# Product overview

2

## 2.1 Properties

### Article number

6ES7552-1AA00-0AB0

### View of the module

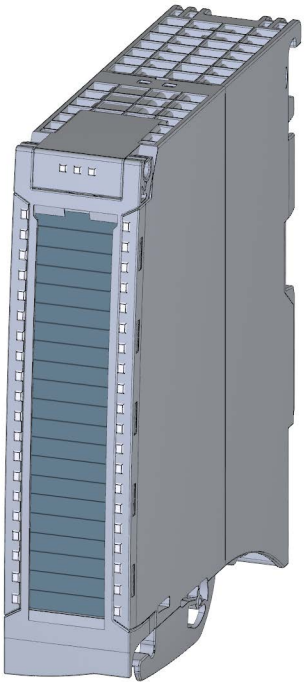


Figure 2-1 View of the TM Timer DIDQ 16x24V module

## Properties

The TM Timer DIDQ 16x24V technology module has the following properties:

- Technical properties
  - 16 digital inputs and outputs, electrically isolated in groups of 8
  - Various combinations of digital inputs and outputs can be configured:
    0 digital inputs and 16 digital outputs (for cam applications with numerous outputs)
    3 digital inputs and 13 digital outputs (for applications similar to FM 352 applications)
    4 digital inputs and 12 digital outputs (for flexible mixed operation)
    8 digital inputs and 8 digital outputs (for probe and incremental encoder)
  - Rated output voltage 24V DC
  - Rated output current 0.5 A or 0.1 A (high-speed operation) per digital output
  - 24 V encoder supply output, short-circuit proof
  - Configurable substitute values (per digital output)
  - Two supply voltages L+
  - Configurable diagnostics
  - Configurable input filters for suppression of interference at digital inputs
- Supported encoder/signal types for digital inputs
  - 24 V incremental encoder with A and B signals
  - 24 V pulse encoder with one signal
- Supported functions
  - Time stamp function for inputs and outputs (resolution 1 µs)
  - Counting (counting range 32-bit)
  - Oversampling for inputs and outputs
  - Pulse width modulation
- Supported system 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
- 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 Detection of the input signals

You can configure up to eight digital inputs for the technology module. You can evaluate the signals at the digital inputs for the following functions:

### Time stamp detection (Timer DI)

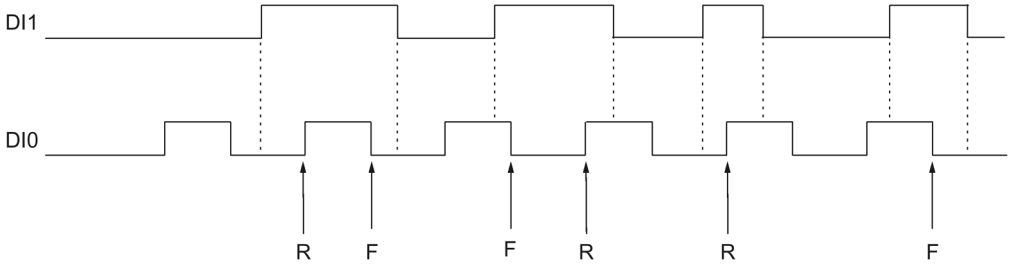
The technology module can detect an associated time stamp for an edge at a digital input. The time stamp indicates when the edge was detected in relation to a time base. These time stamps can be used, for example, to calculate a time difference.

The time stamp is based on the "Time-based IO" technology supported by the technology module and requires isochronous mode.

#### Hardware enable (HW enable)

You can configure a hardware enable by a digital input for the detection of time stamps. A hardware enable defines the time window in which the time stamps are acquired. You can override the hardware enable via the control interface (Page 33) with the respective SETEN bit.

The figure below shows an example for the detection of time stamps at rising and falling edges with enable of the DI0 through the high level of the DI1:




R Associated time stamp detected at rising DI0-edge

F Associated time stamp detected at falling DI0 edge

### Counting

Counting refers to the recording and adding up of events. You can configure up to four counters for the technology module. You can use incremental encoders and pulse encoders at the digital inputs. The two phase-shifted signals from an incremental encoder are evaluated four times. Only the rising or falling edges are counted with the signal of a pulse encoder.

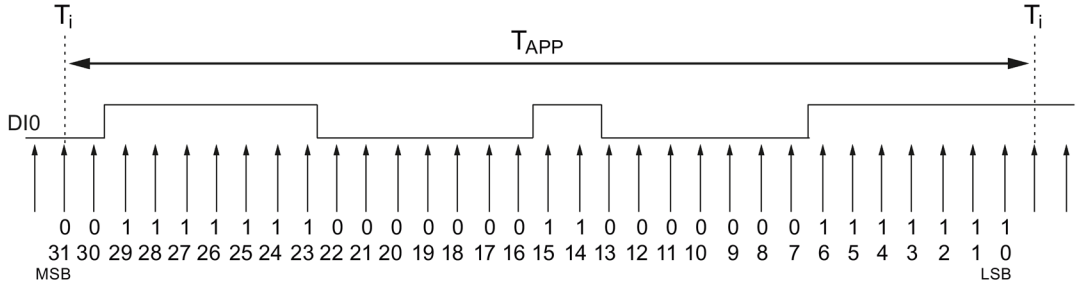
A counter starts at 0, goes up to $2^{32}$-1 and starts again at 0 (overflow). The technology module can also count down if an incremental encoder is used. The counter value is returned in the feedback interface (Page 37) as a 32-bit value for each digital input.

## Oversampling

The Oversampling function is used by the technology module to detect the status of the respective digital input for each application cycle (for example, OB61) at 32 points in time at regular intervals. The 32 states are returned together in the feedback interface (Page 37) as a 32-bit value.

Oversampling requires isochronous mode. If the OB of the type "Synchronous Cycle" works with a clock different than the send clock, you must use the TIO_SYNC instruction.

The figure below shows an example for Oversampling of DI0:




$T_{APP}$ Application cycle
MSB Most significant bit
LSB Least significant bit

## 2.2.2 Switching the outputs

You can configure up to 16 digital outputs for the technology module. You can configure the following functions for switching the digital outputs:

### Time-controlled switching (Timer DQ)

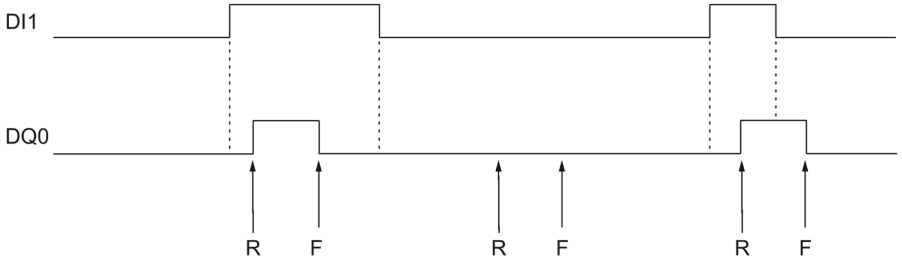
The use of time stamps enables reproducibility of controlled operations with very accurate time. Using this function, the technology module outputs edges at the respective digital output at precisely defined points in time. For example, you can implement a defined reaction time between input and output in conjunction with a digital input.

The Timer function is based on Time-based IO and requires isochronous mode.

#### Hardware enable (HW enable)

You can configure a hardware enable by means of a digital input for a Timer digital output. A hardware enable defines the time window in which the respective digital output can be set. The resetting of the digital output is independent of the hardware enable. You can override the hardware enable via the control interface (Page 33) with the respective SETEN bit.

The figure below shows an example for the output of rising and falling edges with enable of the DQ0 through the high level of the DI1:




R Specified time of a rising DQ0-edge

F Specified time of a falling DQ0-edge

## Pulse width modulation (PWM)

The Pulse width modulation function enables you to specify the time period in the hardware configuration and the pulse-pause ratio in the control interface (Page 33) for the respective digital output. The setpoint for the pulse-pause ratio is a percentage and is evaluated with an accuracy of about 3%.

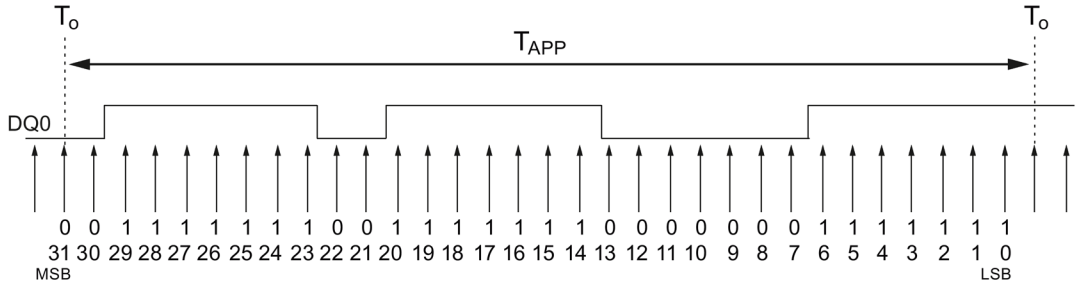
## Oversampling

The Oversampling function is used by the technology module to output 32 states at regular intervals for each application cycle (for example, OB61). This allows up to 32 edges at the respective digital output per application cycle.

The 32 states are sent via the control interface (Page 33) as a 32-bit string for the respective digital output to the technology module.

Oversampling requires isochronous mode. If the OB of the type "Synchronous Cycle" works with a clock different than the send clock, you must use the TIO_SYNC instruction.

The figure below shows an example for Oversampling of DQ0:




$T_{APP}$ Application cycle
MSB Most significant bit
LSB Least significant bit

### Note

When you use the Oversampling function, make sure that the combination of application cycle and the 32-bit output sequence do not result in an output frequency which exceeds the maximum switching frequency for the digital outputs.

## 2.2.3 Additional functions

### Isochronous mode

The technology module supports the system function "isochronous mode" in distributed mode on PROFINET. This system function is required for the following functions of the technology module:

- Time stamp detection (Timer DI)
- Time-controlled switching (Timer DQ)
- Oversampling of digital input
- Oversampling of digital output

In isochronous mode, the cycle of the user program, the transmission of the input signals and processing in the technology module are synchronized.

#### Data processing

The time stamp, counter values and Oversampling bit string as well as status bits are detected at the time $T_i$ and made available in the feedback interface for retrieval in the current bus cycle. The output of the current Oversampling bit stings is started at the time $T_o$.

### Diagnostic interrupt

The technology module can trigger a diagnostic interrupt (Page 44), among other things, if no supply voltage is available or if there is an error at the digital outputs.

### Input filter

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

### 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

### Centralized application

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

# Connecting

# 3

## 3.1 Pin assignment

You connect the encoder signals, digital input and digital output signals, encoder supplies and the supply voltage to the 40-pin front connector of the technology module to supply the module and the digital outputs.

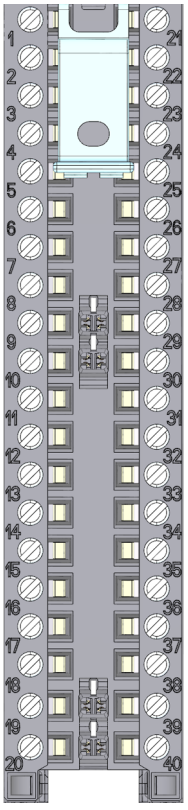
Information on wiring the front connector, creating the cable shield, etc. is available in the ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) system manual and in the Connecting section of the S7-1500 Automation System (http://support.automation.siemens.com/WW/view/en/59191792)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

### Pin assignment for the front connector

The pin assignment of the front connector depends on the channel configuration of the TM Timer DIDQ 16x24V.

The following table shows the pin assignment of the front connector for channel configuration "0 inputs, 16 outputs".

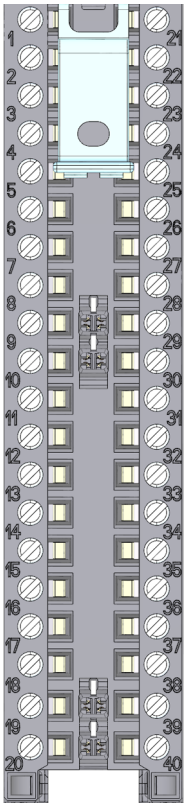
Table 3- 1 Pin assignment of the front connector , channel configuration "0 inputs, 16 outputs"

| Designation | Signal name | | View | Signal name | | Designation |
|---|---|---|---|---|---|---|
| — | — | 1 |  | 21 | DQ0 | Digital output DQ0 |
| | | 2 | | 22 | DQ1 | Digital output DQ1 |
| | | 3 | | 23 | DQ2 | Digital output DQ2 |
| | | 4 | | 24 | DQ3 | Digital output DQ3 |
| | | 5 | | 25 | DQ4 | Digital output DQ4 |
| | | 6 | | 26 | DQ5 | Digital output DQ5 |
| | | 7 | | 27 | DQ6 | Digital output DQ6 |
| | | 8 | | 28 | DQ7 | Digital output DQ7 |
| | | 9 | | 29 | — | — |
| Ground for digital outputs DQ0 to DQ7 | 1M | 10 | | 30 | | |
| | 1M | 11 | | 31 | DQ8 | Digital output DQ8 |
| | 1M | 12 | | 32 | DQ9 | Digital output DQ9 |
| | 1M | 13 | | 33 | DQ10 | Digital output DQ10 |
| | 1M | 14 | | 34 | DQ11 | Digital output DQ11 |
| | 1M | 15 | | 35 | DQ12 | Digital output DQ12 |
| | 1M | 16 | | 36 | DQ13 | Digital output DQ13 |
| | 1M | 17 | | 37 | DQ14 | Digital output DQ14 |
| | 1M | 18 | | 38 | DQ15 | Digital output DQ15 |
| Supply voltage DC 24 V for digital outputs DQ0 to DQ7* | 1L+ | 19 | | 39 | 2L+ | Supply voltage DC 24 V for digital outputs DQ8 to DQ15* |
| Ground for supply voltage 1L+ | 1M | 20 | | 40 | 2M | Ground for supply voltage 2L+ |

* If you would like to supply both load groups with a shared voltage, insert the potential jumpers between terminals 19 and 39 as well as 20 and 40.

The following table shows the pin assignment of the front connector for channel configuration "3 inputs, 13 outputs".

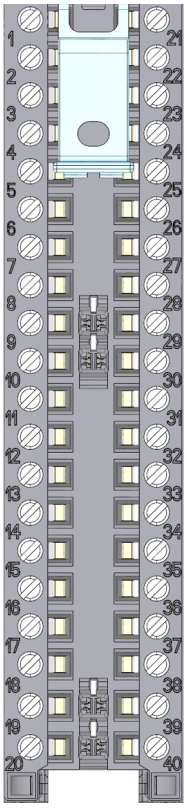
Table 3- 2 Pin assignment of the front connector , channel configuration "3 inputs, 13 outputs"

| Designation | Signal name | | View | Signal name | | Designation |
|---|---|---|---|---|---|---|
| Digital input DI0 | DI0 | 1 |  | 21 | DQ0 | Encoder supply 24 V for DI0 |
| Digital input DI1 | DI1 | 2 | | 22 | DQ1 | Encoder supply 24 V for DI1 |
| — | — | 3 | | 23 | DQ2 | Digital output DQ2 |
| Digital input DI3 | DI3 | 4 | | 24 | DQ3 | Encoder supply 24 V for DI3 |
| — | — | 5 | | 25 | DQ4 | Digital output DQ4 |
| | | 6 | | 26 | DQ5 | Digital output DQ5 |
| | | 7 | | 27 | DQ6 | Digital output DQ6 |
| | | 8 | | 28 | DQ7 | Digital output DQ7 |
| | | 9 | | 29 | — | — |
| Ground for encoder supply, digital inputs DI0, DI1 and DI3 and digital outputs DQ2 and DQ4 to DQ7 | 1M | 10 | | 30 | | |
| | 1M | 11 | | 31 | DQ8 | Digital output DQ8 |
| | 1M | 12 | | 32 | DQ9 | Digital output DQ9 |
| | 1M | 13 | | 33 | DQ10 | Digital output DQ10 |
| | 1M | 14 | | 34 | DQ11 | Digital output DQ11 |
| | 1M | 15 | | 35 | DQ12 | Digital output DQ12 |
| | 1M | 16 | | 36 | DQ13 | Digital output DQ13 |
| | 1M | 17 | | 37 | DQ14 | Digital output DQ14 |
| | 1M | 18 | | 38 | DQ15 | Digital output DQ15 |
| Supply voltage DC 24 V for digital inputs DI0, DI1 and DI3 and digital outputs DQ2 and DQ4 to DQ7* | 1L+ | 19 | | 39 | 2L+ | Supply voltage DC 24 V for digital outputs DQ8 to DQ15* |
| Ground for supply voltage 1L+ | 1M | 20 | | 40 | 2M | Ground for supply voltage 2L+ |

* If you would like to supply both load groups with a shared voltage, insert the potential jumpers between terminals 19 and 39 as well as 20 and 40.

The following table shows the pin assignment of the front connector for channel configuration "4 inputs, 12 outputs".

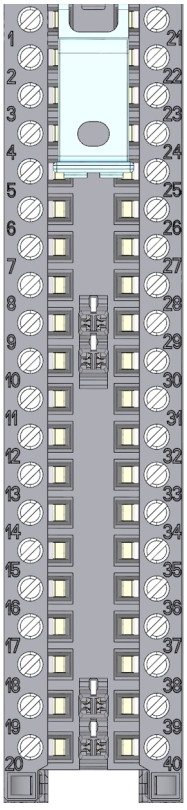
Table 3- 3 Pin assignment of the front connector , channel configuration "4 inputs, 12 outputs"

| Designation | Signal name | | View | Signal name | | Designation |
|---|---|---|---|---|---|---|
| — | — | 1 |  | 21 | DQ0 | Digital output DQ0 |
| Digital input DI1 | DI1 | 2 | | 22 | DQ1 | Encoder supply 24 V for DI1 |
| — | — | 3 | | 23 | DQ2 | Digital output DQ2 |
| Digital input DI3 | DI3 | 4 | | 24 | DQ3 | Encoder supply 24 V for DI3 |
| — | — | 5 | | 25 | DQ4 | Digital output DQ4 |
| Digital input DI5 | DI5 | 6 | | 26 | DQ5 | Encoder supply 24 V for DI5 |
| — | — | 7 | | 27 | DQ6 | Digital output DQ6 |
| Digital input DI7 | DI7 | 8 | | 28 | DQ7 | Encoder supply 24 V for DI7 |
| — | — | 9 | | 29 | — | — |
| Ground for encoder supply, digital inputs DI1, DI3, DI5 and DI7 and digital outputs DQ0, DQ2, DQ4 and DQ6 | 1M | 10 | | 30 | | |
| | 1M | 11 | | 31 | DQ8 | Digital output DQ8 |
| | 1M | 12 | | 32 | DQ9 | Digital output DQ9 |
| | 1M | 13 | | 33 | DQ10 | Digital output DQ10 |
| | 1M | 14 | | 34 | DQ11 | Digital output DQ11 |
| | 1M | 15 | | 35 | DQ12 | Digital output DQ12 |
| | 1M | 16 | | 36 | DQ13 | Digital output DQ13 |
| | 1M | 17 | | 37 | DQ14 | Digital output DQ14 |
| | 1M | 18 | | 38 | DQ15 | Digital output DQ15 |
| Supply voltage DC 24 V for digital inputs DI1, DI3, DI5 and DI7 and digital outputsDQ0, DQ2, DQ4 and DQ6* | 1L+ | 19 | | 39 | 2L+ | Supply voltage DC 24 V for digital outputs DQ8 to DQ15* |
| Ground for supply voltage 1L+ | 1M | 20 | | 40 | 2M | Ground for supply voltage 2L+ |

* If you would like to supply both load groups with a shared voltage, insert the potential jumpers between terminals 19 and 39 as well as 20 and 40.

The following table shows the pin assignment of the front connector for channel configuration "8 inputs, 8 outputs".

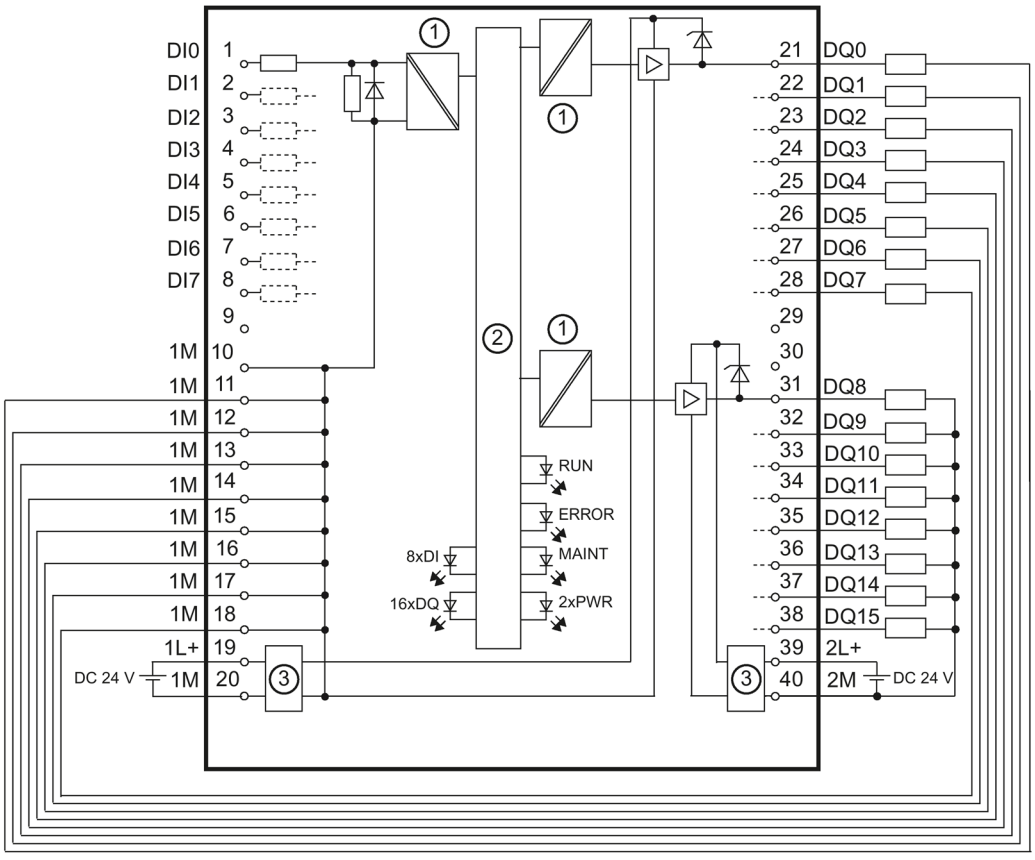
Table 3- 4 Pin assignment of the front connector , channel configuration "8 inputs, 8 outputs"

| Designation | Signal name | | View | Signal name | | Designation |
|---|---|---|---|---|---|---|
| Digital input DI0 | DI0 | 1 |  | 21 | DQ0 | Encoder supply 24 V for DI0 |
| Digital input DI1 | DI1 | 2 | | 22 | DQ1 | Encoder supply 24 V for DI1 |
| Digital input DI2 | DI2 | 3 | | 23 | DQ2 | Encoder supply 24 V for DI2 |
| Digital input DI3 | DI3 | 4 | | 24 | DQ3 | Encoder supply 24 V for DI3 |
| Digital input DI4 | DI4 | 5 | | 25 | DQ4 | Encoder supply 24 V for DI4 |
| Digital input DI5 | DI5 | 6 | | 26 | DQ5 | Encoder supply 24 V for DI5 |
| Digital input DI6 | DI6 | 7 | | 27 | DQ6 | Encoder supply 24 V for DI6 |
| Digital input DI7 | DI7 | 8 | | 28 | DQ7 | Encoder supply 24 V for DI7 |
| — | — | 9 | | 29 | — | — |
| Ground for encoder supply and digital inputs DI0 to DI7 | 1M | 10 | | 30 | | |
| | 1M | 11 | | 31 | DQ8 | Digital output DQ8 |
| | 1M | 12 | | 32 | DQ9 | Digital output DQ9 |
| | 1M | 13 | | 33 | DQ10 | Digital output DQ10 |
| | 1M | 14 | | 34 | DQ11 | Digital output DQ11 |
| | 1M | 15 | | 35 | DQ12 | Digital output DQ12 |
| | 1M | 16 | | 36 | DQ13 | Digital output DQ13 |
| | 1M | 17 | | 37 | DQ14 | Digital output DQ14 |
| | 1M | 18 | | 38 | DQ15 | Digital output DQ15 |
| Supply voltage DC 24 V for digital inputs DI0 to DI7* | 1L+ | 19 | | 39 | 2L+ | Supply voltage DC 24 V for digital outputs DQ8 to DQ15* |
| Ground for supply voltage 1L+ | 1M | 20 | | 40 | 2M | Ground for supply voltage 2L+ |

* If you would like to supply both load groups with a shared voltage, insert the potential jumpers between terminals 19 and 39 as well as 20 and 40.

## Block diagram

The figure below shows the block diagram of the technology module for the use of all 16 digital outputs.

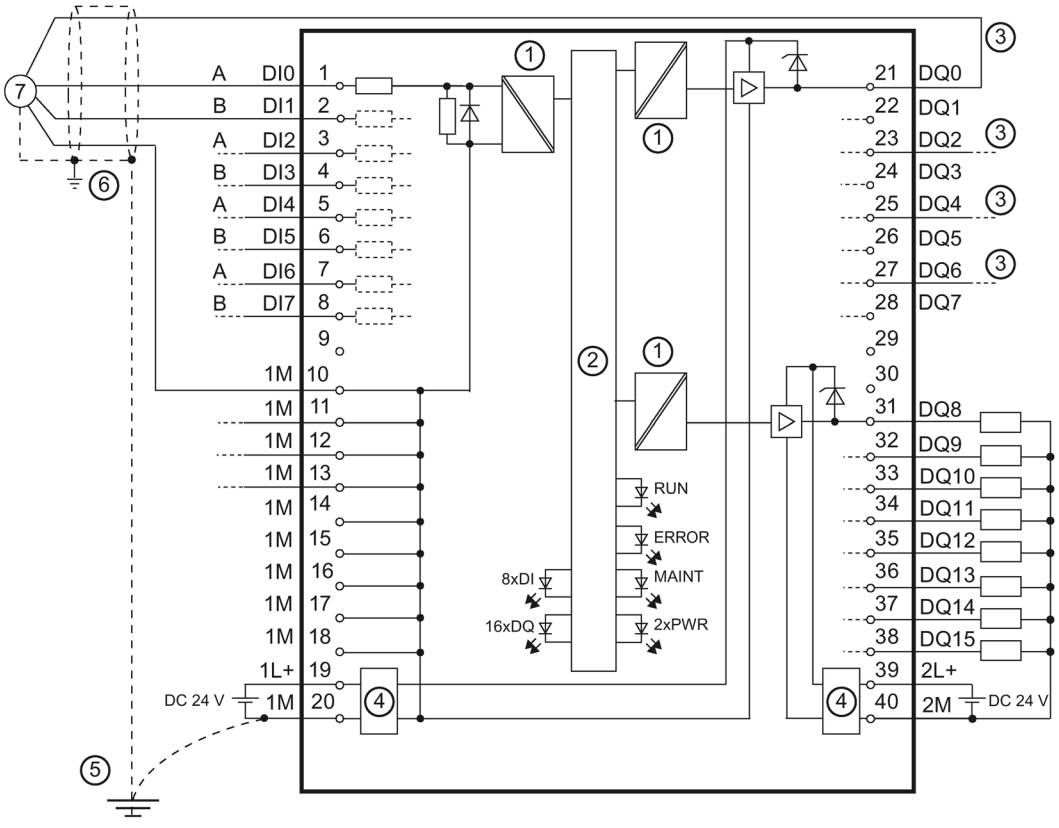



① Electrical isolation
② Technology and backplane bus interface
③ Input filter for supply voltage

Figure 3-1 Block diagram for use of 16 digital outputs

When you connect the encoder you must, depending on the configured input delay and potential effect of interference, ground the shields of the cables between encoder and technology module both through the shield connection element at the front connector (shield bracket and terminal) and at the encoder.

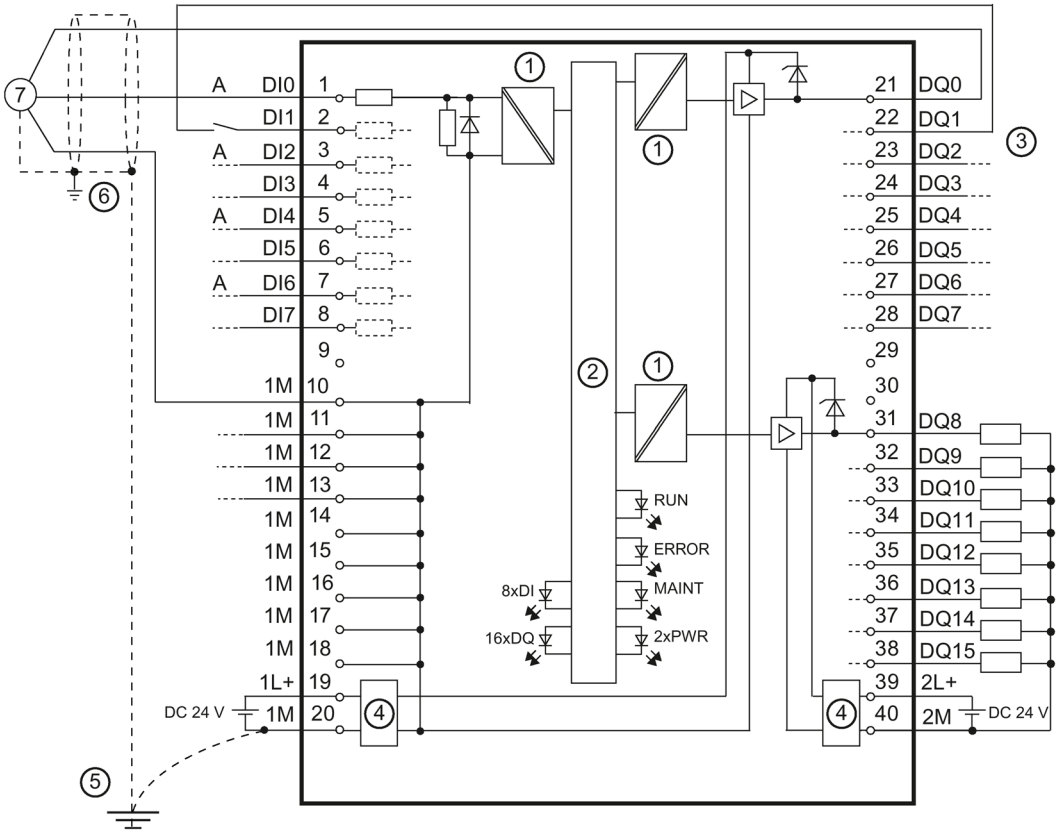
The figure below shows the block diagram of the technology module with four connected incremental encoders.




① Electrical isolation
② Technology and backplane bus interface
③ 24 V supply for respective incremental encoder
④ Input filter for supply voltage
⑤ Equipotential bonding
⑥ Shield support at the front connector
⑦ Incremental encoder with A and B signals

Figure 3-2 Block diagram with incremental encoders

The following figure shows the block diagram of the technology module to which four pulse encoders and four sensors are connected.




① Electrical isolation
② Technology and backplane bus interface
③ 24 V supplies for pulse encoders and sensors
④ Input filter for supply voltage
⑤ Equipotential bonding
⑥ Shield support at the front connector
⑦ Pulse encoder with signal A

Figure 3-3 Block diagram with pulse encoders and sensors

**Note**

If you want to use Timer digital inputs and high-speed outputs at the same time, you should minimize the effects of interference by electrically isolating the supply to the inputs and outputs via the terminal pairs 19 and 20 and 39 and 40.

## Supply voltage

The digital inputs and outputs of the technology module are divided into two load groups that are supplied with DC 24 V. The digital inputs DI0 to DI7 and digital outputs DQ0 to DQ7 are supplied via the 1L+ and 1M connections. The digital outputs DQ8 to DQ15 are supplied via the 2L+ and 2M connections.

You can supply both load groups electrically isolated or non-isolated. If you want to supply both load groups with the same potential (non-isolated), use potential jumpers to loop-through the supply voltage from the load group already supplied to another load group.

The technology module monitors the supply voltage connections. When a load group is not supplied, the lack of supply voltage generates a diagnostic interrupt (Page 45). If you want to prevent this reaction when using only *one* load group, insert the potential jumpers.

An internal protective circuit protects the technology module against damage due to reversed polarity of the supply voltage. Unexpected conditions can occur at the digital outputs with reversed polarity of the supply voltage.

**Note**

Note that a maximum current load of 8 A per potential jumper must not be exceeded.

## Digital inputs DI0 to DI7

You can use three, four or eight digital inputs, whereby the number of digital outputs that can be used is reduced accordingly. The technology module can evaluate the edges at the digital inputs for the following functions:

Table 3- 5 Evaluation of the signals at the digital inputs

| Evaluation of the signals for ... | Usable digital inputs | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | DI0 | DI1 | DI2 | DI3 | DI4 | DI5 | DI6 | DI7 |
| Time stamp detection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Hardware enable for time stamp detection | — | ✓ | — | ✓ | — | ✓ | — | ✓ |
| Hardware enable for time-controlled switching | — | ✓ | — | ✓ | — | ✓ | — | ✓ |
| Counting with incremental encoder with signals A and B | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Counting with pulse encoder with signal A | ✓ | — | ✓ | — | ✓ | — | ✓ | — |
| Oversampling | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

When you use the counting function, you can connect the following encoder types with 24 V signals to the digital inputs:

- Incremental encoder with signals A and B:

  Signals A and B are each connected via the connections of the digital input pairs DI0/DI1, DI2/DI3, DI4/DI5 and DI6/DI7. Signals A and B are the two incremental signals phase-shifted by 90°.

- Pulse encoder / sensor with signal A:

  Signal A is connected via the connection of the digital input DI0, DI2, DI4 or DI6.

The digital inputs are not electrically isolated from each other or from the digital outputs DQ0 to DQ7. The digital inputs are electrically isolated from the digital outputs DQ8 to DQ15 and the backplane bus.

## Input filters for digital inputs

You can configure an input filter for each digital input to suppress interference. Signals with a pulse duration below the configured input delay are suppressed.

You can specify the following values for the input delay:

- None
  (input delay of 4 µs, minimum pulse width of 3 µs)
- 0.05 ms
- 0.1 ms (default)
- 0.4 ms
- 0.8 ms

The input delay has the following effect on the functions of the signal evaluation at the digital inputs:

Table 3- 6 Influence of the input delay

| Function | Influence of the input delay |
|---|---|
| Time stamp detection | The detected time stamp is moved by the input delay. |
| Counting | The counter value that was valid at time $T_i$ minus the input delay is returned. |
| Oversampling | The detected states are moved together by the input delay. |

**Note**

If you select the "None" or "0.05 ms" option, you have to use shielded cables for connection of the digital inputs. To increase the accuracy of the time stamp function, we recommend the use of shielded cables even for longer input delays. The use of shielded cables limits the jitter to maximum of 1 µs.

## Encoder supply

When you use the digital inputs, you can connect incremental encoders and pulse encoders. The terminal opposite the digital input provides the respective DC 24 V supply voltage with reference to 1M and a rated load current of 0.5 A to supply an encoder. The voltage is fed from the 1L+/1M supply voltage and monitored for short-circuit and overload.

**Note**

Note that a total current of 1.2 A for all encoder supplies must not be exceeded.

**Note**

The outputs of the technology module are disabled during its startup. As a result. the encoder supply can be disabled briefly after an interruption of the PROFINET connection of the associated system.

## Digital outputs DQ0 to DQ15

You can use 8, 12, 13 or 16 digital outputs, whereby the number of digital inputs that can be used is reduced accordingly. The digital outputs can be switched directly at defined points in time or via the user program. Alternatively, you can output pulse width modulation or Oversampling at the respective digital output.

The digital outputs DQ0 to DQ7 are electrically isolated from the digital outputs DQ8 to DQ15 and the backplane bus, but not from the digital inputs. The digital outputs DQ8 to DQ15 are electrically isolated from the digital outputs DQ0 to DQ7; the digital inputs are electrically isolated from the backplane bus.

You can use each of the digital outputs as a high-speed output or as a sourcing output:

- High-speed output (default):
  The digital output works as fast push-pull switch and can carry a rated load current of 0.1 A. A push-pull switch is alternately switched to DC 24 V and ground. This makes for very steep edges.
- Sourcing output:
  The digital output works as 24 V sourcing output in reference to M and can carry a rated load current of 0.5 A.

The digital outputs are protected from overload and short-circuit.

| NOTICE |
| --- |
| **Overtemperature from unsuitable loads**<br>A high-speed output generates edges that are very steep. This creates very powerful charge reversals for the connected load, which can overheat the load at very high switching frequencies.<br>The connected load must therefore be approved for high input frequencies. |

**Note**

If you use a digital output as sourcing output, the switch-off response / switch-off edge depends on the load. Thus, it is possible that very short pulses cannot be output correctly.

**Note**

Relays and contactors can be connected direct without external circuitry.

# Technical specifications

# 6

| | 6ES7552-1AA00-0AB0 |
|---|---|
| Product type designation | TM Timer DIDQ 16x24V |
| **General information** | |
| **Product function** | |
| I&M data | Yes; I&M 0 |
| **Engineering with** | |
| STEP 7 TIA Portal can be configured/integrated as of version | V13 Update 3 |
| **Installation type/mounting** | |
| Rail mounting possible | Yes; S7-1500 mounting rail |
| **Supply voltage** | |
| **Load voltage 1L+** | |
| 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; against destruction |
| **Load voltage 2L+** | |
| 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; against destruction |
| **Input current** | |
| from load voltage 1L+ (no load), max. | 40 mA; without load |
| from load voltage 2L+ (no load), max. | 30 mA; without load |
| **Encoder supply** | |
| Number of outputs | 8; max. depending on parameter assignment |
| **24 V encoder supply** | |
| 24 V | Yes; L+ (-0.8 V) |
| Short-circuit protection | Yes |
| Output current, max. | 1.2 A; total current of all encoders / channels, max. 0.5 A per output |
| **Power** | |
| Power from the backplane bus | 1.3 W |
| **Power loss** | |
| Power loss, typ. | 5 W |

| | 6ES7552-1AA00-0AB0 |
|---|---|
| **Address area** | |
| **Occupied address area** | |
| Inputs | 44 bytes |
| Outputs | 74 bytes |
| **Digital inputs** | |
| Number of inputs | 8; max. depending on parameter assignment |
| • In groups of | 8 |
| Digital inputs, configurable | Yes |
| Input characteristics to IEC 61131, Type 3 | Yes |
| **Digital input functions, configurable** | |
| Digital input with time stamp | Yes |
| • Number, max. | 8 |
| Counter | Yes |
| • Number, max. | 4 |
| Counter for incremental encoder | Yes |
| • Number, max. | 4 |
| Digital input with oversampling | Yes |
| • Number, max. | 8 |
| Hardware enable for digital input | Yes |
| • Number, max. | 4 |
| Hardware enable for digital output | Yes |
| • Number, max. | 4 |
| **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, min. | -30 V |
| Permitted voltage at input, max. | 30 V |
| **Input current** | |
| for signal "1", typ. | 2.5 mA |
| **Input delay (at rated value of input voltage)** | |
| Minimum pulse width for program reaction | 3 µs; with parameter assignment "none" |
| For standard inputs | |
| • Configurable | Yes; none / 0.05 / 0.1 / 0.4 / 0.8 ms) |
| • at "0" to "1", min. | 4 µs; with parameter assignment "none" |
| • at "1" to "0", min. | 4 µs; with parameter assignment "none" |

| | 6ES7552-1AA00-0AB0 |
|---|---|
| **Cable length** | |
| Cable length shielded, max. | 1000 m; depending on sensor, cable quality and edge slope |
| Cable length unshielded, max. | 600 m; depending on sensor, cable quality and edge slope |
| **Digital outputs** | |
| Type of digital output | Transistor |
| Number of outputs | 16; max. depending on parameter assignment |
| • In groups of | 8 |
| M switching | Yes; with high-speed output |
| Sourcing | Yes |
| Digital outputs, configurable | Yes |
| Short-circuit protection | Yes; electronic/thermal |
| • Response threshold, typ. | 1.7 A with standard output; 0.5 A with high-speed output |
| Limiting of inductive shutdown voltage to | -0.8 V |
| Control of a digital input | Yes |
| **Digital output functions, configurable** | |
| Digital output with time stamp | Yes |
| • Number, max. | 16 |
| PWM output | Yes |
| • Number, max. | 16 |
| Digital output with oversampling | Yes |
| • Number, max. | 16 |
| **Output switching capacity** | |
| With resistive load, max. | 0.5 A; 0.1 A with high-speed output |
| With lamp load, max. | 5 W; 1 W with high-speed output |
| **Load resistance range** | |
| Low limit | 48 Ω; 240 Ohm with high-speed output |
| High limit | 12 kΩ |
| **Output voltage** | |
| Type of output voltage | DC |
| for signal "0", max. | 1 V; with high-speed output |
| for signal "1", min. | 23.2 V; L+ (-0.8 V) |
| **Output current** | |
| for signal "1" rated value | 0.5 A; 0.1 A with high-speed output, note derating |
| for signal "1" permissible range, max. | 0.6 A; 0.12 A with high-speed output, note derating |
| for signal "1" minimum load current | 2 mA |
| for signal "0" residual current, max. | 0.5 mA |

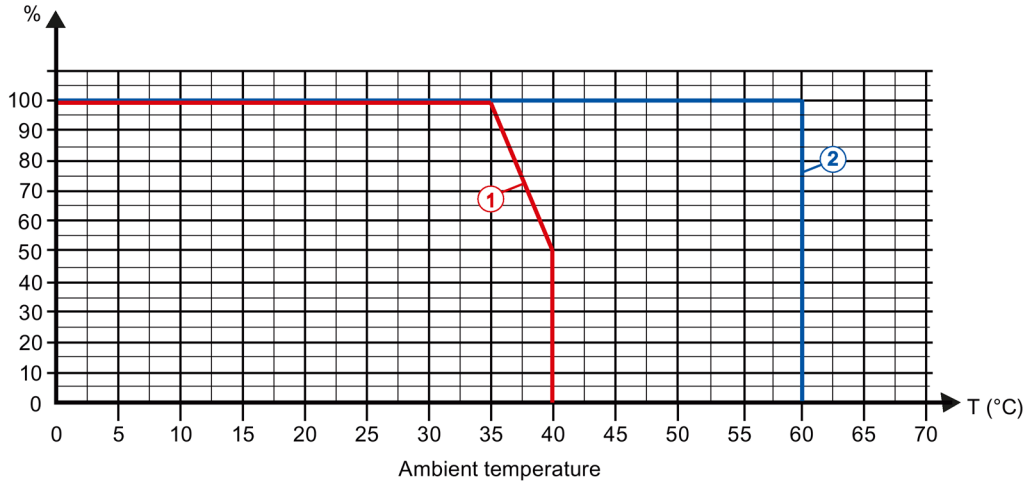
| | 6ES7552-1AA00-0AB0 |
|---|---|
| **Output delay with resistive load** | |
| "0" to "1", max. | 1 µs; for high-speed output, 5 µs with standard output |
| "1" to "0", max. | 1 µs; for high-speed output, 6 µs with standard output |
| **Switching frequency** | |
| With resistive load, max. | 10 kHz |
| With lamp load, max. | 10 Hz |
| **Total current of outputs** | |
| Max. current per group | 4 A |
| Max. current per module | 8 A; note derating |
| **Cable length** | |
| Cable length shielded, max. | 1000 m; depending on load and cable quality |
| Cable length unshielded, max. | 600 m; depending on load and cable quality |
| **Encoders** | |
| **Supported encoders** | |
| Incremental encoder (asymmetric) | Yes |
| 24 V initiator | Yes |
| 2-wire sensor | Yes |
| • Permitted quiescent current (2-wire sensor), max. | 1.5 mA |
| **Encoder signals, incremental encoders (asymmetrical)** | |
| Input voltage | 24 V |
| Input frequency, max. | 50 kHz |
| Counting frequency, max. | 200 kHz; with quadruple evaluation |
| Cable length shielded, max. | 600 m; depends on input frequency, encoder and cable quality; max. 200 m with 50 kHz |
| Incremental encoder with A/B tracks, phase-shifted by 90° | Yes |
| Pulse encoder | Yes |
| 24 V encoder signal | |
| • Permitted voltage at input, min. | -30 V |
| • Permitted voltage at input, max. | 30 V |
| **Interface hardware** | |
| Input characteristics to IEC 61131, Type 3 | Yes |
| **Isochronous mode** | |
| Isochronous mode (application synchronized until terminal) | Yes |
| Bus cycle time (TDP), min. | 250 µs |
| Jitter, max. | 1 µs |

| | 6ES7552-1AA00-0AB0 |
|---|---|
| **Interrupts/diagnostics/status information** | |
| Activation of substitute values | Yes |
| **Interrupts** | |
| Diagnostic interrupt | Yes |
| **Diagnostic alarms** | |
| Diagnostics | Yes |
| Monitoring of supply voltage | Yes |
| Short-circuit | Yes |
| **LED diagnostics display** | |
| RUN LED | Yes; green LED |
| ERROR LED | Yes; red LED |
| MAINT LED | Yes; yellow LED |
| Monitoring of supply voltage (PWR LED) | Yes; green LED |
| Channel status display | Yes; green LED |
| For channel diagnostics | Yes; red LED |
| **Integrated functions** | |
| Number of counters | 4 |
| Counting frequency (counters), max. | 200 kHz; with quadruple evaluation |
| **Counting functions** | |
| Continuous counting | Yes |
| **Electrical isolation** | |
| **Electrical isolation channels** | |
| Between the channels and the backplane bus | Yes |
| **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 |
| Vertical installation, min. | 0 °C |
| Vertical installation, max. | 40 °C; note derating |
| **Distributed operation** | |
| At SIMATIC S7-1500 | Yes |
| **Dimensions** | |
| Width | 35 mm |
| Height | 147 mm |
| Depth | 129 mm |
| **Weights** | |
| Weight, approx. | 320 g |

## Derating information for standardized total current of outputs

If the digital outputs of the TM Timer DIDQ 16x24V are operated with resistive loads, you should derate the standardized total current of the loads at the digital outputs for each load group of the technology module. The standardized total current is the standardized total of the mean output currents at all digital outputs and encoder supplies related to its nominal current in each case.

You should derate only if the system is mounted vertically. The following derating curve shows the load capacity of the digital outputs for each load group depending on the ambient temperature and mounting position:




① Vertical installation of the system

② Horizontal installation of the system

Figure 6-1 Standardized total current for each load group depending on ambient temperature and mounting position for resistive loads

### Example

The following table shows the calculation of the standardized total current for each load group for the channel configuration "3 inputs, 13 outputs":

Table 6- 1 Calculation of the standardized total current (1L+)

| Load group of the supply voltage 1L+ | | | | | |
|---|---|---|---|---|---|
| Digital output | Use as encoder supply | High-speed output (0.1 A) | Output current | | |
| | | | Nominal value according to parameter assignment | Mean value | Mean value in relation to the nominal value |
| DQ0 | Yes | — | 0.5 A | 0.3 A | 60 % |
| DQ1 | Yes | — | 0.5 A | 0.4 A | 80 % |
| DQ2 | No | No | 0.5 A | 0.5 A | 100 % |
| DQ3 | Yes | — | 0.5 A | 0.4 A | 80 % |
| DQ4 | No | Yes | 0.1 A | 0.05 A | 50 % |
| DQ5 | No | No | 0.5 A | 0.15 A | 30 % |
| DQ6 | No | Yes | 0.1 A | 0.09 A | 90 % |
| DQ7 | No | No | 0.5 A | 0.35 A | 70 % |
| Total | | | | | 560 % |
| **Standardized total current**<br>= total / number of outputs = 560 % / 8 outputs | | | | | **70 %** |

Table 6- 2 Calculation of the standardized total current (2L+)

| Load group of the supply voltage 2L+ | | | | | |
|---|---|---|---|---|---|
| Digital output | Use as encoder supply | High-speed output (0.1 A) | Output current | | |
| | | | Nominal value according to parameter assignment | Mean value | Mean value in relation to the nominal value |
| DQ8 | — | Yes | 0.1 A | 0.05 A | 50 % |
| DQ9 | — | Yes | 0.1 A | 0.07 A | 70 % |
| DQ10 | — | No | 0.5 A | 0.5 A | 100 % |
| DQ11 | — | No | 0.5 A | 0.4 A | 80 % |
| DQ12 | — | Yes | 0.1 A | 0.09 A | 90 % |
| DQ13 | — | No | 0.5 A | 0.15 A | 30 % |
| DQ14 | — | Yes | 0.1 A | 0.04 A | 40 % |
| DQ15 | — | No | 0.5 A | 0.25 A | 50 % |
| Total | | | | | 510 % |
| **Standardized total current**<br>= total / number of outputs = 510 % / 8 outputs | | | | | **64 %** |

For the determination of the maximum ambient temperature for the technology module, the higher standardized total current of the two load groups is considered. In this example, it amounts to 70 %. With a standardized total current of 70 % and vertical mounting of the system, the ambient temperature according to the derating curve may amount to a maximum of approx. 38 °C.

# Dimension 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.

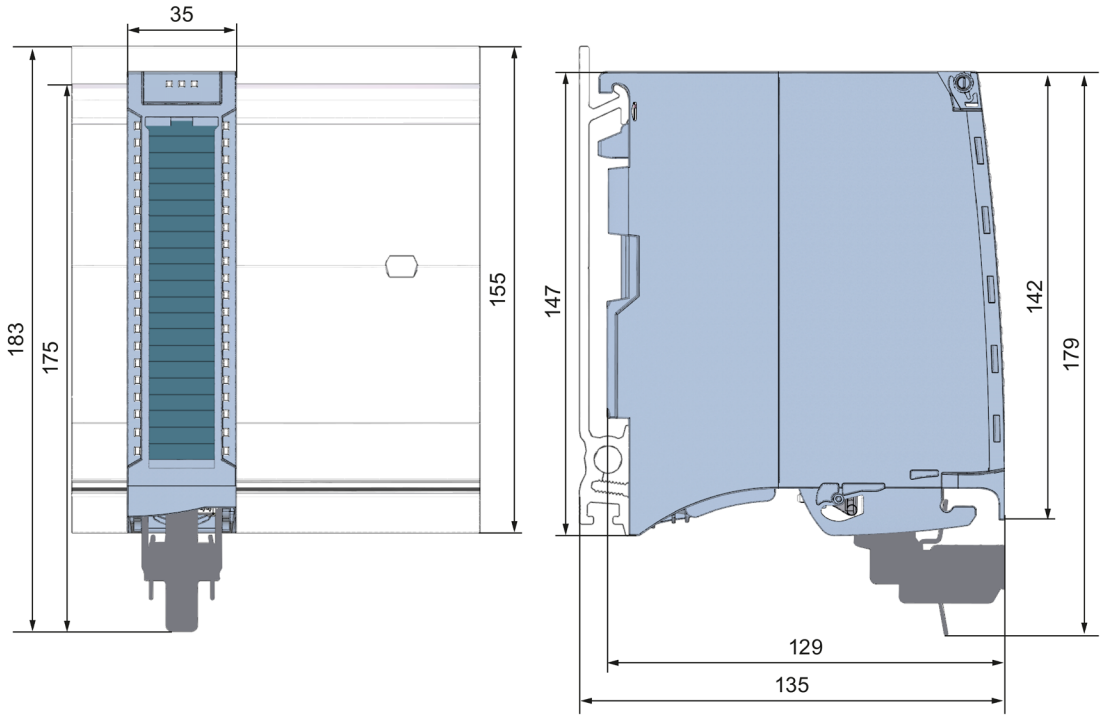



Figure A-1 Dimensional drawing of the TM Timer DIDQ 16x24V technology module

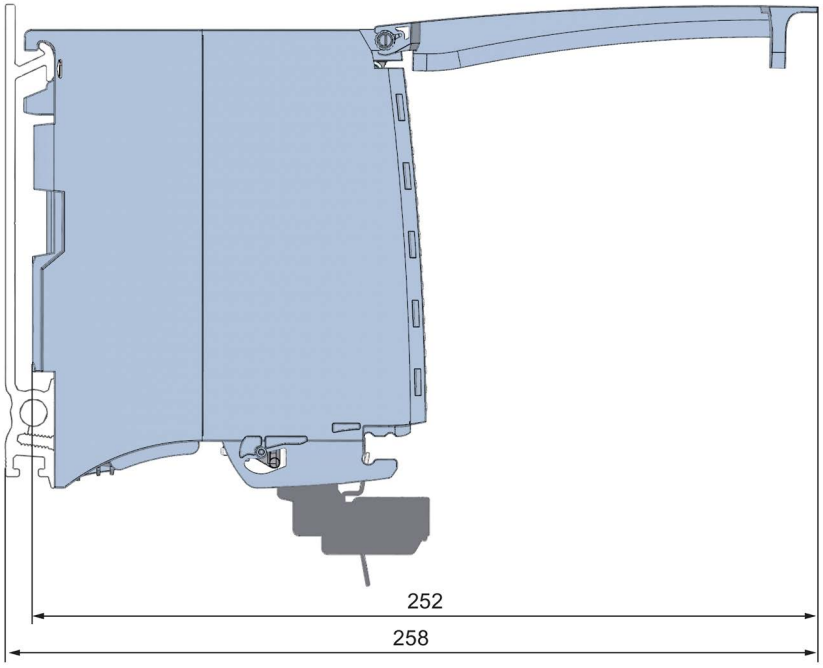



Figure A-2 Dimensional drawing of the TM Timer DIDQ 16x24V module, side view with open front panel