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D Series

VTP403D, TSP128D, DMX16D, DMX19D, DMX30D, DMX32D, GTS240D, GTS128D, KS367, KS405, KS414, KS427, PAN16

USER MANUAL

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1.0 Memory

The PLC has 2048 internal memory locations, each one at 16 bits (1 word) each locations is called DATA . These locations are designed to contain the running program's variables, and they are called from **DATA.00** to **DATA.2048**. These locations are visible and shared from PLC side and also from the operator panel side, so they can be read and write from both two.
Some internal DATA are system words, or rather have fixed meaning, instead others are free and thay can be used, from the application program, for any purpose. The value write into a system DATA is interpreted as a specific parameter; the table 1.0 show the system data memory map.

Note

Typically to do calculations and insert values into the application program, are used the words from DATA.400 onwards .

1.1 16 and 32 bits operations

The operations on data memory are usually at 16 bits, namely they are of the same size of DATAs, any data memory can have a decimal value from 0 to 65535 (2^16) . However is possible need biggest size variables (long at 32 bits): these numerical values are stored into two consecutive DATAs (lowest address = least significant word, highest address = more significant word). The operations which work with long variables are preceded by the prefix 'L', and they take account of this format automatically, so for example:

Instruction list	Ladder	Commentary
LMOV #1234,DATA.100	#1234 LMOV DATA.100	put 0 value in DATA.100 and the 1234 value in DATA.101
LMOV #65537,DATA_100	#65537 LMOV DATA.100	put 1 in DATA.100 and 1 into DATA.101

Note

Using 16bit operations and others at 32bits, in the same application program, may generate chaos. It is therefore advisable to standardize the work method; alternatively be very careful to rimember that in case of LONG operations, the data memory indicated on software is always the most significant.

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1.2 Redempive memory and volatile memory

Volatile memory : words from **DATA.00** to **DATA.943** are volatile, except of those otherwise specified in picture 4.0 .

Buffered RAM : Since the E²PROM has a maximum finite number of writings, declared by the manufacturer (more or less 100.000 for any single DATA) to meet the need of frequent and numerous saves, was planned a buffered RAM dedicated memory area. The locations are from **DATA.944** to **DATA.1023** and they are automatically copied into buffered RAM every 100msec and reloaded at the PLC switch-on with the last value. The RAM is buffered with a rechargeable battery, with the fully charged battery the autonomy is **1 year**, *if the KS is turned off for a longer time DATA may be lost*. The bufferd RAM is always enabled and don't needs abilitation. (Only the KS367 have the buffered RAM which go from DATA.1712 to DATA.1791)

E²PROM : The locations from **DATA.1024** to **DATA.2048** are used for the DATA saving into E²PROM and so they are non-volatile DATA. You can save the datas in E²PROM in two ways: automaticaly by the remote writing, or by software with a command. Remote writing means any external device connected to PLC by serial port with Kernel Sistemi protocol, which modifies the value of this DATA (also the Flash debug use the Kernel Sistemi protocol). Also the editing of a display's variable is considered remote writing. The software writing, instead, needs to use of **DATA.27**, **DATA.28** and **SYS.20** the two DATAs must contain respectively the address of the first DATA to save and the address of the last DATA to save whereas the saving will start setting SYS.20 who then will reset itself. At the switching time, the saved DATA, takes the last stored value. (Only the KS367 have the EEPROM which go from DATA.1792 to DATA.2048)

Note

Before start to write the application program, it's good divide volatile datas and non-volatile datas. Once made this dinstinction, will be necessary think what non-volatile datas should be system paramiters and what should be machine parameters. Generally the working parameters are alla those values necessary to work which must be continuously saved to, for example, continue to work next day (for example the number of machined parts) , the machine parameters instead will be the values given like machine set up , which maybe will modify only a technician, into a page under password.

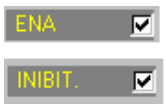
WARNING!

The EEPROM for their characteristic allow a limitate writes (more or less 100.000 for any single data memory address). Above that limit the EEPROM doesn't work anymore and must be replaced, is therefore recommended not to exceed this limit otherwise it can cause the device malfunction.

4.1.3 Memory map

Any DATA in this table is a 16 bits word. Any DATA which isn't speified in this table is to be considered “free” .

Picture 4.0

<table>
<tr><td>DATA.00</td><td>Current page number. This DATA is in reading mode and also in writing mode, so will be read to know what page is show on diplay and it can be write to change the page.</td></tr>
<tr><td>DATA.01</td><td>DATA command. Some bits of this DATA have a special meaning :
<table>
<tr><th>N° bit</th><th>descrizione</th></tr>
<tr><td>0</td><td>Signalling but not alarm displaying. If this bit is enable, the KS beeps repeated, blink the ALR led and on display will appear a “bell button” which blink. Pushing the “bell button” (if at least one alarm bit is active) you will enter in pages of alarm management.</td></tr>
<tr><td>1</td><td>Immediate alarm displaying. If it is active with also an alarm bit, the alarm page is immediately shown on display.</td></tr>
<tr><td>2</td><td>Display alarm mode. This bit is active when on the KS screen is shown an alarm page. If is programmed a scroll alarm time into “project option” page, the KS will do the automatic alarm scroll with the programmed time. If the operator push the “E” button into the alarm page, is resetted the alarm bit into KS.</td></tr>
<tr><td>3</td><td>It is active in variable's input mode. Input variable mode is enabled when is push the variable on touch screen to insert a new value and appear the numeric keyboard; in this case, the bit number three of DATA.01 is one, and go to zero when the new value is confirmed with the “E” button.</td></tr>
<tr><td>10</td><td>Print current page. Print of the current page if is selected the PRINTER protocol on serial port.</td></tr>
<tr><td>11</td><td>Read/write variables inhibition. Is possile enable or disable from PLC the variables modifing. To do this is necessary select the box ENA into the variable's settings window (which allow the variable modify from touch screen) and the INIBIT. Box (which the variable modify in accordance with this bit state).
 
</td></tr>
</table></td></tr>
</table>

....

DATA.03	Last modified variable address.

....

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DATA.04

DEDICATED

First alarm word. From alarm 0 to 15. For each bit is associated the corresponding alarm page. **THIS ALARM WORD IS FULLY DEDICATED TO COMUNICATION ERRORS OR SYSTEM ALARMS (don't use this DATA)**

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ALR 15	ALR 14	ALR 13	ALR 12	ALR 11	ALR 10	ALR 9	ALR 8	ALR COM 5	ALR COM 4	ALR COM 3	ALR COM 2	ALR COM 1	ALR COM 0	ALR CAN 1	ALR CAN 0

DATA.05

From alarm 16 to alarm 31. **FIRST USABLE ALARM WORD**

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ALR 31	ALR 30	ALR 29	ALR 28	ALR 27	ALR 26	ALR 25	ALR 24	ALR 23	ALR 22	ALR 21	ALR 20	ALR 19	ALR 18	ALR 17	ALR 16

DATA.06	From alarm 32 to alarm 47. Each bit is associated to the respective alarm page.
DATA.07	From alarm 48 to alarm 63. Each bit is associated to the respective alarm page.
DATA.08	From alarm 64 to alarm 79. Each bit is associated to the respective alarm page.
DATA.09	From alarm 80 to alarm 95. Each bit is associated to the respective alarm page.
DATA.10	From alarm 96 to alarm 111. Each bit is associated to the respective alarm page.
DATA.11	From alarm 112 to alarm 127. Each bit is associated to the respective alarm page.
DATA.12	From alarm 128 to alarm 143. Each bit is associated to the respective alarm page.
DATA.13	From alarm 144 to alarm 159. Each bit is associated to the respective alarm page.
DATA.14	From alarm 160 to alarm 175. Each bit is associated to the respective alarm page.
DATA.15	From alarm 176 to alarm 191. Each bit is associated to the respective alarm page.
DATA.16	From alarm 192 to alarm 207. Each bit is associated to the respective alarm page.
DATA.17	From alarm 208 to alarm 223. Each bit is associated to the respective alarm page.
DATA.18	From alarm 224 to alarm 239. Each bit is associated to the respective alarm page.
DATA.19	From alarm 240 to alarm 255. Each bit is associated to the respective alarm page.

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DATA.20	Support word of keystrokes	
DATA.21	Support word of keystrokes	
DATA.22	When it's different to zero, the PLC read the specified external variable.	
DATA.23	External variable number's which must be write (look § External Variables)	
DATA.24	Value to write on the external variable (look § External Variables)	
DATA.25	Least significant word in case that the value to write is 32bits value.	
DATA.26	Comunication node address	
DATA.27	Address first data to save in E²PROM – or recipe	
DATA.28	Address last data to save in E²PROM – or recipe	
DATA.29	Recipe size	
DATA.30	PLC speed (in µsec)	
DATA.31	Day of the month (calendar clock)	RO
DATA.32	Day of the week (calendar clock)	RO
DATA.33	Month (calendar clock)	RO
DATA.34	Year (calendar clock)	RO
DATA.35	Hour (calendar clock)	RO
DATA.36	Minutes (calendar clock)	RO
DATA.37	Seconds (calendar clock)	RO
DATA.38	Number of days elapsed since the beginning of the year.	RO
DATA.39	Number of minutes elapsed since the beginning of the year.	RO
DATA.40	Astronomical dawn (in base ai parametri forniti da DATA.44 a DATA.50)	RO
DATA.41	Astronomical sunset (based on the parameters provided from DATA.44 to DATA.50)	RO
DATA.42	Civil dawn (based on the parameters provided from DATA.44 to DATA.50)	RO
DATA.43	Civil sunset (based on the parameters provided from DATA.44 to DATA.50)	RO
DATA.44	Time zone in reference to the zero meridian (+/- 180)	
DATA.45	Latitude (degrees)	

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DATA.46	Latitude (degree tenths)	
DATA.47	Latitude (degree thousandths)	
DATA.48	Longitude (degree)	
DATA.49	Longitude (degree tenths)	
DATA.50	Longitude (degree thousandths)	
DATA.51	Altitude (NOT CURRENTLY MANAGED)	

....

DATA.54	Page number to send by SMS

....

DATA.60	Week prog
DATA.61	Week prog
DATA.62	Week prog
DATA.63	Week prog
DATA.64	Week prog
DATA.65	Week prog
DATA.66	Week prog
DATA.67	Week prog
DATA.68	Week prog
DATA.69	Week prog
DATA.70	Week prog
DATA.71	Week prog
DATA.72	Week prog
DATA.73	Week prog
DATA.74	Week prog

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DATA.75	Week prog
DATA.76	Week prog
DATA.77	Week prog
DATA.78	Week prog
DATA.79	Week prog
DATA.80	Week prog
DATA.81	Week prog
DATA.82	Week prog
DATA.83	Week prog
DATA.84	Week prog
DATA.85	Week prog
DATA.86	Week prog
DATA.87	Week prog
DATA.88	Week prog
DATA.89	Week prog
DATA.90	Week prog
DATA.91	Week prog
DATA.92	Week prog
DATA.93	Week prog
DATA.94	Week prog
DATA.95	Week prog
DATA.96	Week prog
DATA.97	Week prog
DATA.98	Week prog

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DATA.99	Week prog
DATA.100	Week prog
DATA.101	Week prog
DATA.102	Week prog
DATA.103	Week prog
DATA.104	Week prog
DATA.105	Week prog
DATA.106	Week prog
DATA.107	Week prog

....

DATA.120	Analog input channel 0 - *ISTANT VALUE* [bit]
DATA.121	Analog input channel 1 - *ISTANT VALUE* [bit]
DATA.122	Analog input channel 2 - *ISTANT VALUE* [bit]
DATA.123	Analog input channel 3 - *ISTANT VALUE* [bit]
DATA.124	Analog input channel 0 – *AVERAGED VALUE* [bit]
DATA.125	Analog input channel 1 - *AVERAGED VALUE* [bit]
DATA.126	Analog input channel 2 – *AVERAGED VALUE* [bit]
DATA.127	Analog input channel 3 - *AVERAGED VALUE* [bit]
DATA.128	Temperature Analog input channel 0 [degrees]
DATA.129	Temperature Analog input channel 1 [degrees]
DATA.130	Temperature Analog input channel 2 [degrees]
DATA.131	Temperature Analog input channel 3 [degrees]

...

DATA.180	Encoder value 0 [H] (more significant word MSW)
DATA.181	Encoder value 0 [L] (least significant word LSW)

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DATA.182	Encoder value 1 [H] (more significant word MSW)
DATA.183	Encoder value 1 [L] (least significant word LSW)

....

DATA.188	Preset Encoder 0 [H] (more significant word MSW)
DATA.189	Preset Encoder 0 [L] (least significant word LSW)
DATA.190	Preset Encoder 1 [H] (more significant word MSW)
DATA.191	Preset Encoder1 [L] (least significant word LSW)

....

DATA.208	Input – PID 0 REGULATOR	
DATA.209	Set Point – PID 0 REGULATOR	
DATA.210	Cycle time (dsec) – PID 0 REGULATOR	
DATA.211	Regulation band – PID 0 REGULATOR	
DATA.212	Integral value – PID 0 REGULATOR	
DATA.213	Derivative value – PID 0 REGULATOR	
DATA.214	Alarm level – PID 0 REGULATOR	
DATA.215	Actuation (regulation PID output from 0 to 255 to DAC) – PID 0 REGULATOR	RO
DATA.216	Input – PID 1 REGULATOR	
DATA.217	Set Point – PID 1 REGULATOR	
DATA.218	Cycle time (dsec) – PID 1 REGULATOR	
DATA.219	Regulation band – PID 1 REGULATOR	
DATA.220	Integral value – PID 1 REGULATOR	
DATA.221	Derivative value – PID 1 REGULATOR	
DATA.222	Alarm level – PID 1 REGULATOR	
DATA.223	Actuation (regulation PID output from 0 to 255 to DAC) – PID 1 REGULATOR	RO
DATA.224	Input – PID 2 REGULATOR	

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DATA.225	Set Point – PID 2 REGULATOR	
DATA.226	Cycle time (dsec) – PID 2 REGULATOR	
DATA.227	Regulation band – PID 2 REGULATOR	
DATA.228	Integral value – PID 2 REGULATOR	
DATA.229	Derivative value – PID 2 REGULATOR	
DATA.230	Alarm level – PID 2 REGULATOR	
DATA.231	Actuation (regulation PID output from 0 to 255 to DAC) – PID 2 REGULATOR	RO
DATA.232	Input – PID 3 REGULATOR	
DATA.233	Set Point – PID 3 REGULATOR	
DATA.234	Cycle time (dsec) – PID 3 REGULATOR	
DATA.235	Regulation band – PID 3 REGULATOR	
DATA.236	Integral value – PID 3 REGULATOR	
DATA.237	Derivative value – PID 3 REGULATOR	
DATA.238	Alarm level – PID 3 REGULATOR	
DATA.239	Actuation (regulation PID output from 0 to 255 to DAC) – PID 3 REGULATOR	RO

…

DATA.244	Output value DAC 0 (0...4095) from -10V to +10V
DATA.245	Output value DAC 1 (0...4095) from -10V to +10V
DATA.246	Output value DAC 2 (0...4095) from -10V to +10V
DATA.247	Output value DAC 3 (0...4095) from -10V to +10V

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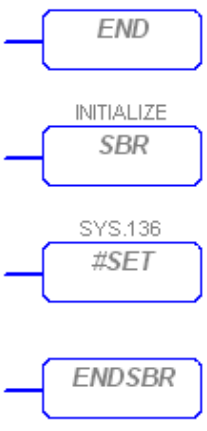
Legend	
commentary	***icon***
E²PROM saved DATA	
Read only DATA	RO

2.0 System flags

The KS have more or less 180 system flags (SYS). Every system flag is write like : " **SYS.nn** " . The SYS are single bits (0 o 1) and it can be of two types :

- The SYS used by operative system to signal a resource state (for example there are the time SYS, enabled every second, every minute etc ...)
- Otherwise there are SYS which must be enabled by the application program to enable a specific PLC resource (for example the encoder input isn't a fast encoder input if isn't triggered the appropriate SYS, and so on for other resources)

The second case, namely a resource enable with a SYS, is usually done inside the INITIALIZE subroutine; because this subroutine is read always the first PLC cycle, in this way the resourece will be enable from the PLC start for all the program duration.
Example, if you want use the monodirectional encoder 0:

Instruction list	Ladder	Commentary
END SBR INITIALIZE #SET SYS.136 ENDSBR		The unconditional SYS setting runs immediately at the first program cycle, enabling in this way the encoder. Just as they would through a switch, at the application start the program put ON this resource.

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Complete map of all the system flags :

SYS.00	Always false
SYS.01	Always true
SYS.02	Enable only the first program cycle
SYS.03	Flag used by the CMP intruction (compare) : SYS.03 enabled if the two compared operands are equal. OPR1 = OPR2
SYS.04	Flag used by the CMP intruction (compare) : SYS.04 enabled if the first operand is lower than second. OPR1 < OPR2
SYS.05	Flag used by the CMP intruction (compare) : SYS.05 enabled if the first operand is higher than second. OPR1 > OPR2
SYS.06	Math Flag : carry (not used)

...

SYS.08	Enabled every 10 msec
SYS.09	Enabled every 100 msec
SYS.10	Enabled every second
SYS.11	Enabled every minute
SYS.12	Enabled every 15 minutes
SYS.13	Enabled every hour
SYS.14	Blinking 0.5 sec ON , 0.5 sec OFF

SYS.15	Beeper enable

...

SYS.19	Reading forcing. Will be read all the external variables.
SYS.20	EEPROM save forcing (DATA.27 = start, DATA.28 = stop)
SYS.21	Memory bank saving into EEPROM
SYS.22	Memory bank restoration from EEPROM

...

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SYS.24	Enable PID regulation PWM mode Channel 0
SYS.25	Enable PID regulation MODULATING mode Channel 0
SYS.26	Enable PID regulation PWM mode Channel 1
SYS.27	Enable PID regulation MODULATING mode Channel 1
SYS.28	Enable weekly programmer
SYS.29	Enable MAC_SEGMENT

SYS.30	Enable cams

...

SYS.32	Weekly program N°1 enable
SYS.33	Weekly program N°2 enable
SYS.34	Weekly program N°3 enable
SYS.35	Weekly program N°4 enable
SYS.36	Weekly program N°5 enable
SYS.37	Weekly program N°6 enable
SYS.38	Weekly program N°7 enable
SYS.39	Weekly program N°8 enable
SYS.40	Weekly program N°9 enable
SYS.41	Weekly program N°10 enable
SYS.42	Weekly program N°11 enable
SYS.43	Weekly program N°12 enable
SYS.44	Weekly program N°13 enable
SYS.45	Weekly program N°14 enable
SYS.46	Weekly program N°15 enable
SYS.47	Weekly program N°16 enable

...

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SYS.60	Enable free running timer N°0 base 1msec
SYS.61	Enable free running timer N°1 base 1msec
SYS.62	Enable free running timer N°2 base 1msec
SYS.63	Enable free running timer N°3 base 1msec
SYS.64	Enable free running timer N°4 base 1msec
SYS.65	Enable free running timer N°5 base 1msec
SYS.66	Enable free running timer N°6 base 1msec
SYS.67	Enable free running timer N°7 base 1msec

…

SYS.72	Enable P.I.D. 0
SYS.73	P.I.D. 0 temperature regulation
SYS.74	Enable attuation DAC - P.I.D. 0
SYS.75	P.I.D. 0 output
SYS.76	Ready (enable inside the regulation band SP +/- Band) P.I.D. 0
SYS.77	Alarm (enable over the temperature SP + alarm band) P.I.D. 0

…

SYS.80	Enable P.I.D. 1
SYS.81	P.I.D. 1 temperature regulation
SYS.82	Enable attuation DAC - P.I.D. 1
SYS.83	P.I.D. 1 output
SYS.84	Ready (enable inside the regulation band SP +/- Band) P.I.D. 1
SYS.85	Alarm (enable over the temperature SP + alarm band) P.I.D. 1

…

SYS.88	Enable P.I.D. 2
SYS.89	P.I.D. 2 temperature regulation

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SYS.90	Enable attuation DAC - P.I.D. 2
SYS.91	P.I.D. 2 output
SYS.92	Ready (enable inside the regulation band SP +/- Band) P.I.D. 2
SYS.93	Alarm (enable over the temperature SP + alarm band) P.I.D. 2

...

SYS.96	Enable P.I.D. 3
SYS.97	P.I.D. 3 temperature regulation
SYS.98	Enable attuation DAC - P.I.D. 3
SYS.99	P.I.D. 3 output
SYS.100	Ready (enable inside the regulation band SP +/- Band) P.I.D. 3
SYS.101	Alarm (enable over the temperature SP + alarm band) P.I.D. 3

...

SYS.144	Enable encoder 0 monodirectional
SYS.145	Enable encoder 0 bidirectional

...

SYS.148	Enable encoder 1 monodirectional

SYS.149	Enable encoder 1 bidirectional

...

SYS.180	Enable OUT.03 PWM
SYS.181	Enable OUT.07 PWM
SYS.182	Enable OUT.11 PWM