

WITTENSTEIN



motion control



TPM(A) 004 – 110

**SIEMENS
SIMODRIVE 611 U/D**

Quick Startup Guide

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Technical changes reserved!

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Modification History

Document Designation	Version	Date	Note
QSG SIEMENS SimoDrive10.doc	1.0	27. Sep. 2002	First edition
4091_D004455_2.doc	1.1	15 th April 2004	Correction Wiring diagrams, TPM004, TPMA 025 , 050, 110 added
4091_D004455_3.doc	1.2	20 th April 2005	Correction armature inductance
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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.

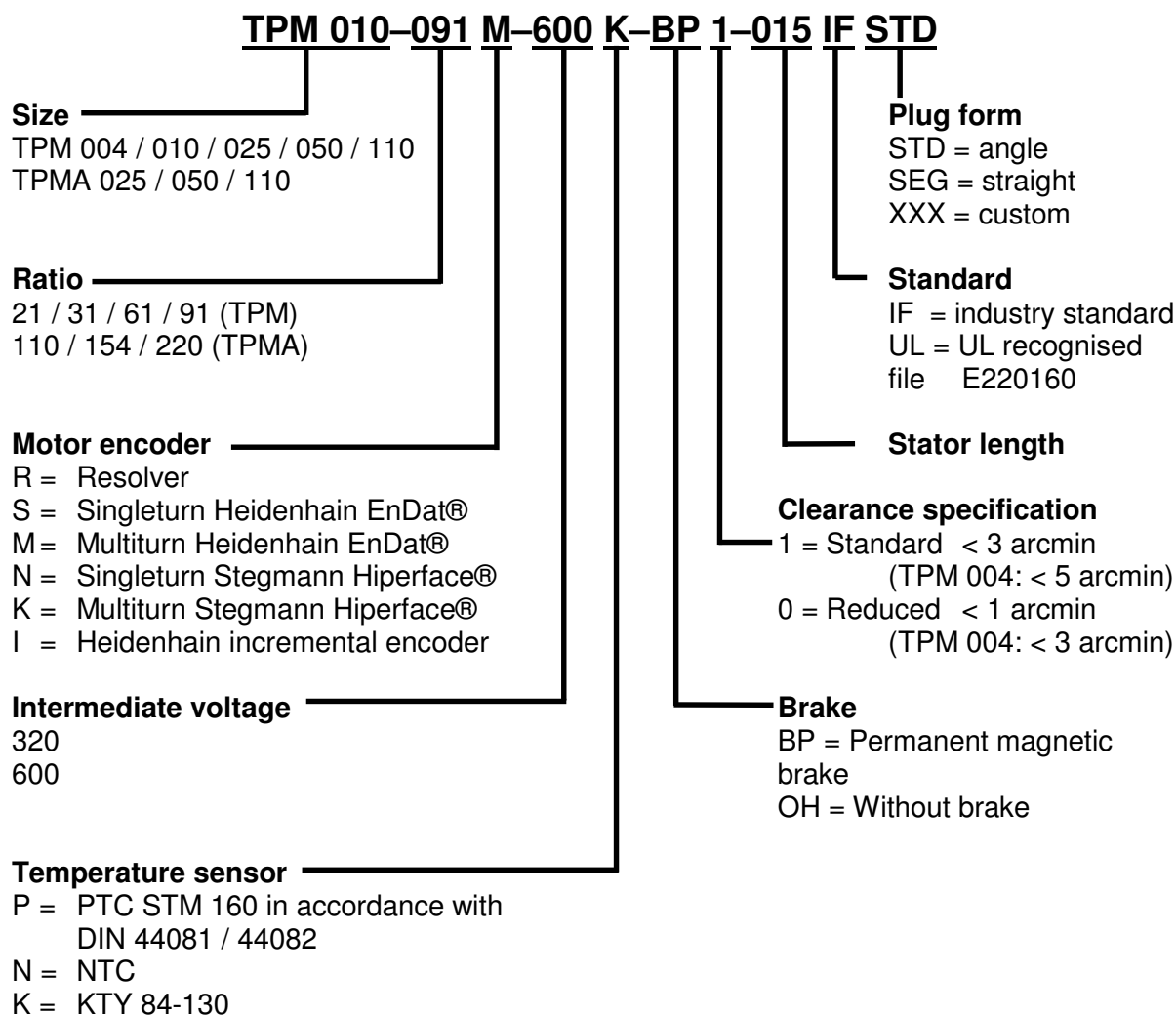
Observe all of the national safety regulations and guidelines of the country where the device is being used. All transportation, installation, start-up, and service work is to be performed by qualified technicians. Qualified technicians are those who are completely familiar with the assembly, installation, 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.



3 Parameter list TPM 004 – 110 ↔ SimoDrive 611 U/D

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.

Code	Description	TPM 004	TPM 010	TPM 025	TPM 050	TPM 110
	DC Bus Voltage	600V	600V	600V	600V	600V
	ratio 21 / 31 stator length	30	30	45	60	75
1103	Rated motor current [A_{rms}]	0.7	1.1	3.1	5.6	9.7
1104	Maximum motor current [A_{rms}]					
	Ratio $i = 21$	2.40	5.00	10.60	41.80	26.20
	Ratio $i = 31$	2.10	5.00	8.90	36.40	26.20
1113	Torque constant [Nm/Arms]	0.67	0.83	1.16	0.91	1.51
1114	Voltage constant [Vrms/1000rpm]	40.7	50.4	70.3	54.8	91.1
1115	Armature resistance [Ohm]	23.7	9.65	1.9	0.18	0.36
1116	Armature inductance [mH]	15.3	10.2	5.0	1.2	2.7
1117	$i = 21$, Moment of inertia without brake [kgm ²]	0.000017	0.000041	0.000248	0.000946	0.001367
	$i = 21$, Moment of inertia with brake [kgm ²]	0.000023	0.000049	0.000257	0.000969	0.001542
	$i = 31$, Moment of inertia without brake [kgm ²]	0.000017	0.000040	0.000244	0.000935	0.001311
	$i = 31$, Moment of inertia with brake [kgm ²]	0.000023	0.000048	0.000253	0.000958	0.001486
1118	Motor zero-speed current [A_{rms}]	0.8	1.3	4.4	15.3	12.1
1400	Rated motor speed [rpm]	6000	6450	5900	4650	3500 ¹
	ratio 61 / 91 stator length	15	15	15	15	60
1103	Rated motor current [A_{rms}]	0.5	0.7	1.8	2.6	5.6
1104	Maximum motor current [A_{rms}]					
	ratio $i = 61$	1.20	2.40	7.00	13.70	37.10
	ratio $i = 91$	0.80	1.50	4.80	9.70	23.90
1113	Torque constant [Nm/Arms]	0.45	0.77	0.76	1.02	0.91
1114	Voltage constant [Vrms/1000rpm]	27.4	46.7	45.9	61.5	54.8
1115	Armature resistance [Ohm]	30.55	22.1	4.6	2.25	0.18
1116	Armature inductance [mH]	13.8	15.3	6.3	6.3	1.2
1117	$i = 61$, Moment of inertia without brake [kgm ²]	0.000008	0.000023	0.000087	0.000234	0.000995
	$i = 61$, Moment of inertia with brake [kgm ²]	0.000015	0.000030	0.000095	0.000257	0.001170
	$i = 91$, Moment of inertia without brake [kgm ²]	0.000008	0.000023	0.000087	0.000233	0.000988
	$i = 91$, Moment of inertia with brake [kgm ²]	0.000015	0.000030	0.000095	0.000256	0.001163
1118	Motor zero-speed current [A_{rms}]	0.6	0.8	2.3	3.6	15.3
1400	Rated motor speed [rpm]	6000	6450	5900	4650	3500 ¹
Common data						
1112	No. of pole pairs of motor	4	4	6	6	6
1122	Motor current limit [A_{rms}]	→ Parameter 1104				
1136	Motor no-load current [A_{rms}]	0.15	0.2	0.35	0.5	0.75
1146	Maximum motor speed [rpm]	7000	7000	6000	5000	4500
1180	Lower current limit adaption [%]	60	60	60	60	60
1181	Upper current limit adaption [%]	100	100	100	100	100
1182	Factor current controller adaption [%]	30	30	30	30	30
1407	Speed controller P gain [Nms/rad]	0.1	0.1	0.1	0.1	0.1
1409	Speed controller reset time [ms]	10	10	10	10	10

¹ The maximum useable speed is limited to 1.2 times rated motor speed. Depending on the application cycle higher values are possible after check.

4 Parameter list TPMA 025 – 110 ↔ SimoDrive 611 U/D

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.

Code	Description	TPMA 025	TPMA 050	TPMA 110
	DC Bus Voltage	600V	600V	600V
	ratio 110 / 154 / 220			
	stator length	15	15	60
1103	Rated motor current [A_{rms}]	1.8	2.6	5.6
1104	Maximum motor current [A_{rms}]			
	Ratio i = 110	7.00	13.70	41.40
	Ratio i = 154	5.50	11.30	28.80
	Ratio i = 220	3.70	7.10	19.20
1113	Torque constant [Nm/ A_{rms}]	0.76	1.02	0.91
1114	Voltage constant [$V_{rms}/1000rpm$]	45.9	61.5	54.8
1115	Armature resistance [Ohm]	4.6	2.25	0.18
1116	Armature inductance [mH]	6.3	6.3	1.2
1117	i = 110, Moment of inertia without brake [kgm^2]	0.000089	0.000243	0.001032
	i = 110, Moment of inertia with brake [kgm^2]	0.000098	0.000266	0.001208
	i = 154, Moment of inertia without brake [kgm^2]	0.000087	0.000235	0.001000
	i = 154, Moment of inertia with brake [kgm^2]	0.000096	0.000258	0.001175
	i = 220, Moment of inertia without brake [kgm^2]	0.000087	0.000231	0.000984
	i = 220, Moment of inertia with brake [kgm^2]	0.000095	0.000254	0.001159
1118	Motor zero-speed current [A_{rms}]	2.3	3.6	15.3
1400	Rated motor speed [rpm]	4200 ²	4200	3300 ²
1112	No. of pole pairs of motor	6	6	6
1122	Motor current limit [A_{rms}]	→ Parameter 1104		
1136	Motor no-load current [A_{rms}]	0.75	0.75	0.75
1146	Maximum motor speed [rpm]	6000	5000	4500
1180	Lower current limit adaption [%]	60	60	60
1181	Upper current limit adaption [%]	100	100	100
1182	Factor current controller adaption [%]	30	30	30
1407	Speed controller P gain [Nms/rad]	0.1	0.1	0.1
1409	Speed controller reset time [ms]	10	10	10

² The maximum useable speed is limited to 1.2 times rated motor speed. Depending on the application cycle higher values are possible after check.

5 Parameterisation Measuring system / encoder

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

5.1 TPM(A) with resolver

Inversion of Actual Speed Value: NO

No. Pole Pairs / Speed: 1

5.2 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

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

Encoder type: Incremental – one zero mark

Inversion of Actual Speed Value: NO

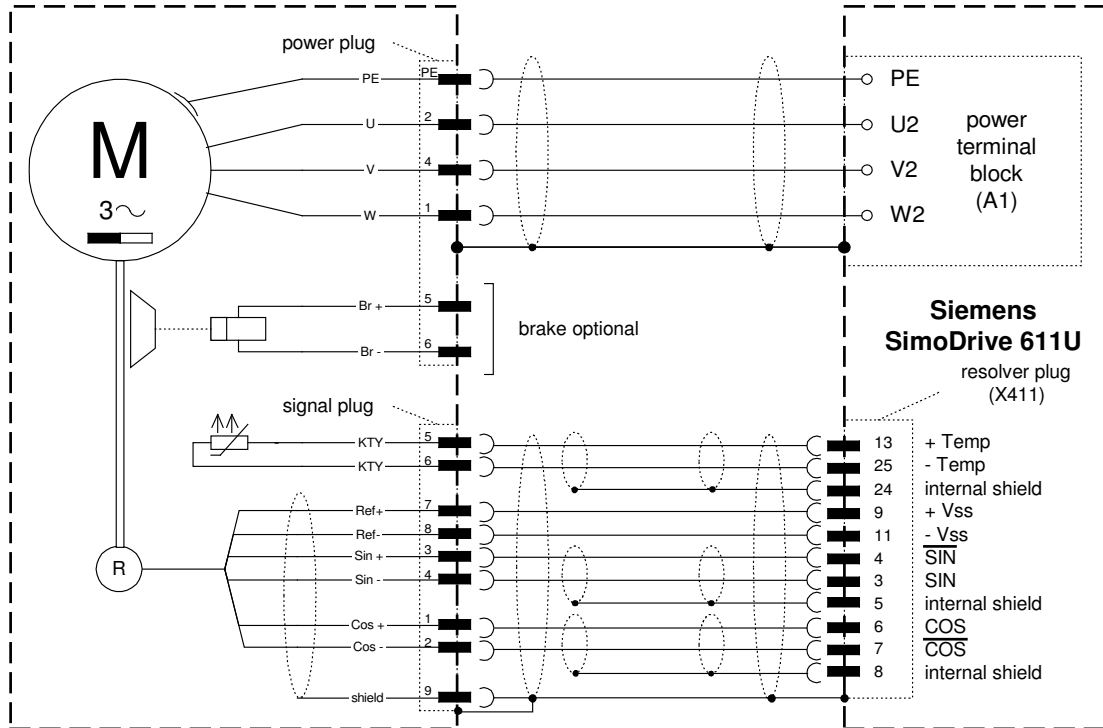
Commutation Information: Coarse synchronisation with C/D track

Pulses Per Revolution: 2048

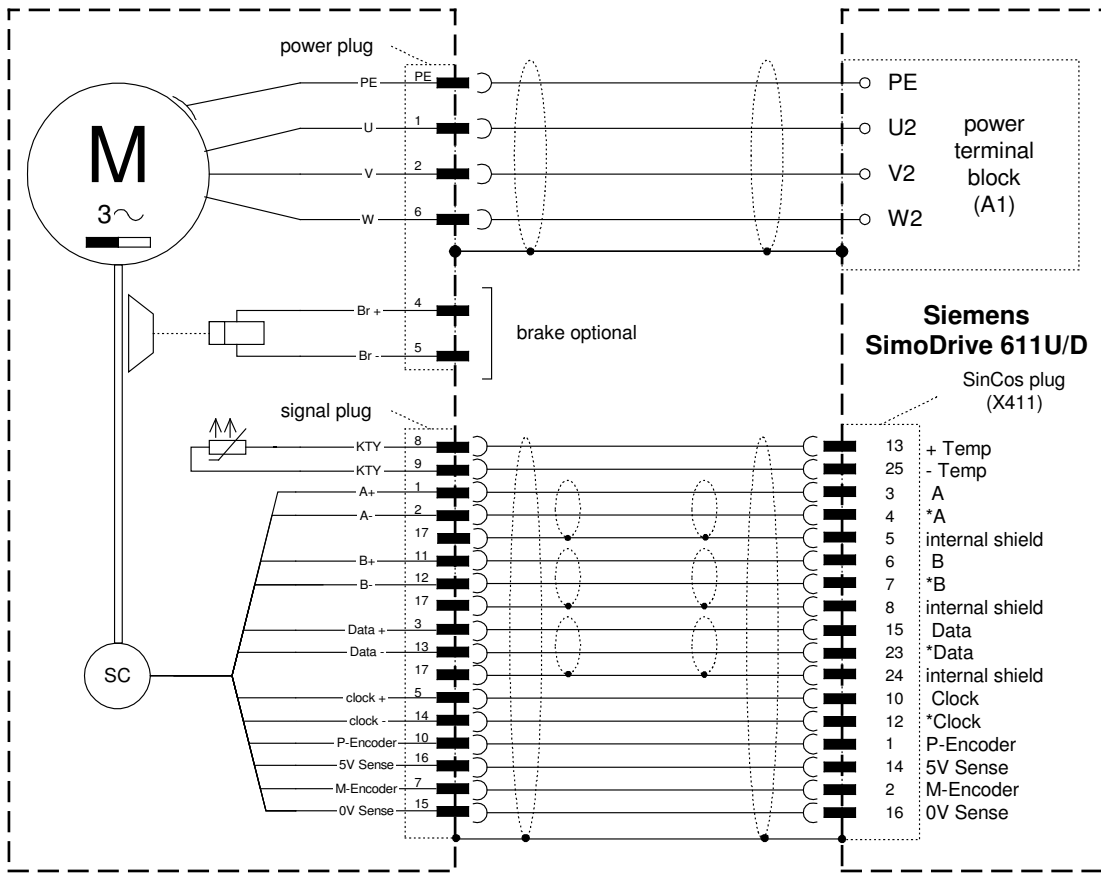
6 Connection schematic TPM(A) ↔ SimoDrive 611 U/D

For detailed information about cable design and screening the documentaion of the drive manufactu-
 rer has to be consulted.

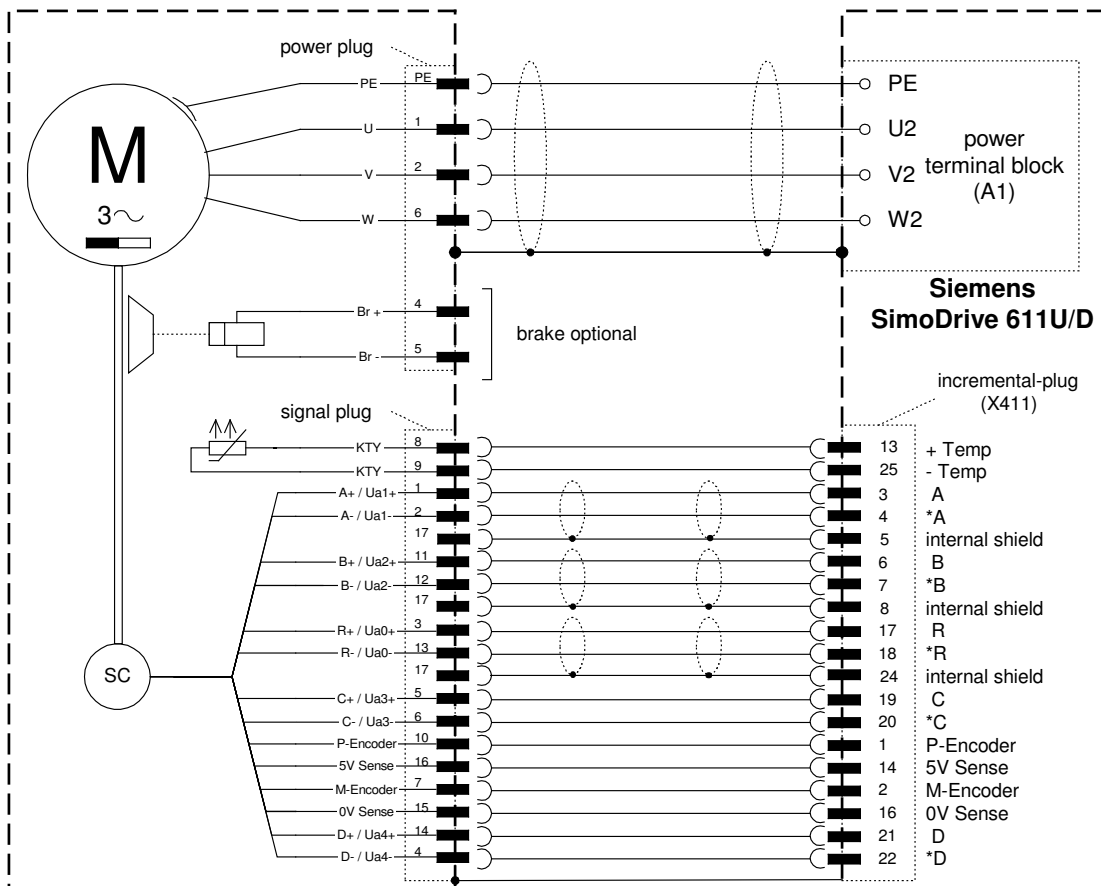
6.1 TPM(A) with resolver feedback (only for 611 U)



6.2 TPM(A) with absolute rotary encoder ECN 1313 / EQN 1325 / ECN 1113 / EQN1125 (611 U/D)



6.3 TPM(A) with incremental rotary encoder ERN 1387 / ERN1185 (for 611 U/D)



7 Assignment TPM(A) ↔ servo amplifier ↔ cable set

7.1 TPM(A) with resolver feedback

feed-back	TPM type		controller		WMC Article code of power- (L) and feedback cable (S)																	
	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		
Resolver	TPM 004	021, 031, 061, 091	-	6SN1123-1AA00-0HA1	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	-	6SN1123-1AA00-0AA1																		
		061, 091	-	6SN1123-1AA00-0HA1																		
	TPM(A) 025	021, 031	-	6SN1123-1AA00-0BA1																		
		061, 110	-	6SN1123-1AA00-0AA1																		
		091, 154, 220	-	6SN1123-1AA00-0AA1																		
	TPM(A) 050	061, 091, 110, 154	-	6SN1123-1AA00-0BA1																		
		220	-	6SN1123-1AA00-0AA1																		
		021	-	6SN1123-1AA00-0CA1																		
	TPM(A) 110	031	-	6SN1123-1AA00-0DA1																		
		021, 061, 091, 154, 220	-	6SN1123-1AA00-0CA1																		
		031, 110	-	6SN1123-1AA00-0DA1	4000 6328		4000 6329		4000 6330		4000 6331		4000 7688		4000 7689		4000 7690		4000 7691			

¹ WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufacturer 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)

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

feed-back	TPM type		controller		WMC Article code of power- (L) and feedback cable (S) [G: straight; W: angled]															
	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
Absolut single-/multiturn encoder with EnDat	TPM 004	021, 031, 061, 091	-	6SN1123-1AA00-0HA1	4000 5465	G: 4000 5408 / W: 4000 6049	4000 5466	G: 4000 6050	4000 5467	G: 4000 6051	4000 5468	G: 4000 6052	4000 6054	G: 4000 6053	4000 7679	G: 4000 7645	4000 7328	G: 4000 7646	4000 5920	G: 4000 7647
	TPM 010	021, 031	-	6SN1123-1AA00-0AA1																
		061, 091	-	6SN1123-1AA00-0HA1																
	TPM(A) 025	021, 031	-	6SN1123-1AA00-0BA1																
		061, 110 091, 154, 220	- -	6SN1123-1AA00-0AA1 6SN1123-1AA00-0AA1																
	TPM(A) 050	061, 091, 110, 154	-	6SN1123-1AA00-0BA1	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
		220	-	6SN1123-1AA00-0AA1																
		021	-	6SN1123-1AA00-0CA1																
		031	-	6SN1123-1AA00-0DA1																
	TPM(A) 110	021, 061, 091, 154, 220	-	6SN1123-1AA00-0CA1	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, 110	-	6SN1123-1AA00-0DA1																

¹ WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufacturer 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)

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

feed-back	TPM type		controller		WMC Article code of power- (L) and feedback cable (S)															
	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	-	6SN1123-1AA00-0HA1	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, 031 061, 091	-	6SN1123-1AA00-0AA1 6SN1123-1AA00-0HA1																
	TPM(A) 025	021, 031	-	6SN1123-1AA00-0BA1																
		061, 110 091, 154, 220	-	6SN1123-1AA00-0AA1 6SN1123-1AA00-0AA1																
	TPM(A) 050	061, 091, 110, 154 220	-	6SN1123-1AA00-0BA1 6SN1123-1AA00-0AA1																
		021	-	6SN1123-1AA00-0CA1																
		031	-	6SN1123-1AA00-0DA1																
	TPM(A) 110	021, 061, 091, 154, 220 031, 110	-	6SN1123-1AA00-0CA1 6SN1123-1AA00-0DA1	4000 6830	4000 6831	4000 6832	4000 6833	4000 7692	4000 7693	4000 7694	4000 7695								

¹ WMC recommendation is based on use of a power stage with maximal PWM-frequency. Please refer to WMC or controller manufacturer 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)