



S.p.A. - Via Indipendenza, 56 - Vigevano

Titolo documento : Manuale del protocollo di comunicazione ver Inglese			
Codice documento : K-series.protocol.GB02.CP.DOC		Codice mag.:	
Sostituisce codice :		Codice mag.:	
E' sostituito da :		Codice mag.:	
Codice commessa :	Sezione :	Modulo:	Totale pagine : 33
Genere documento :	Sig.doc :	Vers : 02	
Compilato : Carlo Pisani	Verificato :		Approvato :
Data : 23/09/09	Data :		Data :

Variazioni rispetto al documento precedente:

K family Communication protocol user's guide

INDEX

1 Preface	4
2 Physical connection	5
2.1 Interface	5
2.2 Line	5
3 Communication protocol.....	6
3.1 Function 3 - read n word	7
3.2 Function 6 - one word write	8
3.3 The exception replay	9
3.4 Cyclic redundancy check (CRC)	10
4 Data exchange.....	12
4.1 Some definitions	12
4.2 Memory zones	13
4.2.1 Variables zones.....	13
4.2.2 Parameters programming	15
4.2.3 Identification code zone.....	25
5 Performance.....	25

1 Preface

This document is intended to describe the TLK series controllers using the MODBUS protocol in their communication capability and is mainly directed to technicians, system integrators and software developers.

The subject is subdivided in four levels of interest:

- first level describes the physical connection to the line;
- second level presents the data link protocol, that is a subset of the MODBUS RTU (JBUS) protocol;
- third level describes in detail each data that can be exchanged;
- fourth level states performance characteristics of the system.

2 Physical connection

2.1 Interface

TLK series controllers are provided with a RS485 serial communication interface, insulated so that any problem arising from ground potential is removed.

While at rest, the instruments are in a receive condition and are revert to transmission after a correct message has been decoded that matches the configured address.

2.2 Line

The instruments are equipped with 2 terminals named A and B.
The connection between TLKs has to be carried on in parallel, i.e. all A terminals have to be connected between them so as B terminals.

A termination resistor of 120 ohm is required to maintain the quiescent condition on the line;

Adopted baud rates range from 1200 to 38400 baud, that is very satisfactory for application performances, yet very slow for RS485 interface. This fact allows the wiring of the line with a medium quality twisted pair cable: total capacity of the line should not exceed 200 nF.

The line can be up to 1000 meters in length.

3 Communication protocol

The protocol adopted by TLK series is a subset of the widely used MODBUS RTU (JBUS)¹ protocol, so that connections are easy for many commercial PLCs and supervisory programs.

For users needing to develop their own communication software, all information is available as well as implementation hints.

The MODBUS RTU (JBUS) communication functions implemented in TLK series are:

- function 3 - n word read
- function 6 - one word write.

These functions allow the supervisory program to read and modify any data of the controller.

The communication is based on messages sent by the master station (host) to the slave stations (TLK) and viceversa.

The slave station that recognises the message as sent to it, analyses the content and, if it is formally and semantically correct, generates a reply message directed back to the master.

The communication process involves five types of messages:

from master to slave	from slave to master
function 3: n word read request	function 3: n word read reply
function 6: one word write request	function 6: one word write reply
	exception reply (as reply to both functions in abnormal conditions)

Every a message contains four fields:

- slave address (from 1 to 255): MODBUS RTU (JBUS) reserves address 0 for broadcasting messages, but due to inherent unreliability of its not implemented for TLK series;
- function code: contains 3 or 6 for specified functions;
- information field: contains data like word addresses and word values as required by function in use;
- control word: a cyclic redundancy check (CRC) performed with particular rules for CRC16.

The characteristics of the asynchronous transmission are 8 bits, no parity, one stop bit.

¹ AEG Schneider Automation, Inc. registered trade mark

3.1 Function 3 - read n word

The number of words to be read must be less or equal four.

The request has the following frame:

slave number	3	first word address		number of words		CRC	
		MSB	LSB	MSB	LSB	LSB	MSB
byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

The normal reply (as opposed to exception reply) has the following frame:

slave number	3	NB number of read bytes	value of first word		following words	CRC	
			MSB	LSB		LSB	MSB
byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte NB + 2	byte NB + 3

3.2 Function 6 - one word write

The request has the following frame:

slave number	6	word address		value to write		CRC	
byte 0	byte 1	MSB	LSB	MSB	LSB	LSB	MSB
		byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

The normal reply (as opposed to exception reply) is merely an echo of the request message:

slave number	6	word address		value to write		CRC	
byte 0	byte 1	MSB	LSB	MSB	LSB	LSB	MSB
		byte 2	byte 3	byte 4	byte 5	byte 6	byte 7

3.3 The exception replay

TLK series instruments reply with an exception when the request is formally correct, but cannot be satisfied standing particular situations; the reply contains a code indicating the cause of the missing regular reply, the frame is:

slave number	function code with most sign. bit set to 1	exception code	CRC	
			LSB	MSB
byte 0	byte 1	byte 2	byte 3	byte 4

TLK series adopts a subset of MODBUS RTU (JBUS) exception code:

ÿ unknown function code	1
ÿ invalid memory address	2
ÿ invalid data field	3
ÿ controller not ready	6

3.4 Cyclic redundancy check (CRC)

CRC is a check word that permits to verify the integrity of a message.

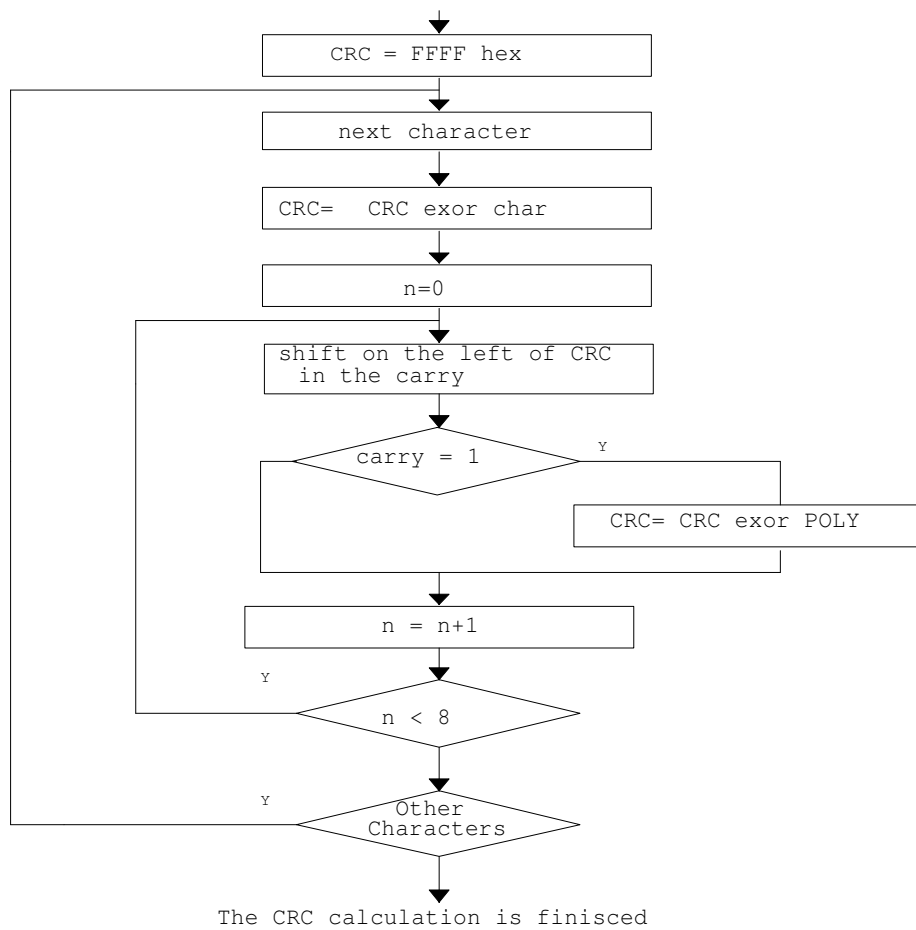
Every message, sent or received, has in the two last characters the CRC check word.

After receiving a request, the controller checks the validity of the received message comparing the received CRC with the calculated one.

When a reply is ready the controller calculates the CRC word and adds two characters to the prepared message.

CRC calculation is performed on every character of the message, excluding the last two.

Being MODBUS RTU (JBUS) compatible , TLK series controllers adopt an identical algorithm for CRC calculation, sketched in following diagram:



The polinomial adopted by MODBUS RTU (JBUS) is 1010 0000 0000 0001.

Note: the first transmitted character of the CRC word is the least significant between calculated bytes.

.

4 Data exchange

This section contains informations about data exchanged with TLK series controllers concerning numerical and not numerical data, with their formats and limits.

4.1 Some definitions

All exchanged data are in the form of 16 bit words.

Two types of data are distinguished: numerical and symbolic (or not numerical).

Numerical data represents the value of a quantity (e.g. the measured variable, the set point).

Symbolic data represents a particular value in a set of values (e.g. the thermocouple type in the set of available ones : J,K,S...).

Both types are coded as integers number : signed numbers for numerical and unsigned numbers for symbolic.

A numerical data, coded as an integer, is coupled with appropriate number of decimal digits to represent a quantity with the same engineering units adopted aboard the instrument.

Numerical data are in fixed point representation; however we make a distinction between two kinds of data:

- the first kind has determined and unmodifiable decimal point position;
- the second has programmable decimal point position (dP parameter).

4.2 Memory zones

All readable and writable data appear to be allocated as 16 bit words in the memory of the instrument.

The memory map has three zones:

• variables,

• parameters,

• instrument identification code.

Following parameters explore the characteristics of each zone.

4.2.1 Variables zones

In this zone there is a collection of main TLK controller variables, it is a group of frequently computed or updated data residing in volatile memory.

MOST IMPORTANT CHANGE

A) during parameter modification **by push-button**, the serial interface continue to operate without any "limit" (you can see by serial link the value of all parameters and you can set it also)

B) When you write a value in a location the instrument will operate as follows:

B.1) if you write a value within parameter range, the instrument will accept it; the new value will be memorized and the instrument will send back the standard answer.

B.2) If you try to write a value OUT of parameter range, the instrument will refuse the new value; the new value will NOT be memorized and the instrument will send an exception message to the master.

These are available data:

5 Address map

All K instruments use only words :

Initial address		Final address		mining
Hex	Dec	Hex	Dec	
1	1	13	21	Group of variables common to all new Tecnologic's instruments.
200	512	250	592	Group of variables compatible with the old Tecnologic's instruments (before K series)
2800	10240	2891	10385	Configuration parameters.

n.	Address		Description	Dec	r/w
	HEX	Dec.			
1A	1	1	PV : Measured value Note: When a measuring error is detected the instrument send: -10000 = Underrange 10000 = Overrange 10001 = Overflow of the A/D converter 10003 = Variable not available	dP	r
2A	2	2	Number of decimal figures of the measured value		r
3A	3	3	Operative set point (value)	dP	r
4A	4	4	Power output Range: -100.00 ÷ 100.00 (%) Note: This parameter is ever writeable but it will be active only when the instrument operate in Manual mode.	2	r/w
5A	5	5	Active set point selection 0 = SP 1 1 = SP 2 2 = SP 3 3 = SP 4	0	r/w
6A	6	6	SP 1 Range: SPLL ÷ SPLH	dP	r/w
7A	7	7	SP 2 Range: SPLL ÷ SPLH	dP	r/w
8A	8	8	SP 3 Range: SPLL ÷ SPLH	dP	r/w
9A	9	9	SP 4 Range: SPLL ÷ SPLH	dP	r/w
10A	A	10	Alarms status bit 0 = Alarm 1 status bit 1 = Alarm 2 status bit 2 = Alarm 3 status bit 3÷8 = reserved bit 9 = LBA status bit 10 = power feilure indicator bit 11 = Generic error bit 12÷15 = reserved	0	r
11A	B	11	Outputs status (physical outputs) bit 0 = Output 1 status bit 1 = Output 2 status bit 3 = Output 3 status bit 4 = Output 4 status bit 5÷15 = Reserved When an output is driven by serial link, the relative bit will remain equal to 0.	0	r

n.	Address		Description	Dec	r/w
	HEX	Dec.			
12A	C	12	Instrument status bit 0 = Automatic bit 1 = manual bit 2 = Standby bit 3 = Remote Set point (temporary) used bit 4 = Auto-tuning active bit 5 = Self tuning active bit 6 = Reserved bit 7 = Timer running bit 8 = Soft start running bit 9 = Ramp for set point change (up or down) running bit 10 = Delay at start up (od) running bit 11 = Program running bit 12 = Measure status (0 = OK while 1 = error). bit 13÷15 = Reserved	0	r
13A	D	13	Alarms reset 0 = Not resetted 1 = Resetted	0	r/w
14A	E	14	Alarms acknowledge 0 = Not acknowledge 1 = acknowledge	0	r/w
15A	F	15	Control status 0 = Automatic 1 = Manual 2 = Stand-by	0	r/w
16A	10	16	Remote set point (temporary) (from serial link) Range: SPLL ÷ SPLH Note: the remote set point is memorized in RAM	dP	r/w
17A	11	17	Auto tuning activation 0 = not active 1 = active	0	r/w
18A	12	18	Power output used when a measuring error is detected. Range: -100 ÷ 100 Note: This valie is memorized in RAM	0	r/w
19A	13	19	Default parameters loading. 481 = Default parameter loading	0	r/w
20A	14	20	Parameters table identification code Range: 0 ÷ 65535 Note The word is composed by two parts: Low byte – Version of the parameter table High byte - Version of the family protocoll	0	r
21A	15	21	Instrument identification code 1 = K85	0	r

Group of variables compatible with the old Tecnologic's instruments (before K series)

n.	Address		Description	Dec	r/w
	HEX	Dec.			
1B	0200	512	PV : Measured value As address 1		
2B	0201	513	Number of decimal figure of the measured value As address 2		
3B	0202	514	Power output As address 4	2	r
4B	0203	515	Power output of the heating output Range: 0 ÷ 100.00 (%)	2	r
5B	0204	516	Power output of the cooling output Range: 0 ÷ 100.00 (%)	2	r
6B	0205	517	Alarm 1 status 0 = OFF 1 = ON	0	r
7B	0206	518	Alarm 2 status 0 = OFF 1 = ON	0	r
8B	0207	519	Alarm 3 status 0 = OFF 1 = ON	0	r
9B	0208	520	Operative set point As address 3		
10B	020A	522	LBA status 0 = OFF 1 = ON	0	r
11B	020F	527	Control status 0 = Automatic 1 = Manual 2 = Standby 3 = Tuning	0	r/w
12B	0224	548	Status / remote control of the Output 1 0 = OFF 1 = ON Note: This parameter is writeable when out 1 is "not used" by the controller (o1F output 1 function = nonE) This parameter is memorized in RAM	0	r/w
13B	0225	549	Status / remote control of the Output 2 0 = OFF 1 = ON Note: This parameter is writeable when out 2 is "not used" by the controller (o2F output 2 function = nonE) This parameter is memorized in RAM	0	r/w

n.	Address		Description	Dec	r/w
	HEX	Dec.			
14B	0226	550	Status / remote control of the Output 3 0 = OFF 1 = ON Note: This parameter is writeable when out 3 is “not used” by the controller (o3F output 3 function = nonE) This parameter is memorized in RAM	0	r/w
15B	0227	551	Status/remote control of the Output 4 0 = OFF 1 = ON Note: This parameter is writeable when out 4 is “not used” by the controller (o4F output 4 function = nonE) This parameter is memorized in RAM	0	r/w
16B	0240	576	Digital input 1 status 0 = OFF 1 = ON Note: The digital input 1 status shows its status even if the input is not used	0	r/w
17B	0241	577	Digital input 2 status 0 = OFF 1 = ON Note: The digital input 2 status shows its status even if the input is not used	0	r/w
18B	0244	580	Program status 0 = Not configured 1 = Reset (not running) 2 = Run 3 = Hold 4 = Wait 5 = End	0	r/w
19B	0245	581	Timer status 0 = Not configured 1 = Reset 2 = Run 3 = Hold 4 = End	0	r/w
20B	0246	582	Program step in execution 0 = Program not active 1 = ramp step 1 2 = soak step 1 2 = ramp step 2 4 = soak step 2 5 = ramp step 3 6 = soak step 3 7 = ramp step 4 8 = soak step 4 9 = END	0	r
21B	0247	583	Remaining time to the program end Range: 0 ÷ 65535 (when Pru=hh.mm the E.U. is minutes, when Pru=mm.ss the E.U. Is seconds) Note: When the program is not running this parameter is equal to zero.	2	r

n.	Address		Description	Dec	r/w
	HEX	Dec.			
22B	248	584	Program events status 0 > E1 = 0 E2 = 0 1 > E1 = 1 E2 = 0 2 > E1 = 0 E2 = 1 3 > E1 = 1 E2 = 1	0	r
23B	249	585	Remaining time to the timer end Range: 0 ÷ 65535 (Hours when Tru=hh.mm, Minutes when Tru=mm.ss) 0 ÷ 9959 (tenth of seconds when Tru=SSS.d) Note: When the timer is not active this parameter is equal to zero.	2 1	r
24B	24A	586	Wattmeter: The meaning of this parameter is defined by the CO.ty parameter setting. 0 CO.ty = 0ff KW CO.ty = 1 Kwh CO.ty = 2 Energy used during program execution (Kwh) CO.ty = 3 worked days CO.ty = 4 Worked hours CO.ty = 5	0	r
25B	250	592	Power output when the instrument is in manual mode Campo: -100.00 ÷ 100.00 (%)	2	r/w

Configuration parameters

inP group (Inputs parameters)

n.	Parameter	address		Mining	Values	Dec	r/w
		Hex	Dec				
1	HcFG	2800	10240	Built in Hardware	0 = 0 > TC/RTD 1 = 1 > TC/PTC 2 = 2 > Corrente 3 = 3 > Volt	0	r
2	SEnS	2801	10241	Input type Note: According to the built in hardware Hardware: TC, Pt100 TC, PTC, NTC Current (I) Voltage (V)	0 = J, 1 = crAL, 2 = S, 3 = r, 4 = t, 5 = ir.J, 6 = ir.cA, 7 = Pt1, 8 = 0.50 (mV), 9 = 0.60 (mV), 10 = 12.60 (mV) 0 = J, 1 = crAL, 2 = S, 3 = r, 4 = t, 5 = ir.J, 6 = ir.cA, 7 = Ptc, 8 = ntc, 9 = 0.50 (mV), 10 = 0.60 (mV), 11 = 12.60 (mV) 0 = 0.20 (mA), 1 = 4.20 (mA) 0 = 0.1 (V) 1 = 0.5(V), 2 = 1.5(V), 3 = 0.10(V), 4 = 2.10(V)	0	r/w
3	dP	2802	10242	Decimal figures	0 ÷ 3 for linear inputs 0 ÷ 1 for TC, RTD, PTC, NTC	0	r/w
4	SSc	2803	10243	Initial scale readout for linear inputs	-1999 ÷ FSC (E.U.)	dP	r/w
5	FSc	2804	10244	Full scale readout for linear inputs	SSC ÷ 9999 (E.U.)	dP	r/w
6	unit	2805	10245	Engineering unit.	0 = C > °C 1 = F > °F	0	r/w
7	FiL	2806	10246	Digital input filter Note This filter affect the control, the retrasmission and the alarm actions.	0 = (oFF) ÷ 200	1	r/w
8	inE	2807	10247	Selection of the Sensor Out of Range type that will enable the safety output value	0 = our > Over and Under 1 = or > Over-range 2 = ur > Under-range	0	r/w
9	oPE	2808	10248	Safety output value	-100 ÷ 100 (%)	0	r/w

n.	Parameter	address		Mining	Values	Dec	r/w
		Hex	Dec				
10	diF1	2809	10249	Digital input 1 function Note: The digital input status is available even if the input is “not used”.	0 = oFF > not used 1 = Alarm Reset 2 = Alarm acknowledge (ACK) 3 = Hold of the measured value 4 = Stand by mode 5 = HEAt with SP1 and Cool with “SP2” 6 = Timer run/hold/reset [transition] 7 = Timer run [transition] 8 = Timer reset [transition] 9 = Timer run/hold [Status] 10 = Program run 11 = Program reset 12 = Program hold 13 = Program run/hold 14 = Program run/reset 15 = Instrument in Manual mode 16 = Sequential set point selection 17 = SP1 / SP2 selection 18 = Set point Binary selection 19 = Digital inputs in parallel to the UP and Down keys	0	r/w
11	diF2	280A	10250	Digital input 12 function Note: The digital input status is available even if the input is “not used”.	0 = oFF > not used 1 = Alarm Reset 2 = Alarm acknowledge (ACK) 3 = Hold of the measured value 4 = Stand by mode 5 = HEAt with SP1 and Cool with “SP2” 6 = Timer run/hold/reset [transition] 7 = Timer run [transition] 8 = Timer reset [transition] 9 = Timer run/hold [Status] 10 = Program run 11 = Program reset 12 = Program hold 13 = Program run/hold 14 = Program run/reset 15 = Instrument in Manual mode 16 = Sequential set point selection 17 = SP1 / SP2 selection 18 = Set point Binary selection 19 = Digital inputs in parallel to the UP and Down keys	0	r/w

out Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
12	o1F	280B	10251	Out 1 function	0 = nonE > Output not used 1 = H.rEG > Heating output 2 = c.rEG > Cooling output 3 = AL > Alarm output 4 = t.out > Timer output 5 = t.HoF > Timer out -OFF in hold 6 = P. End > Program end 7 = P.HLd > Program Hold 8 = P.uit > Program wait 9 = P.run > Program Run 10 = P.Et1 > Program Event 1 11 = P.Et2 > Program Event 2 12 = or.bo > Over-range & burnout 13 = P.FaL > Power failure 14 = bo.PF > Burnout & power Fail 15 = diF1 > The output repeats the digital input 1 status 16 = diF2 > The output repeats the digital input 2 status 17 = St.bY > Instrumnt in stand by mode	0	r/w
13	o1AL	280C	10252	Alarms linked up with the out 1	0÷ 15 +1 > Alarm 1 +2 > Alarm 2 +4 > Alarm 3 +8 > Loop break alarm	0	r/w
14	o1Ac	280D	10253	Out 1 action	0 = dir > Direct 1 = rEV = Reverse 2 = dir.r > Direct with reversed LED 3 = rev.r > reverse with reversed LED	0	r/w
15	o2F	280E	10254	Out 2 function	See o1.F		
16	o2AL	280F	10255	Alarms linked up with the out 2	See o1.AL		
17	o2Ac	2810	10256	Out 2 action	See o1Ac		
18	o3F	2811	10257	Out 3 function	See o1.F		
19	o3AL	2812	10258	Alarms linked up with the out 3	See o1.AL		
20	o3Ac	2813	10259	Out 3 action	See o1Ac		

AL1 Group

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
21	AL1t	2817	10263	Alarm 1 type	0 = nonE. 1 = LoAb > Absolute low alarm 2 = HiAb > Absolute high alarm 3 = LHAb > Absolute band alarm 4 = LodE > Deviation low alarm 5 = HidE > Deviation high alarm 6 = LHdE > Band alarm	0	r/w
22	Ab1	2818	10264	Alarm 1 function	0 ÷ 15 +0 = no function +1 = not active at power up +2 = latched alarm +4 = Acknowledgeable alarm +8 = Mask alarm at power up and after a set point change.	0	r/w
23	AL1L	2819	10265	- For High and low alarms, it is the low limit of the AL1 threshold - For band alarm, it is low alarm threshold	from -1999 to AL1H (E.U.)	dP	r/w
24	AL1H	281A	10266	- For High and low alarms, it is the high limit of the AL1 threshold - For band alarm, it is high alarm threshold	From AL1L to 9999 (E.U.)	dP	r/w
25	AL1	281B	10267	Alarm 1 threshold	From AL1L to AL1H (E.U.)	dP	r/w
26	HAL1	281C	10268	Alarm 1 hysteresis	From 0 = (oFF) to 9999 (E.U.)	dP	r/w
27	AL1d	281D	10269	Alarm 1 delay	From 0 = (oFF) to 9999 (s)	0	r/w
28	AL1o	281E	10270	Alarm 1 enabling during Stand-by mode	0 = no > Alarm disabled 1 = YES > Alarm enabled	0	r/w

AL2 group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
29	AL2t	281F	10271	Alarm 2 type	0 = nonE. 1 = LoAb > Absolute low alarm 2 = HiAb > Absolute high alarm 3 = LHAb > Absolute band alarm 4 = LodE > Deviation low alarm 5 = HidE > Deviation high alarm 6 = LHdE > Band alarm	0	r/w
30	Ab2	2820	10272	Alarm 2 function	0 ÷ 15 +0 = no function +1 = not active at power up +2 = latched alarm +4 = Acknowledgeable alarm +8 = Mask alarm at power up and after a set point change.	0	r/w

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
31	AL2L	2821	10273	- For High and low alarms, it is the low limit of the AL1 threshold - For band alarm, it is low alarm threshold	From -1999 to AL2H (E.U.)	dP	r/w
32	AL2H	2822	10274	- For High and low alarms, it is the high limit of the AL1 threshold - For band alarm, it is high alarm threshold	From AL2L to 9999 (E.U.)	dP	r/w
33	AL2	2823	10275	Alarm 2 threshold	From AL2L to AL2H (E.U.)	dP	r/w
34	HAL2	2824	10276	Alarm 2 hysteresis	From 0 = (oFF) to 9999 (E.U.)	dP	r/w
35	AL2d	2825	10277	Alarm 2 delay	From 0 = (oFF) to 9999 (s)	0	r/w
36	AL2o	2826	10278	Alarm 2 enabling during Stand-by mode	0 = no > Alarm disabled 1 = YES > Alarm enabled	0	r/w

AL3 Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
37	AL3t	2827	10279	Alarm 3 type	0 = nonE. 1 = LoAb > Absolute low alarm 2 = HiAb > Absolute high alarm 3 = LHAb > Absolute band alarm 4 = LodE > Deviation low alarm 5 = HidE > Deviation high alarm 6 = LHdE > Band alarm	0	r/w
38	Ab3	2828	10280	Alarm 3 function	0 ÷ 15 +0 = no function +1 = not active at power up +2 = latched alarm +4 = Acknowledgeable alarm +8 = Mask alarm at power up and after a set point change.	0	r/w
39	AL3L	2829	10281	- For High and low alarms, it is the low limit of the AL1 threshold - For band alarm, it is low alarm threshold	From -1999 to AL3H (E.U.)	dP	r/w
40	AL3H	282A	10282	- For High and low alarms, it is the high limit of the AL1 threshold - For band alarm, it is high alarm threshold	From AL3L to 9999 (E.U.)	dP	r/w
41	AL3	282B	10283	Alarm 3 threshold	From AL3L to AL3H (E.U.)	dP	r/w
42	HAL3	282C	10284	Alarm 2 hysteresis	From 0 = (oFF) to 9999 (E.U.)	dP	r/w
43	AL3d	282D	10285	Alarm 3 delay	From 0 = (oFF) to 9999 (s)	0	r/w
44	AL3o	282E	10286	Alarm 2 enabling during Stand-by mode	0 = no > Alarm disabled 1 = YES > Alarm enabled	0	r/w

LbA Group

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
45	LbAt	282F	10287	Loop break alarm time	From 0 = (oFF) to 9999 (s)	0	r/w
46	LbSt	2830	10288	Delta measure used by LBA during Soft start	From 0 = (oFF) to 9999 (E.U.)	dP	r/w
47	LbAS	2831	10289	Delta measure used by LBA	From 0 = (oFF) to 9999 (E.U.)	dP	r/w
48	LbcA	2832	10290	Condition for LBA enabling	0 = uP > active when Pout =100% 1 = dn > Active when Pout= -100% 2 = both > Active in both cases	0	r/w

rEG Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
49	cont	2833	10291	Control type When heating and cooling outputs are programmed When heating or cooling outputs are programmed	0 = Pid > PID control 1 = nr > neutral zone On/OFF 0 = Pid > PID control 1 = On.FA > asymmetrical ON/OFF 2 = On.FS > symmetrical ON/OFF	0	r/w
50	Auto	2834	10292	Auto tune selection	-4 = Oscillating auto-tune with automatic restart at power up (after soft start) and after all set point change. -3 = Oscillating auto-tune with manual start. -2 = Oscillating auto-tune with automatic start at the first power up only. -1 = Oscillating auto-tune with automatic restart at every power up 0 = Not used 1 = Fast auto tuning with automatic restart at every power up 2 = Fast auto-tune with automatic start at the first power up only. 3 = FAST auto-tune with manual start 4 = FAST auto-tune with automatic restart at power up (after soft start) and after a set point change.	0	r/w
51	Aut.r	2835	10293	Manual start of the auto-tune Note: it is r/w when a auto-tune with manual start is selected, it is read only in all other cases	0 = oFF > The instrument is NOT performing auto-tune 1 = on > The instrument is performing the auto-tune	0	r/w

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
52	SELF	2836	10294	Self-tuning enabling	0 = no > self tuning disabled 1 = YES > self tuning enabled	0	r/w
53	HSEt	2837	10295	Hysteresis of the ON/OFF control	From 0 to 9999 (E.U.)	dp	r/w
54	cPdt	2838	10296	Time for compressor protection	From 0 = (oFF) to 9999 (s)	0	r/W
55	Pb	2839	10297	Proportional band	From 1 to 9999 (E.U.)	dp	r/w
56	int	283A	10298	Integral time	From 0 = (oFF) to 10000 = (inF) (s)	0	r/w
57	dEr	283B	10299	Derivative time	From 0 = (oFF) to 9999 (s)	0	r/w
58	Fuoc	283C	10300	Fuzzy overshoot control	From 0 to 200	2	r/w
59	H.Act	283D	10301	Heating output actuator	0 = SSr > SSR 1 = rEly > relay 2 = Slou > slow actuator	0	r/w
60	tcrH	283E	10302	Heating output cycle time	From 0 = (oFF) to 1300 (s)	1	r/w
61	PrAt	283F	10303	Power ratio between heating and cooling action	From 1 to 9999	2	r/w
62	c.Act	2840	10304	Cooling output actuator	0 = SSr > SSR 1 = rELY > relay 2 = SLou > slow actuator	0	
63	tcrc	2841	10305	Cooling output cycle time	From 0 = (oFF) to 1300	1	r/w
64	rS	2842	10306	Manual reset (Integral pre-load)	From -1000 to 1000 (%)	1	r/w
65	od	2843	10307	Delay at power up	From 0 = (oFF) to 9959 (hh.min)	2	r/w
66	St.P	2844	10308	Maximum power output used during soft start	From -100 to 100 (%)	0	r/w
67	SSt	2845	10309	Soft start time	From 0 = (oFF) to 800 = (inF) (h.min)	2	r/w
68	SSth	2846	10310	Threshold for soft start disabling	From -2000 = (oFF) to 9999 (E.U.)	dP	r/w

SP Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
69	nSP	2847	10311	Number of used set points	From 1 to 4	0	r/w
70	SPLL	2848	10312	Minimum set point value	From -1999 to SPHL (E.U.)	dP	r/w
71	SPHL	2849	10313	Maximum set point value	From SPLL to 9999 (E.U.)	dP	r/w
72	SP 1	284A	10314	Set point 1	From SPLL to SPLH (E.U.)	dP	r/w
73	SP 2	284B	10315	Set point 2	From SPLL to SPLH (E.U.)	dP	r/w
74	SP 3	284C	10316	Set point 3	From SPLL to SPLH (E.U.)	dP	r/w
75	SP 4	284D	10317	Set point 4	From SPLL to SPLH (E.U.)	dP	r/w

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
76	SPAt	284E	10318	Active set point selection	0 = SP 1 1 = SP 2 2 = SP 3 3 = SP 4	0	r/w
77	SP.rt	284F	10319	Remote set point type	0 = rSP > The value coming from serial link is used as remote set point (RSP). 1 = trin > The value coming from serial link will be algebraically added to the local set point selected by SPAt and the sum becomes the operative set point 2 = PErc > The value coming from serial will be scaled on the input range and this value will be used as remote set point	0	r/w
78	SPLr	2850	10320	Local/remote set point selection	0 = Loc > Local 1 = rEn > Remote	0	r/w
79	SP.u	2851	10321	Rate of rise for positive set point change (ramp up)	From 1 to 10000 = (inF) units per minute	2	r/w
80	SP.d	2852	10322	Rate of rise for negative set point change (ramp down)	From 1 to 10000 = (inF) units per minute	2	r/w

tin group

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
81	tr.F	2853	10323	Independent timer function	0 = nonE > Timer not used 1 = i.d.A > Delayed start timer 2 = i.uP.d > Delayed start at power up 3 = i.d.d > Feed-through timer 4 = i.P.L > Asymmetrical oscillator with start in OFF 5 = i.L.P > Asymmetrical oscillator with start in ON	0	r/w
82	tr.u	2854	10324	Engineering tuning of the time	0 = hh.nn > Hours and minutes 1 = nn.SS > Minutes and seconds 2 = SSS.d > seconds and thenth of seconds	0	r/w
83	tr.t1	2855	10325	Time 1	From 1 to 9959 (hh.min) when tr.u = 0 From 1 to 9959 (mm.ss) when tr.u = 1 From 1 to 9959 (tenth of second) when tr.u = 2	2 1	r/w

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
84	tr.t2	2856	10326	Time 2	From 0 (oFF) to 9959 (inF) (hh.min) when tr.u = 0 From 0 (oFF) to 9959 (inF) (mm.ss) when tr.u = 1 From 0 (oFF) to 9959 (inF) (tenth of second) when tr.u = 2	2 1	r/w
85	tr.St	2857	10327	Timer status	0 = rES 1 = run 2 = HoLd	0	r/w

PrG Group

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
86	Pr.F	2858	10328	Programmer action at power up	0 = nonE > Program not used 1 = S.uP.d > Start at power up with a first step in stand by 2 = S.uP.S > Start at power up 3 = u.diG > Start at RUN command detection only 4 = U.dG.d > Start at RUN command detection with a first step in stand by	0	r/w
87	Pr.u	2859	10329	Engineering unit of the time (soak)	0 = hh.nn > hours and minutes 1 = nn.SS > minutes and seconds	0	r/w
88	Pr.E	285A	10330	Instrument behaviour at the End of the program execution	0= cnt > continue (the instrument will use the set point of the last soak until a reset command is detected) 1 = SPAt > go to the set point selected by [79] SPAt parameter 2 = St.bY > Go in stand by mode.	0	r/w
89	Pr.Et	285B	10331	Time of the “end program” indication	From 0 = (oFF) to 10000 = (inF) (mm.ss)	2	r/w
90	Pr.S1	285C	10332	Set point of the first soak	From SPLL to SPHL (E.U.) -8000 = Program END	dP	r/w
91	Pr.G1	285D	10333	Gradient of the first ramp	From 1 to 10000 = (inF) (Unit/min) where inF = step transfer	1	r/w
92	Pr.t1	285E	10334	Time of the first soak	From 0 to 9959	2	r/w
93	Pr.b1	285F	10335	Wait band of the first soak	From 0 = (oFF) to 9999 (E.U.)	0	r/w
94	Pr.E1	2860	10336	Event of the first group	From 00.00 to 11.11 (binary)	2	r/w
95	Pr.S2	2861	10337	Set point of the second soak	From SPLL to SPHL (E.U.) -8000 = Program END	dP	r/w
96	Pr.G2	2862	10338	Gradient of the second ramp	From 1 to 10000 = (inF) (Unit/min) where inF = step transfer	1	r/w
97	Pr.t2	2863	10339	Time of the second soak	From 0 to 9959	2	r/w

n.	Parameter	address		Meaning	Values	Dec	r/w
		Hex	Dec				
98	Pr.b2	2864	10340	Wait band of the second soak	From 0 = (oFF) to 9999 (E.U.)	0	r/w
99	Pr.E2	2865	10341	Event of the second group	From 00.00 to 11.11 (binary)	2	r/w
100	Pr.S3	2866	10342	Set point of the third soak	From SPLL to SPHL (E.U.) -8000 = Program END	dP	r/w
101	Pr.G3	2867	10343	Gradient of the third ramp	From 1 to 10000 = (inF) (Unit/min) where inF = step transfer	1	r/w
102	Pr.t3	2868	10344	Time of the third soak	From 0 to 9959	2	r/w
103	Pr.b3	2869	10345	Wait band of the third soak	From 0 = (oFF) to 9999 (E.U.)	0	r/w
104	Pr.E3	286A	10346	Events of the third group	From 00.00 to 11.11 (binary)	2	r/w
105	Pr.S4	286B	10347	Set point of the fourth soak	From SPLL to SPHL (E.U.) -8000 = Program END	dP	r/w
106	Pr.G4	286C	10348	Gradient of the fourth ramp	From 1 to 10000 = (inF) (Unit/min) where inF = step transfer	1	r/w
107	Pr.t4	286D	10349	Time of the fourth soak	From 0 to 9959	2	r/w
108	Pr.b4	286E	10350	Wait band of the fourth soak	From 0 = (oFF) to 9999 (E.U.)	0	r/w
109	Pr.E4	286F	10351	Events of the fourth group	From 00.00 to 11.11 (binary)	2	r/w
110	Pr.St	2870	10352	Program status	0 = rES 1 = run 2 = HoLd	0	r/w

PAn Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
111	PAS2	2871	10353	Level 2 password: Assistance	From 0 = (oFF) to 999	0	r/w
112	PAS3	2872	10354	Level 3 password: Configuration	From 0 to 999	0	r/w
113	uSrb	2873	10355	U button function during run time	0 = nonE > No function 1 = tunE > Auto-tune/self-tune enabling. 2 = oPLo > Manual mode. 3 = AAc > Alarm reset 4 = ASi > Alarm acknowledge 5 = chSP > Sequential set point selection 6 = St.by > Stand by mode 7 = Str.t > Timer run/hold/reset 8 = P.run > Program run 9 = P.rES > Program reset. 10 = P.r.H.r > Program run/hold/reset	0	r/w

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
114	diSP	2874	10356	Display management	0 = nonE > Standard display 1 = Pou > Power output 2 = SPF > Final set point 3 = SPo > Operative set point 4 = AL1 > Alarm 1 threshold 5 = AL2 > Alarm 2 threshold 6 = AL3 > Alarm 3 threshold 7 = Pr.tu > Increasing time count of the current soak. 8 = Pr.td > Decreasing time count of the current soak. 9 = P.t.tu > Increasing time count of the total program time. 10 = P.t.td > Decreasing time count of the total program time. 11 = ti.uP > Increasing time of the timer 12 = ti.du > Decreasing time of the timer 13 = Perc > Percent of the power output used during soft start.		r/w
115	AdE	2875	10357	Bargraph deviation	From 0 = (oFF) to 9999 (E.U.)	Dp	r/w
116	FiLd	2876	10358	Digital filter on the displayed value	From 0 = (oFF) to 9999	1	r/w
117	DSPu	2877	10359	Status of the instrument at power up	0 = AS.Pr > Starts in the same way it was prior to the power down. 1 = Auto > Starts in AUTO mode 2 = oP.o > Starts in Manual mode with a power out equal to 0 3 = StbY > Starts in stand-by mode	0	r/w
118	oPr.E	2878	10360	Operative modes enabling	0 = ALL > All 1 = Au.oP > Only Auto and Man. 2 = Au.Sb > Only Auto and Stand-by	0	r/w
119	oPEr	2879	10361	Operative mode selection	0 = Auto > Auto 1 = oPLo > Manual 2 = StbY > stand by	0	r/w

SEr Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
120	Add	287A	10362	Instrument address	From 0 = (oFF) to 254	0	r/w
121	bAud	287B	10363	Baud rate	0 = 1200 baud 1 = 2400 baud 2 = 9600 baud 3 = 19200 baud 4 = 38400 baud	0	r/w
122	tr.SP	287C	10364	Remote set point retransmission	0 = not used 1 = Operative Set point 2 = Control output percent	0	r/w

con Group (Wattmeter)

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
123	co.tY	287D	10365	Measurement type	0 = Off- not used 1 = Istantaneous power (KW) 2 = Power consumption (KW/h) 3 = Power consumption during program run. 4 = Worked days 5 = Worked hours	0	r/w
124	UOLt	287E	10366	Nominal voltage	From 1 to 999 (Volt)	0	r/w
125	cur	287F	10367	Nominal current	From 1 to 9999 (A)	0	r/w
126	H.Job	2880	10368	Threshold of the worked days/hours	From 0 = (oFF) to 9999	0	r/w

cAL Group

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
127	A.L.P	2881	10369	Adjust low point	From -1999 to A.H.P-10 (E.U.)	dP	r/w
128	A.L.o	2882	10370	Adjust low offset	From -300 to 300 (E.U.)	dP	r/w
129	A.H.P	2883	10371	Adjust high point	From A.L.P+10 to 9999 (E.U.)	dP	r/w
130	A.H.o	2884	10372	Adjust high offset	From -300 to 300 (E.U.)	dP	r/w

SYS Group (Not visible parameters)

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
131	ES.L	2885	10373	Low measure value for “measuring error” generation	From -1999 to ES.H (E.U.)	dP	r/w
132	ES.H	2886	10374	High measure value for “measuring error” generation	From ES.L to 9999 (E.U.)	dP	r/w
133	At.L	2887	10375	Percent of the set point used to stop the soft start and start the auto-tune.	From -20 to 100 (%)	0	r/w
134	c.Pb	2888	10376	Proportional band adjustment	From 1 to 1000	1	r/w
135	c.int	2889	10377	Integral time adjustment	From 1 to 1000	1	r/w
136	c.dEr	288A	10378	Derivative time adjustment	From 1 to 1000	1	r/w
137	c.tcr	288B	10379	Tcr adjustment	From 1 to 1000	1	r/w

n.	Parameter	Address		Meaning	Values	Dec	r/w
		Hex	Dec				
138	oS.Pb	288C	10380	Proportional band for Oscillator method (autotune)	From 1 to 1000	1	r/w
139	Osti	288D	10381	Output span	From 1 to 1000	1	r/w
140	A	288E	10382	Span of the calculated oscillation (autotune)	From 0 to 9999	0	r/w
141	t	288F	10383	Oscillation period (auto-tune)	From 0 to 9999	0	r/w
142	tAu	2890	10384	Time constant for auto-tune calculation	From -1999 to 9999	0	r/w

5.1.1 Identification code zone

This zone provides only informations for identifying model, order code and software release of the K series instrument.

Starting from the address 0800H it's possibile to read the instrument name (TLK41, etc) and from the address 0x80A (up to 0x818) it's possibile to read the instrument sales code (starting from 2.2 version)

6 Performance

After receiving a valid request the instrument prepares the reply, then sends it back to the master station according following specifications:

- a minimum time is granted greater or equal 3 characters time (depending on adopted baud rate, allowing line direction reversal)
- the reply is ready to be transmitted in less then 20 ms except in case 3;

A 20 ms silence on the line is necessary to recover from abnormal contitions or erroneous messages; this means that a time less than 20 ms is allowed between any two characters in the same message.

NOTE VERY WELL: It's now possible to write up to 16 words at the same time.



Tecnologic S.p.A.
Via Indipendenza, 56
27029 Vigevano (PV) Italia

Tel. ++39/0381/69871
Fax ++39/0381/698730
e-mail : support@tecnologic.it
info@tecnologic.it

All rights reserved. No parts of this publication may be reproduced, in any form, without Tecnologic S.p.A. written permission.

Every care has been taken preparing this manual; the document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist Tecnologic S.p.A. reserves the right to make changes without any notice.

In no event shall Tecnologic S.p.A. be liable for any damages arising out of or related to this document or the information contained in it.

If errors are suspected, please contact Tecnologic S.p.A. at the above address.