

FM 352-5 HIGH-SPEED BOOLEAN PROCESSOR



Function

- Instruction set:
 - Bit instructions:
NO operators, NC operators, negation, output, connector, RS flipflop, SR memory, recording of positive/negative signal edge
 - Conversion functions:
Conversion of 16-bit integers into 32-bit integers
 - Comparison functions:
16/32-bit integers
 - Timer functions:
Pulse timer, ON delay, OFF delay, each with an accuracy of 10 μ s
 - Counter functions:
16 bit up, 16 bit down, 32 bit up/down
 - Other functions:
Frequency generator, frequency scaler, bit shift registers, pulse-width modulation
 - Mathematical functions:
Add, subtract, multiplication, division, absolute value for 16 and 32 bit
- Actual value query: Query of the actual values for
 - Incremental encoders with 24 V signal voltage or
 - Incremental encoders with 5 V signal voltage (RS 422) or
 - SSI absolute encoders.

- Counter functions for incremental encoders
 - Continuous counting
 - Individual counting
 - Periodic counting
 - 16-bit or 32-bit value range
- Integrated 24 V power supply for position encoder
- Selectable times for DE-filter:
0, 5, 10, 15, 20, 50 μ s and 1.5 ms

Mode of operation

- Creating an FM 352-5 program with STEP 7 in LAD or FBD.
- Implementation of simulations and tests on an S7-CPU or with the PLCSIM software simulation.
- Compiling an FM 352-5 program in destination code for the FM 352-5.
- Download the data directly to the module, either directly through the S7-CPU or using an MMC card.
- In RUN position: The FPGA processed the program in a cycle of 1 μ s duration.
- Data exchange with the CPU is carried out via the 16-byte I/O interface.

Parameter settings

Parameters are assigned with STEP 7 or COM PROFIBUS and standardized *.GSE files. In order to accelerate the switch-on procedure, the *.GSE file is already operable.

Technical specifications

	6ES7 352-5AH01-0AE0	6ES7 352-5AH11-0AE0
Supply voltage		
24 V DC	Yes	Yes
Load voltage L+		
•Rated value (DC)	24 V	24 V
•permissible range, lower limit (DC)	20.4 V	20.4 V
•permissible range, upper limit (DC)	28.8 V	28.8 V
•Reverse polarity protection	Yes	Yes
Input current		
from load voltage 1L+, max.	150 mA; typ. 60 mA	150 mA; typ. 60 mA
from load voltage 2L+ (without load), max.	200 mA; typ. 60 mA, DI/DO supply	200 mA; typ. 60 mA, DI/DO supply
from load voltage 3L+ (with encoder), max.	600 mA; typ. 80 mA plus encoder supply	600 mA; typ. 80 mA plus encoder supply

from load voltage 3L+ (without encoder), max.	200 mA; typ. 80 mA	200 mA; typ. 80 mA
from backplane bus 5 V DC, max.	135 mA; typ.	135 mA; typ.
Encoder supply		
5 V encoder supply		
•5 V	Yes	Yes
•Short-circuit protection	Yes; Electronic overload protection; no protection on applying a normal or counter voltage.	Yes; Electronic overload protection; no protection on applying a normal or counter voltage.
•Output current, max.	250 mA	250 mA
24 V encoder supply		
•24 V	Yes	Yes
•Short-circuit protection	Yes; Overvoltage and overheating protection if overloaded; diagnostics if output reaches temperature limit; no protection on applying a normal or counter voltage	Yes; Overvoltage and overheating protection if overloaded; diagnostics if output reaches temperature limit; no protection on applying a normal or counter voltage
•Output current, max.	400 mA	400 mA
Power losses		
Power loss, typ.	6.5 W	6.5 W

Memory		
Memory card, RAM	128 kbyte; required for operation, MMC	128 kbyte; required for operation, MMC
Digital inputs		
Number/binary inputs	8; Standard and up to 12 with 24 V DC encoder inputs as digital inputs	8; Standard and up to 12 with 24 V DC encoder inputs as digital inputs
Input voltage		
•Rated value, DC	24 V	24 V
•for signal "0"	-30 to +5 V	-30 to +5 V
•for signal "1"	11 to 30 V	11 to 30 V
Input current		
•for signal "0", max. (permissible quiescent current)	1.5 mA	1.5 mA
•for signal "1", typ.	3.8 mA	3.8 mA
Input delay (for rated value of input voltage)		
•Input frequency (with a time delay of 0.1 ms), max.	200 kHz	200 kHz
•Programmable digital filter delay	None, 5 μ s, 10 μ s, 15 μ s, 20 μ s, 50 μ s, 1.6 ms	None, 5 μ s, 10 μ s, 15 μ s, 20 μ s, 50 μ s, 1.6 ms
•Minimum pulse width for program reactions	1 μ s, 5 μ s, 10 μ s, 15 μ s, 20 μ s, 50 μ s, 1.6 ms	1 μ s, 5 μ s, 10 μ s, 15 μ s, 20 μ s, 50 μ s, 1.6 ms
•for standard inputs		

• at "0" to "1", max.	3 μ s; typ. 1.5 μ s	3 μ s; typ. 1.5 μ s
Cable length		
•Cable length, shielded, max.	600 m	600 m
•Cable length unshielded, max.	100 m; Shielded cable recommended if filtering delay is set to less than 1.6 ms	100 m; Shielded cable recommended if filtering delay is set to less than 1.6 ms
Digital outputs		
Number/binary outputs	8	8
Current-sinking	Yes	No
Current-sourcing	No	Yes
Functionality/short-circuit strength	Yes; Overvoltage protection, thermal protection	Yes; Overvoltage protection, thermal protection
•Response threshold, typ.	1.7 to 3.5 A	1.7 to 3.5 A
Limitation of inductive shutdown voltage to	2M -45 V typ., (-40 to -55 V); comment: no protection against inductive kickback >55mJ	2M -45 V typ., (-40 to -55 V); comment: no protection against inductive kickback >55mJ
Lamp load, max.	5 W	5 W
Controlling a digital input	No	Yes
Output voltage		
•Rated value (DC)	24 V	24 V

•for signal "0" (DC), max.	28.8 V	28.8 V
•for signal "1" (DC), max.	0.5 V	0.5 V
Output current		
•for signal "1" rated value	0.5 A; At 60 °C	0.5 A; At 60 °C
•for signal "1" permissible range for 0 to 60 °C, min.	5 mA	5 mA
•for signal "1" permissible range for 0 to 60 °C, max.	600 mA	600 mA
•for signal "0" residual current, max.	1 mA	1 mA
Output delay with resistive load		
•0 to "1", max.	1 μs; 0.6 μs 50 mA / 1.0 μs 0.5 A	1 μs; 0.6 μs 50 mA / 1.0 μs 0.5 A
•1 to "0", max.	1.5 μs; 1.7 μs 50 mA / 1.5 μs 0.5 A	1.5 μs; 1.7 μs 50 mA / 1.5 μs 0.5 A
Parallel switching of 2 outputs		
•for increased power	Yes; 2	Yes; 2
Switching frequency		
•with resistive load, max.	100 kHz; 20 kHz at 0.5 A; 100 kHz at 0.25 A	100 kHz; 20 kHz at 0.5 A; 100 kHz at 0.25 A
•with inductive load, max.	2 Hz; 2 Hz at 0.5 A with external commutator diodes; 0.5 Hz at 0.5 A without external	2 Hz; 2 Hz at 0.5 A with external commutator diodes; 0.5 Hz at 0.5 A without external commutator diodes

	commutator diodes	
•on lamp load, max.	10 Hz	10 Hz
Cable length		
•Cable length, shielded, max.	600 m	600 m
•Cable length unshielded, max.	100 m	100 m
Encoder		
Connectable encoders		
•Incremental encoder (symmetrical)	Yes	Yes
•Incremental encoder (asymmetrical)	Yes	Yes
•Absolute encoder (SSI)	Yes	Yes
•2-wire BEROS	Yes	Yes
<ul style="list-style-type: none"> • permissible quiescent current (2-wire BEROS), max. 	1.5 mA	1.5 mA
Encoder signals, incremental encoder (symmetrical)		
•Trace mark signals	A, notA, B, notB	A, notA, B, notB
•Zero mark signal	N, notN	N, notN
•Input signal	5 V difference signal (phys. RS 422)	5 V difference signal (phys. RS 422)
•Input frequency, max.	500 kHz	500 kHz
•Cable length, shielded, max.	100 m; 100 m with 24 V	100 m; 100 m with 24 V

	supply and 500 kHz; 32 m with 5 V supply and 500 kHz	supply and 500 kHz; 32 m with 5 V supply and 500 kHz
Encoder signals, incremental encoder (asymmetrical)		
•Trace mark signals	A, B	A, B
•Zero mark signal	N	N
•Input voltage	24 V	24 V
•Input frequency, max.	200 kHz	200 kHz
•Cable length, shielded, max.	50 m; Cable length, HTL incremental encoder, Siemens, type 6FX2001-4: 50 kHz, 25 m shielded, max., 25 kHz, 50 m shielded, max.	50 m; Cable length, HTL incremental encoder, Siemens, type 6FX2001-4: 50 kHz, 25 m shielded, max., 25 kHz, 50 m shielded, max.
Encoder signals, absolute encoder (SSI)		
•Data signal	DATA, notDATA	DATA, notDATA
•Clock signal	CK, notCK	CK, notCK
•Telegram length	13 or 25 bit	13 or 25 bit
•Clock frequency, max.	1 MHz; 125 kHz, 250 kHz, 500 kHz or 1 MHz	1 MHz; 125 kHz, 250 kHz, 500 kHz or 1 MHz
•Cable length, shielded, max.	320 m; At 125 kHz	320 m; At 125 kHz
•Monoflop time	settable: 16/32/48/64 μ s	settable: 16/32/48/64 μ s

•Listening mode	Yes; one or two stations	Yes; one or two stations
•Multiturn	Yes; 25 bit message frame	Yes; 25 bit message frame
Encoder signal evaluation		
•Counting direction, forward	Yes	Yes
•Counting direction, backward	Yes	Yes
Response times		
Input and output response time	5 V input to 24 V output, 0 filter: 1 to 4 μ s (typ.); 24 V input to 24 V output, 0 filter: 2 to 6 μ s (typ.)	5 V input to 24 V output, 0 filter: 1 to 4 μ s (typ.); 24 V input to 24 V output, 0 filter: 2 to 6 μ s (typ.)
Interfaces		
Point-to-point		
•Updating time	PLC interface: 1.7 ms	PLC interface: 1.7 ms
Interrupts/diagnostics/status information		
Alarms		
•Diagnostic alarm	Yes; 1L, 2L, 3L missing; MMC error; output overload (8); encoder supply overload; differential wire break; parameterization error; SSI message frame overflow	Yes; 1L, 2L, 3L missing; MMC error; output overload (8); encoder supply overload; differential wire break; parameterization error; SSI message frame overflow
•Hardware interrupt	Yes; 8 available; for	Yes; 8 available; for

	generation by user program	generation by user program
Diagnoses		
•Wire break in signal transmitter cable	Yes	Yes
•Overflow/underflow	Yes	Yes
•Missing load voltage	Yes	Yes
Counter		
Counting range, description	Counting range (16-bit counters): -32,768 to 32,767 (user-specific within this range); counting range (32-bit counters): -2,147,483,648 to 2,147,483,647 (user-specific within this range)	Counting range (16-bit counters): -32,768 to 32,767 (user-specific within this range); counting range (32-bit counters): -2,147,483,648 to 2,147,483,647 (user-specific within this range)
Counting range, lower limit	-2147480000	-2147480000
Counting range, upper limit	2 147 480 000	2 147 480 000
Counting mode		
•Counting mode, individual	Yes	Yes
•Counting mode, continuous	Yes	Yes
•Counting mode, periodic	Yes	Yes
Galvanic isolation		
between 1L and 2L and 3L	Yes; 75 VDC / 60 VAC	Yes; 75 VDC / 60 VAC
between digital I/O and 2L and encoder I/O and 3L	Yes (75 V DC, 60 V AC)	Yes (75 V DC, 60 V AC)

between backplane bus and digital encoder I/O & 1L & 2L & 3L	Yes (75 V DC, 60 V AC)	Yes (75 V DC, 60 V AC)
Galvanic isolation digital inputs		
•Galvanic isolation digital inputs	Yes; Yes CPU, I/O and sensor units are isolated	Yes; Yes CPU, I/O and sensor units are isolated
Configuration		
programming		
•Program cycle time (scan)	1 μ s	1 μ s
Connection method		
required front connector	1x 40-pin	1x 40-pin
Dimensions		
Width	80 mm	80 mm
Height	125 mm	125 mm
Depth	120 mm	120 mm
Weight		
Weight, approx.	434 g; Module weight: approx. 434 g (with 1L connection and without I/O connection or MMC); shipping weight: approx. 500 g (with bus and 1L connection and without I/O	434 g; Module weight: approx. 434 g (with 1L connection and without I/O connection or MMC); shipping weight: approx. 500 g (with bus and 1L connection and without I/O connection or MMC)