

Application Note AN0702

Operation Instructions and Details of the optional PLC of TC S1 / M2

1.) Gernal Informations

The bentrup TC S1 and TC M2 are available with an integrated PLC. This option enables the user to add features relating to the controller as well as any other functional networks. Typical examples are

- delaying controller outputs or lock them each other if required
- adding networks or latches to create more complex output signals or to save contactors
- disable controller outputs depending on the status of any (digital) input signals

Since all important internal controller informations are accessible by special marker bytes / bits (SMB) you can also directly affect controllers operation according to your demands. You can create for instance your individual dependencies to HOLD programme run, to SKIP to the next segment etc.

2.) Instruction Set

The instruction set of the PLC is a subset of the SIEMENS S7 Model 221. This list is continuously extended according to customer request. Currently the following instructions are available:

LD	A	O	LDN	AN	ON	LDI	AI	OI	LDNI
ANI	ONI	EQU	EQUI	NOT	EU	ED	LDB=	AB=	OB=
LDB>=	AB>=	OB>=	LDB<=	AB<=	OB<=	LDW=	AW=	OW=	LDW<=
AW<=	OW<=	LDW>=	AW>=	OW>=					
						S	R	SI	RI
STOP	ALD	OLD	LPS	LRD	LPP	MOVB	MOVW	MOVD	MOVR
TON	TONR	CU	CUD						

3.) Timers

The bentrup PLC provides 24 Timers called T0 to T23. The resolution / timebase can be individually set to 100ms, 1 s or 1 min by loading the assigned SMB accordingly. Please see the following tables:

Timer	SMB to define resolution
T0	SMB20
T1	SMB21
T2	SMB22
...	
T23	SMB43

Timer Resolution	Value to load into SMB
10ms	0 (NOT AVAILABLE YET)
100ms	1
1000ms	2
1 minute	3

4.) Special Marker Bytes

To check various controller status as well as to gain control over the TC S1 / M2 a set of Special Marker Bytes / Bits is available:

SMB0	Bit 0-ON 1-1 st cycle ON 2-ON for 1 cycle if perm Data got lost 3-OFF 4-30sec toggle 5-0.5s toggle 6-cycle toggle 7-OFF
SMB2	Bit 0-power up 1-new programme 2-new segment 3-new time NOTE: Bits are reset automatically, i.e. active during 1 cycle ONLY
SMB4	process Info (process events)
SMB5	process Info Highbyte (process events)
SMB6	upper nibble: controller model code / lower nibble: integer part of controller release number (e.g. 6.xx)
SMB7	fractional part of controller release number (x.18)
SMB8	status of controller read only: Bit 0-CMD buffer OR 3-ERROR 5-manual mode 6-HOLD 7-RUN
SMB9	Controller commands: Bit 0-RESET PROG 1-LDPROG 2-CONTINUE 3-STOP 4-SKIP 5-NONE 5-HOLD 7-START. Read returns 0 if job accepted / processed. Check SMB8 Bit 0 (CMD buffer OR if multiple launching might occur)
SMB10	programme number to load (see LDPROG)
SMB11	current segment (READ ONLY) 255 (-1) = end of programme
SMB12	Reserved
SMB13	Reserved
SMB15	DEBUG flags for EVENT LOG
SMB 20 to 43	Define Timer modes T0 to T23
SMB 50 to 59	channel control output (signed byte)
SMB 60 to 69	Alternate channel control output variable (signed byte) to be accessed by outputs
SMB 70 to 79	channel status for CH0 to CH9: READ: Bit 7-error 6-over 5-gradient err 4-inactive 3-in control 2 / 1 / 0- OFF WRITE: 7 / 6 / 5 / 4 / 3 / 2 – reserved, 1-inactivate channel 0-reset channel
SMB 80 to 119	View to value in programme table - actual copy of programme memory

5.) Creating and Downloading the PLC programme

The free bentrup PLCDL utility provides download of AWL to the TC S1 / M2. To work with the easy to understand KOP we recommend using Siemens MICROWIN Version 3.1 Software. Use the "Export" feature to create a file that can be directly downloaded using the bentrup PLCDL. Make sure that no subroutines or interrupts included in the PLC programme.

The bentrup PLCDL download utility also shows the current status of the PLC. During normal operation it must read "PLC RUN" to indicate successful operation.

Initial Issue	July 10 th 2002		Be
Updated	Feb 11 th 2003	applies to version >=6.32	Be

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