Technology board T400

The T400 is used to implement supplementary process-specific functions (e.g.for tension and position controls, winders, reels, synchronous and positioning controls, hoisting gear and drive-related open-loop control functions. Frequently used supplementary process-specific functions are available as pre-programmed standard configurations.

End users who wish to implement specialist applications or who want to market their own technological know-how can create their own process solution on the T400 using CFC configuring language that is familiar from SIMATIC® STEP® 7.

Process-specific functions are configured with CFC. The processor then executes these functions cyclically. The closed-loop control sampling time is about 1 ms.

A virtually instantaneous parallel interface (dual-port RAM) allows data to be exchanged between the basic unit and T400. All signals can be directly connected to terminals on the T400. A 15 V/100 mA pulse power supply is available.

An external 24 V DC supply must be available to drive the binary inputs and outputs. This voltage can be supplied by the basic unit provided the total current at the terminals does not exceed 150 mA.

The configuration is parameterized by means of:

- The PMU operation and parameterization unit
- The OP1S operator control panel
- A PC with DriveMonitor[1]) on the basic unit
- An interface board
- Altered parameter settings can be stored permanently in the EEPROM.

The T400 board can be installed in the electronics box of SIMOREG converters. The LBA bus adapter is needed for this purpose.

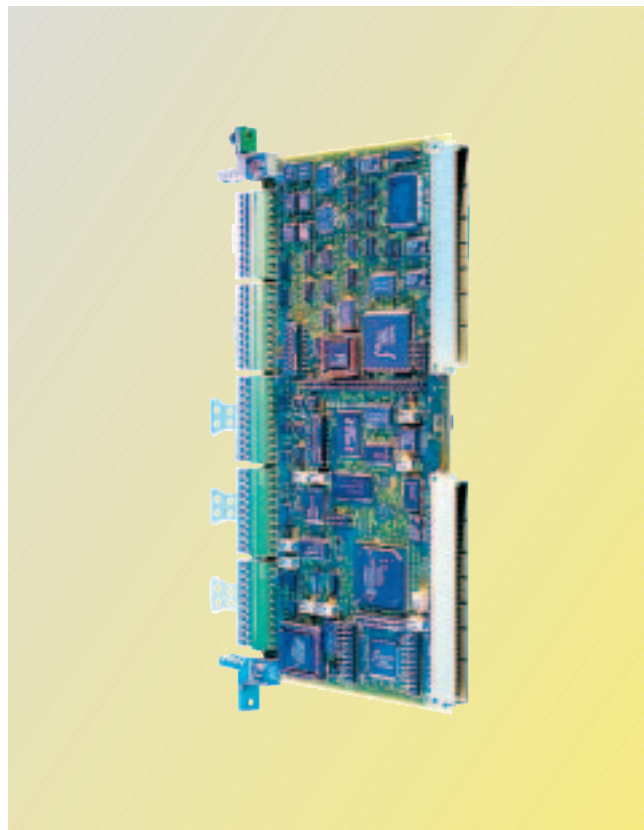
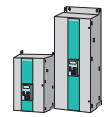


Fig. 4/16
Technology board T400

1) The DriveMonitor service program enables the entire parameter set of a standard configuration to be read or written via a PC or programming device.



Technology board T400

Features (inputs/outputs)

- 2 analog outputs
- 5 analog inputs
- 2 binary outputs
- 8 binary inputs
- 4 bidirectional binary inputs or outputs
- 2 incremental encoder inputs with zero pulse
  – Encoder 1 for HTL (15 V) encoder.
  – Encoder 2 for HTL (15 V) or TTL/RS 422 encoder (5 V)
- For each incremental encoder: One coarse pulse input for suppression of zero pulse, coarse pulse inputs (simultaneous) also available as binary inputs
- No isolation of inputs/outputs.
- Serial interface 1
  with RS 232 and RS 485 transmission format; protocol can be selected via switch on board:
  – Service protocol DUST1 with 19.2 Kbits/s and RS 232 transmission format
  – USS protocol, 2-wire with selectable RS 232 or RS 485 transmission format, max. 38.4 Kbits/s, configurable as slave for parameterization with OP1S, Drive ES Basic or SIMOVIS or as master for OP2 operator panel connection
- Serial interface 2
  with RS 485 transmission format and protocol that is selectable through configuring of the appropriate function block:
  – Peer-to-peer for high-speed process link, 4-wire.
  – USS protocol configurable as slave for parameterization with OP1S, Drive ES Basic or DriveMonitor
  (2-wire or 4-wire)
  baudrates [Kbits/s]:
  9.6/19.2/38.4/93.75/187.5.

Note

If serial interface 2 (peer-to-peer, USS) is used, the second absolute encoder cannot be operated since both applications utilize the same terminals.

- Absolute encoder 1 with SSI or EnDat protocol (RS 485) for positioning applications.
- Absolute encoder 2 with SSI or EnDat protocol (RS 485) for positioning applications.

Note

If the second absolute encoder is used, serial interface 2 (peer-to-peer, USS) cannot be used since both applications utilize the same terminals.

- Wide variety of synchronizing options:
  – Synchronization of T400 with MASTERDRIVES (CUx, CBx) or second T400
  – T400 supplies synchronizing signals for MASTERDRIVES (CUx, CBx) or second T400.
- Operation without a fan
- 3 LEDs for operational status displays.
- Hardlock PAL: Plug-in base for 28-pin EPLD submodule as copy protection for user program (as on 32-bit CPU boards).
- Soldered-in flash memory (2 MB) for downloadable program code (no MS5x memory module needed).
- 4 MB DRAM as main memory for program and data.
- 32 KB permanent modification memory.
- 128 byte NOVRAM for data storage during power off.
- Cache: 4 KB program, 4 KB data.
- Clock cycle (external/internal): 32/32 MHz.

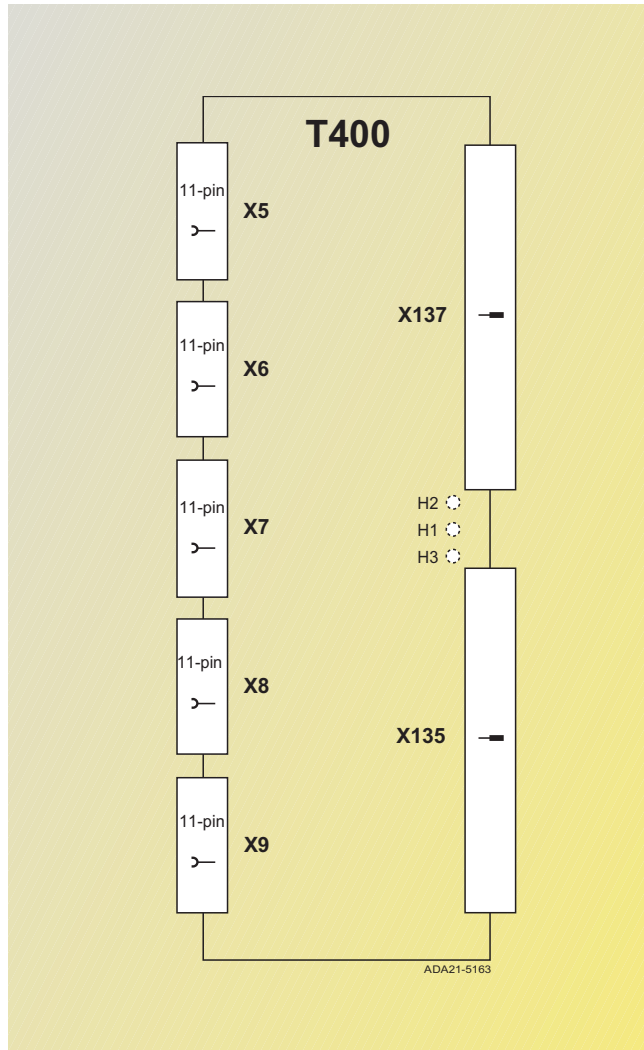
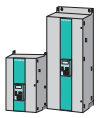


Fig. 4/17
Technology board T400



Technology board T400

Type	Features	
General	Isolation of inputs/outputs. Space required Dimensions (W x H x D) in mm Weight	No 1 slot 267 x 140 x 14 0.4 kg
Power supply	Voltage supply/typ. power consumption	+ 5 V ± 5 %: 1.1 A +15 V ± 4 %: 140 mA + max. 100 mA encoder supply –15 V ± 3 %: 140 mA
Analog outputs	Number Output range Short-circuit protection Short-circuit current Resolution Accuracy, absolute Linearity error Voltage rise time Delay time	2 ± 10 V Yes ± 10 mA 12 bits (4.88 mV) ± 3 bits < 1 bit 4.2 V/µs 3.5 µs
Analog inputs	Number Input range Measuring principle Conversion time Input impedance Input filter (-3 dB limit frequency) Resolution Accuracy, absolute Linearity error	2 differential inputs, 3 unipolar ± 10 V Sampling 12 µs 20 kΩ 1.5 kHz 12 bits (4.88 mV) ± 3 bits < 1 bit
Binary outputs	Number Ext. Supply voltage: • Rated value • Permissible range • For “0” signal • For “1” signal Output current Output current, ext. Supply voltage Switching frequency/ohmic load Overload protection Max. switching delay	2 + max. 4 (bidirect.) 24 V DC 15 to 33 V DC Max. 0.1 V Ext. supply voltage –0.3 V Max. 50 mA/output 50 mA + output currents 5 kHz Yes (limited to 100 mA) 70 µs
Binary inputs and coarse signals	Number Input voltage: • Rated value • For “0” signal • For “1” signal	8 + max. 4 (bidirect.) + max. 2 (coarse pulse) 24 V DC –1 to +6 V or input open +13 to +33 V
Input current	Input current: • For “0” signal • For “1” signal Input smoothing (time constant)	 – 8 mA typ. 0.1 ms
5 V, 15 V incremental encoder	Number Signal voltage (rated value): • “Encoder 1” • “Encoder 2” Max. pulse frequency Input filter	2 15 V (HTL only) unipolar 5 V or 15 V unipolar or differential 1.5 MHz Configurable on function block (NAV)
5 V incremental encoder	Signal voltage for differential inputs (RS 422 encoder): • For “0” signal • For “1” signal Signal voltage for unipolar inputs (TTL encoder): • For “0” signal • For “1” signal Input current	 –>0.2 V >0.2 V < 0.8 V > 2.3 V 15 mA (limited)
15 V incremental encoder	Signal voltage for differential inputs • For “0” signal • For “1” signal Signal voltage for unipolar inputs: • For “0” signal • For “1” signal Input current	 –30 V to 4 V 8 V to 30 V < 5 V > 8 V 15 mA (limited)
Absolute encoder	Number of connectable encoders Signal voltage Data transfer rate Data display	Max. 2 Single-turn or multi-turn encoder With SSI (synchronous-serial) or EnDat interface 5 V to RS 422 100 kHz to 2 MHz Dual, Gray, Gray Excess Code

Options

Technology boards

Technology board T400

Standard configurations

Standard configurations for commonly used application types are available as pre-installed configurations. The standard configuration can be adapted to suit a specific plant by means of parameterization.

Components and features of standard configuration

- Peer-to-peer communication (digital setpoint cascade)
- The T400 with standard configuration can be operated with and without a communication board (e.g. CBP)

A communication board can be used to

1. Specify T400 control commands and set points via a bus system (e.g.PROFIBUS-DP) or a point-to-point connection
2. Read actual values and status words and to read and write technology parameters

- Inputs, outputs and process data can be "wired up" to the DRAM to provide access to all important SIMOREG data, thereby ensuring highly flexible configuring
- Non-volatile storage of all important operating data
- All parameters can be reset to IPL status
- Parameters can be set via PC with DriveMonitor linked to the basic unit interface

Available standard configurations

- Standard configuration for axial winders
- Standard configuration for angular synchronism controls

Standard configuration for axis winder with T400

Scope of applications:

- Foil plants
- Paper machines
- Paper finishing machines
- Coating machines
- Printing presses of all types (foil, paper)
- Wire-drawing machines
- Reels in metalworking (e.g. straightening machines, treatment plants, etc.)

Features

- Suitable for wind-on and wind-off coils, with and without on-the-fly roller change
- Suitable for direct and indirect tension control
- Compensating roller or tension capsule-type dynamometer can be connected
- Diameter calculation with "Set diameter" and "Stop" plus non-volatile storage of diameter measurement
- Adaptation of tension and speed controllers as a function of diameter
- Polygon-based friction compensation, speed-dependent
- Acceleration as a function of diameter, material width and gear stage
- Ramp-function generator for acceleration on on-the-fly roller change followed by shutdown
- Pulse encoder for path velocity measurement can be connected
- Initial diameter can be measured via contact pulse encoder
- Tension controller can be applied either to the speed controller or directly to the torque control
- V = constant control can be implemented
- Winder-specific open-loop control with alarm and fault evaluation
- Inching and crawling operation
- Two motorized potentiometers for optional use
- Smooth, overshoot-free shutdown via braking characteristic

Standard configuration for angular synchronism control with T400

Scope of applications:

- Substitute for mechanical and electrical shafts, e.g. on gantry traversing mechanisms, feed and discharge machines on furnaces or looms
- Substitute for gear units with fixed or variable gear ratio, e.g. change-gear units, installed at transition points on conveyor belts or at transition point between one machine section and the next, such as on packaging machines or book spine gluing machines
- Phase-locked synchronism, also applicable for mutual engagement of two machine parts. Also suitable for printing or folding of bags, round stock, etc.

Features

- Angular synchronism with gear ratio adjustable within wide limits
- Offset angle setting between drives as a function of coarse and fine pulse markers for angle sensing (synchronization)
- Synchronization signals can be supplied by proximity-type switches (e.g. BERO®s) or pulse encoders (zero pulse)
- Modification of angle setting by setpoint input
- Different offset angles can be specified for both directions of rotation (automatic switchover on direction reversal). This option must be applied for synchronization if the switching positions of the fine pulse marker are different for clockwise and anti-clockwise rotation of the drive (or machine part acting as the synchronization partner) and need to be compensated. Another example is a crane runway on which the fine pulse marker is two-dimensional.
- Backstop function
- Overspeed and blocking protection
- Inching operation
- Adaptation of position controller based on gear ratio
- Setpoint (speed setpoint) can be supplied by pulse encoder, for example, in cases where the speed setpoint is not available via a terminal or interface
- A maximum of ten slave drives can be connected if pulse encoder cable length < 100 m, n < 3 000 min^{-1}

Closed-loop cross-cutter/ shears control

Scope of applications:

- Flying saw/knife
- Rotating cross-cutter (drum shears)

Features

- Local control modes
  - Inch 1/2
  - Calibrate
  - Approach start position
  - Parameterizable angular ranges for synchronism
- Cutter control modes
  - Single cut to separate the material
  - Head cut to separate defective length at start of material
  - End cut to separate defective length at end of material
  - Continuous lengthwise cuts for chopping or panel cutting
  - Trial cut for cutting a panel
  - Cutting program with entry of number and length of cuts
- Referencing
- Error monitoring
- Overspeed for setting the lead
- Format changeover from one cut to the next
- Gentle traversing curves (sin/cos) to enhance the cutting accuracy and protect the mechanical components
- Closed-loop format control to optimize the cutting precision
- Cutting curve to optimize the cutting accuracy
- KP-adaption speed control for enhancing the cutting accuracy
- Compensation of variable inertia (pendulum torque), e.g. for pendulum shears
- Friction compensation
- Torque precontrol for acceleration
- Cutting torque application