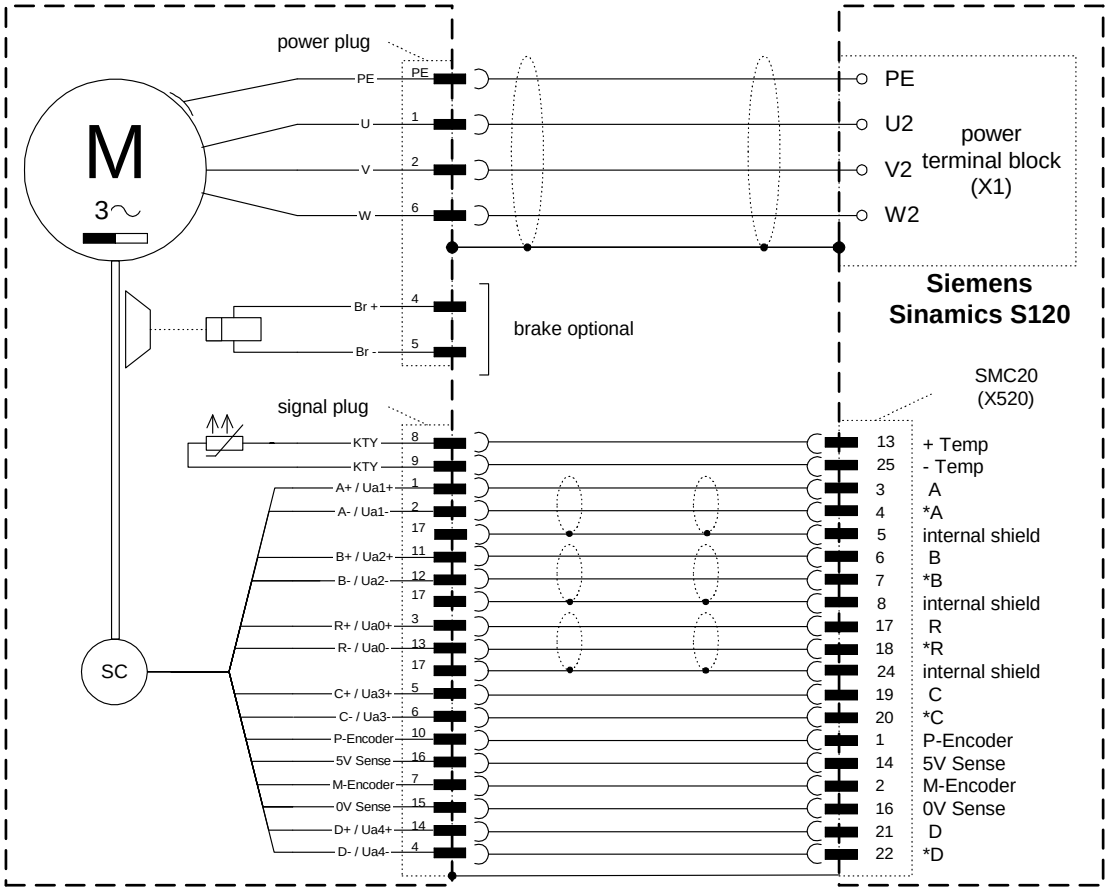
5.1 TPM(A) with resolver feedback (only with SMC10)



5.2 TPM(A) with absolute rotary encoder ECN 1313 / EQN 1325 / ECN 1113 / EQN1125 (SMC20)



5.3 TPM(A) with incremental rotary encoder ERN 1387 / ERN1185 (SMC20)



6 Assignment TPM(A) ⇔ servo amplifier ⇔ cable set

6.1 TPM(A) with resolver feedback

TPM type			controller		WMC Article code of power- (L) and feedback cable (S)													
feed-	size	i	recommendation WMC [1]		5m		10m		15m		20m		25m		30m		40m		50m	
back			320V	600V	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S
Resolver	TPM 004	021, 031, 061, 091	-	6SL3120-1TE13-0AAx	4000 3876	4000 5412	4000 3877	4000 5413	4000 3878	4000 5414	4000 3879	4000 5415	4000 6169	4000 6170	4000 6093	4000 7642	4000 7678	4000 7643	4000 7452	4000 7451
	TPM 010	021, 031	-	6SL3120-1TE13-0AAx																
		061, 091	-	6SL3120-1TE13-0AAx																
	TPM(A) 025	021, 031	-	6SL3120-1TE21-0AAx																
		061, 110	-	6SL3120-1TE15-0AAx																
		091, 154, 220	-	6SL3120-1TE15-0AAx																
	TPM(A) 050	061, 091, 110, 154	-	6SL3120-1TE21-0AAx																
		220	-	6SL3120-1TE15-0AAx																
		021	-	6SL3120-1TE23-0AAx	4000 6328		4000 6329		4000 6330		4000 6331		4000 7688		4000 7689		4000 7690		4000 7691	
		031	-	6SL3120-1TE23-0AAx																
	TPM(A) 110	021, 061, 091, 154, 220	-	6SL3120-1TE21-8AAx																
		031, 110	-	6SL3120-1TE21-8AAx																

[1] WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufactor to select optimized controller size for the application. Possibly you are able to use a smaller controller.

power- and signal cable to connect on motors with resolver feedback
all cable complete and for dynamic laying

power TPM 004-050 i=61/91	KABELL-TPM_-xxSTD_-RES015-STG	design power cable:	4 x 1,5mm2 + 2 x (2 x 1mm2), diameter 12,2mm, min. bending radius 122mm
power TPM050 i=21/31 TPM 110	KABELL-TPM_-xxSTD_-RES025-STG	design power cable:	4 x 2,5mm2 + 2 x (2 x 1mm2), diameter 15,1mm, min. bending radius 151mm
feedback	KABELS-TPM_-xxSIE_-RES000-STG	design feedback cable:	3 x (2 x 0,14mm2) + 4 x 0,14mm2 + 4 x 0,25mm2 + 2 x 0,5mm2
			diameter 10mm; min. bending radius 100mm
	(xx = cable length according to table)		

6.2 TPM(A) with absolute incremental encoder ECN 1313 / EQN 1325 / ECN 1113 / EQN 1125

TPM type			controller		WMC Article code of power- (L) and feedback cable (S) [G: straight; W: angled]															
feed-back	size	i	recommendation WMC [1] 320V	recommendation WMC [1] 600V	5m L	5m S	10m L	10m S	15m L	15m S	20m L	20m S	25m L	25m S	30m L	30m S	40m L	40m S	50m L	50m S
Absolut single-/multiturn encoder with **EnDat**	TPM 004	021, 031, 061, 091	-	6SL3120-1TE13-0AAx	4000 5465	**G:** 4000 5408 / **W:** 4000 6049	4000 5466	**G:** 4000 5409 / **W:** 4000 6050	4000 5467	**G:** 4000 5410 / **W:** 4000 6051	4000 5468	**G:** 4000 5411 / **W:** 4000 6052	4000 6054	**G:** 4000 7639 / **W:** 4000 6053	4000 7679	**G:** 4000 7640 / **W:** 4000 7645	4000 7328	**G:** 4000 7327 / **W:** 4000 7646	4000 5920	**G:** 4000 5919 / **W:** 4000 7647
	TPM 010	021, 031	-	6SL3120-1TE13-0AAx																
		061, 091	-	6SL3120-1TE13-0AAx																
	TPM(A) 025	021, 031	-	6SL3120-1TE21-0AAx																
		061, 110	-	6SL3120-1TE15-0AAx																
		091, 154, 220	-	6SL3120-1TE15-0AAx																
	TPM(A) 050	061, 091, 110, 154	-	6SL3120-1TE21-0AAx																
		220	-	6SL3120-1TE15-0AAx																
		021	-	6SL3120-1TE23-0AAx	4000 6830	**G:** 4000 5408 / **W:** 4000 6049	4000 6831	**G:** 4000 5409 / **W:** 4000 6050	4000 6832	**G:** 4000 5410 / **W:** 4000 6051	4000 6833	**G:** 4000 5411 / **W:** 4000 6052	4000 7692	**G:** 4000 7639 / **W:** 4000 6053	4000 7693	**G:** 4000 7640 / **W:** 4000 7645	4000 7694	**G:** 4000 7327 / **W:** 4000 7646	4000 7695	**G:** 4000 5919 / **W:** 4000 7647
		031	-	6SL3120-1TE23-0AAx																
	TPM(A) 110	021, 061, 091, 154, 220	-	6SL3120-1TE21-8AAx																
		031, 110	-	6SL3120-1TE21-8AAx																

[1] WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufactor to select optimized controller size for the application. Possibly you are able to use a smaller controller.

power- and feedback cable to connect on motors with absolut EnDat feedback ECN1313 / EQN1325 resp. ECN 1113 / EQN 1125

all cable complete and for dynamic laying

Cable			
power TPM 004-050 i=61/91	KABELL-TPM_-xxSTD_-END015-STG	design power cable:	4 x 1,5mm2 + 2 x 1mm2, diameter 12mm, min. bending radius 120mm
power TPM050 i=21/31 TPM 110	KABELL-TPM_-xxSTD_-END025-STG	design power cable:	4 x 2,5mm2 + 2 x 1mm2, diameter 15,1mm, min. bending radius 151mm
feedback	KABELS-TPM_-xxSIE_-END000-STG	design feedback cable:	3 x (2 x 0,14mm2) + 4 x 0,14mm2 + 4 x 0,25mm2 + 2 x 0,5mm2; diameter 10mm
	KABELS-TPM_-xxSIE_-END000-STW		min. bending radius 100mm
	(xx = cable length according to table)		

6.3 TPM(A) with incremental rotary encoder ERN 1387 / ERN 1185

TPM type			controller		WMC Article code of power- (L) and feedback cable (S)													
feed-back	size	i	recommendation WMC [1]		5m		10m		15m		20m		25m		30m		40m		50m	
			320V	600V	L	S	L	S	L	S	L	S	L	S	L	S	L	S	L	S
Incremental encoder	TPM 004	021, 031, 061, 091	-	6SL3120-1TE13-0AAx	4000 5465	4000 6908	4000 5466	4000 6909	4000 5467	4000 6910	4000 5468	4000 6911	4000 6054	4000 7648	4000 7679	4000 7649	4000 7328	4000 7650	4000 5920	4000 7651
	TPM 010	021, 031	-	6SL3120-1TE13-0AAx																
		061, 091	-	6SL3120-1TE13-0AAx																
	TPM(A) 025	021, 031	-	6SL3120-1TE21-0AAx																
		061, 110	-	6SL3120-1TE15-0AAx																
		091, 154, 220	-	6SL3120-1TE15-0AAx																
	TPM(A) 050	061, 091, 110, 154	-	6SL3120-1TE21-0AAx																
		220	-	6SL3120-1TE15-0AAx																
		021	-	6SL3120-1TE23-0AAx	4000 6830		4000 6831		4000 6832		4000 6833		4000 7692		4000 7693		4000 7694		4000 7695	
		031	-	6SL3120-1TE23-0AAx																
	TPM(A) 110	021, 061, 091, 154, 220	-	6SL3120-1TE21-8AAx																
		031, 110	-	6SL3120-1TE21-8AAx																

[1] WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufactor to select optimized controller size for the application. Possibly you are

power- and signal cable to connect on motors with resolver feedback

all cable complete and for dynamic laying

power TPM 004-050 i=61/91	KABELL-TPM_-xxSTD_-END015-STG	design power cable:	4 x 1,5mm2 + 2 x 1mm2, diameter 12mm, min. bending radius 120mm
power TPM050 i=21/31 TPM 110	KABELL-TPM_-xxSTD_-END025-STG	design power cable:	4 x 2,5mm2 + 2 x 1mm2, diameter 15,1mm, min. bending radius 151mm
feedback	KABELS-TPM_-xxSIE_-INK000-STG	design feedback cable:	3 x (2 x 0,14mm2) + 4 x 0,14mm2 + 4 x 0,25mm2 + 2 x 0,5mm2
			diameter 10mm; min. bending radius 100mm
	(xx = cable length according to table)		