SIEMENS

SIMATIC

S7-1500/ET 200MP Technology module TM PosInput 2 (6ES7551-1AB00-0AB0)

Manual

06/2013

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⚠WARNING

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Preface

Purpose of the documentation

This manual includes module-specific information on wiring, diagnostics and the technical specifications of the technology module.

General information regarding design and commissioning of the S7-1500 or ET 200MP is available in the S7-1500 and ET 200MP System Manuals.

The counting and measuring functions and position input of the TM PosInput 2 technology module are described in more detail in the Counting, measurement and position input (http://support.automation.siemens.com/WW/view/en/59709820) Function Manual.

Conventions

Please observe notes marked as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product and on the section of the documentation to which particular attention should be paid.

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Documentation guide

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Introduction

This modular documentation of the SIMATIC products covers diverse topics concerning your automation system.

The complete documentation for the S7-1500 and ET 200MP systems consists of the respective system manuals, function manuals and device manuals.

The STEP 7 information system (TIA Portal) also helps you configure and program your automation system.

Overview of the documentation provided for technology module TM PosInput 2

The following table lists further documentation that you will need when using the TM PosInput 2 technology module.

Table 1- 1 Documentation for technology module TM PosInput 2

Topic	Documentation	Most important contents
System description	S7-1500 Automation System (http://support.automation.siemens.com/WW/view/en/59191792) System Manual ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) System Manual	• Application planning • Installation • Wiring • Commissioning
Designing interference-free controllers	Designing interference-free controllers (http://support.automation.siemens.com/WW/view/en/59193566) Function Manual	• Basics • Electromagnetic compatibility • Lightning protection
Counting, measurement and position input	Counting, measurement and position input (http://support.automation.siemens.com/WW/view/en/59709820) Function Manual	• Counting functions • Measuring functions • Position input • Control and feedback interface
Motion Control	S7-1500 Motion Control (http://support.automation.siemens.com/WW/view/en/59381279) Function Manual	• Configuration • Programming • Commissioning • Diagnostics

SIMATIC manuals

All current manuals for the SIMATIC products are available for download free of charge from the Internet (http://www.siemens.com/automation/service&support).

Product overview

2

2.1 Properties

Order number

6ES7551-1AB00-0AB0

View of the module

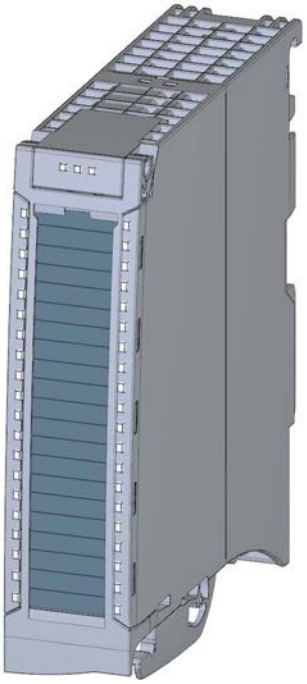


Figure 2-1 View of the TM PosInput 2 module

Properties

The TM PosInput 2 technology module has the following properties:

- Technical properties
  - Width: 35 mm
  - Two channels
  - Interfaces:

    SSI encoder signals DAT and CLK or RS422/TTL encoder signals A, B and N

    5 V and 24 V encoder supply output, short-circuit proof

    DI0 and DI1 digital input signals (per channel)

    DQ0 and DQ1 digital output signals (per channel)

    L+ supply voltage
  - Position value range: 31 bits
  - Count range: 32 bits
  - Monitoring of encoder signals for wire break, short-circuits and faulty voltages channel by channel
  - Hardware interrupts can be configured channel by channel
  - Input filters for suppression of interferences at encoder inputs and digital inputs can be configured
- Supported encoder/signal types
  - SSI absolute encoder
  - RS422/TTL incremental encoder with and without signal N
  - RS422/TTL pulse encoder with direction signal
  - RS422/TTL pulse encoder without direction signal
  - RS422/TTL pulse encoders for up & down pulses
- Supported functions
  - Isochronous mode
  - Firmware Update
  - Identification data I&M

Accessories

The following components are supplied with the technology module and can also be ordered separately as spare parts:

- Shield bracket
- Shield terminal
- Power supply element
- Labeling strip
- U-connector

Other components

The following component needs to be ordered separately:

- Front connectors, including potential jumpers and cable ties

2.2 Functions

2.2.1 Position input with SSI absolute encoder

You can use the TM PosInput 2 technology module with an SSI absolute encoder for position input. The technology module reads the position via a synchronous, serial interface from the SSI absolute encoder and sends it to the controller.

You can switch the digital outputs of the technology module exactly at defined position values, independently of the user program. Position input with an SSI absolute encoder does not involve gate control. Due to system constraints, synchronization is not possible with an SSI absolute encoder.

Gray-dual conversion

Gray-code and dual-code SSI absolute encoders are supported.

Range for position value

You can specify a frame length of 10 bits to 40 bits for the SSI absolute encoder. The configurable bit numbers of the LSB and the MSB of the position value in the frame define the value range. The technology module can read in a position value with a maximum length of 31 bits and transfer it to the PLC. The position value is treated as unsigned positive value and can assume values between "0" and "$2^{(MSB-LSB+1)-1}$".

Complete SSI frame

Instead of having a measured variable returned, you can choose to have the least significant 32 bit of the current unprocessed SSI frame returned. This provides you with encoder-specific additional bits, such as error bits, in addition to the position value. If the SSI frame is shorter than 32 bits, the complete SSI frame is returned right-aligned and the top unused bits are returned with "0" in the feedback interface.

Monitoring of the encoder signals and the SSI frames

The technology module monitors signals of an SSI absolute encoder for wire breaks, short-circuits and faulty voltages. The technology module also monitors SSI frames for errors.

If you enable the diagnostic interrupts, the technology module triggers a diagnostic interrupt in the event of an error at the encoder signals or the SSI frame.

2.2.2 Counting

Counting refers to the recording and adding up of events. The counters of the technology module capture encoder signals and pulses and evaluate them accordingly. The count direction can be specified using encoder or pulse signals or through the user program.

You can control the counting processes with the digital inputs. You can switch the digital outputs exactly at defined counter values, independently of the user program.

You can specify the response of the counters using the functionalities described below.

Counting limits

The counting limits define the counter value range used. The counting limits are configurable and can be modified during runtime with the user program.

The maximum possible counting limit is 2147483647 (2^{31}–1). The minimum possible counting limit is –2147483648 (–2^{31}).

You can configure the response of the counter at the counting limits:

- Continue or stop counting upon violation of a counting limit (automatic gate stop)
- Set counter value to start value or to other counting limit upon violation of a counting limit

Start value

You can configure a start value within the counting limits. The start value can be modified during runtime with the user program.

Depending on the parameter assignment, the technology module can set the current counter value to the start value upon synchronization, upon Capture function activation, upon violation of a counting limit or when the gate is opened.

Gate control

Opening and closing the hardware gate and software gate defines the period of time during which the counting signals are captured.

The control of the hardware gate takes place externally via the digital inputs of the technology module. Control of the software gate takes place via the user program. The hardware gate can be enabled through parameter assignment. The software gate (bit in the control interface of the cyclic I/O data) cannot be disabled.

Capture

You can configure an external reference signal edge that triggers the saving of the current counter value or position value as Capture value. The following external signals can trigger the Capture function:

- Rising or falling edge of a digital input
- Both edges of a digital input
- Rising edge of signal N at the encoder input

For incremental and pulse encoders, you can configure whether counting continues from the current counter value or from the start value after the Capture function.

Hysteresis

You can specify hysteresis for the comparison values, within which a digital output will be prevented from switching again. An encoder can come to a standstill at a specific position, and slight movements may make the counter value or position value fluctuate around this position. If a comparison value or a counting limit lies within this fluctuation range, the corresponding digital output will be switched on and off with corresponding frequency if hysteresis is not used. The hysteresis prevents these unwanted switching operations.

2.2.3 Measuring

The following measuring functions are available:

Measurement type	Description
Frequency measurement	The mean frequency is calculated at set measuring intervals on the basis of the time profile of the count pulses or position values and returned in hertz as the floating point number.
Period measurement	The mean period duration is calculated at set measuring intervals on the basis of the time profile of the count pulses or position values and returned in seconds as the floating point number.
Velocity measurement	The mean velocity is calculated at set measuring intervals on the basis of the time profile of the count pulses or position values and other parameters, and returned in the configured unit of measurement.

The measured value and the counter value are available concurrently in the feedback interface. Instead of having a measured variable returned, you can choose to have the least significant 32 bit of the current unprocessed SSI frame returned when using an SSI absolute encoder.

Update time

You can configure the interval at which the technology module updates the measured values cyclically as the update time. Setting longer update time intervals allows uneven measured variables to be smoothed and increases measuring accuracy.

Gate control for incremental and pulse encoders

Opening and closing the hardware gate and software gate defines the period of time during which the counting signals are captured. The update time is asynchronous to the opening of the gate, which means that the update time is not started when the gate is opened. After closing, the last measured value captured continues to be returned.

Measuring ranges

The measuring functions have the following measuring range limits:

Measurement type	Low measuring range limit	High measuring range limit
Frequency measurement	0.04 Hz	4 MHz*
Period measurement	0.25 µs*	25 s
Velocity measurement	Depends on the configured number of "increments per unit" and the "time base for velocity measurement"	

* Applies to RS422/TTL incremental encoders and "Quadruple" signal evaluation.

All measured values are returned as signed values. The sign indicates whether the counter value increased or decreased during the relevant time period.

2.2.4 Position input for Motion Control

You can use the technology module for position input with S7-1500 Motion Control .

To do this, select "Position input for Motion Control" in the device configuration of the technology module in STEP 7 (TIA Portal). This mode will automatically apply to both channels of the technology module.

When using an incremental encoder or pulse encoder, the position input is based on the counting function of the technology module. With an SSI absolute encoder, the absolute value is read in via a synchronous, serial interface and prepared according to the parameter assignment to be made available for S7-1500 Motion Control.

Additional information

A detailed description of the use of Motion Control and its configuration is available in the function manual S7-1500 Motion Control as a download from the Internet (http://support.automation.siemens.com/WW/view/en/59381279).

2.2.5 Additional functions

Synchronization for incremental encoders and pulse encoders

You can configure the edge of an external reference signal to load the counter with the specified start value. The following external signals can trigger a synchronization:

- Rising or falling edge of a digital input
- Rising edge of signal N at the encoder input
- Rising edge of signal N at the encoder input depending on the level of the assigned digital input

Comparison values

You can specify two comparison values to control the two digital outputs of the channel. If the position, counter or measured value meets the configured comparison condition, the corresponding digital output can be set to initiate control processes directly in the process. The comparison values are configurable and can be modified during runtime with the user program.

Hardware interrupts

The technology module can trigger a hardware interrupt in the CPU, for example, if a compare event occurs, in the event of a zero crossing and/or a change of count direction (direction reversal). You can specify which events (Page 44) are to trigger a hardware interrupt during operation.

Diagnostic interrupt

The technology module can trigger a diagnostic interrupt in the event of a missing supply voltage or an error at the digital outputs, for example. Select the diagnostic interrupts (Page 43) in the device configuration freely.

Input filter

To suppress interference, you can configure an input filter for the RS422/TTL encoder inputs and for the digital inputs.

Centralized application

You can use the technology module centrally in the S7-1500 automation system.

Distributed application

You can use the technology module in a distributed system by means of an interface module in the ET 200MP distributed I/O device. The following applications are possible:

- Distributed operation in an S7-1500 system
- Distributed operation in an S7-300/400 system
- Distributed operation in a third-party system

Isochronous mode

The technology module supports the system function "Isochronous mode". This system function enables position, counter and measured values to be recorded in a defined system cycle.

In isochronous mode, the cycle of the user program, the transmission of the input signals and processing in the technology module are synchronized. The output signals switch immediately if the relevant comparison condition is met.

Wiring

3

3.1 Pin assignment

The encoder signals, the digital input and output signals and the encoder supplies are connected to the 40-pin front connector of the technology module. The supply voltage to supply the module and the digital outputs and generate the encoder supply voltages is connected to the 4-pin power supply element.

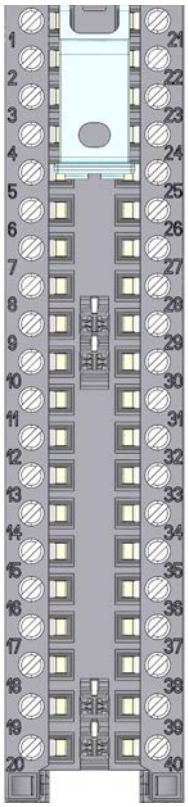
The next two sections detail the pin assignment for the front connector and the power supply element.

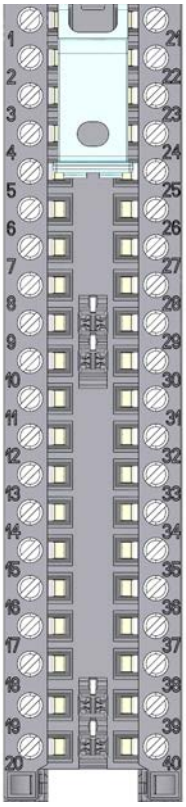
Information on wiring the front connector, creating the cable shield, etc. is available in the Connecting chapter of the S7-1500 Automation System (http://support.automation.siemens.com/WW/view/en/59191792) and ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) system manuals.

Pin assignment for the front connector

The table below shows the pin assignment of the front connector.

Table 3- 1 Pin assignment of the front connector

View	Signal name		Designation					
			RS422/TTL incremental encoder		RS422/TTL pulse encoder			SSI absolute encoder
			with signal N	without signal N	with direction signal	without direction signal	up/down	
	Channel 0							
	1	CH0.A or CH0.D	Encoder signal A		Counting signal A		Up counting signal A	SSI data signal DAT
	2	/CH0.A or /CH0.D	Encoder signal /A (RS422 only)		Counting signal /A (RS422 only)		Up counting signal /A (RS422 only)	SSI data signal /DAT
	3	CH0.B or CH0.C	Encoder signal B		Direction signal B	—	Down counting signal B	SSI clock signal CLK
	4	/CH0.B or /CH0.C	Encoder signal /B (RS422 only)		Direction signal /B (RS422 only)		Down counting signal /B (RS422 only)	SSI clock signal /CLK
	5	CH0.N	Encoder signal N	—				
	6	/CH0.N	Encoder signal /N (RS422 only)	—				
	7	5VDC	5 V encoder supply					
	8	M	Ground for encoder supplies and digital inputs					
	9	24VDC	24 V encoder supply					
	10	M	Ground for encoder supplies and digital inputs					
	11	DI0.0	Digital input DI0					
	12	DI0.1	Digital input DI1					
	13	—	—					
	14	—	—					
	15	DQ0.0	Digital output DQ0					
	16	DQ0.1	Digital output DQ1					
	17	—	—					
	18	M	Digital output ground					
	19 - 20	—	—					

View	Signal name		Designation					
			RS422/TTL incremental encoder		RS422/TTL pulse encoder			SSI absolute encoder
			with signal N	without signal N	with direction signal	without direction signal	up/down	
	Channel 1							
	21	CH1.A or CH1.D	Encoder signal A		Counting signal A		Up counting signal A	SSI data signal DAT
	22	/CH1.A or /CH1.D	Encoder signal /A (RS422 only)		Counting signal /A (RS422 only)		Up counting signal /A (RS422 only)	SSI data signal /DAT
	23	CH1.B or CH1.C	Encoder signal B		Direction signal B	—	Down counting signal B	SSI clock signal CLK
	24	/CH1.B or /CH1.C	Encoder signal /B (RS422 only)		Direction signal /B (RS422 only)		Down counting signal /B (RS422 only)	SSI clock signal /CLK
	25	CH1.N	Encoder signal N	—				
	26	/CH1.N	Encoder signal /N (RS422 only)	—				
	27	5VDC	5 V encoder supply					
	28	M	Ground for encoder supplies and digital inputs					
	29	24VDC	24 V encoder supply					
	30	M	Ground for encoder supplies and digital inputs					
	31	DI1.0	Digital input DI0					
	32	DI1.1	Digital input DI1					
	33	—	—					
	34	—	—					
	35	DQ1.0	Digital output DQ0					
	36	DQ1.1	Digital output DQ1					
	37	—	—					
	38	M	Digital output ground					
	39 - 40	—	—					

Note

Potential jumpers may not be inserted in the front connector.

Pin assignment for the power supply element

The power supply element is plugged onto the front connector and serves to supply the technology module. For this purpose, you need to connect the supply voltage to terminal 41 (L+) and terminal 44 (M). Use terminal 42 (L+) and terminal 43 (M) to loop the supply voltage to the next module.

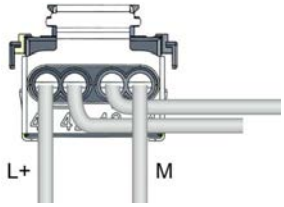


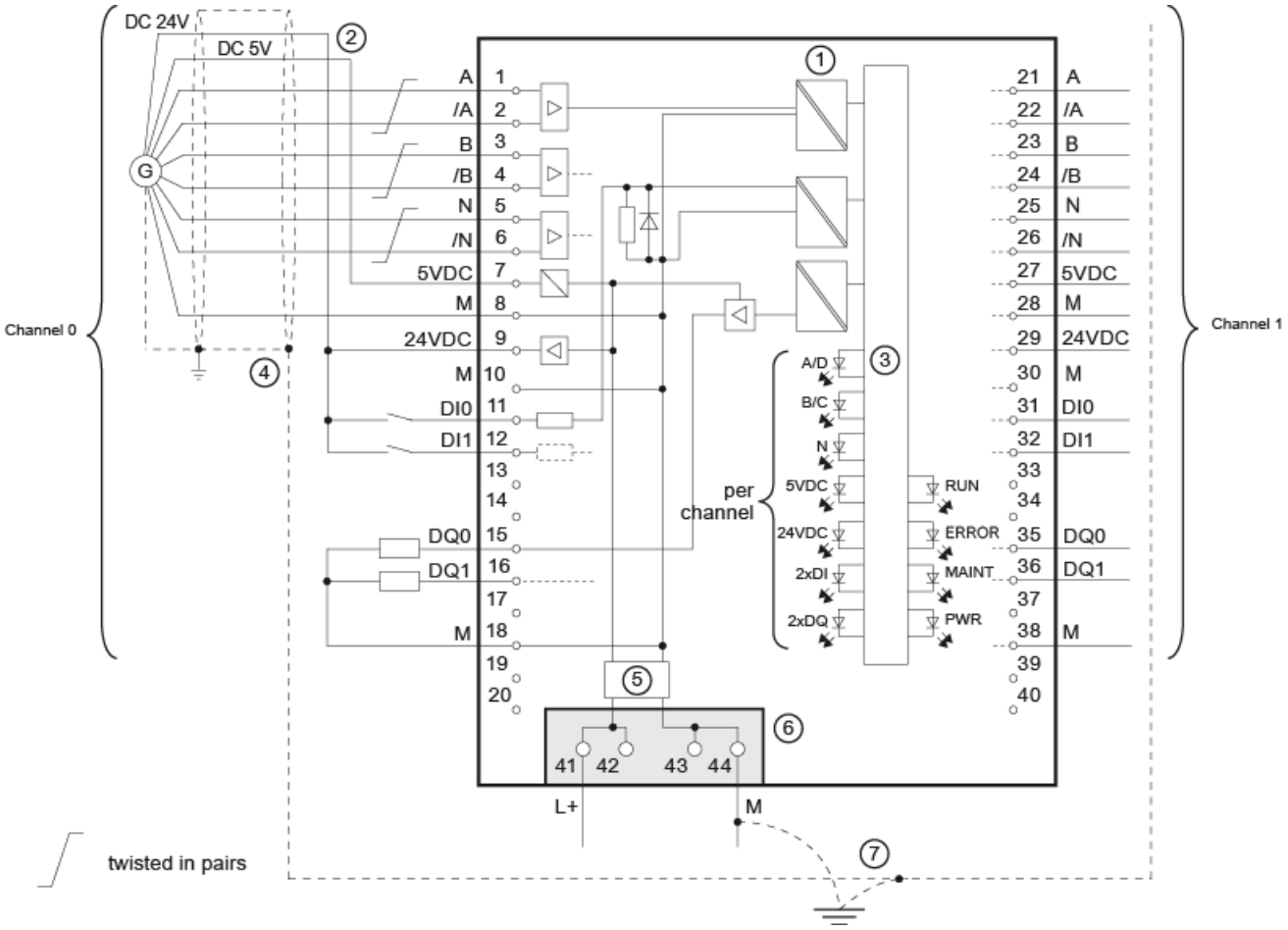
Figure 3-1 Power supply element wiring

L+	DC 24V supply voltage
M	Ground for supply voltage

Block diagrams

You must ground the shields of the cables between encoder and technology module both through the shield support at the front connector (shield bracket and terminal) and at the encoder.

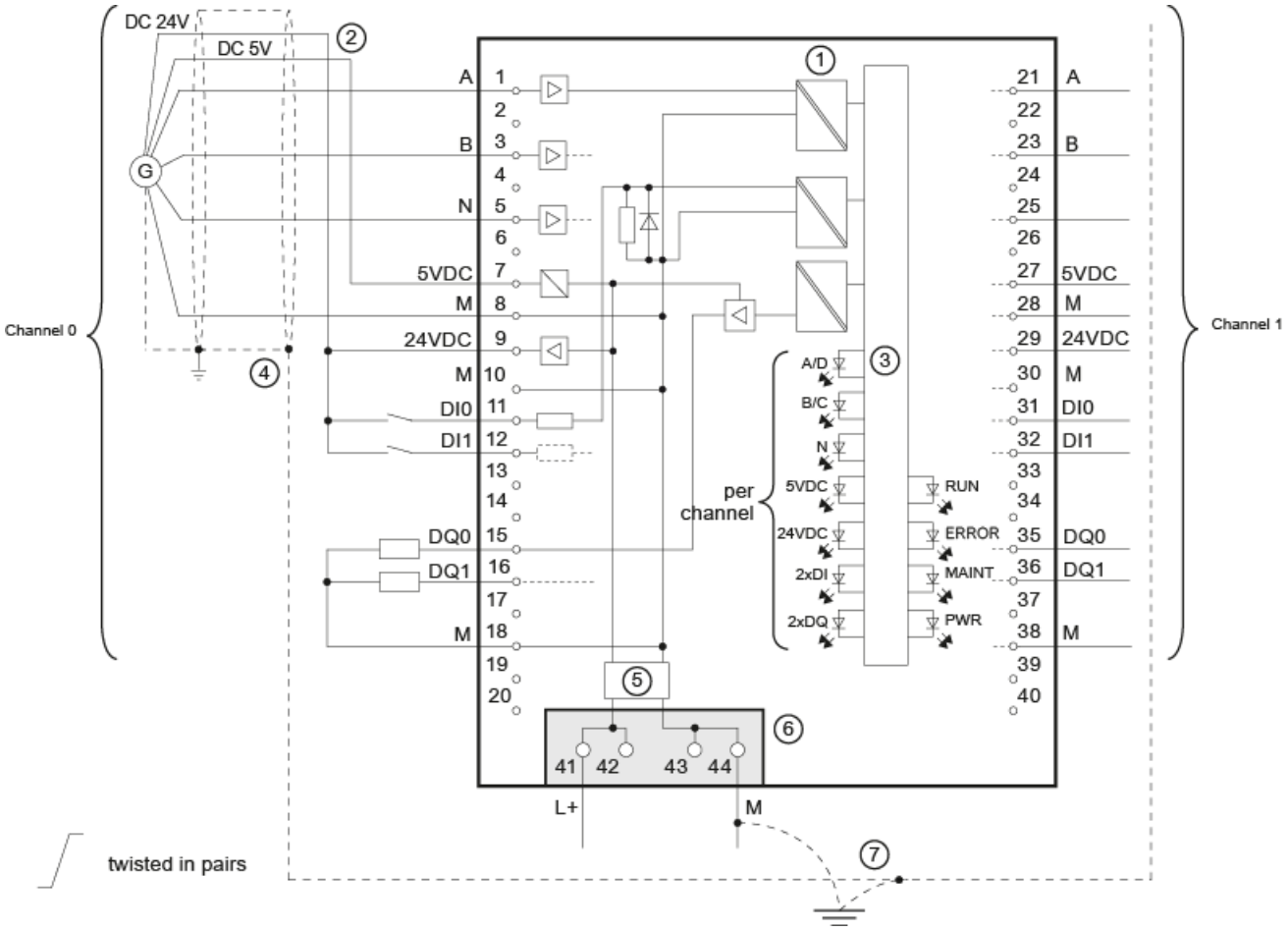
The figure below shows the block diagram of the technology module with one connected RS422 incremental encoder.



① Electrical isolation
② Encoder supply either DC 5V or DC 24V as per encoder manufacturer instructions
③ Technology and backplane bus interface
④ Shield support at the front connector
⑤ Input filter
⑥ Supply voltage via power supply element
⑦ Equipotential bonding

Figure 3-2 Block diagram with RS422 incremental encoder

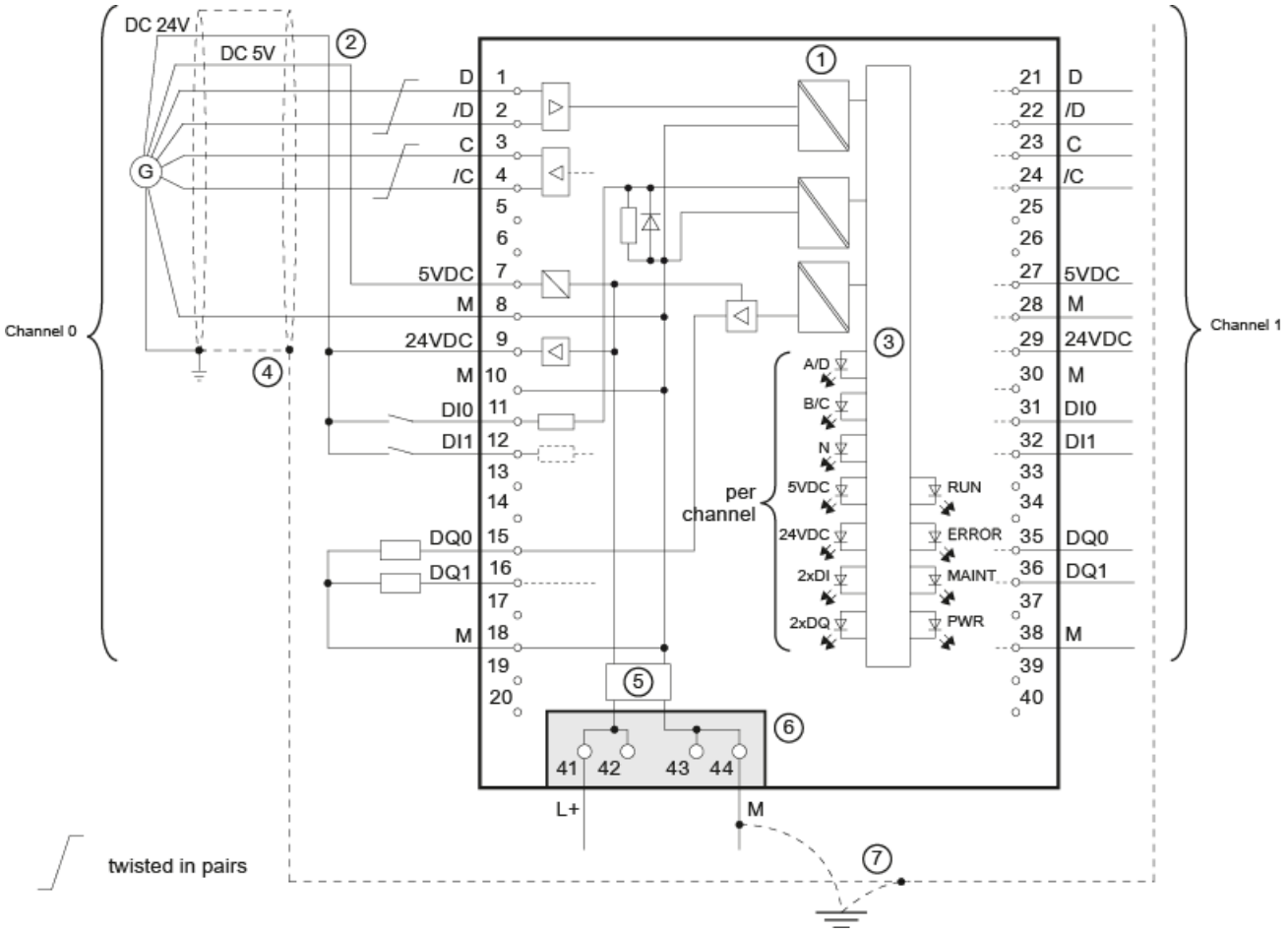
The figure below shows the block diagram of the technology module with one connected TTL incremental encoder.



① Electrical isolation
② Encoder supply either DC 5V or DC 24V as per encoder manufacturer instructions
③ Technology and backplane bus interface
④ Shield support at the front connector
⑤ Input filter
⑥ Supply voltage via power supply element
⑦ Equipotential bonding

Figure 3-3 Block diagram with TTL incremental encoder

The figure below shows the block diagram of the technology module with one connected SSI absolute encoder.



① Electrical isolation
② Encoder supply either DC 5V or DC 24V as per encoder manufacturer instructions
③ Technology and backplane bus interface
④ Shield support at the front connector
⑤ Input filter
⑥ Supply voltage via power supply element
⑦ Equipotential bonding

Figure 3-4 Block diagram with SSI absolute encoder

L+/M supply voltage

Connect the supply voltage (DC 24V) to the L+ and M connections. An internal protective circuit protects the technology module from polarity reversal of the supply voltage. The technology module monitors the connection of the supply voltage.

Encoder supplies 24VDC and 5VDC

To supply the encoders, the technology module supplies the DC 24V and DC 5V supply voltage at the 24VDC and 5VDC outputs with reference to M. To supply the sensors at the digital inputs, the technology module supplies the DC 24V supply voltage at the 24VDC output. Voltage is supplied from the L+/M supply voltage and monitored for short circuits and overload.

RS422/TTL counting signals and SSI encoder signals

The TM PosInput can process either counting or SSI encoder signals. The counting encoder signals are designated A, B and N and use either the RS422 or TTL signal standard. The SSI encoder signals are designated DAT (letter D) and CLK (letter C) and use the RS422 signal standard.

An encoder signal with TTL standard uses a single cable. An RS422 encoder signal uses one cable pair and the count/SSI information is transmitted as differential voltage. This ensures interference-free transmission of RS422 encoder signals even with high frequencies over long distances. The RS422 line pairs must be twisted together in the cable.

You can connect the following encoder types:

- SSI absolute encoder:

  The SSI encoder signals CLK and DAT are connected via the C and D terminals. The N terminals remain disconnected.

- RS422/TTL incremental encoder with signal N:

  The encoder signals A, B and N are connected using the terminals labeled accordingly. A and B are the two incremental signals phase-shifted by 90°. N is the zero mark signal which returns one pulse per revolution.

- RS422/TTL incremental encoder without signal N:

  The encoder signals A and B are connected via the terminals labeled accordingly. A and B are the two incremental signals phase-shifted by 90°. The N terminals remain disconnected.

- RS422/TTL pulse encoder without direction signal:

  The counting signal is connected at the A terminals. The count direction is specified via the control interface. The B and N terminals remain disconnected.

- RS422/TTL pulse encoder with direction signal:

  The counting signal is connected at the A terminals. The direction signal is connected at the B terminals. The N terminals remain disconnected.

- RS422/TTL pulse encoder with up/down counting signal:

  The up counting signal is connected at the A terminals. The down counting signal is connected at the B terminals. The N terminals remain disconnected.

The inputs of the two channels are not isolated from each other. The inputs are isolated against the backplane bus.

Note

The RS422 signal standard offers greater interference immunity than the TTL signal standard. If your incremental encoder or pulse encoder supports the RS422 **and** the TTL signal standard, we recommend using the RS422 signal standard.

Input filter for RS422/TTL signals from incremental encoders and pulse encoders

To suppress interference, you can configure an input filter for the encoder inputs A, B and N. The selected filter frequency is based on a pulse-break ratio of between 40:60 and 60:40. This produces a set minimum pulse/break time. Signal changes with a duration shorter than the minimum pulse/break time are suppressed.

You can specify the following values for the filter frequency:

Table 3- 2 Filter frequency and respective minimum pulse/break time

Filter frequency	Minimum pulse/break time
100 Hz	4.0 ms
200 Hz	2.0 ms
500 Hz	800 µs
1 kHz	400 µs
2 kHz	200 µs
5 kHz	80 µs
10 kHz	40 µs
20 kHz	20 µs
50 kHz	8.0 µs
100 kHz	4.0 µs
200 kHz	2.0 µs
500 kHz	0.8 µs
1 MHz (default)	0.4 µs

Digital inputs DI0 and DI1

Two digital inputs are available per counting channel. The digital inputs are used for gate control, synchronization and the Capture function. Alternatively, you can use one or both digital inputs without the functions named and read the signal state of the respective digital input via the feedback interface.

The digital inputs of the two counting channels are not isolated from each other.

Input filters for digital inputs

To suppress interferences, you can configure an input filter for the digital inputs.

You can specify the following values for the filter time:

- None
- 0.05 ms
- 0.1 ms (default)
- 0.4 ms
- 0.8 ms
- 1.6 ms
- 3.2 ms
- 12.8 ms
- 20 ms

Note

If you select the "None" or "0.05 ms" option, you have to use shielded cables for connection of the digital inputs.

Digital outputs DQ0 and DQ1

Two digital outputs are available per channel. The two digital outputs DQ0 and DQ1 can be activated/switched directly by the specified comparison values or by the user program.

The digital outputs of the two channels are not isolated from each other.

The digital outputs are 24 V sourcing outputs in reference to M and can carry a rated load current of 0.5 A. They are protected from overload and short-circuit.

Note

Relays and contactors can be connected direct without external circuitry. Information on the maximum possible operating frequencies and the inductance values of the inductive loads at the digital outputs is available in the chapter Technical specifications (Page 45).

Configuring/address space

4

4.1 Configuring

Introduction

The technology module is configured and assigned parameters with the configuration software.

The technology module functions are controlled and monitored by the user program.

System environment

The technology module can be used in the following system environments:

Applications	Components required	Configuration software	In the user program
Central and distributed operation in an S7-1500 system with a corresponding ET 200MP system	• S7-1500 automation system • ET 200MP distributed I/O system • TM PosInput 2	STEP 7 (TIA Portal): • Device configuration with hardware configuration (HWCN) • Parameter setting with High_Speed_Counter technology object	Position input: Direct access to the control and feedback interface (Page 33) of the TM PosInput 2 in the I/O data Counting and measuring functions: High_Speed_Counter instruction for the technology object
Distributed operation in an S7-300/400 system	• S7-300/400 automation system • ET 200MP distributed I/O system • TM PosInput 2	STEP 7 (TIA Portal): Device configuration and parameter settings with hardware configuration (HWCN) STEP 7: Device configuration and parameter settings with GSD file	Direct access to the control and feedback interface (Page 33) of the TM PosInput 2 in the I/O data
Distributed operation in a third-party system	• Third-party automation system • ET 200MP distributed I/O system • TM PosInput 2	Third-party configuration software: Device configuration and parameter settings with GSD file	Direct access to the control and feedback interface (Page 33) of the TM PosInput 2 in the I/O data

Additional information

A detailed description of the counting and measuring functions and their configuration is available:

- In the Counting, measurement and position input function manual available as a download from the Internet (http://support.automation.siemens.com/WW/view/en/59709820)
- In the STEP 7 (TIA Portal) information system under "Using technology functions > Counting, measurement and position input" > Counting, measurement and position input (S7-1500)"

A detailed description of the use of Motion Control and its configuration is available:

- In the S7-1500 Motion Control function manual available as a download from the Internet (http://support.automation.siemens.com/WW/view/en/59381279)
- In the STEP 7 (TIA Portal) information system under "Using technology functions > Motion Control > Motion Control (S7-1200, S7-1500)"

The GSD files for the ET 200MP distributed I/O system are available for download from the Internet (http://support.automation.siemens.com/WW/view/en/68189683).

4.2 Reaction to CPU STOP

Reaction to CPU STOP

You set the response of the technology module for each channel to CPU STOP in the basic parameters of the device configuration.

Table 4- 1 Response of the technology module to CPU STOP depending on parameter assignment

Basic parameters	Reaction to CPU STOP
Continue operation	The technology module remains fully functional. Incoming count pulses are processed or the position value is read in. The digital outputs continue to switch according to the parameter assignment.
Output substitute value	The technology module outputs the configured substitute values at the digital outputs until the next CPU STOP-RUN transition. The technology module is returned to its startup state after a STOP-RUN transition: The counter value is set to the Start value (with incremental encoders or pulse encoders) and the digital outputs switch according to the parameter assignment.
Keep last value	The technology module outputs the values at the digital outputs that were valid when the transition to STOP took place until the next CPU STOP-RUN transition. The technology module is returned to its startup state after a STOP-RUN transition: The counter value is set to the Start value (with incremental encoders or pulse encoders) and the digital outputs switch according to the parameter assignment.

4.3 Address space

Address space of the technology module

Table 4- 2 Range of the input addresses and output addresses of the TM PosInput 2

	Inputs	Outputs
Range per counting channel	16 bytes	12 bytes
Total range	32 bytes	24 bytes

Table 4- 3 Range of the input and output addresses of the TM PosInput 2 in the "Position input for Motion Control" mode

	Inputs	Outputs
Range per counting channel	16 bytes	4 bytes
Total range	32 bytes	8 bytes

Additional information

A description on how to use the control and feedback interface of TM PosInput 2 can be found in the chapter Control and feedback interface (Page 33).

4.4 Control and feedback interface

Information on using the control and feedback interface can be found in the chapter Configuring (Page 29).

A detailed description of the TM PosInput 2 control and feedback bits is available in the Counting, measurement and position input function manual which can be downloaded from the Internet (http://support.automation.siemens.com/WW/view/en/59709820).

4.4.1 Assignment of the control interface

The user program uses the control interface to influence the behavior of the technology module.

Control interface per channel

The following table shows control interface assignment:

Offset to the start address	Parameter	Meaning				
Bytes 0 to 3	Slot 0	Load value (significance of the value is specified in LD_SLOT_0)				
Bytes 4 to 7	Slot 1	Load value (significance of the value is specified in LD_SLOT_1)				
Byte 8	LD_SLOT_0	Specifies the significance of the value in Slot 0				
		Bit 3	**Bit 2**	**Bit 1**	**Bit 0**	
		0	0	0	0	No action, idle
		0	0	0	1	Load count value (with incremental or pulse encoder)
		0	0	1	0	Reserve
		0	0	1	1	Load Start value (with incremental encoder or pulse encoder)
		0	1	0	0	Load comparison value 0
		0	1	0	1	Load comparison value 1
		0	1	1	0	Load Low counting limit (with incremental encoder or pulse encoder)
		0	1	1	1	Load High counting limit (with incremental encoder or pulse encoder)
		1	0	0	0	Reserve
		to				
		1	1	1	1	

Offset to the start address	Parameter	Meaning				
Byte 8	LD_SLOT_1	Specifies the significance of the value in Slot 1				
		Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	
		0	0	0	0	No action, idle
		0	0	0	1	Load count value (with incremental or pulse encoder)
		0	0	1	0	Reserve
		0	0	1	1	Load Start value (with incremental encoder or pulse encoder)
		0	1	0	0	Load comparison value 0
		0	1	0	1	Load comparison value 1
		0	1	1	0	Load Low counting limit (with incremental encoder or pulse encoder)
		0	1	1	1	Load High counting limit (with incremental encoder or pulse encoder)
		1	0	0	0	Reserve
		to				
		1	1	1	1	
Byte 9	EN_CAPTURE	Bit 7: Capture function enable				
	EN_SYNC_DN	Bit 6: Enable synchronization down (with incremental encoder or pulse encoder)				
	EN_SYNC_UP	Bit 5: Enable synchronization up (with incremental encoder or pulse encoder)				
	SET_DQ1	Bit 4: Set DQ1				
	SET_DQ0	Bit 3: Set DQ0				
	TM_CTRL_DQ1	Bit 2: Enable technological function DQ1				
	TM_CTRL_DQ0	Bit 1: Enable technological function DQ0				
	SW_GATE	Bit 0: Software gate (with incremental encoder or pulse encoder)				
Byte 10	SET_DIR	Bit 7: Count direction (for encoders without direction signal)				
	–	Bits 2 to 6: Reserve; bits must be set to 0				
	RES_EVENT	Bit 1: Reset of saved events				
	RES_ERROR	Bit 0: Reset of saved error states				
Byte 11	–	Bits 0 to 7: Reserve; bits must be set to 0				

4.4.2 Assignment of the feedback interface

The user program receives current values and status information from the technology module by means of the feedback interface.

Feedback interface per channel

The following table shows the assignment of the feedback interface:

Offset to the start address	Parameter	Meaning
Bytes 0 to 3	COUNT VALUE	Current counter value or position value
Bytes 4 to 7	CAPTURED VALUE	The last acquired Capture value
Bytes 8 to 11	MEASURED VALUE	Current measured value or complete SSI frame
Byte 12	–	Bits 3 to 7: Reserve; set to 0
	LD_ERROR	Bit 2: Error when loading via control interface
	ENC_ERROR	Bit 1: Faulty encoder signal or SSI frame
	POWER_ERROR	Bit 0: Incorrect supply voltage L+
Byte 13	–	Bits 6 to 7: Reserve; set to 0
	STS_SW_GATE	Bit 5: Software gate status (with incremental encoder or pulse encoder)
	STS_READY	Bit 4: Technology module started up and configured
	LD_STS_SLOT_1	Bit 3: Load request for Slot 1 detected and carried out (toggling)
	LD_STS_SLOT_0	Bit 2: Load request for Slot 0 detected and carried out (toggling)
	RES_EVENT_ACK	Bit 1: Resetting of status bits active
	–	Bit 0: Reserve; set to 0
Byte 14	–	Bit 7: Reserve; set to 0
	STS_DI1	Bit 6: Status DI1
	STS_DI0	Bit 5: Status DI0
	STS_DQ1	Bit 4: Status DQ1
	STS_DQ0	Bit 3: Status DQ0
	STS_GATE	Bit 2: Internal gate status (with incremental encoder or pulse encoder)
	STS_CNT	Bit 1: Count pulse or position value change detected within the last 0.5 s
	STS_DIR	Bit 0: Direction of last counter value or position value change
Byte 15	STS_M_INTERVAL	Bit 7: Count pulse or position value change detected in previous measurement interval
	EVENT_CAP	Bit 6: Capture event has occurred
	EVENT_SYNC	Bit 5: Synchronization has occurred (with incremental encoder or pulse encoder)
	EVENT_CMP1	Bit 4: Comparison event for DQ1 has occurred
	EVENT_CMP0	Bit 3: Comparison event for DQ0 has occurred
	EVENT_OFLW	Bit 2: An overflow has occurred
	EVENT_UFLW	Bit 1: An underflow has occurred
	EVENT_ZERO	Bit 0: A zero pass has occurred

Interrupts/diagnostic messages

5

5.1 Status and error displays

LEDs

The following figure shows you the LED displays (status and error displays) of TM PosInput 2.

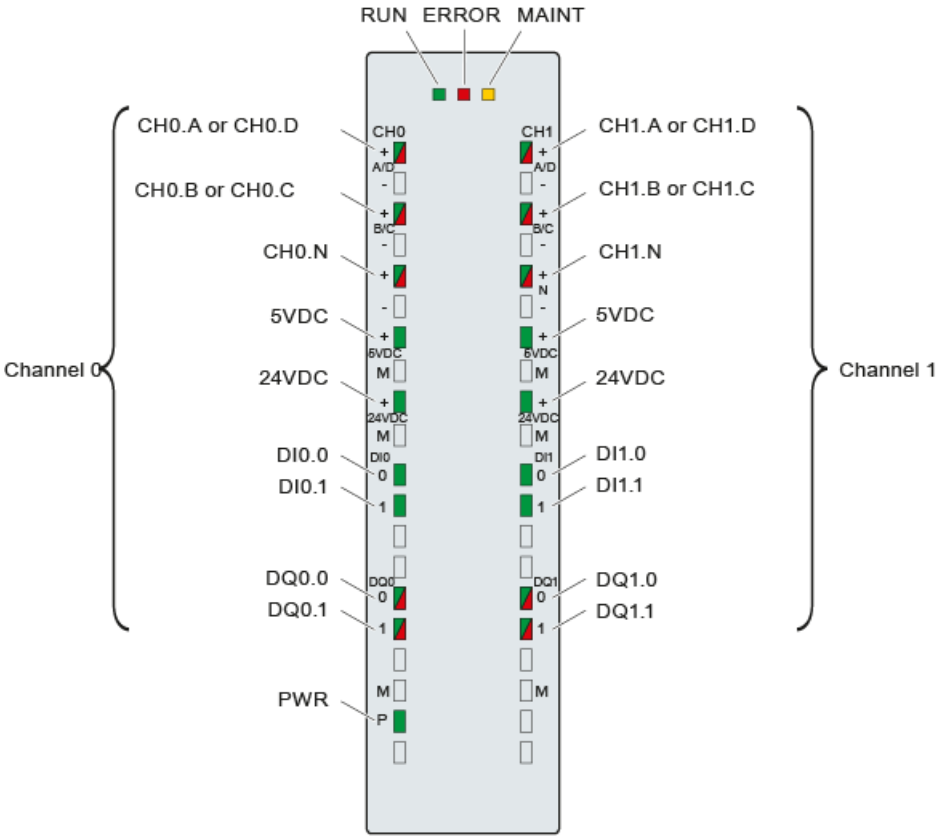


Figure 5-1 LEDs of the TM PosInput 2

Meaning of the LED displays

The following tables explain the meaning of the status and error displays. Remedial measures for diagnostic alarms can be found in the section Diagnostic messages (Page 40).

Table 5- 1 Status and error displays RUN/ERROR/MAINT

LEDs			Meaning	To correct or avoid errors
RUN	ERROR	MAINT		
Off	Off	Off	Supply voltage from CPU/power supply module not present or too low	Check or turn on the supply voltage at the PS, at the CPU or at the interface module.
Flashes	Off	Off	The technology module starts and flashes until parameter assignment is complete	---
On	Off	Off	The parameters of the technology module have been assigned.	
On	Flashes	Off	Indicates a group error (at least one active error)	Evaluate the diagnostic alarms and eliminate the error.
Flashes	Flashes	Flashes	Hardware or firmware defective	Replace the technology module.

ChannelLEDs

The LEDs CHn.A, CHn.B, CHn.N andDIn.m indicate the current level of the associated signals. The LEDs of the digital outputs DQn.m indicate the desired state.

The flashing frequency of the channel LEDs is limited to approximately 12 Hz. If higher frequencies are present, the channel LEDs will flash at 12 Hz instead of indicating the current status.

If you are using an SSI absolute encoder, the LEDs CHn.D and CHn.C light up in green during transmission of the encoder frame and in red if an error has occurred. The LEDs CHn.D and CHn.C are off if an encoder frame is not transmitted or if an error has occurred for which the diagnostic interrupt has not been enabled.

Table 5- 2 Status displays CHn.m/DIn.m/DQn.m

LEDs CHn.m/DIn.m/DQn.m	Meaning	To correct or avoid errors
Off	Counter input/digital input/digital output at 0 level	---
On	Counter input/digital input/digital output at 1 level.	---
On (CHn.m/DQn.m)	Diagnostic alarm: for example, wire break, short-circuit, faulty voltage	Check the wiring or the connected load.

Table 5- 3 PWR/24VDC/5VDC/ERROR status displays

LEDs			Meaning	To correct or avoid errors
PWR	**24VDC/ 5VDC**	**ERROR**		
Off	Off	Flashes	Supply voltage too low or missing	• Check the supply voltage. • Make sure that the front connector is correctly inserted.
On	On	Off	Supply voltage is present and OK	---
On	Off	Flashes	Short-circuit or overload at the encoder supply	• Correct the encoder wiring. • Check the loads connected to the encoder supply.

5.2 Diagnostic messages

Diagnostic alarms

If a diagnostic alarm is pending, the ERROR-LED is flashing.

The diagnostic alarms are displayed as clear text in STEP 7 (TIA Portal) in the online and diagnostics view. You can evaluate the error codes with the user program.

The following diagnostics can be signaled:

Table 5- 4 Diagnostic alarms, their meaning and remedies

Diagnostic alarm	Error code		Meaning	To correct or avoid errors
	Dec.	Hex.		
Hardware interrupt lost	22_D	16_H	• Technology module cannot send an interrupt because a previous interrupt has not been processed • Possible causes: – Parameter assignment error – Too many hardware interrupts in too short a time	Change interrupt processing in the CPU and re-assign technology module parameters correspondingly
Internal error	256_D	100_H	Technology module defective	Replace technology module
Watchdog tripped. Module is defective.	259_D	103_H	Firmware error	Run firmware update
			Technology module defective	Replace technology module
External auxiliary voltage missing	266_D	$10A_H$	No technology module L+ supply voltage	Provide L+ supply voltage to technology module
			Front connector not inserted correctly	Insert front connector correctly
Short circuit or overload at external encoder supply	270_D	$10E_H$	• Error at encoder supply • Possible causes: – Short circuit – Overload	• Correction of encoder wiring • Check consumers connected to encoder supply
Error at digital outputs	271_D	$10F_H$	• Error at the digital outputs • Possible causes: – Short circuit – Overload – External feed	• Correct the wiring at the digital outputs • Check consumers connected to the digital outputs
Faulty external auxiliary voltage	272_D	110_H	• Error at supply voltage L+ • Possible causes: – Low voltage – Wiring of L+ supply voltage defective	• Check the L+ supply voltage • Check the wiring of the L+ supply voltage

Diagnostic alarm	Error code		Meaning	To correct or avoid errors
	Dec.	Hex.		
Illegal A/B signal ratio	1280_D	500_H	• Time profile of signals A and B of the incremental encoder does not meet certain specifications • Possible causes: – Signal frequency too high – Encoder faulty – Process wiring faulty	• Correct the process wiring • Check encoder/sensor • Check parameter assignment
RS422/TTL error	1282_D	502_H	• Error at RS422 or TTL encoder connection • Possible causes: – Wire break – No encoder connected – Cable too long – Short circuit – Overload – External voltage – Overheating – Parameter assignment error	• Correct the process wiring • Check encoder/sensor • Check parameter assignment
Error at SSI encoder	1283_D	503_H	• Error at SSI absolute encoder connection • Possible causes: – Wire break – Cable too long – Frame error (error of the start bit or stop bit) – Parity error – Parameter assignment error	• Correct the process wiring • Check encoder/sensor • Check parameter assignment
Overheating	1286_D	506_H	• Short circuit or overload at the digital outputs or outputs of the encoder supplies • Ambient temperature outside specifications	• Correct the process wiring • Improve cooling • Check connected loads

5.3 Interrupts

5.3.1 Trigger a diagnostic interrupt

Enabling the diagnostic interrupts

You enable the diagnostic interrupt for wire break and the diagnostic interrupts for additional errors in the basic parameters during device configuration.

A list of all errors that can trigger a diagnostic interrupt is available at Cause of the error triggering a diagnostic interrupt (Page 43).

Reactions to a diagnostic interrupt

The following happens when an event occurs that triggers a diagnostic interrupt:

- The ERROR LED flashes.

  Once you have remedied the error, the ERROR LED goes out.
- The S7-1500 CPU interrupts processing of the user program. The diagnostic interrupt OB (e.g. OB 82) is called. The event that triggered the interrupt is entered in the start information of the diagnostic interrupt OB.
- The S7-1500 CPU remains in RUN even if no diagnostic interrupt OB is present in the CPU. The technology module continues working unchanged if this is possible despite the error.

Detailed information on the error event is available with the instruction "RALRM" (read additional interrupt information).

Default setting

These diagnostic interrupts are not enabled in the default setting.

5.3.2 Cause of the error triggering a diagnostic interrupt

Which errors can trigger a diagnostic interrupt?

The technology module can trigger the following diagnostic interrupts:

Table 5- 5 Possible diagnostic interrupts

Diagnostic interrupt	Monitoring
• Internal error • Watchdog tripped. Module is defective.	Monitoring is always active. A diagnostic interrupt is triggered each time an error is detected.
• RS422/TTL error	Monitoring is always active. An error detected only triggers a diagnostic interrupt if "Enable diagnostic interrupt on wire break" has been enabled in the device configuration.
• Hardware interrupt lost • External auxiliary voltage missing • Short circuit or overload at external encoder supply • Error at digital outputs • Faulty external auxiliary voltage • Error at SSI encoder • Illegal A/B signal ratio • Overheating	Monitoring is always active. An error detected only triggers a diagnostic interrupt if "Enable additional diagnostic interrupts" has been enabled in the device configuration.

5.3.3 Triggering of a Hardware Interrupt

Introduction

For the technology module, you can configure which events are to trigger a hardware interrupt during operation.

What is a Hardware Interrupt?

The technology module will trigger a hardware interrupt as configured in response to specific events/states. When a hardware interrupt occurs, the CPU interrupts execution of the user program and processes the assigned hardware interrupt OB. The event that triggered the interrupt is entered in the start information of the assigned hardware interrupt OB by the CPU.

Activating the hardware interrupts

You activate the hardware interrupts in STEP 7 (TIA Portal) under "Basic parameters > Channel 0 or 1 > Hardware interrupts" during device configuration of the technology module.

A list of the individual hardware interrupts is available at Events which can trigger a hardware interrupt (Page 44).

Lost hardware interrupt

If an event occurs which is supposed to trigger a hardware interrupt but there is an identical, previous event which has not yet been processed, no further hardware interrupt will be triggered. The hardware interrupt is lost. This may lead to the "Hardware interrupt lost" diagnostic interrupt, depending on the parameter assignment.

Default setting

No hardware interrupts are activated in the default setting.

5.3.4 Events which can trigger a hardware interrupt

Which events can trigger a hardware interrupt?

A hardware interrupt is triggered if the condition for changing the respective status bit or event bit in the feedback interface is fulfilled.

The following two tags, among others, are entered in the start information of the assigned hardware interrupt OB when a process interrupt is triggered:

- EventType: Number of the event type to which the event triggering the interrupt belongs
- IChannel: Number of the channel that triggered the hardware interrupt

You can configure hardware interrupts to be triggered for the following event types:

Hardware interrupt	EventType number
Internal gate opening (Gate start)[1)]	1
Internal gate closing (Gate stop)[1)]	2
Overflow (high counting limit violated)	3
Underflow (low counting limit violated)	4
Compare event for DQ0 has occurred	5
Compare event for DQ1 has occurred	6
Zero pass	7
New Capture value available[2)]	8
Synchronization of the counter by an external signal[1)]	9
Direction reversal[3)]	10

1) Not for SSI absolute encoder

2) Can only be configured in Counting mode

3) The feedback bit STS_DIR has the default value "0". A hardware interrupt is not triggered when the first counter value or position value is changed immediately after switching on the technology module in *down direction*.

You can activate any combination of events to trigger hardware interrupts.

Technical specifications

6

	6ES7551-1AB00-0AB0
Product type designation	TM PosInput 2
General information	
Product function	
• I&M data	Yes; I&M 0
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V12.0 SP1 / V12.0 SP1
STEP 7 can be configured/integrated as of version	as of V5.5 SP3 / -
PROFIBUS as of GSD version/GSD revision	V1.0 / 5.0
PROFINET as of GSD version/GSD revision	V2.3 / -
Installation type/mounting	
• Rail mounting possible	Yes; S7-1500 mounting rail
Supply voltage	
Load voltage L+	
• Rated value (DC)	24 V
• Low limit of valid range (DC)	19.2 V
• High limit of valid range (DC)	28.8 V
• Reverse polarity protection	Yes
Input current	
• Current consumption, max.	75 mA; without load
Encoder supply	
• Number of outputs	4; one 5V and one 24V encoder supply per channel
5 V encoder supply	
• 5 V	Yes; 5.2 V +/-2%
• Short-circuit protection	Yes
• Output current, max.	300 mA; per channel
24 V encoder supply	
• 24 V	Yes; L+ (-0.8 V)
• Short-circuit protection	Yes
• Output current, max.	300 mA; per channel

	6ES7551-1AB00-0AB0
Power	
• Power from the backplane bus	1.3 W
Power loss	
• Power loss, typ.	5.5 W
Address area	
Occupied address area	
• Inputs	16 bytes; per channel
• Outputs	12 bytes; per channel; 4 bytes with Motion Control
Digital inputs	
• Number of inputs	4; 2 per channel
• Digital inputs, configurable	Yes
• Input characteristics to IEC 61131, Type 3	Yes
Digital input functions, configurable	
• Gate start/stop	Yes; (only with pulse & incremental encoder)
• Capture	Yes
• Synchronization	Yes; (only with pulse & incremental encoder)
• Freely assignable digital input	Yes
Input voltage	
Type of input voltage	DC
• Rated value, DC	24 V
For signal "0"	-30 V to +5 V
For signal "1"	+11 V to +30 V
• Permitted voltage at input, max.	30 V
• Permitted voltage at input, min.	-30 V
Input current	
• for signal "1", typ.	2.5 mA
Input delay (at rated value of input voltage)	
For standard inputs	
• Configurable	Yes; none / 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms
• at "0" to "1", min.	6 µs; with parameter assignment "none"
• at "1" to "0", min.	6 µs; with parameter assignment "none"
For counters/technological functions	
• Configurable	Yes
Cable length	
• Cable length shielded, max.	1000 m
• Cable length unshielded, max.	600 m

	6ES7551-1AB00-0AB0
Digital outputs	
Type of digital output	Transistor
• Number of outputs	4; 2 per channel
• Digital outputs, configurable	Yes
• Short-circuit protection	Yes; electronic/thermal
Response threshold, typ.	1 A
Limiting of inductive shutdown voltage to	L+ (-33 V)
• Control of a digital input	Yes
Digital output functions, configurable	
• Switch at comparison values	Yes
• Freely assignable digital output	Yes
Output switching capacity	
• With resistive load, max.	0.5 A; per digital output
• With lamp load, max.	5 W
Load resistance range	
• Low limit	48 Ω
• High limit	12 kΩ
Output voltage	
Type of output voltage	DC
• for signal "1", min.	23.2 V; L+ (-0.8 V)
Output current	
• for signal "1" rated value	0.5 A; per digital output
• for signal "1" permissible range, max.	0.6 A; per digital output
• for signal "1" minimum load current	2 mA
• for signal "0" residual current, max.	0.5 mA
Output delay with resistive load	
• "0" to "1", max.	50 µs
• "1" to "0", max.	50 µs
Switching frequency	
• With resistive load, max.	10 kHz
• With inductive load, max.	0.5 Hz; to IEC 947-5-1, DC-13; observe derating curve
• With lamp load, max.	10 Hz
Total current of outputs	
• Max. current per module	2 A
Cable length	
• Cable length shielded, max.	1000 m
• Cable length unshielded, max.	600 m

	6ES7551-1AB00-0AB0
Encoders	
Supported encoders	
• 2-wire sensor	Yes
• Permitted quiescent current (2-wire sensor), max.	1.5 mA
Encoder signals, incremental encoder (symmetrical)	
Input voltage	RS 422
• Input frequency, max.	1 MHz
• Counting frequency, max.	4 MHz; with quadruple evaluation
• Signal filter, configurable	Yes
• Cable length shielded, max.	32 m; with 1 MHz
• Incremental encoder with A/B tracks, phase-shifted by 90°	Yes
• Incremental encoder with A/B tracks, phase-shifted by 90°, and zero track	Yes
• Pulse encoder	Yes
• Pulse encoder with direction	Yes
• Pulse encoder with one pulse signal per count direction	Yes
Encoder signals, incremental encoders (asymmetrical)	
Input voltage	TTL 5 V
• Input frequency, max.	1 MHz
• Counting frequency, max.	4 MHz; with quadruple evaluation
• Signal filter, configurable	Yes
• Incremental encoder with A/B tracks, phase-shifted by 90°	Yes
• Incremental encoder with A/B tracks, phase-shifted by 90°, and zero track	Yes
• Pulse encoder	Yes
• Pulse encoder with direction	Yes
• Pulse encoder with one pulse signal per count direction	Yes

	6ES7551-1AB00-0AB0
Encoder signals, absolute encoder (SSI)	
Input signal	to RS 422
Frame length, configurable	10 to 40 bits
• Clock frequency, max.	2 MHz; 125 kHz, 250 kHz, 500 kHz, 1 MHz, 1.5 MHz or 2 MHz
Binary code	Yes
Gray code	Yes
• Cable length shielded, max.	320 m; Cable length, RS-422 SSI absolute encoders, Siemens type 6FX2001-5, 24 V supply: 125 kHz, 320 meters shielded, max.; 250 kHz, 160 meters shielded, max.; 500 kHz, 60 meters shielded, max.; 1 MHz, 20 meters shielded, max.; 1.5 MHz, 10 meters shielded, max.; 2 MHz, 8 meters shielded, max.
• Parity bit, configurable	Yes
Monoflop time	16, 32, 48, 64 µs & automatic
• Multi-turn	Yes
• Single-turn	Yes
Interface hardware	
• RS422	Yes
• TTL 5 V	Yes
Isochronous mode	
• Isochronous mode (application synchronized until terminal)	Yes
• Filter and processing time (TWE), min.	130 µs; (only with pulse & incremental encoder)
• Bus cycle time (TDP), min.	250 µs
Interrupts/diagnostics/status information	
Interrupts	
• Diagnostic interrupt	Yes
• Hardware interrupt	Yes
Diagnostic alarms	
• Monitoring of supply voltage	Yes
• Wire break	Yes
• Short circuit	Yes
• A/B transition error with incremental encoder	Yes
• Frame error with SSI encoder	Yes

	6ES7551-1AB00-0AB0
LED diagnostics display	
• RUN LED	Yes; green LED
• ERROR LED	Yes; red LED
• MAINT LED	Yes; yellow LED
• Monitoring of supply voltage	Yes; green LED
• Channel status display	Yes; green LED
• For channel diagnostics	Yes; red LED
Integrated functions	
• Number of counters	2
• Counting frequency (counters), max.	4 MHz; with quadruple evaluation
Counting functions	
• Can be used with TO High_Speed_Counter	Yes; (only with pulse & incremental encoder)
• Continuous counting	Yes
• Counter response configurable	Yes
• Hardware gate by means of digital input	Yes
• Software gate	Yes
• Event-triggered stop	Yes
• Synchronization by means of digital input	Yes
• Counting range, configurable	Yes
Comparator	
• Number of comparators	2; per channel
• Direction-dependent	Yes
• Can be changed from user program	Yes
Position detection	
• Incremental detection	Yes
• Absolute detection	Yes
• Suitable for S7-1500 Motion Control	Yes

	6ES7551-1AB00-0AB0
Measuring functions	
• Measuring time, configurable	Yes
• Dyn. measuring time adjustment	Yes
• Number of threshold values, configurable	2
Measuring range	
• Frequency measurement, max.	4 MHz
• Frequency measurement, min.	0.04 Hz
• Period measurement, max.	25 s
• Period measurement, min.	0.25 µs
Accuracy	
Frequency measurement	100 ppm; depends on measuring interval and signal evaluation
Velocity measurement	100 ppm; depends on measuring interval and signal evaluation
Period measurement	100 ppm; depends on measuring interval and signal evaluation
Electrical isolation	
Electrical isolation channels	
• Between the channels	No
• Between the channels and the backplane bus	Yes
• Between the channels and load voltage L+	No
Permitted potential difference	
Between different circuits	75 V DC / 60 V AC (basic isolation)
Isolation	
Isolation tested with	707 V DC (type test)
Ambient conditions	
Operating temperature	
• Horizontal installation, min.	0 °C
• Horizontal installation, max.	60 °C; consider derating with inductive loads
• Vertical installation, min.	0 °C
• Vertical installation, max.	40 °C; consider derating with inductive loads
Storage/transport temperatures	
• Min.	-40 °C
• Max.	70 °C

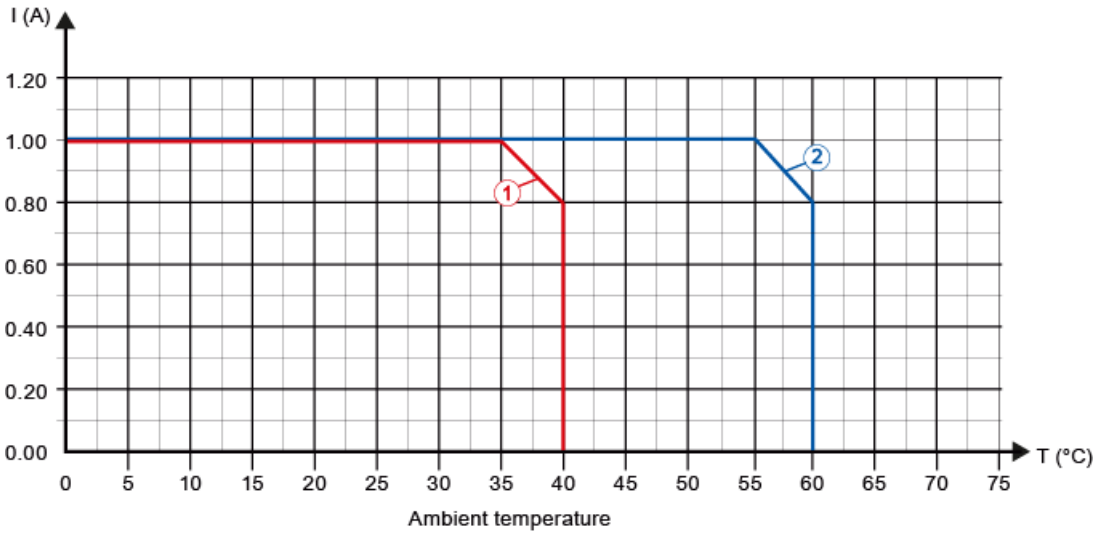
	6ES7551-1AB00-0AB0
Air pressure	
• Operation, min.	795 hPa
• Operation, max.	1080 hPa
• Transport/storage, min.	660 hPa
• Transport/storage, max.	1080 hPa
Distributed operation	
• At SIMATIC S7-1500	Yes
• At Standard Profinet Controller	Yes
Dimensions	
• Width	35 mm
• Height	147 mm
• Depth	129 mm
Weights	
• Weight, approx.	325 g

Derating information for total current of outputs

If the digital outputs of the TM PosInput 2 are operated with inductive loads, you should derate the total current of the loads at the digital outputs of the respective channel. The total current is the sum of the load currents at all digital outputs of a channel (without encoder supply).

The following derating curve shows the load capacity of the digital outputs depending on the ambient temperature and mounting position under the following conditions:

- Maximum switching frequency at digital outputs of 0.5 Hz
- Load resistance: 48 Ω (IEC 947-5-1)
- Load inductance: 1150 mH (IEC 947-5-1)



① Vertical installation of the system
② Horizontal installation of the system

Figure 6-1 Total current depending on ambient temperature and mounting position for inductive loads

Note

If the switching frequency is greater than 0.5 Hz or there is greater inductance at the digital outputs, the total current must be reduced further.

Dimensional drawing

A

The dimensional drawing of the module on the mounting rail, as well as a dimensional drawing with open front panel, are provided in the appendix. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

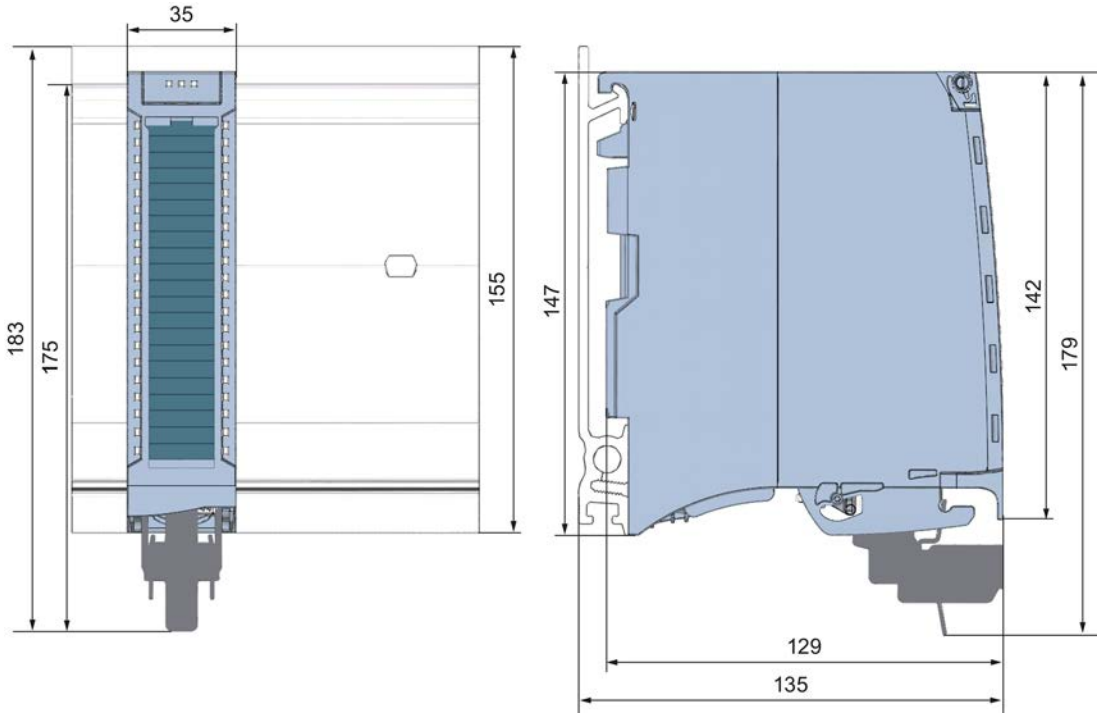


Figure A-1 Dimensional drawing of the TM PosInput 2 technology module

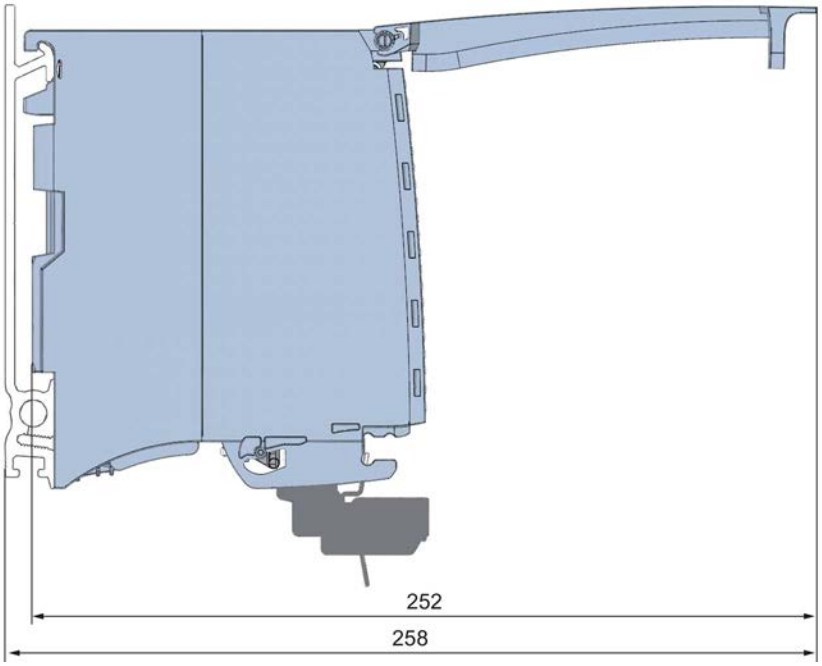


Figure A-2 Dimensional drawing of the TM PosInput 2 module, side view with open front panel

Parameter data records

B

You may edit the module parameters in RUN. The WRREC instruction is used to transfer the parameters to the module using data record 128.

If errors occur during the transfer of parameters with the WRREC instruction, the module continues operation with the previous parameter assignment. A corresponding error code is then written to the STATUS output parameter. If no errors occur, the STATUS output parameter contains the length of the actually transferred data.

The description of the WRREC instruction and the error codes is available in the STEP 7 (TIA Portal) Online Help.

Structure of the data record for central and distributed configuration with PROFINET

The following table shows you the structure of data record 128 for TM PosInput 2 with 2 channels. The values in byte 0 to byte 3 are fixed and may not be changed. The value in byte 4 can only be changed by means of new parameter assignment and not in RUN mode of the CPU.

Table B- 1 Parameter data record 128 for central and distributed configuration with PROFINET

Bit → Byte channel 0/1 ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0...3	**Header**							
0	Major Version = 0				Minor Version = 1			
1	Length of the parameter data per channel = 48							
2	Reserved[2)]							
3	Reserved[2)]							
4...51	**Channel 0**							
52...99	**Channel 1**							
4/52	**Operating mode**							
4/52	Reserved[2)]				Operating mode:			
					0000_B: Reserved			
					0001_B: Counting/Position input			
					0010_B: Measuring			
					0011 to 1111_B: Reserved			

Bit → / Byte channel 0/1 ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5/53	**Basic parameters**							
5/53	Interface standard:	Reserved[2]				Enable additional diagnostic interrupts[1]	Reaction to CPU STOP:	
							00_B: Output substitute value	
							01_B: Keep last value	
	00_B: RS422, symmetrical						10_B: Continue operation	
	01_B: TTL (5 V), asymmetrical						11_B: Reserved	
6...7/ 54...55	**Counter inputs** (parameters for incremental encoders and pulse encoders)							
6/54	Reserved[2]		Signal evaluation:		Signal type:			
			00_B: Single		0000_B: Pulse (A)			
			01_B: Double		0001_B: Pulse (A) and direction (B)			
			10_B: Quadruple		0010_B: Count up (A), count down (B)			
			11_B: Reserved		0011_B: Incremental encoder (A, B phase-shifted)			
					0100_B: Incremental encoder (A, B, N)			
					0101_B: Absolute encoder (SSI)			
					0110 to 1111_B: Reserved			
7/55	Reaction to signal N:		Invert direction[1]	Enable diagnostics interrupt at wire break[1]	Filter frequency:			
	00_B: No reaction to signal N				0000_B: 100 Hz			
	01_B: Synchronization at signal N				0001_B: 200 Hz			
	10_B: Capture at signal N				0010_B: 500 Hz			
	11_B: Reserved				0011_B: 1 kHz			
					0100_B: 2 kHz			
					0101_B: 5 kHz			
					0110_B: 10 kHz			
					0111_B: 20 kHz			
					1000_B: 50 kHz			
					1001_B: 100 kHz			
					1010_B: 200 kHz			
					1011_B: 500 kHz			
					1100_B: 1 MHz			
					1101 to 1111_B: Reserved			

Bit → Byte channel 0/1 ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
6...7/ 54...55	**Counter inputs** (parameters for SSI absolute encoder)							
6/54	Monoflop time:			Code type:	Signal type:			
	000_B: Automatically			0_B: Gray	0000_B: Pulse (A)			
	001_B: 16 µs			1_B: Dual	0001_B: Pulse (A) and direction (B)			
	010_B: 32 µs				0010_B: Count up (A), count down (B)			
	011_B: 48 µs				0011_B: Incremental encoder (A, B phase-shifted)			
	100_B: 64 µs				0100_B: Incremental encoder (A, B, N)			
	101 to 111_B: Reserved				0101_B: Absolute encoder (SSI)			
					0110 to 1111_B: Reserved			
7/55	Parity:		Invert direction[1]	Enable diagnostics interrupt at wire break[1]	Reserved[2]	Transmission rate:		
	00_B: None					000_B: 125 kHz		
	01_B: Even					001_B: 250 kHz		
	10_B: Odd					010_B: 500 kHz		
	11_B: Reserved					011_B: 1 MHz		
						100_B: 1.5 MHz		
						101_B: 2 MHz		
						110 to 111_B: Reserved		
8...9/ 56...57	**Hardware interrupts**[1]							
8/56	Reserved[2]	Reserved[2]	Reserved[2]	Change of direction	Underflow (low counting limit violated)	Overflow (high counting limit violated)	Gate stop[3]	Gate start[3]
9/57	Synchronization of the counter by an external signal[3]	New Capture value available	Reserved[2]	Zero pass	Reserved[2]	Comparison event for DQ1 has occurred	Reserved[2]	Comparison event for DQ0 has occurred

Bit → / Byte channel 0/1 ↓	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
10...15/ 58...63	**Behavior of a DQ**							
10/58	Set output (DQ1):				Set output (DQ0):			
	0000_B: Use by user program				0000_B: Use by user program			
	0001_B: Between comparison value and high counting limit; Measuring: Measured value >= comparison value				0001_B: Between comparison value and high counting limit; Measuring: Measured value >= comparison value			
	0010_B: Between comparison value and low counting limit; Measuring: Measured value <= comparison value				0010_B: Between comparison value and low counting limit; Measuring: Measured value <= comparison value			
	0011_B: At comparison value for a pulse duration				0011_B: At comparison value for a pulse duration			
	0100_B: Between comparison value 0 and 1				0100_B: Reserved			
	0101_B: After set command from CPU until comparison value				0101_B: After set command from CPU until comparison value			
	0110_B: Not between comparison value 0 and 1				0110 to 1111_B: Reserved			
	0111 to 1111_B: Reserved							
11/59	Count direction (DQ1):		Count direction (DQ0):		Reserved[2]	Reserved[2]	Substitute value for DQ1	Substitute value for DQ0
	00_B: Reserved		00_B: Reserved					
	01_B: Forward		01_B: Forward					
	10_B: Backward		10_B: Backward					
	11_B: In both directions		11_B: In both directions					
12/60	Pulse duration (DQ0):							
13/61	WORD: Value range in ms/10: 0 to 65535_D							
14/62	Pulse duration (DQ1):							
15/63	WORD: Value range in ms/10: 0 to 65535_D							
16/64	**Behavior of DI0**							
16/64	Behavior of counter value after Capture[3] (DI0):	Edge selection (DI0):		Select level (DI0):	Reserved[2]	Set function of DI (DI0):		
		00_B: Reserved				000_B: Gate start/stop (level-triggered)[3]		
		01_B: At rising edge		0_B: Active with high level		001_B: Gate start (edge-triggered)[3]		
		10_B: At falling edge				010_B: Gate stop (edge-triggered)[3]		
	0_B: Continue counting	11_B: At rising and falling edge		1_B: Active with low level		011_B: Synchronization[3]		
						100_B: Enable synchronization at signal N[3]		
	1_B: Set to start value and continue counting					101_B: Capture		
						110_B: Digital input without function		
						111_B: Reserved		

Bit → Byte channel 0/1 ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
17/65	**Behavior of DI1**: See Byte 16							
18/66	Reserved[2]							
19/67	Frequency:	Reserved[2]			Filter time:			
	0_B: Once				0000_B: None			
	1_B: Periodic				0001_B: 0.05 ms			
					0010_B: 0.1 ms			
					0011_B: 0.4 ms			
					0100_B: 0.8 ms			
					0101_B: 1.6 ms			
					0110_B: 3.2 ms			
					0111_B: 12.8 ms			
					1000_B: 20 ms			
					1001 to 1111_B: Reserved			
20...43/ 68...91	**Values**							
20...23/ 68...71	High counting limit[3]: DWORD: Value range: –2147483648 to 2147483647_D or 80000000 to $7FFFFFFF_H$							
24...27/ 72...75	Comparison value 0: Operating mode Counting: DWORD: Value range: –2147483648 to 2147483647_D or 80000000 to $7FFFFFFF_H$; Operating mode Measuring: REAL: Floating point number in the configured unit of the measured variable							
28...31/ 76...79	Comparison value 1: Operating mode Counting: DWORD: Value range: –2147483648 to 2147483647_D or 80000000 to $7FFFFFFF_H$; Operating mode Measuring: REAL: Floating point number in the configured unit of the measured variable							
32...35/ 80...83	Start value[3]: DWORD: Value range: –2147483648 to 2147483647_D or 80000000 to $7FFFFFFF_H$							
36...39/ 84...87	Low counting limit[3]: DWORD: Value range: –2147483648 to 2147483647_D or 80000000 to $7FFFFFFF_H$							
40...43/ 88...91	"Position input for Motion Control" mode: **Reference speed**: DWORD: Value range in 10^{-2} rpm: 600 to 21000000_D; Other mode: **Update time**: DWORD: Value range in µs: 0 to 25000000_D							
44/92	**Counter behavior at limits and gate start**							
44/92	Reaction to gate start[3]:		Reaction to violation of a counting limit[3]:			Reset when counting limit is violated[3]:		
	00_B: Set to start value		000_B: Stop counting			000_B: To other counting limit		
	01_B: Continue with current value		001_B: Continue counting			001_B: To start value		
	10 to 11_B: Reserved		010 to 111_B: Reserved			010 to 111_B: Reserved		

Bit → Byte channel 0/1 ↓	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
45/93	**Specify measured value**							
45/93	Reserved[2]			Time base for velocity measurement:			Measured variable:	
				000_B: 1 ms			00_B: Frequency	
				001_B: 10 ms			01_B: Period	
				010_B: 100 ms			10_B: Velocity	
				011_B: 1 s			11_B: Complete SSI frame	
				100_B: 60 s/1 min				
				101 to 111_B: Reserved				
46/94	Increments per unit:							
47/95	DWORD: Value range: 1 to 65535_D							
48/96	Set the hysteresis range: Value range: 0 to 255_D							
49...51/ 97...99	**Parameters for SSI absolute encoder**							
49/97	Reserved[2]		Frame length: Value range: 10 to 40_D					
50/98	Reserved[2]		Bit number LSB of the position value: Value range: 0 to 38_D					
51/99	Reserved[2]		Bit number MSB of the position value: Value range: 1 to 39_D					

1) You enable a specific parameter by setting the corresponding bit to 1.

2) Reserved bits must be set to 0

3) For signal type"Absolute encoder (SSI)": Reserved[2]