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TPS/D PROTOCOL ELETTRATEST

EN

USER MANUAL

**READ AND SAVE
THESE INSTRUCTIONS**

**LEGGI E CONSERVA
QUESTE ISTRUZIONI**

TPS/D Models covered in this manual:

Model	Code
TPS/M/D 1500	99111113
TPS/M/D 3000	99111263
TPS/M/D 6000	99111513
TPS/M/D 9000	99111663
TPS/T/D 10KVA	99116213
TPS/T/D 20KVA	99116313
TPS/T/D 40KVA	99116413
TPS/T/D 60KVA	99116513
TPS/T/D 90KVA	99116713

This manual is written from TPS/T/D firmware version 16 and TPS/M/D firmware version 69.

***Please check the latest manual version at www.elettrotestspa.it
To consult older manual versions, please contact our support at service@elettrotestspa.it***

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1. INTRODUCTION

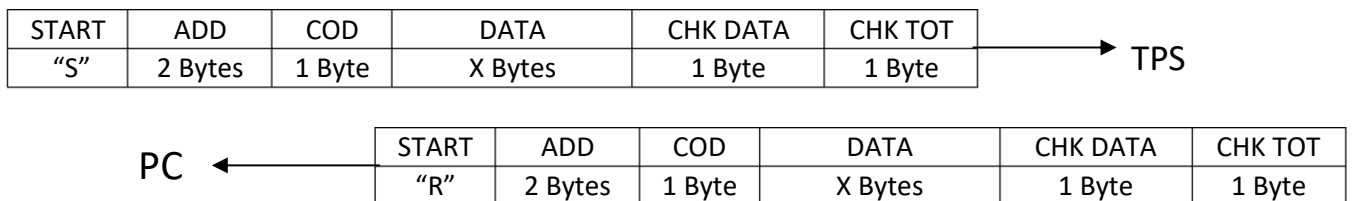
This manual is written for the firmware version 69 of the TPS/M/D series and for the firmware version 16 of the TPS/T/D series.

To consult older manual versions, please contact our support at service@elettestspa.it

This manual is written for both single-phase and three-phase generators. For machines that have only the single-phase version, or when using a three-phase machine in single-phase mode, consider only phase R and ignore the parts of this document that concern phases S and T.

1.1. TPS SERIAL PROTOCOL

The structure of the protocol is a typical master slave system



2. COMMUNICATION PACKET

Down you can find the structure of the communication packet

START	ADD	COD	DATA	CHK DATA	CK TOT
1 Byte	2 Byte	1 Byte	X Byte	1 Byte	1 Byte

START: Start byte of the packet and it can be:

- "S" when the packet is sent to the TPS.
- "R" when the packet is received from the TPS.

ADD: Two address bytes, now those bytes are not used.

COD: It is the code of the packet

DATA Data part of the packet.

CHK DATA: It is the CHKSUM of the data part and It is the least significant byte of the sum of data bytes.

CHK TOT: It is the CHKSUM of all packet and it is the least significant byte of the sum of all bytes of the packet.

3. LIST OF PACKETS OF THE PC

3.1. INIT (1) (7 bytes)

With this packet it is possible to read the current state of your XPS. The XPS sends back the [ECHO packet](#) or, in case of some problems, the [ACK packet](#).

The Init packet is:

INIT PACKET					
START (1 Byte)	ADD (2 Bytes)	COD (1 Byte)	DATA (1 Byte)	CHK DATA (1 Byte)	CHK TOT (1 Byte)
"S"	00	1	0	0	1 Byte

3.2. ACQ (2) (9 bytes)

With this packet is possible to acquire some data from your XPS. The XPS sends back the [RISP packet](#) or, in case of some problems, the [ACK packet](#).

The ACQ packet is:

INIT PACKET					
START (1 Byte)	ADD (2 Bytes)	COD (1 Byte)	DATA (1 Byte)	CHK DATA (1 Byte)	CHK TOT (1 Byte)
"S"	00	2	A B C	X	1 Byte

Bytes B and C for future use

Byte A:

- 0: Not used.
- 1: Request of setting voltage.
- 2: Request of output voltage.
- 3: Request of output current
- 4: Request of phase.
- 5: Request of frequency.
- 6: Request of alarms.
- 7: Request of mode.
- 8: Request of machine and power codes.
- 9: Request of options installed.
- 10: Request of range.
- 12: Request to read instant alarms
- 13: Machine busy status request
- 14: Output current in [A / 100]
- 15: Limit Enabled
- 20: Serial number
- 21: PEAK limit Max. value [Ax10]
- 22: PEAK limit Min. value [Ax10]
- 23: PEAK limit set value [Ax10]
- 24: PEAK limit set value [bit f.s.]
- 25: RMS limit Max. value [Ax10]
- 26: RMS limit Min. value [Ax10]
- 27: RMS limit set value [Ax10]
- 28: RMS limit set value [bit f.s.]
- 29: Delay [s]
- 99: Eeprom byte reading

3.3. SET_MD (3) (8 bytes)

With this command it is possible to set the functional mode of your TPS/D. The power supply sends back the [ACK packet](#).

SET_MD PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (2B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	3	A B	X	1 Byte

A BYTE							
7	6	5	4	3	2	1	0
Range	Sense	Mono	Sync	DC	Remote	OUT	INRSH

Mode	0	1	TPS/M/D	TPS/T/D
RANGE ¹	Low	High	✓	✓
SENSE	2-Wire	4-Wire	✓	✓
MONO ²	Single Phase	Three Phase	✗	✓
SYNC ³	Line	Internal	✗	✗
DC ⁴	AC	DC	✓	✗
REMOTE	Local	Remote	✓	✓
OUT ⁵	Out Relay Off	Out Relay On	✓	✓
INRUSH ⁶	Continuous	Inrush	✗	✓

The commands with "✗" are not enabled in the TPS/M/D or TPS/T/D power supply series.

Byte B: for future use.

- *) DC setting is allowed if Sync=Internal and Range=High.
- *) In DC, it is not allowed to set Sync=Line and Range=Low.

¹ Only with the double range machine

² Only with three-phase machine with single-phase option

³ Only with sync option enabled

⁴ Only with DC option machines

⁵ Only with output relay option machines

⁶ Only with Inrush option machines

3.4. RAMP_VF (4) (24 bytes)

With this command it is possible to perform a voltage and frequency ramp in a specified time. This ramp will go from the setted value to the value set in the **RAMP_VF** packet.

The machine will check the coherency of the data and, if the set values in the packet are not correct, the machine will send back the [ACK packet](#) with 4 on the data bytes.

If the ramp values are correct, the ramp will start and the machine will reply "Busy" for every other command sent during the voltage and frequency Ramp.

Notes:

1) In case of machines with output relay option, the voltage and frequency ramp could be done only with output **ON**.

2) In case of machines with Sync option, the **RAMP_VF** command will not be accepted.

3) The frequency ramp is the same for all the phases because it is not possible to have different frequencies for different phases.

RAMP_VF PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (18B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	4	X	X	1 Byte

	DATA																	
	Phase L1						Phase L2						Phase L3					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	V _{MSB}	V _{LSB}	F _{MSB}	F _{LSB}	T _{MSB}	T _{LSB}	V _{MSB}	V _{LSB}	-	-	-	-	V _{MSB}	V _{LSB}	-	-	-	-
TPS/M/D	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗

The parameters with "✗" are not enabled in the TPS/M/D or TPS/T/D power supply series.

How to calculate values to insert in DATA:

V_{MSB} : V_{LSB}⁷

To obtain the value to insert on the racket you must use this formula:

$$V = \frac{V_{set} * 4095}{Range}$$

Example If you are in the 300V range and you want to set 200V

$$V = \frac{200 * 4095}{300} = 2730$$

F_{MSB} : F_{LSB}

It is the frequency multiply for 100 (example 50Hz = 5000)

$T_{MSB} : T_{LSB}$

The time is expressed in hundredths of a second. (example 1s = 100)

The precision depends on the quantization of the time and the voltage inside the machine.

3.5. RAMP_PAR (5) (19 bytes)

RAMP_PAR PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA (13)		CHK DATA (1B)	CHK TOT (1B)
			Type (1B)	DATA (12B)		
"S"	00	5	T	X	X	1 Byte

Type

- 0 Voltage ramp
- 1 Frequency ramp
- 2 Phase ramp

0: Voltage ramp

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}
TPS/M/D	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

$V_{MSB} : V_{LSB}$ ⁸

To obtain the value to insert on the racket you must use this formula:

$$V = \frac{V_{set} * 4095}{Range}$$

1: Frequency ramp

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	F_{MSB}	F_{LSB}	T_{MSB}	T_{LSB}	-	-	-	-	-	-	-	-
TPS/M/D	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗

$F_{MSB} : F_{LSB}$

It is the frequency multiply for 100 (example 50Hz = 5000)

⁸ For the HPS series only fase R data are used
26/07/23

2: Phase ramp: (The phase is instantly set without any ramp)

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	PH _{MSB}	PH _{LSB}	-	-	PH _{MSB}	PH _{LSB}	-	-	PH _{MSB}	PH _{LSB}	-	-
TPS/M/D	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✗	✗	✓	✓	✗	✗	✓	✓	✗	✗

PH_{MSB} : PH_{LSB}

To obtain the value to insert on the packet you must use this formula:

$$DATO = \frac{PH * 4095}{360}$$

3.6. COM (6) (8 bytes)

COM PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA(2)		CHK DATA (1)	CHK TOT (1)
			Type (1B)	Data (1B)		
"S"	00	6	T	X	X	1 Byte

With this command it is possible to change a single operating mode of the machine.
The machine sends back the [ACK packet](#).

Type	Description	Data		TPS/M/D	TPS/T/D
0	Remote	0 = Local	1 = Remote	✓	✓
1	Out relay	0 = Off	1 = On	✓	✓
2	Range	0 = Low	1 = High	✓	✓
3	Sense	0 = 2wire	1 = 4-wire	✓	✓
4	Mono	0 = 1-Phase	1 = 3-Phase	✗	✓
5	Sync	0 = Line	1 = Internal	✗	✗
6	DC	0 = AC	1 = DC	✓	✗
7	Inrush	0 = Countinous	1 = Inrush	✗	✓
8	Waveform ⁽¹⁾	Not Used		✗	✗
9	Limit RMS ALL	0 = Disabled	1 = Enabled	✗	✓
10	Limit Peak ALL	0 = Disabled	1 = Enabled	✗	✓
11	SOF ALL ⁽¹⁾	Not Used		✗	✗
12	Limit RMS R	0 = Disabled	1 = Enabled	✓	✓
13	Limit Peak R	0 = Disabled	1 = Enabled	✓	✓
14	SOF R ⁽¹⁾	Not Used		✗	✗
15	Limit RMS S	0 = Disabled	1 = Enabled	✗	✓
16	Limit Peak S	0 = Disabled	1 = Enabled	✗	✓
17	SOF S ⁽¹⁾	Not Used		✗	✗
18	Limit RMS T	0 = Disabled	1 = Enabled	✗	✓
19	Limit Peak T	0 = Disabled	1 = Enabled	✗	✓
20	SOF T ⁽¹⁾	Not Used		✗	✗

3.7. RESET (7) (7 bytes)

This command resets the TPS/D.

RESET PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (1B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	7	X	X	1 Byte

With this command it is possible to reset the machine. This command does not reset the display board.

3.8. LIM (8) (9 bytes)

Command for setting current limit.

LIM PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA(3B)		CHK DATA (1B)	CHK TOT (1B)
			Type (1B)	Data (2B)		
"S"	00	8	T	A B	X	1 Byte

The current limit (RMS or/PEAK) could be activated with the same value in all phases or with different values for each phase.

The Delay time causes all the generator outputs to switch off if the set **RMS** limit is exceeded for longer than the set Delay time. The delay time is automatically turned ON if the RMS limit is ON. The Delay time does not intervene in any way if the **Peak** limit is exceeded.

3.8.1. Type

DATA (3 BYTES)			
TYPE (1 BYTE)		DATA (2 BYTES)	
4 bit	4 bit	A Byte	B Byte
Phase	Limit	ILIM _{MSB}	ILIM _{LSB}

PHASE			
N	DESCRIPTION	TPS/M/D	TPS/T/D
0	Current limit for all the phases	✓	✓
1	Current limit for phase L1	✓	✓
2	Current limit for phase L2	✗	✓
3	Current limit for phase L3	✗	✓
4 ÷ 15	Not Used	✗	✗

LIMIT			
N	DESCRIPTION	TPS/M/D	TPS/T/D
0	PEAK current limit setting in bit Ampere x10	✓	✓
1	RMS current limit setting in bit Ampere x10	✓	✓
2	Delay setting in seconds	✓	✓
3	PEAK current limit setting in bit f.s.	✓	✓
4	RMS current limit setting in bit f.s.	✓	✓
5 ÷ 15	Not used	✗	✗

3.8.2. Data

Only for PEAK limit 12 bits are used (1200÷4095; A=MSB, B=LSB)

- 1200 Minimum limit
- 4095 Maximum limit

For RMS limits in bit f.s. please refer to the RMS limit values in ACQ.

4. LIST OF PACKET OF THE TPS

4.1. ECHO (101) (42 byte)

The command ECHO carries the current state of the TPS/D. It is the reply after a [INIT packet](#) sent to the generator.

ECHO PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (36B)	CHK DATA (1B)	CK TOT (1B)
"R"	00	101	X	X	1 Byte

Data has 36 bytes, twelve for each phase.

Phase L1

	DATA											
	1	2	3	4	5	6	7	8	9	10	11	12
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
TPS/M/D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TPS/T/D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Phase L2

	DATA											
	13	14	15	16	17	18	19	20	21	22	23	24
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
TPS/M/D	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Phase L3

	DATA											
	25	26	27	28	29	30	31	32	33	34	35	36
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
TPS/M/D	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

How to calculate values found in ECHO packet DATA:

Vset

It is the setting voltage with 12bit expression, to guarantee the maximum precision. Down you can find the formula

$$V_{set} = \frac{V_{set_{12bit}} * Range}{4095}$$

If range 300

$$V_{set} = \frac{V_{set_{12bit}} * 300}{4095}$$

Vout

It is the output reading voltage. As the setting voltage it is represented with 12 bit expression.

$$V_{out} = \frac{V_{out_{12bit}} * V_{out_{max}}}{4095}$$

if range 300

$$V_{out} = \frac{V_{out_{12bit}} * 315}{4095}$$

Vout max is the maximum setting voltage plus the 5%. (due to slow compensation)

Iout

It is the reading output current, this value has a number after the dot. (XXX.X)

PH

It is the setting phase always with 12bit expression.

$$PH = \frac{PH_{12bit} * 360}{4095}$$

Fset

It is the setting frequency with two numbers after the dot (XX.XX).

Mode

It is the byte for the configurations of each phase

Bit	Description	Data		TPS/M/D	TPS/T/D
1	Remote	0: Local	1: Remote	✓	✓
2	3 phase	0: 1 phase	1: 3 phase	✗	✓
3	DC	0:AC	1: DC	✓	✗
4	Range	0: Low	1: High	✓	✓
5	Output Relay	0: Off	1 : On	✓	✓
6	Inrush	0: Disab.	1: Enable	✗	✓
7	Sync	0: Line	1: Internal	✗	✗
8	Sense	0: 2 wire	1: 4 wire	✓	✓

Alarm

Alarms byte on relative phase

Bit	Alarms	TPS/M/D	TPS/T/D
1	Overvoltage on the bus	✓	✓
2	Undervoltage on the bus	✓	✓
3	Overtemperature	✓	✓
4	Inverter alarm	✓	✓
5	Eeprom data error	✓	✓
6	Error on the output voltage	✓	✓
7	Limitation of output current	✓	✓
8	Not used	✗	✗

Attention: In single-phase mode only the phase R alarm is significant.

4.2. RISP (102) (13byte)

The command RISP carries some data of the TPS/D. It is the reply after a [ACQ packet](#) sent to the generator

RISP PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA(4)		CHK DATA (1B)	CK TOT (1B)
			Type (1B)	Data(6B)		
"R"	00	102	T	X	1 Byte	1 Byte

Type:

- 0: Not used.
- 1: Request of setting voltage.
- 2: Request of output voltage.
- 3: Request of output current (when the TPS can measure it).
- 4: Request of phase
- 5: Request of frequency.
- 6: Request of alarms.
- 7: Request of mode.
- 8: Request of revision and code of the machine.
- 9: Request of options installed in the machine.
- 10: Request of the range.
- 11: Request of the waveform.
- 12: Request of instantaneous alarms.
- 13: Request of busy state of the machine
- 14: Output current in [mA] (2 decimal digits)
- 15: Limit Enabled
- 21: PEAK limit - Max. value [Ax10]
- 22: PEAK limit - Min. value [Ax10]
- 23: PEAK - Setted limit [Ax10]
- 24: PEAK - Setted limit [bit f.s.]
- 25: RMS limit – Max. value [Ax10]
- 26: RMS limit – Min. value [Ax10]
- 27: RMS – Setted limit [Ax10]
- 28: RMS – Setted limit [bit f.s.]
- 29: Delay [s]
- If "99" type = 99, Data[0] =pos, Data[1] = val

4.2.1. Values description

1: Setting voltage

Displays the setting voltage for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Vset _{MSB}	Vset _{LSB}	Vset _{MSB}	Vset _{LSB}	Vset _{MSB}	Vset _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

2: Reading output voltage

Displays the output voltage for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Vout _{MSB}	Vout _{LSB}	Vout _{MSB}	Vout _{LSB}	Vout _{MSB}	Vout _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

3: Output current

Displays the output current. In single-phase mode or in single-phase machine it shows only the phase R output.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Iout _{MSB}	Iout _{LSB}	Iout _{MSB}	Iout _{LSB}	Iout _{MSB}	Iout _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

4: Setting phase

Displays the setting Phase of all the three phases.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	PH _{MSB}	PH _{LSB}	PH _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

5: Frequency

Displays the setting frequency for each phase. It will show the same value for all the phases because it is not possible to set different frequencies from a phase to another.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	FR _{MSB}	FR _{LSB}	FS _{MSB}	FS _{LSB}	FT _{MSB}	FT _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

6: Alarms

It display the alarms for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Not used	Alm L1	Not used	Alm L2	Not used	Alm L3
TPS/M/D	✗	✓	✗	✗	✗	✗
TPS/T/D	✗	✓	✗	✓	✗	✓

Bit	Alarms
1	Overvoltage on the bus
2	Undervoltage on the bus
3	Overtemperature
4	Inverter alarm
5	Eeprom data error
6	Error on the output voltage
7	Limitation of output current
8	Not used

• 7: Mode

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Not used	MDr	Not used	MDs	Not used	MDt
TPS/M/D	✗	✓	✗	✗	✗	✗
TPS/T/D	✗	✓	✗	✓	✗	✓

Bit	Description	Data		TPS/M/D	TPS/T/D
1	Remote	0: Local	1: Remote	✓	✓
2	3 phase	0: 1 phase	1: 3 phase	✗	✓
3	DC	0: AC	1: DC	✓	✗
4	Range	0: Low	1: High	✓	✓
5	Output Relay	0: Off	1: On	✓	✓
6	Inrush	0: Disab.	1: Enable	✗	✓
7	Sync	0: Line	1: Internal	✗	✗
8	Sense	0: 2 wire	1: 4 wire	✓	✓

• 8: Revision and machine code

It displays the machine code and the power code of your TPS/D.

DATA					
1	2	3	4	5	6
Fw Revision	Machine Code	Power Code	0	0	0

Machine Code	
10	TPS/T/D
16	TPS/M/D

The power code depends on which power size your TPS/D has.

• 9: Installed options

It display the installed options of your machine for each phase.

DATA	TPS/M/D	TPS/T/D
1 OP_R_MSB	✓	✓
2 OP_R_LSB	✓	✓
3 OP_S_MSB	✗	✓
4 OP_S_LSB	✗	✓
5 OP_T_MSB	✗	✓
6 OP_T_LSB	✗	✓

OP_R_MSB		TPS/M/D	TPS/T/D
BIT	Description	-	-
0	<i>Sync internal external</i>	✗	✗
1	NU	✗	✗
2	NU	✗	✗
3	NU	✗	✗
4	NU	✗	✗
5	NU	✗	✗
6	NU	✗	✗
7	NU	✗	✗

OP_R_LSB		TPS/M/D	TPS/T/D
BIT	Description	-	-
0	<i>Inrush - countinous</i>	✗	✗
1	<i>Out switching</i>	✓	✓
2	<i>AC-DC</i>	✓	✓
3	<i>Threephase -Singlephase</i>	✗	✓
4	<i>Double Range</i>	✓	✓
5	<i>Fast switch range</i>	✓	✓
6	<i>Reset enable</i>	✓	✓
7	<i>External commands</i>	✓	✓

- **10: Full Range value (value x 10)**

It displays the full range values of your machine.

DATA					
1	2	3	4	5	6
H _{MSB}	H _{LSB}	L _{MSB}	L _{LSB}	0	0

- **11: Not used**

- **12: Not used**

- **13: Busy**

Displays the busy state of the machine and the ramp in progress state.

DATA						
	1	2	3	4	5	6
	Busy R	Ramp R	Busy S	Ramp S	Busy T	Ramp T
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **14: Output current in A/100**

Displays the output current in A/100. In single-phase mode or in single-phase machine it shows only the phase R output.

DATA						
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	I _{out} _{MSB}	I _{out} _{LSB}	I _{out} _{MSB}	I _{out} _{LSB}	I _{out} _{MSB}	I _{out} _{MSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **15: Limit Enabled**

It display the current state of the RMS and Peak abilitation.

DATA						
	1	2	3	4	5	6
	0	Lim. Enable L1	0	Lim. Enable L2	0	Lim. Enable L3
TPS/M/D	x	x	x	x	x	x
TPS/T/D	x	✓	x	✓	x	✓

Bit	Description	Data	
1	RMS	0: Disabled	1: Enabled
2	Peak	0: Disabled	1: Enabled
3	SOF	Not Used	
4	N.U.	Not used	
5	N.U.	Not used	
6	N.U.	Not used	
7	N.U.	Not used	
8	N.U.	Not used	

- **16: Not used**
- **17: Not used**
- **18: Not used**

19: Link

DATA					
1	2	3	4	5	6
Link	0	0	0	0	0

Link:

b7	b6	b5	b4	b3	b2	b1	b0
----	----	----	----	----	----	----	----

B7 ÷ b6

- 0: Elettrotest protocol
- 1: SCPI protocol
- 2: Modbus RTU
- 3: Modbus TCP

B5 ÷ b4

- 0: RS32 communication
- 1: RS485 communication
- 2: tcp-IP

b3 ÷ b0

- 0: Baud rate 1200
- 1: Baud rate 9600
- 2: Baud rate 19200

20: Serial Number

DATA					
1	2	3	4	5	6
SN A	SN B	SN C	SN D	0	0

SN A: serial number MSB

SN B: serial number LSB

SN C: month

SN D: year

- **21: PEAK limit Max. value [Ax10]**

It displays the maximum settable PEAK limit for each phase.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **22: PEAK limit Min. value [Ax10]**

It displays the minimum settable PEAK limit for each phase.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **23: PEAK limit set value [Ax10]**

It displays the set PEAK limit for each phase in Ampere x10.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **24: PEAK limit set value [bit f.s.]**

It displays the set PEAK limit for each phase in bit f.s.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}	IPEAK _{MSB}	IPEAK _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **25: RMS limit Max. value [Ax10]**

It displays the maximum settable RMS limit for each phase.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IRMS _{MSB}	IRMS _{LSB}	IRMS _{MSB}	IPEAK _{LSB}	IRMS _{MSB}	IRMS _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **26: RMS limit Min. value [Ax10]**

It displays the minimum settable RMS limit for each phase.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IRMS _{MSB}	IRMS _{LSB}	IRMS _{MSB}	IPEAK _{LSB}	IRMS _{MSB}	IRMS _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **27: RMS limit set value [Ax10]**

It displays the set RMS limit for each phase in Ampere x 10.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IRMS _{MSB}	IRMS _{LSB}	IRMS _{MSB}	IPEAK _{LSB}	IRMS _{MSB}	IRMS _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **28: RMS limit set value [bit f.s.]**

It displays the set RMS limit for each phase in bit f.s.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	IRMS _{MSB}	IRMS _{LSB}	IRMS _{MSB}	IPEAK _{LSB}	IRMS _{MSB}	IRMS _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

- **29: Delay [s]**

It displays the set delay time for the RMS limit for each phase.

	DATA					
	Phase R		Phase S		Phase T	
	1	2	3	4	5	6
	DELAY _{MSB}	DELAY _{LSB}	DELAY _{MSB}	DELAY _{LSB}	DELAY _{MSB}	DELAY _{LSB}
TPS/M/D	✓	✓	✗	✗	✗	✗
TPS/T/D	✓	✓	✓	✓	✓	✓

4.3. ACK (103) (7 bytes)

This packet contains the informations of the machine reply to a require command. Below you can see the correspondence between the sent packet to the received packet:

ACK PACKET					
START (1)	ADD (2)	COD (1)	DATA (1)	CHK DATA (1)	CHK TOT (1)
"R"	00	103	X	X	1 Byte

DATA:

- 0: Command accepted.
- 1: Error on the packet.
- 2: Command is not enabled.
- 3: TPS/D busy.
- 4: Values are not correct.

4.3.1. CORRESPONDENCE TABLE OF PACKET

PC	TPS
INIT (1)	ECHO (101) o ACK(103)
ACQ (2)	RISP (102) o ACK(103)
SET_MD (3)	ACK (103)
RAMP_VF (4)	ACK (103)
RAMP_PAR (5)	ACK (103)
COM (6)	ACK (103)
RESET (7)	-
LIM (8)	ACK (103)

5. REVISION INDEX

03A	Errata corridge of ACQ/RISP(8) "Machine & Power code"	26/07/23	A.Ferro	M.Rigobello	R.Veronese
03_	Changes for three phase models implementation (DPP001.21) and TPS/M/D FW update v.069 (UT003.22)	07/06/23	A.Ferro	M.Rigobello	R.Veronese
02_	Changes related to I _{PEAK} ed I _{RMS} management (UT005.20)	09/06/22	A.Ferro	M.Rigobello	R.Veronese
01_	New design and general review	01/03/22	A.Ferro	M.Rigobello	R.Veronese
00_	First Emission	10/07/17	FTO	FTO	FTO
Rev.	Description	Date	Author	Verified	Approved