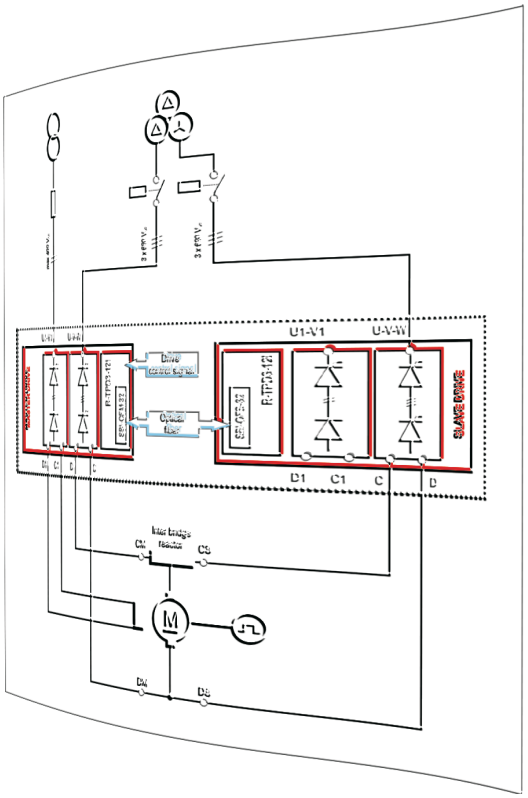
12 pulses DC drives Industrial Application

TPD32-EV

Addendum to Instruction manual
TPD32-EV- ... 12P Parallel configuration
TPD32-EV- ... 12S Series configuration

Language: English



Thank you for choosing this WEG product.

We will be glad to receive any possible information which could help us improve this manual. The e-mail address is the following: techdoc@weg.net.

Before using the product, read the safety instruction section carefully.

Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

The manufacturer has the right to modify products, data and dimensions without notice.

The data can only be used for the product description and they can not be understood as legally stated properties.

This addendum is updated according the software version:

V. 11.4X. (TPD32-EV 12-Pulses Parallel)

V. 11.5X. (TPD32-EV 12-Pulses Series).

Variation of the number replacing "X" have no influence on the functionality of the device.

The identification number of the software version can be read on the converter nameplate or on the label on the EPROM memories mounted on the regulation card.

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SAFETY SYMBOL LEGEND

WARNING: Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in personai injury or death.

CAUTION: Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in damage or destruction of equipment.

NOTE: Commands attention to an operating procedure, practice, condition, or statement that must be highlighted.

1. INTRODUCTION

This manual provides detailed information about the 12 pulse configurations for TPD32-EV DC drive series TPD32-EV instruction manual, all the common basis information are available in the complete TPD32-EV instruction book.

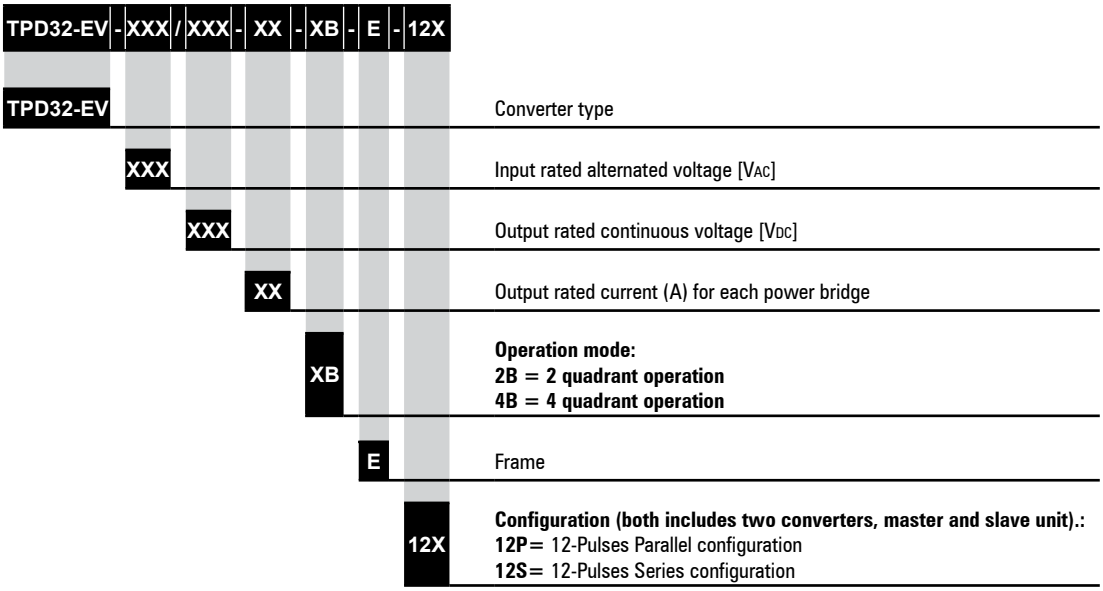
The 12 pulses DC drives are composed by two 6 pulses power bridges connected in two different configuration: parallel (12P) or series (12S).

The most advantages of this technology are:

- reduction of the Harmonics level
- motor efficiency improvement due to a current ripple reduction
- extension of the drive power range for parallel configuration
- possibility of emergency operation with one converter in case of a breakdown in the other converter for series configuration.

It is required to use a twelve pulse line transformer providing the AC power for both converters from separated transformer secondary windings whose phase positions differ by 30°.

1.1. IDENTIFICATION CODE



1.2. AVAILABLE SIZES

Converters	Code
TPD32-EV-690/810-1010-2B-E-12P	On request
TPD32-EV-690/810-1400-2B-E-12P	"
TPD32-EV-690/810-1700-2B-E-12P	"
TPD32-EV-690/810-2000-2B-E-12P	"
TPD32-EV-690/810-2400-2B-E-12P	"
TPD32-EV-690/810-2700-2B-E-12P	"
TPD32-EV-690/810-3300-2B-E-12P	"
TPD32-EV-690/720-1010-4B-E-12P	"
TPD32-EV-690/720-1400-4B-E-12P	"
TPD32-EV-690/720-1700-4B-E-12P	"
TPD32-EV-690/720-2000-4B-E-12P	"
TPD32-EV-690/720-2400-4B-E-12P	"
TPD32-EV-690/720-2700-4B-E-12P	"
TPD32-EV-690/720-3300-4B-E-12P	"
TPD32-EV-1000/...-.....-..-E-12P	"

Converters	Code
TPD32-EV-350/410-1010-2B-E-12S	On request
TPD32-EV-350/410-1400-2B-E-12S	"
TPD32-EV-350/410-1700-2B-E-12S	"
TPD32-EV-350/410-2000-2B-E-12S	"
TPD32-EV-350/410-2400-2B-E-12S	"
TPD32-EV-350/410-2700-2B-E-12S	"
TPD32-EV-350/410-3300-2B-E-12S	"
TPD32-EV-350/360-1010-4B-E-12S	"
TPD32-EV-350/360-1400-4B-E-12S	"
TPD32-EV-350/360-1700-4B-E-12S	"
TPD32-EV-350/360-2000-4B-E-12S	"
TPD32-EV-350/360-2400-4B-E-12S	"
TPD32-EV-350/360-2700-4B-E-12S	"
TPD32-EV-350/360-3300-4B-E-12S	"
TPD32-EV-500/...-....-..-E-12S	"
TPD32-EV-650/670-4400-..-E-12S	"

2. TECHNICAL DATA

2.1. 12-PULSES PARALLEL CONFIGURATION

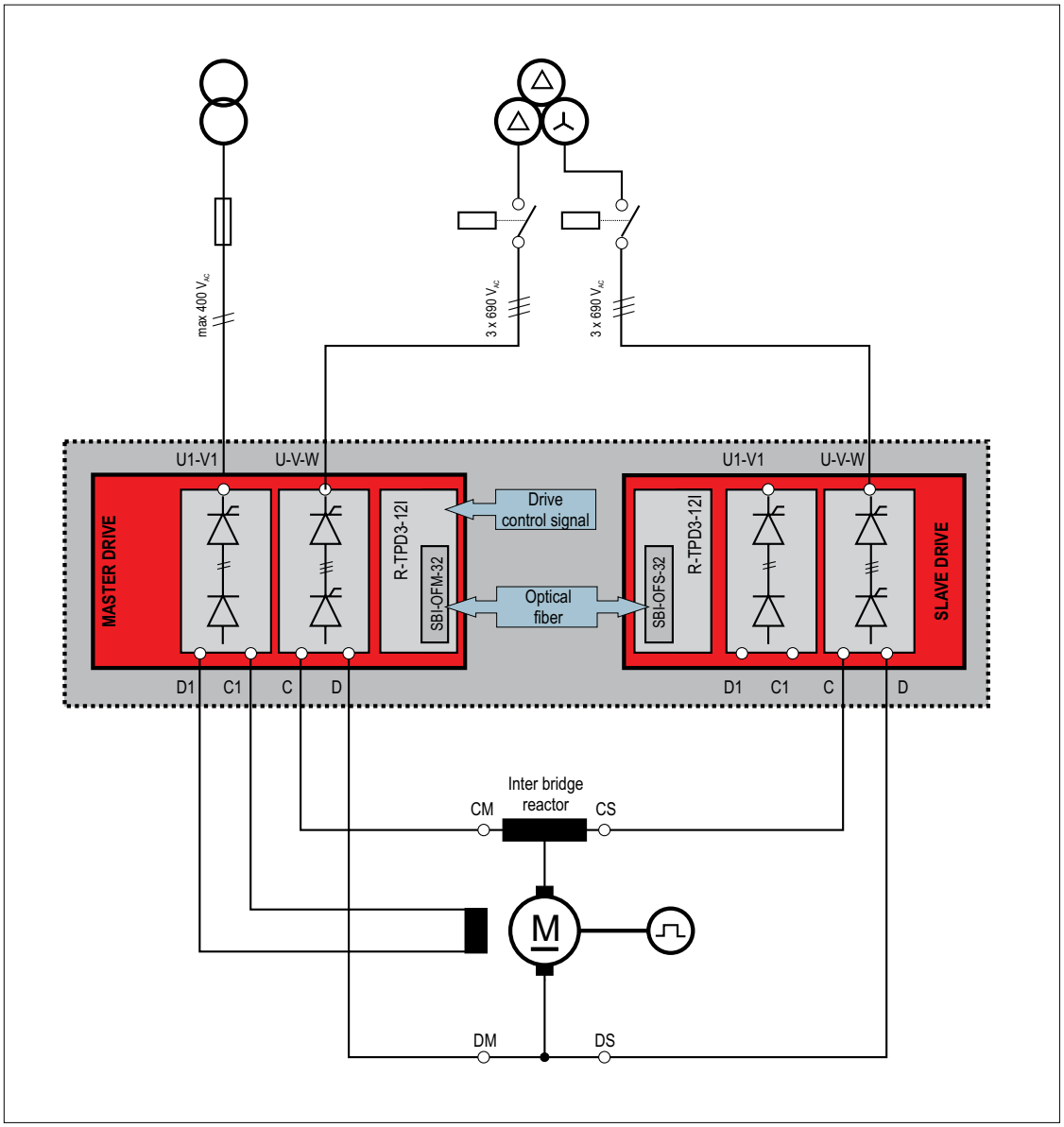


Figure 1 : 12-Pulses PARALLEL Configuration

The motor gets the sum of the DC current of two converters. Thus the current is doubled.

The Power range of the drive is extended by doubling dc drive output current value

2.2. 12-PULSES SERIES CONFIGURATION

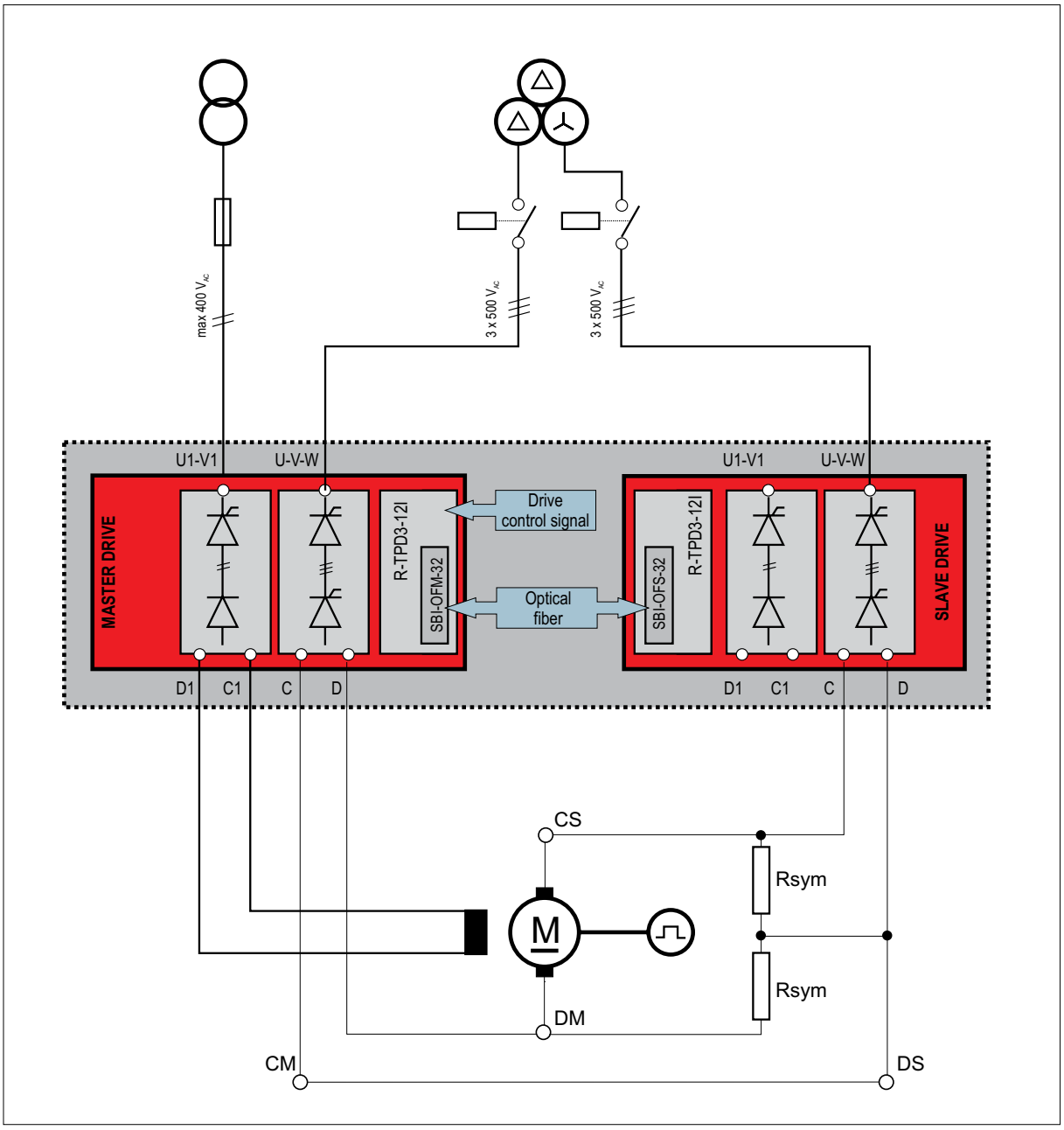


Figure 2 : 12-Pulses SERIES Configuration

The motor gets the sum of the DC voltage of two converters. Thus the voltage is doubled.

An emergency operation is possible with full torque and with 50 % of the former maximum armature voltage.

DC voltage range is extended by doubling dc drive output voltage value, however, the following remark applies:

REMARK ! The output voltage of a 12-pulse series system is limited due to the isolation strength of the individual drives. The isolation against ground for which the drives are designed cannot be fully used because a much higher voltage against ground can result due to series connection in case of a ground fault.

2.3. AVAILABLE SIZES

IMPORTANT ! The 12 pulses external bridge DC drives are composed by two bridges connected in parallel or series.

Table 1 : Converter sizes for AC input supply 690 V, 3ph (12-Pulses PARALLEL Configuration)

Converters	Type		Total Rated DC current	
	4B	2B	Armature [A]	Field [A]
TPD32-EV-690/...-1010-..-12P	•	•	2000	40
TPD32-EV-690/...-1400-..-12P	•	•	2800	40
TPD32-EV-690/...-1700-..-12P	•	•	3400	40
TPD32-EV-690/...-2000-..-12P	•	•	4000	40
TPD32-EV-690/...-2400-..-12P	•	•	4800	70
TPD32-EV-690/...-2700-..-12P	•	•	5400	70
TPD32-EV-690/...-3300-..-12P	•	•	6600	70
TPD32-EV-1000/...-….-..-12P	•	•	…	140

Table 2 : Converter sizes for AC input supply 350 V, 3ph (12-Pulses SERIES Configuration)

Converters	Type		Total Rated DC current	
	4B	2B	Armature [A]	Field [A]
TPD32-EV-350/...-1010-..-12S	•	•	1000	40
TPD32-EV-350/...-1400-.. -12S	•	•	1400	40
TPD32-EV-350/...-1700-.. -12S	•	•	1700	40
TPD32-EV-350/...-2000-.. -12S	•	•	2000	40
TPD32-EV-350/...-2400-.. -12S	•	•	2400	70
TPD32-EV-350/...-2700-.. -12S	•	•	2700	70
TPD32-EV-350/...-3300-.. -12S	•	•	3300	70
TPD32-EV-500/...-….-..-12S	•	•	...	140
TPD32-EV-650/...-….-..-12S	•	•	...	140
TPD32-EV-650/…-4400-..-12S	•		4400	140

TPD32-EV-500/... converters on request

2.4. SUPPLY VOLTAGE

Table 3 : Supply voltage

Device series	Power section (Terminals U/V/W)		Field circuit (Terminals U1/V1)	Power supply regulation (Terminals U2/V2)
TPD32-EV-690/... -12P	3 x 230 V ±10 %* 3 x 400 V ±10 %* 3 x 440 V ±10 % 3 x 460 V ±10 % 3 x 480 V ±10 % 3 x 500 V ±10 % 3 x 690 V ±10 %*	50/60 Hz ±5 %	1 x 230 V ±10 %* 1 x 400 V ±10 %* 1 x 460 V ±10 % 50/60 Hz ±5 %	1 x 115 V ±15 % or 1 x 230 V ±15 % 50 / 60 Hz ±5 %
TPD32-EV-1000/... -12P	3 x 400 V ±10 %* 3 x 440 V ±10 % 3 x 460 V ±10 % 3 x 480 V ±10 % 3 x 500 V ±10 % 3 x 690 V ±10 %* 3 x 1000 V ±10 %*			
TPD32-EV-350/... -12S	3 x 230 V ±10 % to 3 x 350 V ±10 %			
TPD32-EV-500/... -12S	3 x 350 V ±10 % to 3 x 500 V ±10 %			
TPD32-EV-650/... -12S	3 x 500 V ±10 % to 3 x 650 V ±10 %			

* With the indicated tolerance values the output voltage complies with the DIN 40 030 standard.
With wider tolerances the max output voltage changes accordingly.

Table 4 : Armature circuit output voltages 12-Pulses PARALLEL Configuration

Ac input voltage (Terminals U / V / W)	TPD32-EV-690/.... -12P	TPD32-EV-1000/.... -12P	Output armature voltage U_{dN} (Terminals C/D)	
			2B - Two quadrant converter	4B - Four quadrant converter
3 x 690 V ±10 %	•		810 V	720 V
3 x 1000 V ±10 %		•	1200 V	1000 V

Table 5 : Armature circuit output voltages 12-Pulses SERIES Configuration

Ac input voltage (Terminals U / V / W)	TPD32-EV-350/.... -12S	TPD32-EV-500/.... -12S	TPD32-EV-650/.... -12S	Total output armature voltage U_{dN} (Terminals CM/DS)	
				2B - Two quadrant converter	4B - Four quadrant converter
3 x 350 V ±10 %	•			820 V (2*410 V)	720 V (2*360 V)
3 x 500 V ±10 %		•		1170 V (2*585 V)	1030 V (2*515 V)
3 x 650 V ±10 %			•	1500 V (2* 760 V)	1340 V (2*670 V)

Table 6 : Field circuit output voltage

AC input voltage (Terminals U1 / V1)	Output field voltage U_{FN} (Terminals C1 / D1)	
	Fixed field	Adjustable field
1 x 230 V ±15 %	200 V *	200 V *
1 x 400 V ±15 %	310 V *	310 V *
1 x 460 V ±10%	360 V *	360 V *

* Voltage according to DIN 40 030 standard. Is it possible to obtain an output Voltage up to 0.85 x U_{LN}

NOTE! The minimum AC input voltage supply value for the field circuit is 110VAC.

2.5. AC INPUT CURRENTS

Table 7 : AC input current 12-Pulses PARALLEL Configuration

Converters	Armature AC input current (*)	Field AC input max current
TPD32-EV-690/...-1010-..-12P	860 A	40 A
TPD32-EV-690/...-1400-..-12P	1205 A	40 A
TPD32-EV-690/...-1700-..-12P	1464 A	40 A
TPD32-EV-690/...-2000-..-12P	1720 A	40 A
TPD32-EV-690/...-2400-..-12P	2064 A	70 A
TPD32-EV-690/...-2700-..-12P	2313 A	70 A
TPD32-EV-690/...-3300-..-12P	2827 A	70 A
TPD32-EV-1000/...-….-..-12P		140 A

(*) Data valid for each bridge

Table 8 : AC input current 12-Pulses SERIES Configuration

Converters	Armature AC input current (*)	Field AC input max current
TPD32-EV-350/...-1010-..-12S	860 A	40 A
TPD32-EV-350/...-1400-.. -12S	1205 A	40 A
TPD32-EV-350/...-1700-.. -12S	1464 A	40 A
TPD32-EV-350/...-2000-.. -12S	1720 A	40 A
TPD32-EV-350/...-2400-.. -12S	2064 A	70 A
TPD32-EV-350/...-2700-.. -12S	2313 A	70 A
TPD32-EV-350/...-3300-.. -12S	2827 A	70 A
TPD32-EV-500/...-….-.. -12S	….	140 A
TPD32-EV-650/...-….-.. -12S	….	140 A
TPD32-EV-650/670-4400-.. -12S	3772 A	140 A

(*) Data valid for each bridge

Table 9 : Regulation power supply

Card	Power	AC input current	
		@ 115 V	@ 230 V
SW1-31	70 W	1 A	0.5 A

2.6. FIELD CURRENT RESISTORS

Setting all dipswitches to zero (OFF) allows a custom calculated resistor to be used on terminals LA and LB, of the regulation card, using the formulas listed below.

A) For sizes greater than TPD32-EV-.../...-1200-..-E up to TPD32-EV-.../...-2000-..-E **: Resistance = 3332 / field current (A).**

B) For sizes greater than TPD32-EV-.../...-2000-..-E up to TPD32-EV-.../...-3300-..-E **: Resistance = 1667 / field current (A).**

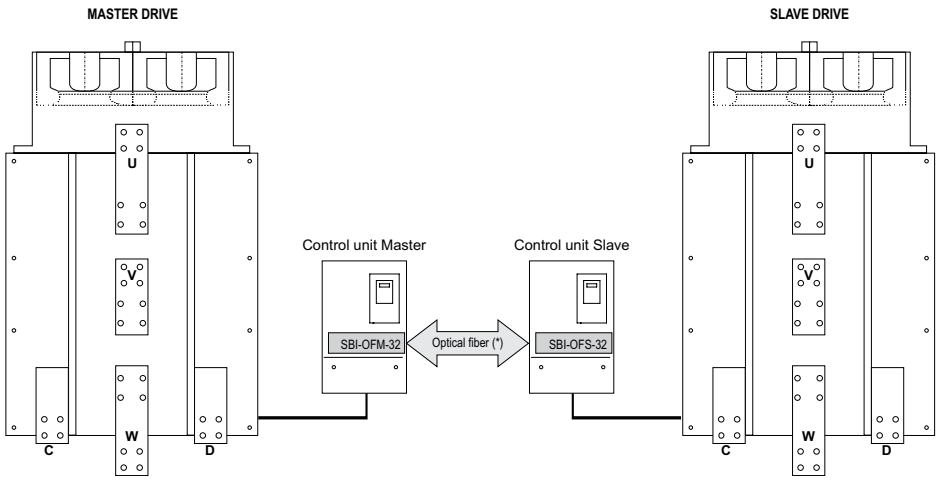
Table 10 : Field current resistors

Type of field circuit	Full scale value	168,5 Ohm	333 Ohm	182 Ohm	36,4 Ohm	845 Ohm	1668 Ohm	3333,3 Ohm	
		S14-1	S14-2	S14-3	S14-4	S14-5	S14-6	S14-7	S14-8
Field card PFC-40 *	1A	OFF	OFF	OFF	OFF	OFF	OFF	ON	Not used
	2A	OFF	OFF	OFF	OFF	OFF	ON	OFF	
	4A	OFF	OFF	OFF	OFF	ON	OFF	OFF	
	6A	OFF	OFF	OFF	OFF	ON	ON	OFF	
	10A	OFF	ON	OFF	OFF	OFF	OFF	OFF	
	20A	ON	OFF	OFF	OFF	OFF	OFF	OFF	
	30A	ON	ON	OFF	OFF	OFF	OFF	OFF	
	40A	ON	OFF	ON	OFF	OFF	ON	OFF	
Field card PFC-70 *	1A	OFF	OFF	OFF	OFF	OFF	ON	OFF	
	5A	OFF	ON	OFF	OFF	OFF	OFF	OFF	
	10A	ON	OFF	OFF	OFF	OFF	OFF	OFF	
	20A	ON	OFF	ON	OFF	OFF	ON	OFF	
	50A	OFF	ON	OFF	ON	OFF	OFF	OFF	
	70A	ON	ON	ON	ON	OFF	OFF	OFF	
Field card PFC-140 *	10 A	OFF	ON	OFF	OFF	OFF	OFF	OFF	
	20 A	ON	OFF	OFF	OFF	OFF	OFF	OFF	
	40 A	ON	OFF	ON	OFF	OFF	ON	OFF	
	55 A	ON	ON	ON	OFF	ON	ON	ON	
	100 A	OFF	ON	OFF	ON	OFF	OFF	OFF	
	120 A	OFF	ON	ON	ON	OFF	OFF	OFF	
	140 A	ON	ON	ON	ON	OFF	OFF	OFF	

* See chapter "2.18. Hardware configuration" on page 15.

2.7. MECHANICAL DIMENSIONS, WEIGHT

NOTE! The 12 pulses DC drives are composed by two identical bridges, **the dimensions and weight showed on chapter 2.4 of TPD32--EV Instruction manual refers to one bridge only.**



(*) S7QAE3, Master / Slave connection Optical cable 3 mt. (optional 5mt. on request).

2.8. WATT LOSS AND FANS

NOTE! The 12 pulses DC drives are composed by two identical bridges, **the data showed on chapter 2.5 of TPD32--EV Instruction manual refers to one bridge only.**

2.9. ADAPTATION OF THE REGULATION CARD TO THE DEVICE TYPE (SWITCH S4)

NOTE! Refer to **the data showed on chapter 11.1 of TPD32--EV Instruction manual** (Table 11.3.5: Selection of dip-switches “S3-XX” and “S4-XX” for FIR4/5P-XX cards),

2.10. INPUT TRANSFORMER AND MAINS CHOKE (COMMUTATING REACTORS)

For parallel and series connections.

On the line side, 12-pulse operation is achieved supplying the two converters with 30 el. degree displaced supply voltages.

This means that at least one of the two converters must be fed by an isolated voltage (isolating transformer) or, as more common, by two separate secondary windings of a transformer having the mentioned phase displacement. The three-phase current on the slave drive must always lag behind that of the master by 30° el.

Such a transformer has, as example, a primary “Δ" and secondary "Δ" - "Y" configuration.

The U_K value should lie between 4% and 6%.

The rated power of the required transformer can be calculated as:

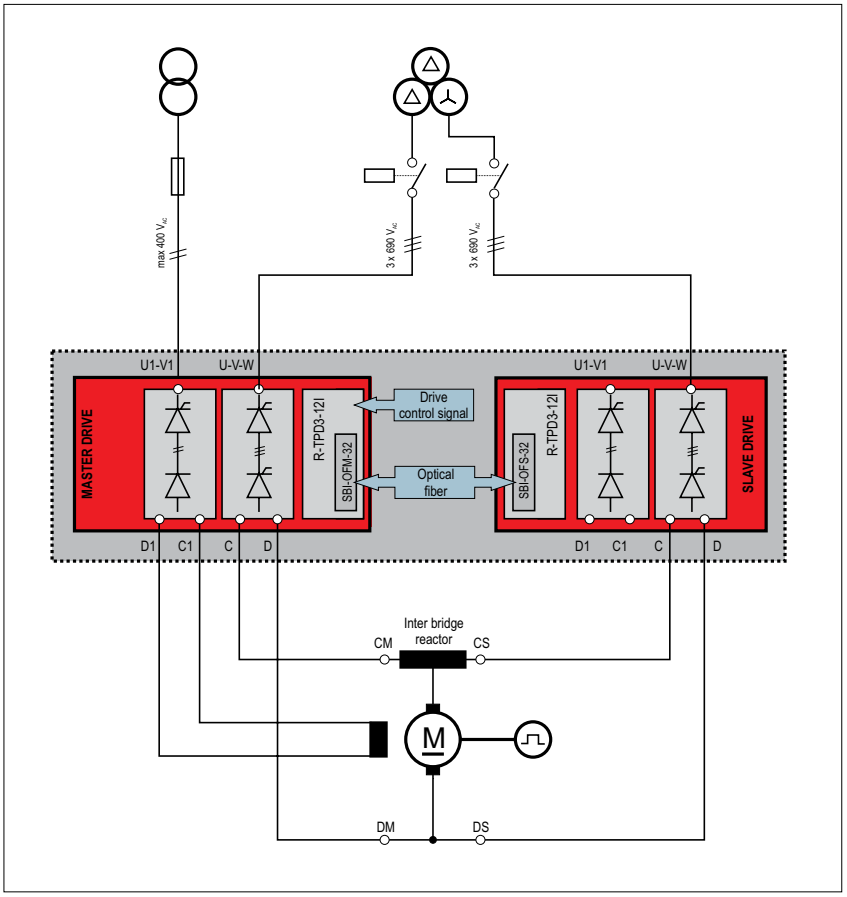
$Pt_L = U_{LN} * 1,35 * 1,05 * Id_N * 2$ [VA]

where U_{LN} is the line supply voltage of the converters and Id_N their output DC current.

With this configuration, commutating reactors are unnecessary.

One of them is required in the case when only one converter is fed by an isolating transformer and the other is directly mains connected. For this branch, U_K values between 2% and 4% are mandatory.

2.11. SMOOTHING (INTER BRIDGE) REACTOR



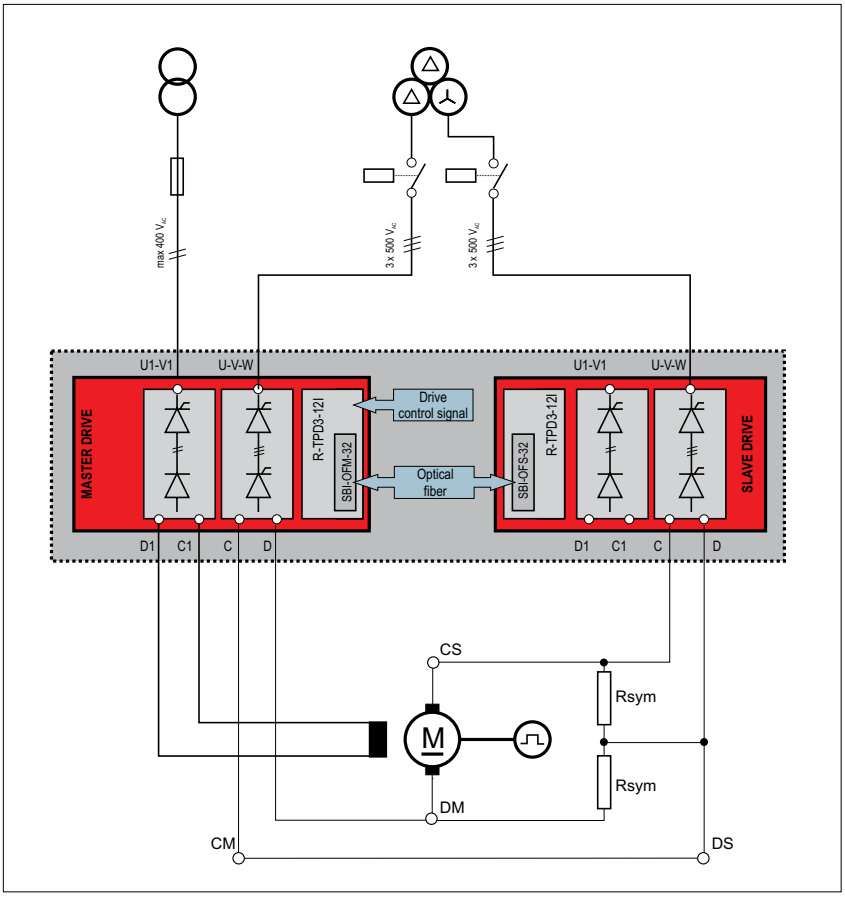
For parallel connection only.

As shown on the drawings, one smoothing reactor is used for each of the two converter sections. The thermal rating of the reactor is based on the effective (RMS) value of the reactor DC current whereas the inductance (of each) can be roughly calculated by the following formula:

$L_D = (74 * 10^{-3} * U_{LN} * 1{,}35) / (Id_N * f_L)$ [H]

where U_{LN} is the line supply voltage, f_L the line frequency and Id_N the output DC current of each converter.

2.12. SYMMETRY RESISTORS



For series connections only.

With a 12-pulse series connection, symmetry resistors must be connected in parallel to the individual converters connected in series, through which at least one current in the amount of the maximum thyristor reverse current flows. This ensures that, in the range of the small armature current or when armature current = 0, the total armature voltage is distributed symmetrically to both individual drives.

As a result of the activation of the thyristors with long pulses, an increased reverse current may flow. The symmetry resistors must be dimensioned so that at maximum armature voltage, a cross-current of at least 100 mA flows.

Having an armature voltage = 1000Vdc

Symmetry resistors = 1000 / 0,1 / 2 = 5000Ω (n°2 resistor connected as for the above reported diagram)

The power of the resistor can be calculated using the formula:

P [W] = R [Ω] * I2 [A]

NOTE! **for the resistor selection, take care about the case temperature at the required power!**

2.13. OVERVOLTAGE PROTECTION

For parallel and series connections.

Converter equipment which is connected to the mains via a separate converter transformer must be protected against overvoltage that can occur as a result of line-side switching operations by means of overvoltage protection.

TPD32-EV-690/ … -12P and TPD32-EV-350/ … -12S are equipped internally with protections.

TPD32-EV-1000/ … -12P, TPD32-EV-500/ … -12S and TPD32-EV-650/ … -12S require external RC line filters (on request).

2.14. ISOLATION MONITORING

With ungrounded networks (secondary sides of line transformer) an insulation monitoring device must be used to verify the state of the insulation. A well know manufacturer for those devices is BENDER (www.bender.org).

2.15. INTERNAL FUSES

Table 11 : Internal fuses for each external power bridges

Converter type		Quantity	Fuses type
TPD32-EV-690/810-1010-2B-E-12P	TPD32-EV-350/410-1010-2B-E-12S	6	170M 5463 700A 690V
TPD32-EV-690/810-1400-2B-E-12P	TPD32-EV-350/410-1400-2B-E-12S	6	170M 6463 900A 690V
TPD32-EV-690/810-1700-2B-E-12P	TPD32-EV-350/410-1700-2B-E-12S	6	170M 6465 1100A 690V
TPD32-EV-690/810-2000-2B-E-12P	TPD32-EV-350/410-2000-2B-E-12S	6	170M 6466 1250A 690V
TPD32-EV-690/810-2400-2B-E-12P	TPD32-EV-350/410-2400-2B-E-12S	12	170M 6461 700A 690V
TPD32-EV-690/810-2700-2B-E-12P	TPD32-EV-350/410-2700-2B-E-12S	12	170M 6462 800A 690V
TPD32-EV-690/810-3300-2B-E-12P	TPD32-EV-350/410-3300-2B-E-12S	12	170M 6466 1250A 690V
TPD32-EV-690/720-1010-4B-E-12P	TPD32-EV-350/360-1010-4B-E-12S	6	170M 6345 700A 1250V
TPD32-EV-690/720-1400-4B-E-12P	TPD32-EV-350/360-1400-4B-E-12S	6	170M 6497 900A 1250V
TPD32-EV-690/720-1700-4B-E-12P	TPD32-EV-350/360-1700-4B-E-12S	12	170M 5394 500A 1250V
TPD32-EV-690/720-2000-4B-E-12P	TPD32-EV-350/360-2000-4B-E-12S	12	170M 6344 630A 1250V
TPD32-EV-690/720-2400-4B-E-12P	TPD32-EV-350/360-2400-4B-E-12S	12	170M 6345 700A 1250V
TPD32-EV-690/720-2700-4B-E-12P	TPD32-EV-350/360-2700-4B-E-12S	12	170M 6346 800A 1250V
TPD32-EV-690/720-3300-4B-E-12P	TPD32-EV-350/360-3300-4B-E-12S	12	170M 6500 1250A 1100V
	TPD32-EV-650/670-4400-4B-E-12S	12	170M 6501 1400A 1100V

Fuses manufacturer type 170M = Bussmann.
TPD32-EV-1000/... and TPD32-EV-500/...converters on request

2.16. EXTERNAL FUSES FOR FIELD CIRCUIT

Table 12 : External fuses for field circuit

Power Bridge sizes	Rated current	External field fuses			Recommended fuseholder
		Quantity	Europe	USA	
Field card PFC-40 *	40 A	2	FWP-50A22Fa or A70QS50-22F WEG code F4M15	FWP-50A22Fa or A70QS50-22F WEG code F4M15	Recommended fuseholder for two 22x58mm fuses : Bussmann CH222D or Ferraz-Shawmut US222. WEG code S85B9 (q.ty = 1)
Field card PFC-70 *	70 A	2	FWP-100A22Fa or A70QS100-22F WEG code F4M21	FWP-100A22Fa or A70QS100-22F WEG code F4M21	
Field card PFC-140 *	140 A	2	FWP-200A WEG code S7G58	FWP-200A WEG code S7G58	

* See chapter "2.18. Hardware configuration" on page 15.
Fuses manufacturer type A70Q..= Gould Shawmut, FWP.. = Bussmann

2.17. CONTROL TERMINALS & JUMPERS

Table 13 : Control terminals on external bridge

Designation	Function	I/O	Max voltage	Max current
U3, V3	AC mains power supply for internal fan	Input	1 x 230V AC	See table 2.5 on TPD32-EV instruction manual
31 / 32	Fan unit power supply relay potential-free NC contact	Output	250 VAC	1 A AC11
81 / 82	Internal fuses intervention signalling	Output	250 VAC	1 A AC11

NOTE ! Refer to TPD32-EV instruction manual tables for other control teminals:

- Table 4.4.4: Jumpers on the Regulator card (Master and Slave)
- Table 4.4.6 - A: Terminal Assignment (terminals from 1 to 20)
- Table 4.4.6 - B: Terminal Assignment (terminals from 21 to 42)
- Table 4.4.8: Terminal strip for the connection of an analog tachometer
- Table 4.4.9: Assignment of an XE1 connector for a sinusoidal encoder
- Table 4.4.10: Assignment of the XE2 connector for a digital encoder
- Table 4.5.2.1: Description of the XS connector for the RS485 serial interface

2.18. HARDWARE CONFIGURATION

Table 14 : Converters in PARALLEL configuration

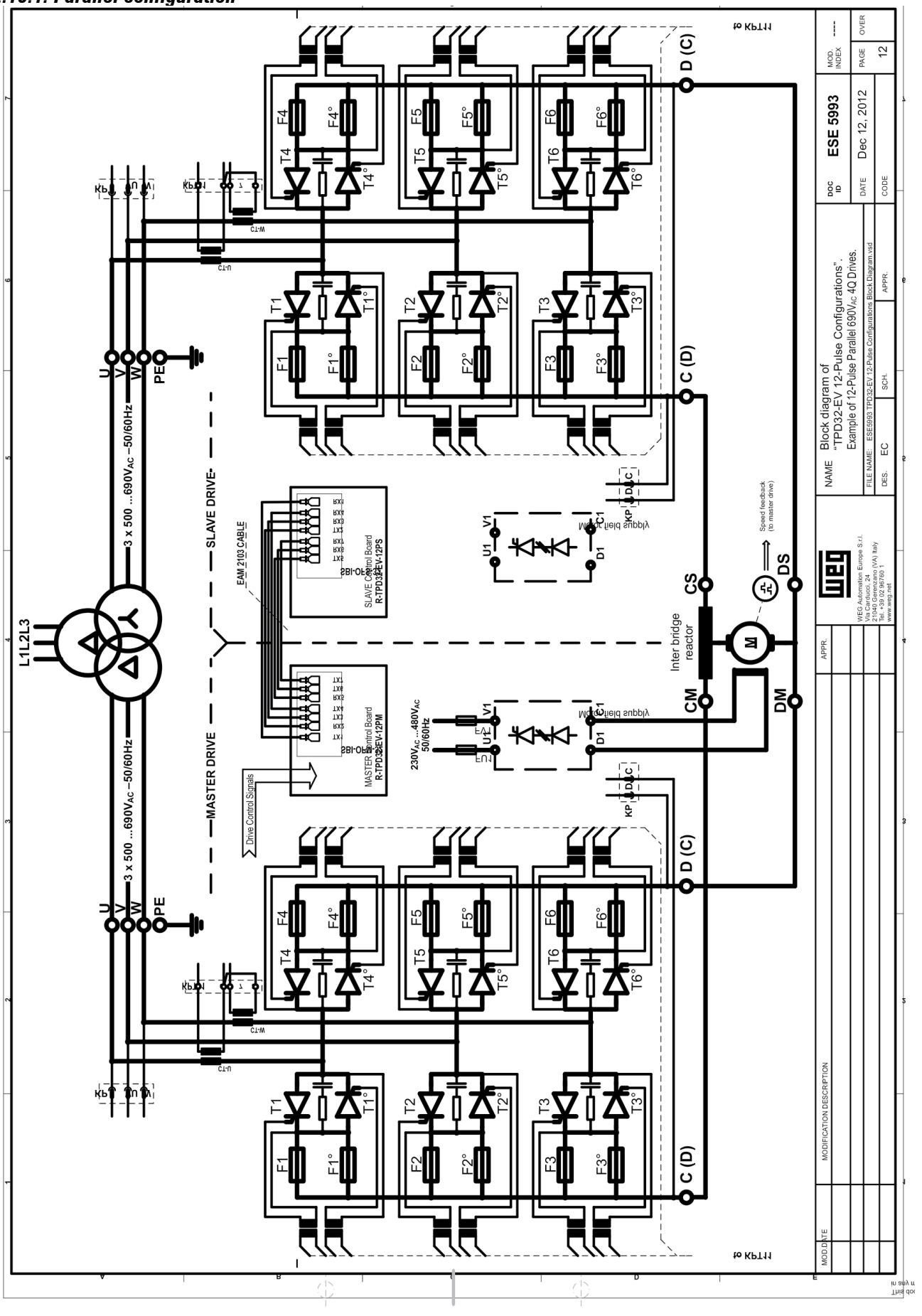
Function	Type	Drawing	Converters in PARALLEL configuration					
			690V (4B)	690V (2B)	1000V (4B)	1000V (2B)		
Regulation board (master for parallel configuration)	R-TPD32-EV-12PM	ESE 4155	•	•	•	•		
Regulation board (slave for parallel configuration)	R-TPD32-EV-12PS	ESE 4155	•	•	•	•		
Optical Fiber interface Master Board	SBI-OFM32	ESE 4000-1	•	•	•	•		
Optical Fiber interface Slave Board	SBI-OFS32	ESE 4000-2	•	•	•	•		
Power board for 2 power bridges in parallel	FIR5-63-1K	ESE3597			•			
Power board for 2 power bridges in parallel	FIR5-63-1K-2B	ESE3597				•		
Power board for 1-2 power bridges with 2 SCR in parallel	FIR5-64-1K	ESE3597			•			
Power board for 1-2 power bridges with 2 SCR in parallel	FIR5-64-1K-2B	ESE3597				•		
Power board	FIR5P-64	ESE5534	•	•				
Power Supply board	SW1-31	ESE 2192	•	•	•	•		
Field board	PFC-40/70	ESE 2374	•	•				
	PFC-140	ESE 4086			•	•		
Filter card	CFS-..	ESE 5301	•	•				
I/O expansion board	TBO-32 (opt.)	ESE 2121	•	•	•	•		

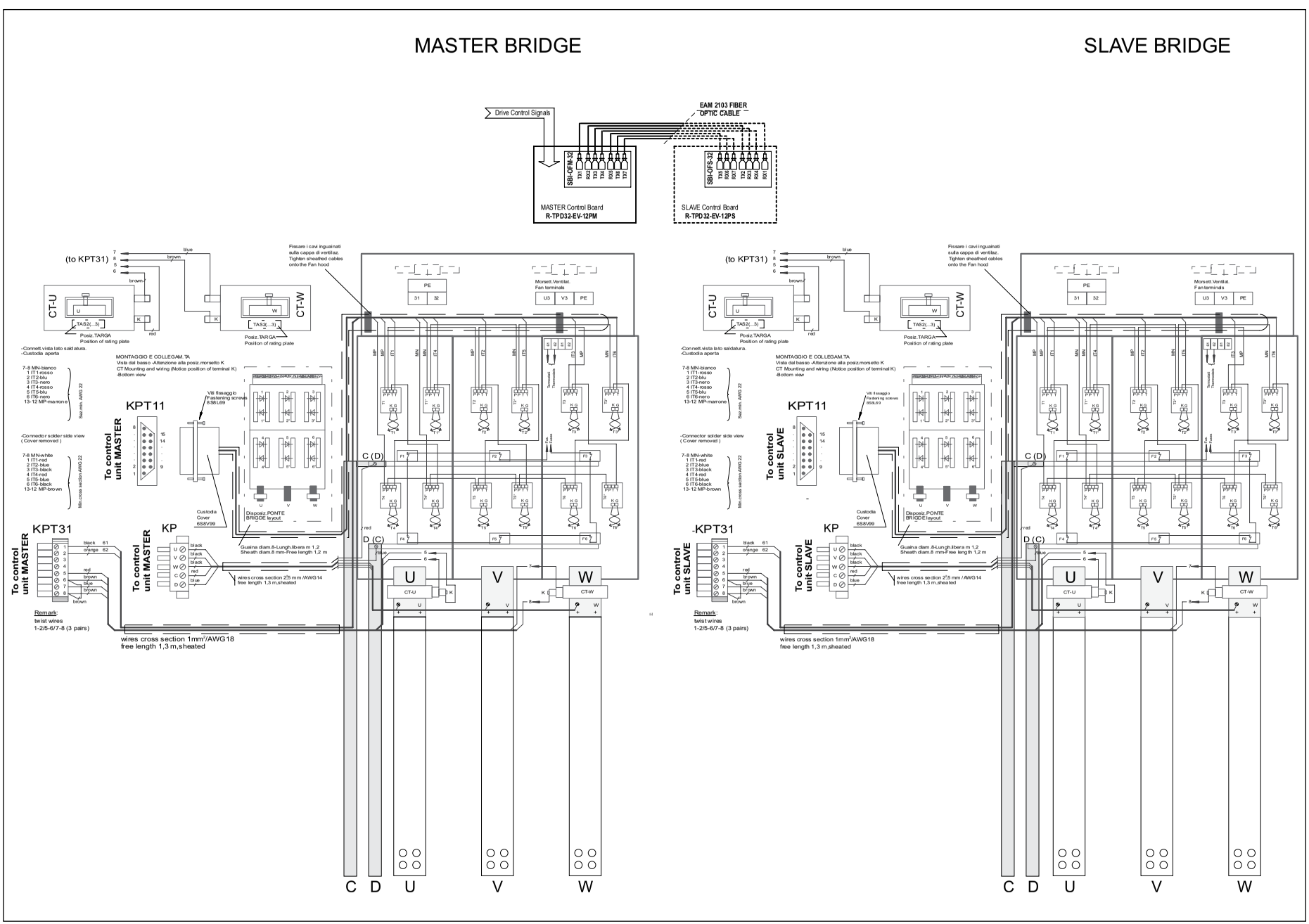
Table 15 : Converters in SERIES configuration

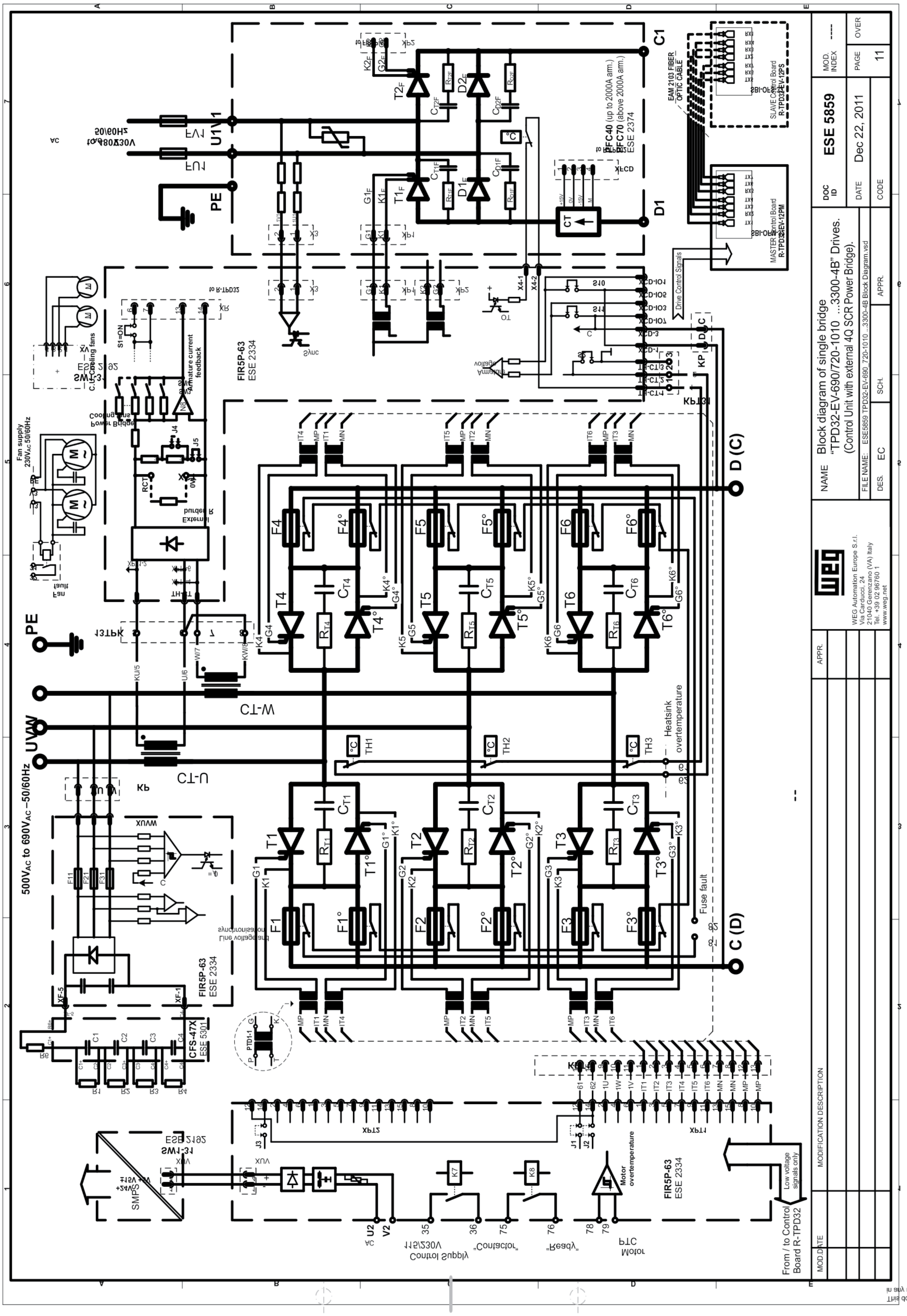
Function	Type	Drawing	Converters in SERIES configuration					
			350V (4B)	350V (2B)	500V (4B)	500V (2B)	1000V (4B)	1000V (2B)
Regulation board (master for series configuration)	R-TPD32-EV-12SM	ESE 4155	•	•	•	•	•	•
Regulation board (slave for series configuration)	R-TPD32-EV-12SS	ESE 4155	•	•	•	•	•	•
Optical Fiber interface Master Board	SBI-OFM32	ESE 4000-1	•	•	•	•	•	•
Optical Fiber interface Slave Board	SBI-OFS32	ESE 4000-2	•	•	•	•	•	•
Power board for 2 power bridges in parallel	FIR5-63-1K	ESE3597			•		•	
Power board for 2 power bridges in parallel	FIR5-63-1K-2B	ESE3597				•		•
Power board for 1-2 power bridges with 2 SCR in parallel	FIR5-64-1K	ESE3597			•		•	
Power board for 1-2 power bridges with 2 SCR in parallel	FIR5-64-1K-2B	ESE3597				•		•
Power board	FIR5P-64	ESE5534	•	•				
Power Supply board	SW1-31	ESE 2192	•	•	•	•	•	•
Field board	PFC-40/70	ESE 2374	•	•				
	PFC-140	ESE 4086			•	•	•	•
Filter card	CFS-..	ESE 5301	•	•				
I/O expansion board	TBO-32 (opt.)	ESE 2121	•	•	•	•	•	•

2.19. BLOCKS DIAGRAM FOR CONVERTER WITH EXTERNAL BRIDGE

2.19.1. Parallel configuration




MASTER BRIDGE
SLAVE BRIDGE
Drive Control Signals
EAM 2103 FIBER OPTIC CABLE
SBI-DFM-32
SBI-DFS-32
MASTER Control Board
R-TPD32-EV-12PM
SLAVE Control Board
R-TPD32-EV-12PS
(to KPT31)
CT-U
CT-W
Posiz.TARGA
Position of rating plate
Fissare i cavi inguainati sulla cappa di ventilaz.
Tighten sheathed cables onto the Fan hood
Morsett.Ventilat.
Fan terminals
-Connett.vista lato saldatura.
-Custodia aperta
MONTAGGIO E COLLEGAM.TA
Vista dal basso -Attenzione alla posiz.morsetto K
CT Mounting and wiring (Notice position of terminal K)
-Bottom view
KPT11
To control unit MASTER
To control unit SLAVE
Viti fissaggio
Fastening screws
6SBL69
-Connector solder side view
(Cover removed)
Custodia
Cover
6SBV99
KPT31
KP
Disposiz.PONTE
BRIGDE layout
Guaina diam.8-Lungh.libera m 1,2
Sheath diam.8 mm-Free length 1,2 m
wires cross section 2'5 mm /AWG14
free length 1,3 m,sheated
Remark:
twist wires
1-2/5-6/7-8 (3 pairs)
wires cross section 1mm²/AWG18
free length 1,3 m,sheated
C (D)
D (C)
U
V
W


Block diagram of single bridge
"TPD32-EV-690/720-1010 ...3300-4B" Drives.
(Control Unit with external 4Q SCR Power Bridge).
ESE 5859
Dec 22, 2011
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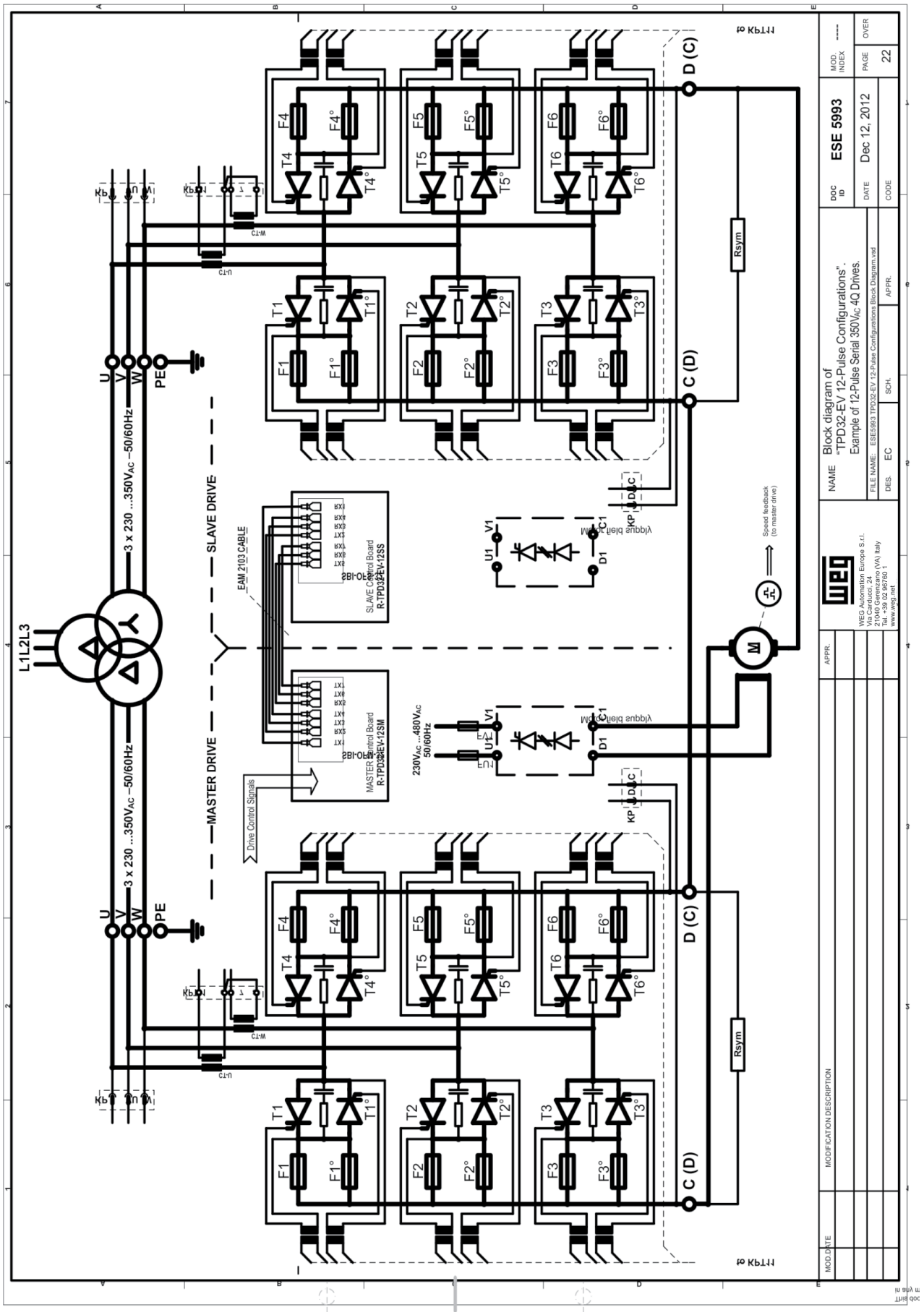
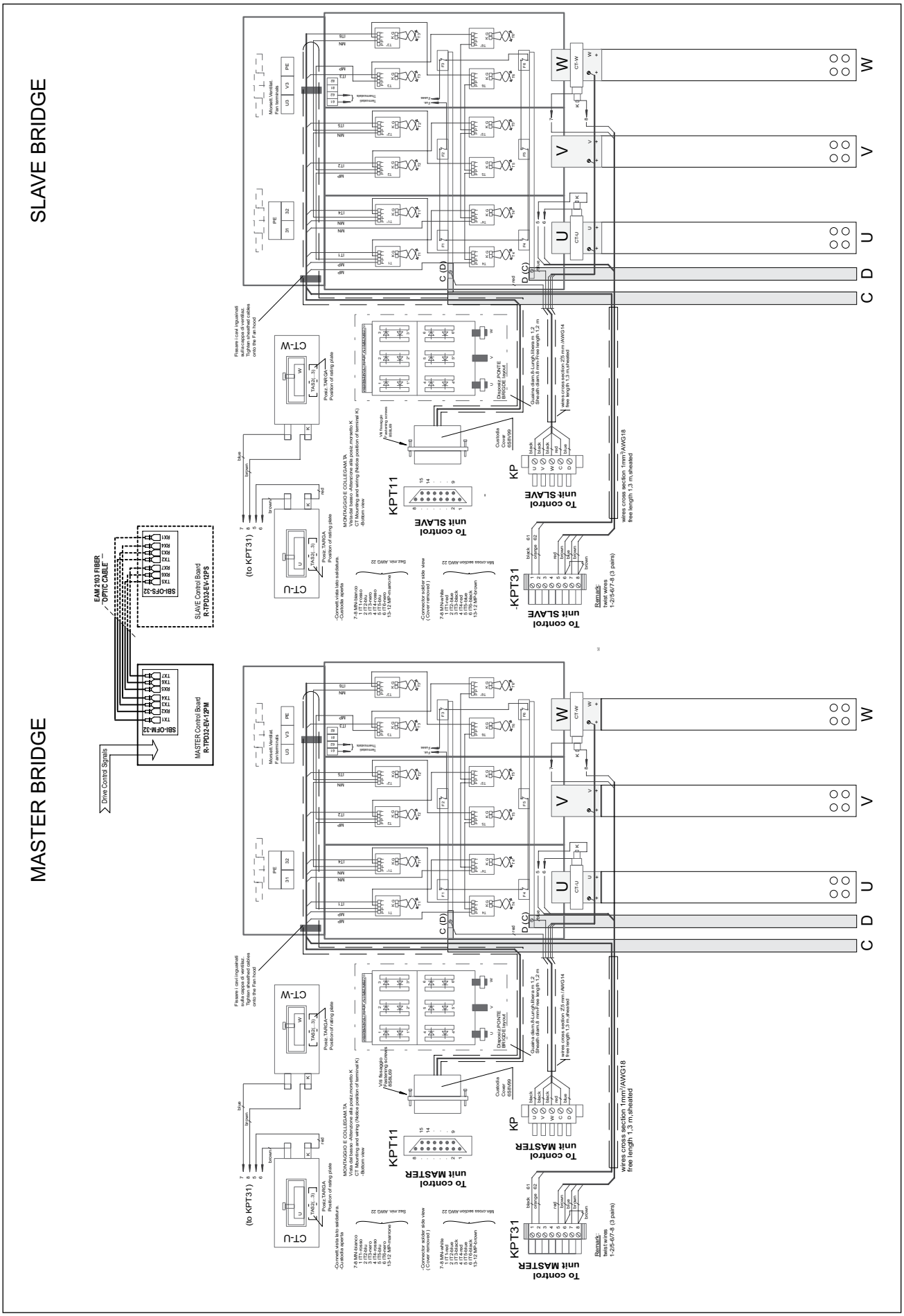
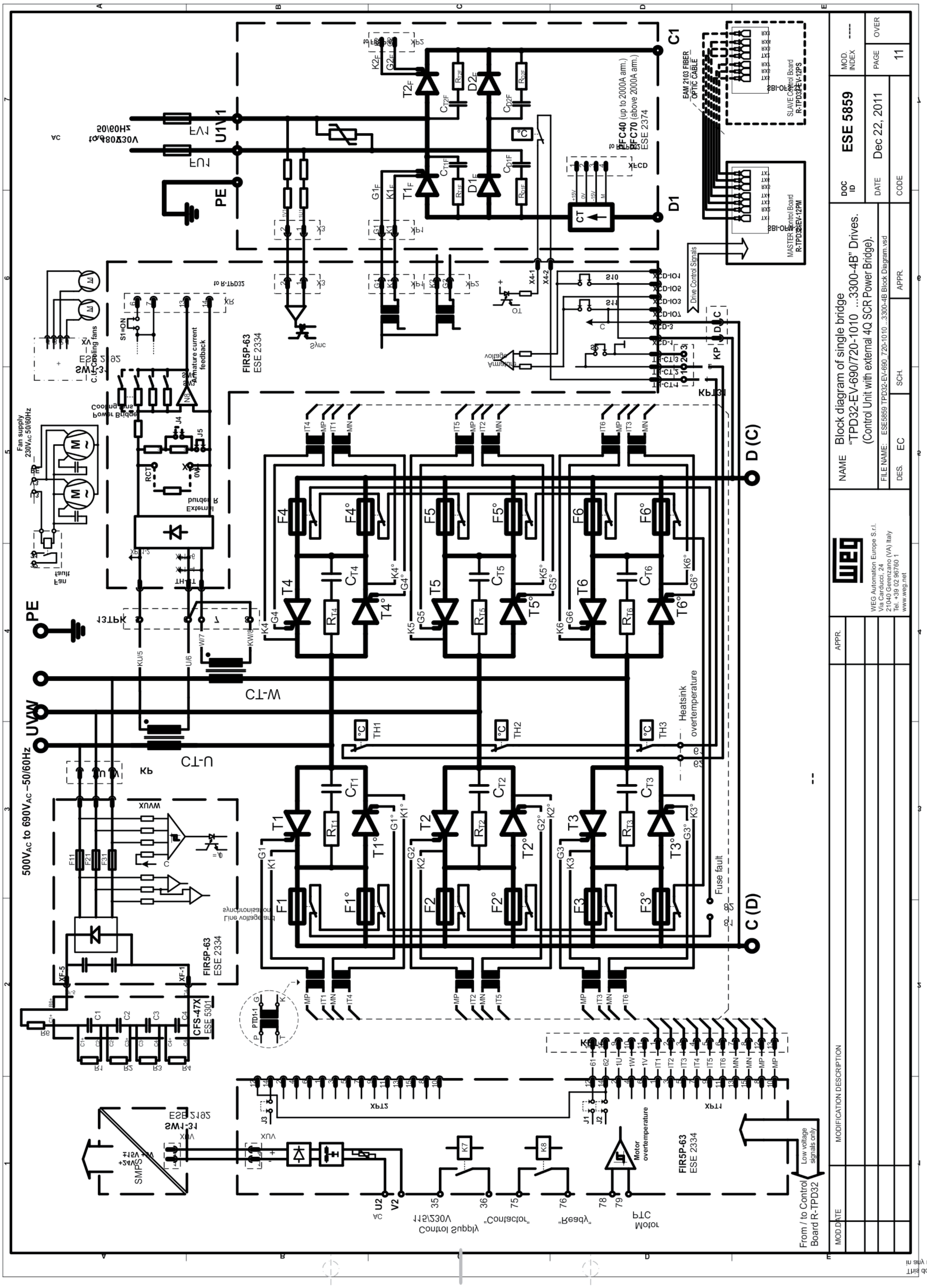
WEG Automation Europe S.r.l.
Via Carducci, 24
21040 Gerenzano (VA) Italy
Tel. +39 02 96760 1
www.weg.net
500VAC to 690VAC - 50/60Hz
UVW
C (D)
D (C)
C1
D1
PE
Fan supply 230VAC 50/60Hz
Fuse fault
Heatsink overtemperature
Motor overtemperature
Control Supply
"Contactor"
"Ready"
Motor PTC
From / to Control Board R-TPD32
Low voltage signals only
MASTER Control Board R-TPD32-EV-12PM
SLAVE Control Board R-TPD32-EV-12PS
EAM 2103 FIBER OPTIC CABLE
Drive Control Signals
FIR5P-63 ESE 2334
CFS-47X ESE 5301
CT-U
CT-W

2.19.2. Series configuration




MASTER BRIDGE
SLAVE BRIDGE
Drive Control Signals
EAM 2103 FIBER OPTIC CABLE
SBI-OFM-32
MASTER Control Board R-TPD32-EV-12PM
SBI-OFS-32
SLAVE Control Board R-TPD32-EV-12PS
KPT11
KPT31
KP
To control unit MASTER
To control unit SLAVE
CT-U
CT-V
CT-W
(to KPT31)
Remark:
twist wires
1-2/3-6/7-8 (3 pairs)
wires cross section 1mm²/AWG18
free length 1,5 m,shielded


Block diagram of single bridge
"TPD32-EV-690/720-1010 ...3300-4B" Drives.
(Control Unit with external 4Q SCR Power Bridge).
ESE 5859
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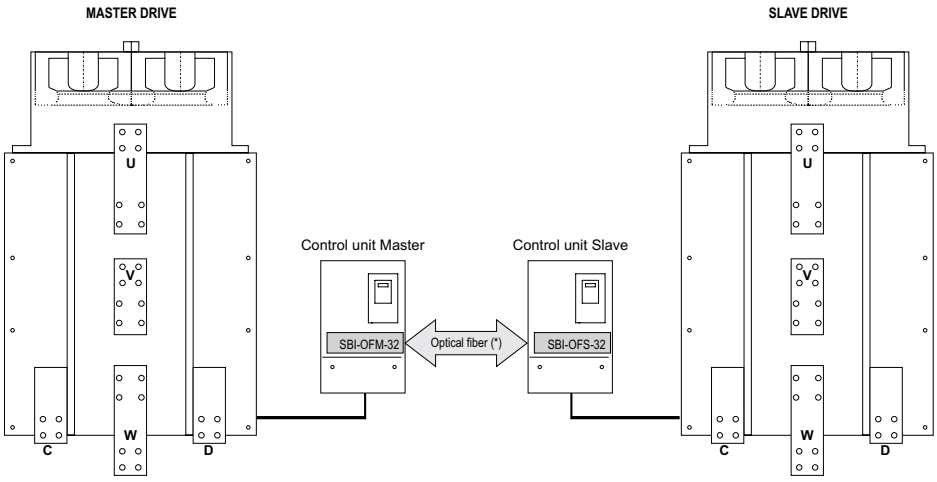
11
WEG Automation Europe S.r.l.
500VAC to 690VAC –50/60Hz
C (D)
D (C)
C1
D1
PE
U V W

2.20. CONFIGURATION MANAGEMENT



(*) S7QAE3, Master / Slave connection Optical cable 3 mt. (optional 5mt. on request).

2.20.1. 12-Pulses Parallel (FW10.4X)

Through the implementation of a synchronous serial communication (SSC) the data between the drive Master and Slave drive is exchanged. References, commands and control variables are handled by the drive Master while the Slave simply implements the current reference info coming from the Master drive.

In this way, and through the line transformer with secondary windings whose phase positions differ by 30° , the current value available to the terminals of a DC motor connected to 12 pulses is a sum of output currents coming from the drive Master and Slave drives.

The serial communication is performed throught the supplied optical fibers expansion cards mounted on both Control Unit: SBI-OFM-32 (S5H78) for the Master drive and SBI-OFS-32 (S5H83) for the slave drive.

Data exchange between drive master and slave is performed throught the supplied optical fiber cable 2 meters lenght (code S7QAE3), 5 meters lenght option is available (code S7QAQ8).

In this combination speed and field control are performed by the drive Master whereas current control is carried out by the drive master and drive slave.

2.20.2. 12-Pulses Series (FW10.5X)

Through the implementation of a synchronous serial communication (SSC) the data between the drive Master and Slave drive is exchanged. References, commands and control variables are handled by the drive Master while the Slave simply implements the reference of the firing angle info coming from the Master drive.

In this way, and through the line transformer with secondary windings whose phase positions differ by 30° , the current value available to the terminals of a DC motor connected to 12 pulses is the same of the single drive value and the sum of the DC voltage coming from the drive Master and Slave drives.

The serial communication is performed through the use of two optical fibers expansion cards mounted on both Control Unit: SBI-OFM-32 (S5H78) for the Master drive and SBI-OFS-32 (S5H83) for the slave drive.

Data exchange between drive master and slave is performed through optical fiber cable 2 meters lenght (code S7QAE3), 5 meters lenght option is available (code S7QAQ8).

In this combination, speed, current and field control are performed by the drive master.

2.21. ADMISSIBLE OVERLOAD FOR CONVERTERS WITH EXTERNAL BRIDGE

NOTE ! Refer to TPD32-EV Instruction manual, chapter 6.14.6 Overload control (**Acceptable overload curves**, Standard sizes).

IMPORTANT ! The 12 pulses external bridge DC drives are composed by two bridges connected in parallel or series, **the overload current showed on those figures refers to one bridge only.**

3. FUNCTION DESCRIPTION

Addendum to TPD32-EV_EN instruction manual, chapter 6.

3.1. SPECIFIC PARAMETERS

Parametrization with respect to 12-pulse operation is identical to TPD32-EV converters except for the specific below parameters.

PARAMETERS ADDED TO THE STANDARD TPD32-EV FIRMWARE

Menu SPEED REGULAT

Trq Speed Reg (From fw 11.53). This parameter, which is normally set to OFF, if set to ON ensures that, in the event of current control, when the stop is given, the current reference is not zeroed, but continues to follow that written in **T Current Ref 1**. This is useful in the event in which the speed regulator is fitted with an external device (e.g. PLC or APC300) which sends the current reference to the TPD32-EV.

In any event the drive is disabled when the speed drops below the **Speed zero level**.

Menu CURRENT REGULAT

See also the chapter 6.8 of the TPD32-EV Instruction manual

CD cur thr Parameter of gains adaptation block denoting discontinuous/continuous output current boundary for bridge in percent of the **Full load curr** parameter. For proper setting of this parameter refer to section below.

CD P factor Current regulator gains reduction factor for Proportional gain. It is applied when reference current exceeds discontinuous/continuous current boundary set by **CD cur thr** parameter. For proper setting of this parameter refer to section below.

CD I factor Current regulator gains reduction factor for Integral gain. It is applied when reference current exceeds discontinuous/continuous current boundary set by **CD cur thr** parameter. For proper setting of this parameter refer to section below.

Gain rmp start (From fw 11.53). The gains selection occurs in accordance with the current reference.

Above the threshold, the gains value is P = **DC Curr P * CD Factor P**, I = **DC Curr I * CD Factor I**.

Below the threshold, the gains value is P = **DC Curr P**, I = **DC Curr I**, except for the zone between a percentage of the threshold given by the value of the **Gain rmp start** parameter and the same threshold in which a parameter value connection ramp is made.

E.g.: if the threshold = 30% and **Gain rmp start** = 50%, the gains ramp is obtained by current references between 15% and 30%.

Menu REG. PARAMETERS / Percent values

See also the chapter 6.10 of the TPD32-EV Instruction manual

DC Curr P Proportional gain of the PI motor current regulator as a percentage of the **DC Curr P B** parameter.

DC Curr I Integral gain of the PI motor current regulator as a percentage of the **DC Curr I B** parameter.

Menu REG PARAMETERS / Base values

See also the chapter 6.10 of the TPD32-EV Instruction manual

DC Curr P B Base value of the proportional gain of the motor current regulator in °el/A.

DC Curr I B Base value of the integral gain of the current regulator in °el/A·s.

Menu CONFIGURATION

See also the chapter 6.11 of the TPD32-EV Instruction manual

Pulse config (ONLY 12 Pulses Series configuration) This parameter allows the system to be use on 12 Pulses Master/Slave series configuration or 6 Pulses of a single drive (Master or Slave).

It is available in both master and slave drives: the selected configuration must be consistent otherwise

enabling drive is inhibited by the alarm SSC error.

12P Series (default)	DC voltage output value is automatically doubled by the drive master (all the internal controls, overvoltage, field weakeng are accordingly set taking into consideration the voltage on the motor terminals) Speed regulator and field regulator are automatically disabled on the slave drive.
6P only	6 Pulses of a single drive (Master or Slave).

Speed res This parameter manages the internal speed resolution. Resolution values can be set between 1/4 and 1/64; to avoid a speed overshoot the **Motor Max Speed *** (1 / res) < 32767 should be checked.

MENU ADDED TO THE STANDARD TPD32-EV FIRMWARE

Menu SPEC FUNCTIONS \ Alpha Test

Alpha Test Sel (From fw 11.53). This function activates the drive specifying the triggering angle of the armature circuit's SCRs. In particular **Alpha Test Sel** can assume the following values:

OFF	Aplha Test not enabled (default)
Fwd (1)	Positive bridge enabled
Rev (2)	Negative bridge enabled

Fwd and Rev **are** values that the **Alpha Test Sel** parameter can assume.

ADDITIONAL NOTE:

Speed feedback input signal from Sinusoidal encoder NOT AVAILABLE.

4. COMMISSIONING AND CONTROL DESCRIPTION

4.1. FOR PARALLEL AND SERIES CONFIGURATION

The following chapters replace chapters 5.3.5.1 and 5.3.5.1.1 of TPD32-EV instruction manual.

1. TUNING/OPTIMIZATION OF CURRENT REGULATOR

The tuning of current regulator is required because the self-tuning procedure (R&L search) doesn't work on this control type.

The purpose is to set current regulator gains and several other parameters to adopt the operation of internal current regulation loop to the non-linear control characteristic of the converter power bridges.

The tuning procedure is divided into two steps:

Part 1 tuning without flux regulation (converters are disabled)

Part 2 tuning in working conditions (converters are enabled, motors operating at their nominal load and do their normal load cycle).

Only Part 1 is required for the initial commissioning procedure.

A two channel digital oscilloscope is needed. The tuning must be performed in the final installation setup. The procedure does not require to modify the power or control wiring if the standard enabling sequence is used. It's necessary that the Slave device has ENABLE and START before enabling the Master: since the Master checks the state of the Slave, if this one is not yet enabled, you will have a Slave Error alarm.

Once ended the current loop tuning procedure you have to set the same parameter you found both in Master and in Slave device.

1.1. Part 1

The converter function to generate the test signal **Test generator** will be used in this step.

This function is under SPEC FUNCTION menu and makes available a square wave signal with adjustable frequency, amplitude and offset that can be connected to the regulation chain for the purpose of manual tuning.

More details about the test signal generator are given in section 6.15.1 of Instruction manual.

First of all you have to detect the point where discontinuous current of the armature circuit changes to continuous current, in order to set **CD cur thr** parameter.

1. Connect the oscilloscope channels (or a DC current probe) to **Analog output 1** (terminals 21,22 on regulation card) and to test point XY17 (motor current signal) and XY18 (ground) on regulation card
2. Set **Analog output 1** in I/O CONFIG menu to **T current ref**
3. Set **T current lim** in LIMITS/Current limits menu to 50 % (or more if necessary)
4. Set **Enable spd reg** in SPEED REGULAT menu to Disabled
5. Set **Enable flux reg** in FLUX REGULATION menu to Disabled
6. Enable the driver
7. Increase **T current ref 1** parameter until you can see on oscilloscope motor current becomes continuous. Now you can set **CD cur thr** parameter with the 3 - 5% less of the value you read in **Motor current** parameter.

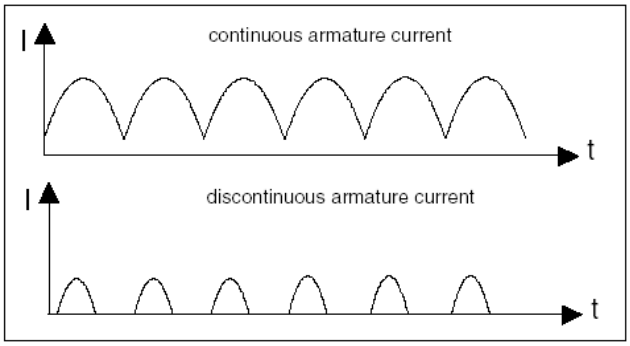


Figure 3 : Motor current

Now it's possible to tune **DC Curr P** and **DC Curr I** parameters.

1. Connect the oscilloscope channels (or a DC current probe) to **Analog output 1** (terminals 21,22 on regulation card) and to test point XY17 (motor current signal) and XY18 (ground) on regulation card
2. Set **Analog output 1** in I/O CONFIG menu to **T current ref**
3. Set **Gen access** in SPEC FUNCTIONS/Test generator menu to **T current ref**
4. Set **T current lim** in LIMITS/Current limits menu to 50 % (or more if necessary)
5. Set **Gen offset** in SPEC FUNCTIONS/Test generator menu to 50% of **CD cur thr** parameter
6. Set **Gen amplitude** in SPEC FUNCTIONS/Test generator menu to 50% of **CD cur thr** parameter
7. Set **Enable spd reg** in SPEED REGULAT menu to Disabled
8. Set **Enable flux reg** in FLUX REGULATION menu to Disabled
9. Enable the driver

In this setup, the Motor is charged and discharged periodically by a constant current with the frequency determined by **Gen frequency** parameter. The maximum (charged) and minimum (discharge) current reference levels are determined by **Gen offset** and **Gen amplitude** parameters.

After changing the time scale to 10ms/div and proper positive edge synchronisation you should observe a detail of first positive step in the current reference as shown in "*Figure 4 : T current ref and Motor current*". and "*Figure 5 : integral gain too high T current ref and Motor current*"

At this point, the current regulator gains, parameters **DC Curr P** and **DC Curr I** can be changed to obtain the regulator response time of 20-25ms as shown in "*Figure 4 : T current ref and Motor current*". The response should be heavily damped without any overshoot. A small error present in the steady state is natural behaviour and it is due to control loop operating conditions.

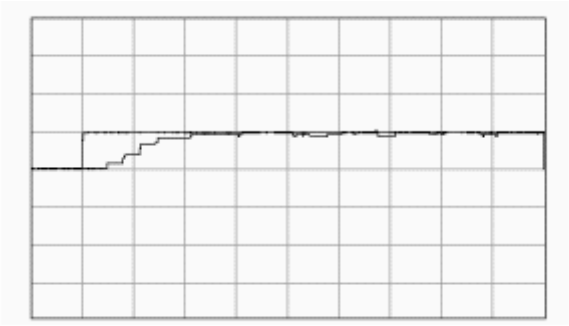
Finally it's possible to tune CD P factor and CD I factor parameters.

1. Connect the oscilloscope channels (or a DC current probe) to Analog output 1 (terminals 21,22 on regulation card) and to test point XY17 (motor current signal) and XY18 (ground) on regulation card
2. Set Analog output 1 in I/O CONFIG menu to T current ref
3. Set Gen access in SPEC FUNCTIONS/Test generator menu to T Current ref
4. Set T current lim in LIMITS/Current limits menu to 50 % (or more if necessary)
5. Set Gen offset in SPEC FUNCTIONS/Test generator menu to (10% + CD cur thr)
6. Set Gen amplitude in SPEC FUNCTIONS/Test generator menu to 10%
7. Set Enable spd reg in SPEED REGULAT menu to Disabled
8. Set Enable flux reg in FLUX REGULATION menu to Disabled
9. Enable the driver

After changing the time scale to 10ms/div and proper positive edge synchronisation you should observe a detail of first positive step in the current reference as shown in "*Figure 1 : 12-Pulses PARALLEL Configuration*". and "*Figure 5 : integral gain too high T current ref and Motor current*"

At this point, you have to increase Gen offset parameter and Gen amplitude parameter step by step (i.e. 15% + CD cur thr and 15%, 20% + CD cur thr and 20%, 25% + CD cur thr and 25% respectively) and to change the current regulator gains (CD P factor and CD I factor parameters) in order to obtain the regulator response time of 20-25ms as shown in "*Figure 4 : T current ref and Motor current*". The response should be heavily damped without any overshoot.

A small error present in the steady state is natural behaviour and it is due to control loop operating conditions.



(oscilloscope settings: vertical scale 1V/div, horizontal scale 10ms/div)

Figure 4 : T current ref and Motor current

"*Figure 4 : T current ref and Motor current*": illustrates that the integral gain is too high. The response is fast but the oscillations in motor current are unacceptable and the integral gain must be reduced.

(oscilloscope settings: vertical scale 1V/div, horizontal scale 10ms/div)

Figure 5 : integral gain too high T current ref and Motor current

1.2. Part 2

The object now is to verify the previous parameters set. A load must be applied to the DC output, variable from zero to the full converter output current.

The current is discontinuous at light load and becomes continuous. The exact C/D boundary depends on the mains choke inductance, output choke and motor inductance. The C/D thresholds parameters must be set to a current which is approximately 3 - 5% less than the current at real discontinuous/continuous boundary.

1. Connect the oscilloscope channels (or a DC current probe) to **Analog output 1** (terminals 21,22 on regulation card) and to test point XY17 (motor current signal) and XY18 (ground) on regulation card
2. Set **Analog output 1** in I/O CONFIG menu to **T current ref**
4. Set **T current lim** in LIMITS/Current limits menu to 100 %
7. Set **Enable spd reg** in SPEED REGULAT menu to Enabled
8. Set **Enable flux reg** in FLUX REGULATION menu to Enabled
9. Enable the driver and make the driver work until full load current

DC Curr P and **DC Curr I** parameters determine the PI regulator gains which are applied while the reference current is below the C/D boundary set by the **CD cur thr** parameter.

CD P factor and **CD I factor** parameters determine the PI regulator gains reduction factors which are applied after the reference current exceeds the C/D boundary set by the **CD cur thr** parameter.

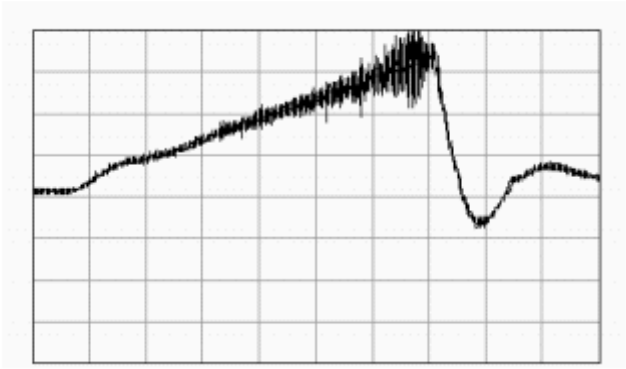
The **CD P factor** and **CD I factor** parameters must be set to such values that output current does not oscillate when the converter operates in continuous conduction.

A small oscillation when crossing the C/D boundary is permitted but it must drop off quickly. A better tuning can be done by observing the currents **T current ref** and **Motor current** programmed on analog outputs and on test point.

The examples of tuning for corresponding parameters for rectifier mode are shown in "*Figure 6 : Insufficient tuning of Gain adaptation block parameters (T current ref and Motor current)*". and "*Figure 7 : Correct tuning of Gain adaptation block parameters (T current ref and Motor current)*". In the first case (figure 6), the tuning is insufficient.

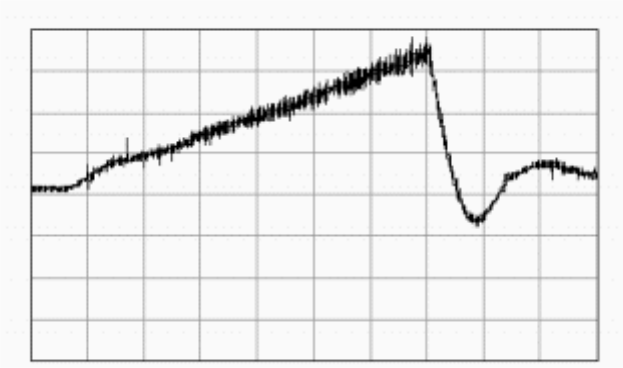
CD cur thr parameter is set to a higher value than the real C/D boundary, increased oscillation/ripple can be observed on the waveform of Motor current starting from about 55% of rated converter current.

The second figure shows correct behaviour after the **CD cur thr**, **CD factor P** and **CD factor I** parameters have been reduced.



(oscilloscope settings: vertical scale 2V/div corresponds to 20% of rated current, horizontal scale 1s/div)

Figure 6 : Insufficient tuning of Gain adaptation block parameters (T current ref and Motor current)



(oscilloscope settings: vertical scale 2V/div corresponds to 20% of rated current, horizontal scale 1s/div)

Figure 7 : Correct tuning of Gain adaptation block parameters (T current ref and Motor current)

5. PROGRAMMABLE ALARMS

5.1. NEW ALARMS

Addendum to chapter 6.11.8 of TPD32-EV instruction manual.

Menu CONFIGURATION / Prog alarms

Alarm	N.	Factory					Standard
		Activity	Latch	Open OK relay	Hold off time [ms]	Restart time [ms]	
SSC Error		Disable drive	On	On	-	-	
Slave Error			On	-	-	-	
Diffcurrent		Ignore	On	On	100	0	

SSC Error It indicates a failure in the communication between drive master and slave. The configuration of this alarm can not be changed.the drive is disabled:

- If drive Slave (or Master) is not powered or no signals are present on the fiber optics cable (hw problems or fiber not properly connected)
- Pulse config parameter not properly set 12P series
- Checksum not valid.

Drivecom code is 0x8100.

SSC alarm can be programmed on a digital output (79).

Slave Error (available Only on the master drive): It indicates a failure on the drive slave if the enabling sequence is not correct (e.g. drive enabled not at the same time of the master) or general allarm is present on the drive slave.

Diffcurrent (Parallel Configuration and master ONLY): this alarm will be ON when the total current measured on the master and slave drives are not the same of the value set on **Diffcurrent thr** parameter.

NOTE! The slave must have ENABLE and START before the master.

When the master is enabled it checks the state of the slave then starts.

If the slave is not yet enabled you will have a Slave Error alarm.

The same the master must be disabled before the slave; if not, the master generates a Slave Error alarm.

NOTE! SSC Error alarm is always active.

Do not use the R&L Search because is useless

Sinusoidal Encoder 1 has been removed.

5.1.1. Malfunction code

Addendum to chapter 6.18.1 of TPD32-EV instruction manual.

Malfunction code Malfunction code according to DRIVECOM specification (Mandatory functions)

2600h Slave Error

2200h Diff Current

6. SBI-OFM-32 AND SBI-OFS-32

The connections between Master and slave is performed through the cards SBI-OFM-32 (on the master) and SBI-OFS-32 (on the slave). They are connected to the regulation board through the connector XF0.

The connection between master and slave is performed through the supplied optical fiber. You must connect the cable following below references

MASTER	SLAVE
TX1	RX1
RX2	TX2
TX3	RX3
TX4	RX4
RX5	TX5
TX6	RX6
TX7	RX7

7. PARAMETERS LIST

Addendum to chapter 10 of TPD32-EV instruction manual.

Parameter	No.	Format	Value				Access via			
			min	max	Factory American	Factory European	Keyp.	RS485/ BUS/ Opt2-M	Term.	Opt2-A/ PDC
SPEED REGULAT										
Trq Speed Reg (2) ON OFF	1551	Enum	-	-	OFF	OFF	✓	?	-	-
CURRENT REGULAT/CD cur thr										
CD curr thr	838	I16	0	100	30	30	✓	R/W	-	-
CD factor P	839	Float	0.001	99.95	0.1	0.1	✓	R/W	-	-
CD factor I	1289	Float	0.0	1.95	0.01	0.01	✓	R/W	12 H L	R/W 1 0
Gain rmp start (2)	529	Short	0	100	90	90	✓	R/W	-	-
REG. PARAMETERS/Percent values/DC PI reg										
DC Curr P	847	Float	0.0	100.0	16.31	16.31	✓	R/W	-	-
DC Curr I	848	Float	0.0	100.0	12.23	12.23	✓	R/W	-	-
REG. PARAMETERS/Base values/DC PI reg										
DC Curr P base	849	Float	0.001	S	S	S	✓	R/Z	-	-
DC Curr I base	850	Float	0.01	S	S	S	✓	R/Z	-	-
CONFIGURATION \ Prog alarms \ Slave Error										
Ok relay open ON OFF	1531	I16	0	1	ON	ON	✓	R/W 0 1	-	-
CONFIGURATION										
Max out voltage [V]	175	Float	20	(1)	S	S	✓	R/Z	-	-
Pulse config. (2) 12P Series 6P only	1536	U16	0	1	12P Series (0)	12P Series (0)	✓	R/Z 0 1	-	-
Speed res (2) 1/4 1/8 1/16 1/32 1/64	1429	Enum	-	-	1/4	1/4	✓	R/Z 0 1 2 3 4	-	-
CONFIGURATION \ Prog alarms \ Diffcurrent										
Diffcurrent thr [%] (3)	1525	U16	0	50	20	20	✓	R/Z	-	-
Activity Ignore Warning Disable drive	1528	U16	0	2	Ignore	Ignore	✓	R/Z 0 1 2	-	-
Latch ON OFF	1529	U16	0	1	ON	ON	✓	R/Z 0 1	-	-
Ok relay open ON OFF	1530	I16	0	1	ON	ON	✓	R/W 0 1	-	-
Hold off time [ms]	1527	U16	0	10000	100	100	✓	R/W	-	-
Restart time [ms]	1526	U16	0	10000	0	0	✓	R/W	-	-
CONFIGURATION \ Prog alarms \ SSC error										
Hold off time [s]	1536	Uns16	0	240	1	1	✓	R/W	-	-

Parameter	No.	Format	Value				Access via			
			min	max	Factory American	Factory European	Keyp.	RS485/ BUS/ Opt2-M	Term.	Opt2-A/ PDC
FLUX REGULATION (FIELD CURRENT REGULATION)										
Flux reg mode	469	U16	0	2	Const. current (0)	Const. current (0)	✓	R/Z	-	-
Constant current								0		
Voltage control								1		
External control (OFF)								2		
~~Ext digital FC~~								3		
Ext wired FC								4		
CONFIGURATION \ Speed fbk										
Speed fbk sel (4)	414	U16	0	3	1	1	✓	R/Z	-	R
Encoder 1								0		
Encoder 2								1		
Tacho								2		
Armature								3		
SPEC FUNCTIONS \ Alpha Test										
Alpha Test Sel (2)	1525	Enum	-	-	OFF	OFF	✓	R/W	-	-
OFF								0		
Fwd								1		
Rev								2		
Alpha Test Angle [deg] (2)	1526	Float	5.0	180.0	180	180	✓	R/W	-	-
Angle Acc [deg] (2)	409	Float	-	-	-	-	✓	R	-	-
DRIVECOM										
Malfunction code	57	I16					✓	R	-	-
Failure supply							5100h	5100h		
Undervoltage							3120h	3120h		
Overvoltage							3310h	3310h		
Overcurrent							2300h	2300h		
Heatsink							4210h	4210h		
Hardware							5000h	5000h		
DSP error							6110h	6110h		
Interrupt error							6120h	6120h		
Speed fbk loss							7301h	7301h		
External fault							9000h	9000h		
Overtemp motor							4310h	4310h		
Field loss							3330h	3330h		
Bus loss							8110h	8110h		
Hw opt 1 failure							7510h	7510h		
Opt2							7400h	7400h		
Unknown							1001h	1001h		
Enable seq err							9009h	9009h		
SSC Error							8100h	8100h		
Slave Error							2600h	2600h		
Diff Current							2200h	2200h		

(1) Parallel configuration = 999, Series configuration = 1700.
(2) AVAILABLE FOR SERIES CONFIGURATION ONLY.
(3) AVAILABLE FOR PARALLEL CONFIGURATION ONLY.
(4) Encoder 1 (Sinusoidal Encoder for speed feedback on XE1 connector) is not Active

Addendum to Instruction manual
Series: TPD32-EV
Revision: 0.6
Date: 15-12-2022
Code: 1S4T6EN

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