# Product overview

# 2

## 2.1 Properties

### Article number

6ES7138-6AA01-0BA0 (packing unit: pack of 1)

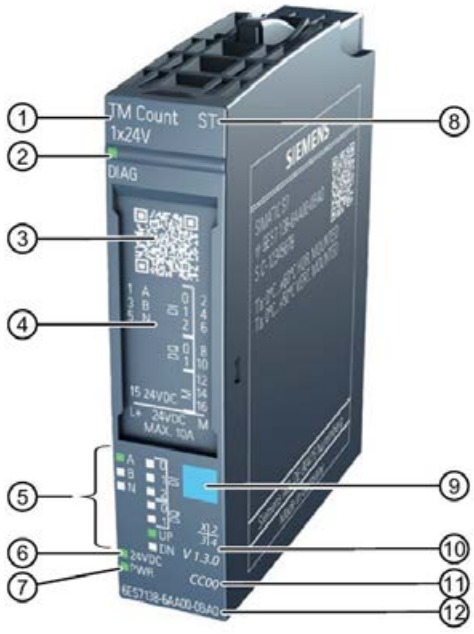
6ES7138-6AA01-2BA0 (packing unit: pack of 10)

The TM Count 1x24V technology module with article number 6ES7138-6AA01-0BA0 and firmware version V2.0 is a compatible replacement for the TM Count 1x24V with article number 6ES7138-6AA00-0BA0.

### Firmware version

This manual describes the properties of firmware version V2.0 of the module.

## View of the module




① Module type and designation
② LED for diagnostics
③ 2D matrix code
④ Wiring diagram
⑤ LEDs for channel status
⑥ LED for encoder supply
⑦ LED for supply voltage
⑧ Function class
⑨ Module type color coding
⑩ Function and firmware version
⑪ Color code for selection of the color-coded labels and BaseUnit type
⑫ Article number

Figure 2-1 View of the TM Count 1x24V module as an example

## Properties

The TM Count 1x24V technology module has the following properties:

- Technical properties
  - One channel
  - Interfaces:

    24 V encoder signals A, B and N from sourcing, sinking or push-pull encoders and sensors

    24 V encoder supply, short-circuit-proof

    DI0, DI1 and DI2 digital input signals

    DQ0 and DQ1 digital output signals

    Supply voltage L+
  - Count range: 32 bits
  - Monitoring of encoder signals for wire break
  - Hardware interrupts configurable
  - Input filters for suppression of interferences at encoder inputs and digital inputs can be configured
- Supported encoder/signal types
  - 24 V incremental encoder with N signal
  - 24 V incremental encoder without N signal
  - 24 V pulse encoder with direction signal
  - 24 V pulse encoder without direction signal
  - 24 V pulse encoder with up/down counting signal
- Supported system functions
  - Isochronous mode
  - Firmware update
  - Identification data I&M

The module supports the following functions:

Table 2- 1 Version dependencies of the functions

| Function | Firmware version of module | Configurable as of | | | |
|---|---|---|---|---|---|
| | | STEP 7 (TIA Portal) | STEP 7 | GSD file | |
| | | | | PROFINET IO | PROFIBUS DP |
| Firmware update | V1.0 or higher | V13 | V5.5 SP4 | X | — |
| I&M identification data | V1.0 or higher | V13 | V5.5 SP4 | X | X |
| Parameter reassignment in RUN | V1.0 or higher | V13 | V5.5 SP4 | X | X |
| Isochronous mode | V1.0 or higher | V13 | V5.5 SP4 | — | — |
| Counting/measuring | V1.0 or higher | V13 | V5.5 SP4 or V5.5 SP3 with HSP0240 V1.0 | X | X |
| Operating with technology object "Counting and measurement" | V1.0 or higher | V13 | — | — | — |
| Position input for "Motion Control" technology object | V1.0 or higher | V13 | — | — | — |
| Central operation on CPU 151xSP | V1.1 or higher | V13 SP1 | — | — | — |
| Fast Mode | V1.2 or higher | V14 SP1 or V14 with HSP0199 | V5.6 or V5.5 SP4 with HSP0240 V5.0 | X | X |
| Operating with "Measuring input" technology object | V1.3 or higher | V15 with HSP0256 | — | — | — |
| Position value range of 32 bits | V1.3 or higher | V15 with HSP0256 | — | X | X |
| Display of digital input states in the process image for position input for "Motion Control" technology object | V2.0 or higher | V15.1 with HSP0300 | — | — | — |

Firmware versions V1.x are available for the article number 6ES7138-6AA00-0BA0.
Firmware version V2.0 is available for the article number 6ES7138-6AA01-xBA0.

## Accessories

A **BaseUnit** of **type A0** is needed for operation of the technology module. You can find an overview of the BaseUnits that you can use with the technology module in the product information for the documentation of the ET 200SP distributed I/O system (http://support.automation.siemens.com/WW/view/en/73021864).

For detailed information on the installation procedure, refer to the ET 200SP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/58649293) system manual.

# Technical specifications

6

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **General information** | |
| Product type designation | TM Count 1x24V |
| Firmware version | V2.0 |
| • FW update possible | Yes |
| usable BaseUnits | BU type A0 |
| Color code for module-specific color identification plate | CC00 |
| **Product function** | |
| • I&M data | Yes; I&M0 to I&M3 |
| **Engineering with** | |
| • STEP 7 TIA Portal configurable/integrated as of version | STEP 7 V15 SP1 or higher |
| • STEP 7 configurable/integrated as of version | V5.6 and higher |
| • PROFIBUS as of GSD version/GSD revision | One GSD file each, Revision 3 and 5 and higher |
| • PROFINET as of GSD version/GSD revision | GSDML V2.34 |
| **Supply voltage** | |
| **Load voltage L+** | |
| • Rated value (DC) | 24 V |
| • permissible range, lower limit (DC) | 19.2 V |
| • permissible range, upper limit (DC) | 28.8 V |
| • Reverse polarity protection | Yes |
| **Input current** | |
| Current consumption, max. | 60 mA; without load |
| **Encoder supply** | |
| Number of outputs | 1 |
| **24 V encoder supply** | |
| • 24 V | Yes; L+ (-0.8 V) |
| • Short-circuit protection | Yes; electronic/thermal |
| • Output current, max. | 300 mA |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Power loss** | |
| Power loss, typ. | 1 W |
| **Address area** | |
| **Address space per module** | |
| • Inputs | 16 byte; 4 bytes in Fast mode |
| • Outputs | 12 byte; 4 bytes for Motion Control, 0 bytes for Fast mode |
| **Digital inputs** | |
| Number of digital inputs | 3 |
| Digital inputs, parameterizable | Yes |
| Input characteristic curve in accordance with IEC 61131, type 3 | Yes |
| **Digital input functions, parameterizable** | |
| • Gate start/stop | Yes |
| • Capture | Yes |
| • Synchronization | Yes |
| • Freely usable digital input | Yes |
| • Probe | Yes |
| **Input voltage** | |
| • Rated value (DC) | 24 V |
| • for signal "0" | -5 ... +5 V |
| • for signal "1" | +11 to +30V |
| • permissible voltage at input, min. | -30 V; -5 V continuous, -30 V brief reverse polarity protection |
| • permissible voltage at input, max. | 30 V |
| **Input current** | |
| • for signal "1", typ. | 2.5 mA |
| **Input delay (for rated value of input voltage)** | |
| **for standard inputs** | |
| – parameterizable | 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; for parameterization "none" |
| – at "1" to "0", min. | 6 µs; for parameterization "none" |
| **for technological functions** | |
| – parameterizable | Yes |
| **Cable length** | |
| • shielded, max. | 1 000 m |
| • unshielded, max. | 600 m |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Digital outputs** | |
| Type of digital output | Transistor |
| Number of digital outputs | 2 |
| Short-circuit protection | Yes; electronic/thermal |
| • Response threshold, typ. | 1 A |
| Limitation of inductive shutdown voltage to | L+ (-53 V) |
| Controlling a digital input | Yes |
| **Digital output functions, parameterizable** | |
| • Switching tripped by comparison values | Yes |
| • Freely usable digital output | Yes |
| **Switching capacity of the outputs** | |
| • with resistive load, max. | 0.5 A; Per digital output |
| • on lamp load, max. | 5 W |
| **Load resistance range** | |
| • lower limit | 48 Ω |
| • upper limit | 12 kΩ |
| **Output voltage** | |
| • 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; Acc. to IEC 60947-5-1, DC-13; observe derating curve |
| • on lamp load, max. | 10 Hz |
| **Total current of the outputs** | |
| • Current per module, max. | 1 A |
| **Cable length** | |
| • shielded, max. | 1 000 m |
| • unshielded, max. | 600 m |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Encoder** | |
| **Connectable encoders** | |
| • 2-wire sensor | Yes |
| – permissible quiescent current (2-wire sensor), max. | 1.5 mA |
| **Encoder signals, incremental encoder (asymmetrical)** | |
| • Input voltage | 24 V |
| • Input frequency, max. | 200 kHz |
| • Counting frequency, max. | 800 kHz; with quadruple evaluation |
| • Cable length, shielded, max. | 600 m; depending on input frequency, encoder and cable quality; max. 50 m at 200 kHz |
| • Signal filter, parameterizable | Yes |
| • Incremental encoder with A/B tracks, 90° phase offset | Yes |
| • Incremental encoder with A/B tracks, 90° phase offset and zero track | Yes |
| • Pulse encoder | Yes |
| • Pulse encoder with direction | Yes |
| • Pulse encoder with one impulse signal per count direction | Yes |
| **Encoder signal 24 V** | |
| – permissible voltage at input, min. | -30 V; -5 V continuous, -30 V brief reverse polarity protection |
| – permissible voltage at input, max. | 30 V |
| **Interface types** | |
| • Source/sink input | Yes |
| • Input characteristic curve in accordance with IEC 61131, type 3 | Yes |
| **Isochronous mode** | |
| Isochronous operation (application synchronized up to terminal) | Yes |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Interrupts/diagnostics/status information** | |
| Substitute values connectable | Yes; Parameterizable |
| **Alarms** | |
| • Diagnostic alarm | Yes |
| • Hardware interrupt | Yes |
| **Diagnostic messages** | |
| • Monitoring the supply voltage | Yes |
| • Wire-break | Yes |
| • Short-circuit | Yes |
| • A/B transition error at incremental encoder | Yes |
| • Group error | Yes |
| **Diagnostics indication LED** | |
| • Monitoring of the supply voltage (PWR-LED) | Yes; green PWR LED |
| • Channel status display | Yes; Green LED |
| • for module diagnostics | Yes; green/red DIAG LED |
| • Status indicator backward counting (green) | Yes |
| • Status indicator forward counting (green) | Yes |
| **Integrated Functions** | |
| Number of counters | 1 |
| Counting frequency (counter) max. | 800 kHz; with quadruple evaluation |
| Fast mode | Yes |
| **Counting functions** | |
| • Can be used with TO High_Speed_Counter | Yes |
| • Continuous counting | Yes |
| • Counter response parameterizable | Yes |
| • Hardware gate via digital input | Yes |
| • Software gate | Yes |
| • Event-controlled stop | Yes |
| • Synchronization via digital input | Yes |
| • Counting range, parameterizable | Yes |
| **Comparator** | |
| – Number of comparators | 2 |
| – Direction dependency | Yes |
| – Can be changed from user program | Yes |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Position detection** | |
| • Incremental acquisition | Yes |
| • Suitable for S7-1500 Motion Control | Yes |
| **Measuring functions** | |
| • Measuring time, parameterizable | Yes |
| • Dynamic measurement period adjustment | Yes |
| • Number of thresholds, parameterizable | 2 |
| **Measuring range** | |
| – Frequency measurement, min. | 0.04 Hz |
| – Frequency measurement, max. | 800 kHz |
| – Cycle duration measurement, min. | 1.25 µs |
| – Cycle duration measurement, max. | 25 s |
| **Accuracy** | |
| – Frequency measurement | 100 ppm; depending on measuring interval and signal evaluation |
| – Cycle duration measurement | 100 ppm; depending on measuring interval and signal evaluation |
| – Velocity measurement | 100 ppm; depending on measuring interval and signal evaluation |
| **Potential separation** | |
| **Potential separation channels** | |
| • between the channels and backplane bus | Yes |
| **Isolation** | |
| Isolation tested with | 707 V DC (type test) |
| **Ambient conditions** | |
| **Ambient temperature during operation** | |
| • horizontal installation, min. | -30 °C |
| • horizontal installation, max. | 60 °C |
| • vertical installation, min. | -30 °C |
| • vertical installation, max. | 50 °C |
| **Altitude during operation relating to sea level** | |
| • Installation altitude above sea level, max. | 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual |

| Article number | 6ES7138-6AA01-0BA0 |
|---|---|
| **Decentralized operation** | |
| to SIMATIC S7-300 | Yes |
| to SIMATIC S7-400 | Yes |
| to SIMATIC S7-1200 | Yes |
| to SIMATIC S7-1500 | Yes |
| to standard PROFIBUS master | Yes |
| to standard PROFINET controller | Yes |
| **Dimensions** | |
| Width | 15 mm |
| Height | 73 mm |
| Depth | 58 mm |
| **Weights** | |
| Weight, approx. | 45 g |