SIEMENS

Data sheet 6SE7090-0XX84-0AH2

SPARE PART SIMOVERT MASTERDRIVES T300
MODULE 6SE7090-0XX84-0AH2

Further information

Information- and Downloadcenter (Catalogs, Brochures,…)
http://www.siemens.de/industrial-controls/catalogs

Industry Mall (Online ordering system)
https://mall.industry.siemens.com

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STRUCTURE

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1 Description of the concept

1.1 General overview

Presently, SIMOREG DC-MASTER 6RA70 devices are being used for the closed-loop control of DC crane drives and SIMOVERT MASTER DRIVES CUVC for AC drives.

In order to implement the technological closed-loop control tasks and functions, in almost all cases, it is necessary to use an additional T300 technology processor in the units mentioned above.

The T300 is a freely-configurable technology processor with analog and digital inputs and outputs, two connections for pulse encoders, serial interfaces etc. On the plant/system side, these connections are routed to the SE300 terminal block. This is connected to the T300 technology module using screened round cables. (For this application, only the pulse encoder connections, the analog inputs and outputs and the serial interfaces are used. The digital inputs and outputs are only used for commissioning purposes.)

The sub-modules (Eproms, program memory modules) for the T300 are programmed with the STRUC programming language from SIMADYN D. However, these are not required for this particular application.

The T300 technology module is used in the electronics box of the drive converter units as option board (slot 2). Module T300 is shown on Page 9, the installation on Page 8 as well as a connection example on page 16.

For the various crane drive types, the necessary and frequently required closed-loop control structures and functions required for these drives, are combined in drive-specific software modules. These are listed in the table on Page 10 together with the functions which have been implemented.

If other functions are required, which are not listed in the table on the next page, then these must be implemented as custom software.

With the software, the open-loop- and closed-loop control tasks are clearly separated. These are executed in the systems which have been designed for these purposes, i.e. the implementation of all of the open-loop control functions in the SIMATIC as well as implementation of all closed-loop control functions which are distributed in the drive control system.

Digital interlocking, e.g. controlling contactors, generating enable signals for the drive must therefore be implemented in the higher-level open-loop control system. Only the drive-specific closed-loop control circuits and functions are implemented in the freely-programmable technology modules.

The closed-loop technology control is realized in the technology modules. However, the closed-loop speed control and the closed-loop current control in the basic drives are fully utilized.

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The drive units communication with the SIMATIC via Profibus SINEC L2 DP with PPO type 5 (4 PKW and 10 PZD words). (Alternative a free configuration of the cyclical data (no PPO type) with the Engineering tool DriveES is possible, when a communication board CBP2 is used. There are up to 16 process data words configurable. A parameter area (PKW) is configurable, .independent on the amount of process data. However the allocation of the process data (Chapter 3) has to be noticed while usage.

The complete control (control words and setpoint-actual values) of the drive converters is realized via this interface. (The communication board CBP/CBP2 has to be inserted in slot G via the adaption board ADB (slot 3)).

The essential signals from the automation system to the drives are four 16-bit control words as well as the setpoints for the speeds and the position setpoint for a closed-loop position control.

The communications between the technology module and a basic drive is realized through a DPR (dual port Ram).

The setpoint is entered from the master switch via ET200, SIMATIC and Profibus to the drive unit.

The position actual values must be sensed for the closed-loop position control of a drive. In many cases, this can be realized using the speed encoder is mounted on the motor.

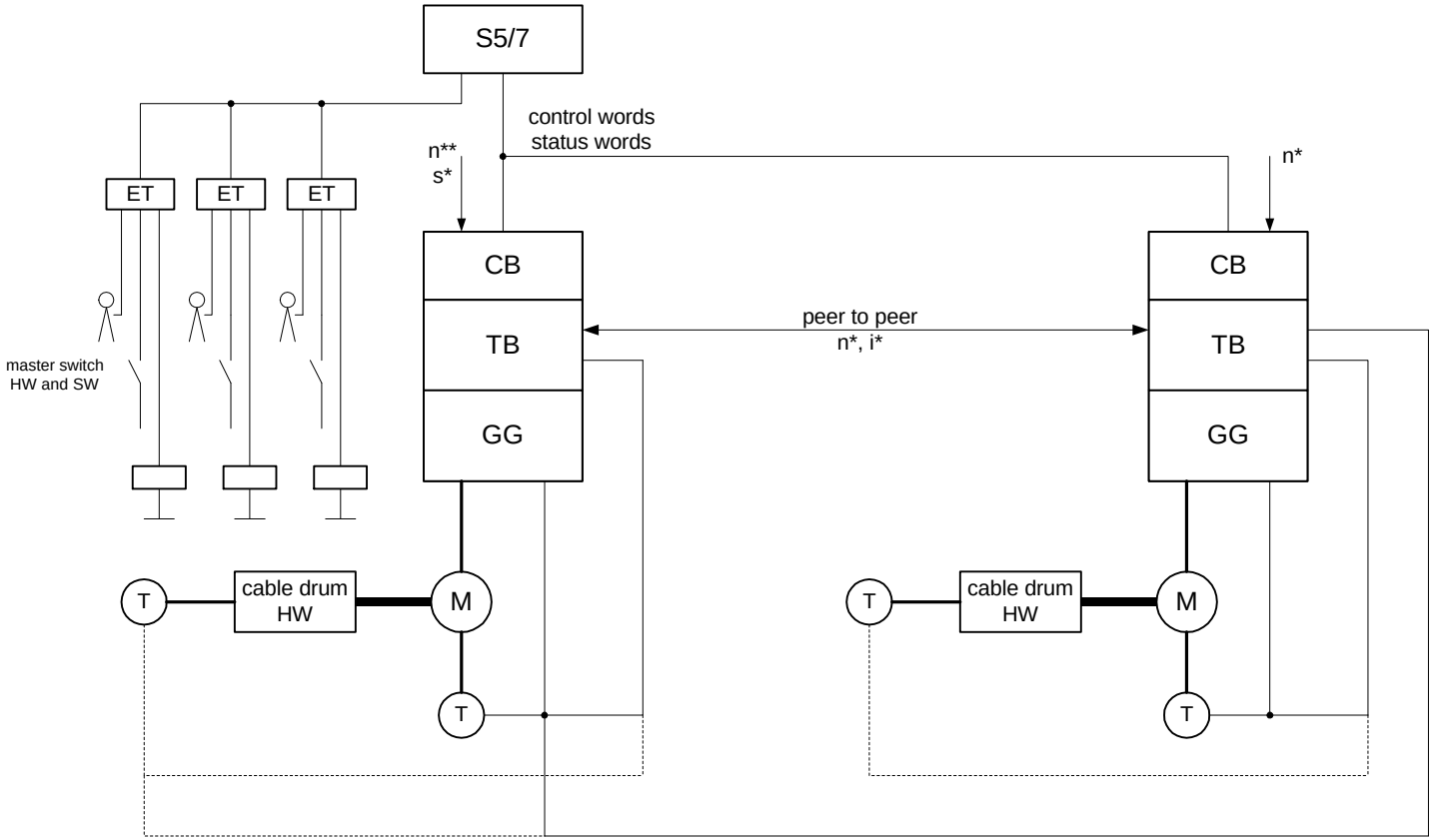
For the grab position control of a grab crane or for the closed-loop synchronous control of two drives, it is necessary to sense the position actual values of both drives. This can also be realized using the pulse encoder, mounted on the motor for the speed actual values.

The pulse encoder signals for the speed actual value sensing are fed to the basic drives and for the position actual value sensing, to the technology module. It is also possible to mount additional pulse encoders on the cable drum.

The necessary parameters are defined as technology parameters and these can be set and changed. They are set via the basic drive operator panel. It is also possible to parameterize the units (basic drive and technology module) using the SIMOVIS service tool. (The database of the T300 technology module is included in delivery.)

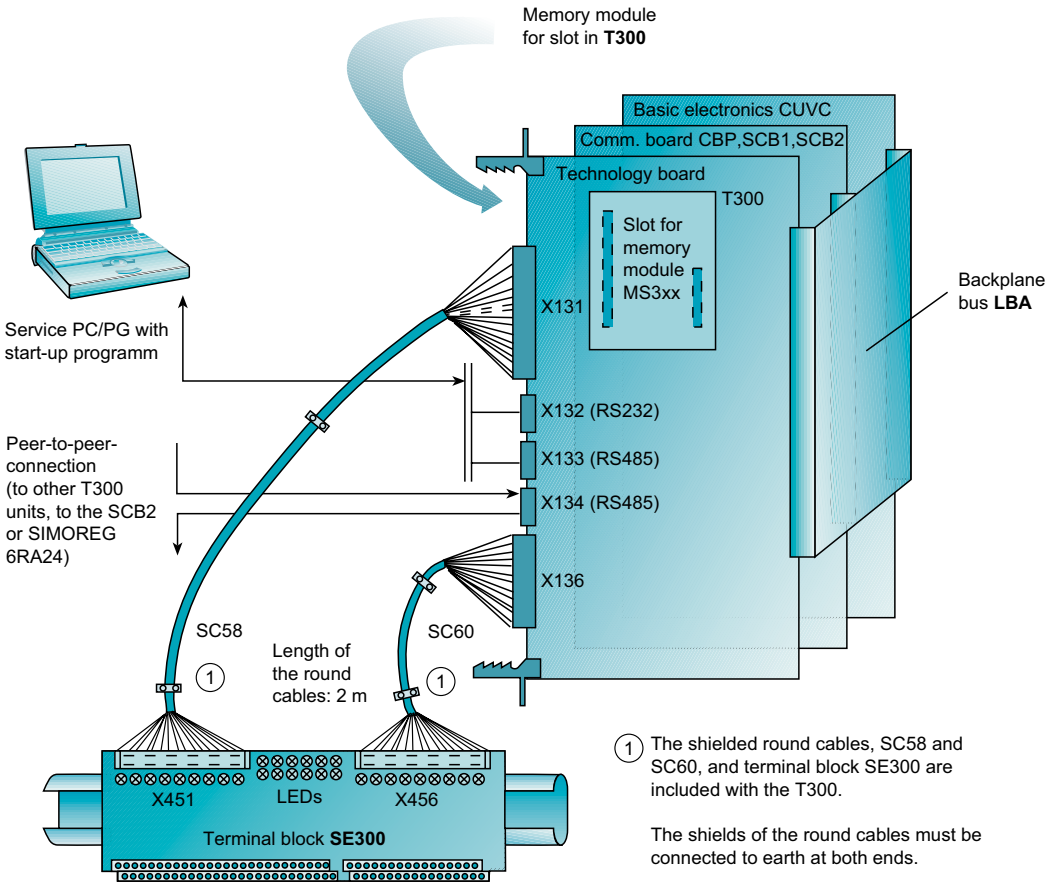
An overview of the concept is shown in the following block diagram using as an example, the holding- and closing gear of a grab crane. The block diagram is also valid for an individual drive or a master-slave drive.

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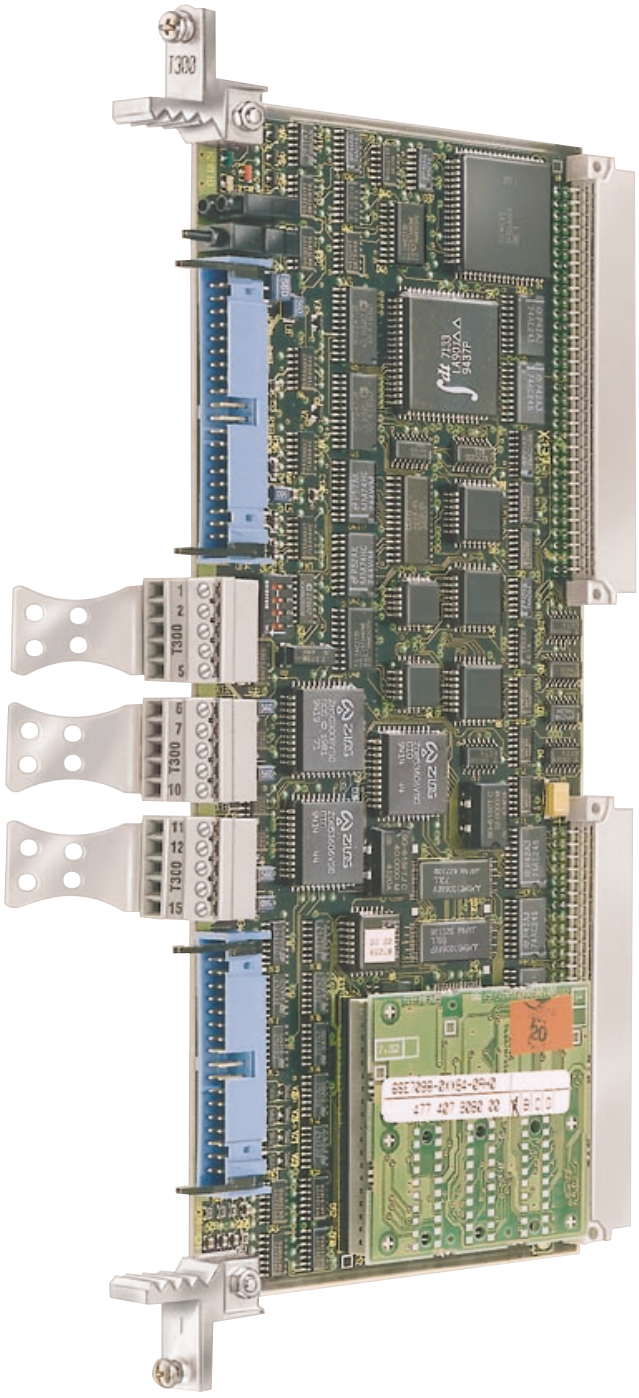
ET: electrical terminal block
T: pulse encoder
HW: holding gear
SW: closing gear
CB: communication board
TB: technology board
GG: basic unit

1.2 Hardware and software components of the T300 technology module



Hardware- and software components of the T300 technology board

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T300 module with memory module

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1.3 Overview of the various drives, modules and functions

Hoisting gear	
► Load-depending field weakening ► Heavy load operation (reduced setpoint) ► Jogging ► Ramp-function generator changeover for field-weakening and heavy loads ► Changeover to synchronous operation control with one-only (manual) setting of the position difference (slave operation)	► Position sensing with synchronization (of the position) ► Closed-loop position control (for automatic- or manual operation) ► Non-linear master switch setpoint ► Pre-limit switch ► Start pulse ► Monitoring functions ► Current distribution monitoring ► Braking with constant distance
Holding gear	
► Constant field weakening (efficiency) ► Heavy load operation (reduced setpoint) ► Closed-loop position control (for automation- or manual operation) ► Jogging ► Ramp-function generator changeover for heavy loads	► Slack rope control ► Position sensing with synchronization (of the position) ► Non-linear master switch setpoint ► Pre-limit switch ► Start pulse ► Monitoring functions
Closing gear	
► Grab adjustment ► Start pulse ► Current equalization control with polyp grab operation ► Changeover to synchronous operation control with one-only (manual) setting of the position difference (slave operation))	► Grab position sensing ► Closed-loop grab position control ► Jogging ► Monitoring functions
Slewing gear	
► Non-linear master switch setpoint ► Closed-loop position control (for automatic or manual operation) ► Jogging ► Working angle-dependent accelerating time ► Working angle-dependent slewing speed	► Position sensing with synchronization (of the position) ► Pre-limit switch ► Monitoring functions ► Influencing the ramp-function generator dependent on the system deviation
Traversing gear, master	
► Non-linear master switch setpoint ► Closed-loop position control (for automation- or manual operation) ► Jogging ► Changeover to synchronous operation control with one-only (manual) setting of the position difference (slave operation)	► Position sensing with synchronization (of the position) ► Pre-limit switch ► Monitoring functions ► Current distribution monitoring
Traversing gear, slave	
► Current distribution monitoring ► Closed-loop synchronous operation control with offset as position difference	► Jogging ► Position sensing with synchronization (of the position) ► Monitoring functions

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Monitoring functions:	Closed-loop control monitoring Speed actual-actual monitoring Overspeed monitoring Zero speed signal

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1.4 Communications between SIMATIC and the drive units

The communications between these two systems is implemented via Profibus SINEC L2-DP.
This serial peripheral SINEC L2-DP bus system is optimized for extremely fast cyclic master-slave operation. In this case, the drives are always operated as slaves; the higher-level system has the master function, which in this case is the SIMATIC.

The CBP/CBP2 module is used as communication module in the drive units.

The net data structure with which a DP master can access the drives is described in the following text.
The SINEC L2-DP transfers the net data with the SRD utility (Send and Request with Data). This means, that net data are always transferred via the bus, both from the master to the slave as well as in return telegrams from the slave to the master.

The master formulates a task, the slave processes this task and formulates the appropriate response.
There is precisely one task in each telegram from the master to the slave; there is precisely one response in each telegram from the slave to the master.

The length and structure of the net data are permanently specified, and are known as **P**arameter **P**rocess data **O**bjects (**PPO**).

Five types are defined to transfer net data (PPO), with which process data, i.e. control words, status words, setpoints and actual values can be simultaneously transferred, also parameters from the master to the slave and vice versa.

In the following application, only PPO type 5 is used.[1]

The PPOs are sub-divided into two areas:

PKW (parameter identification value)
PZD (process data)

The PKW area allows parameter values to be read and written into and parameter descriptions and texts read. Every drive parameter can be visualized or changed via this mechanism.

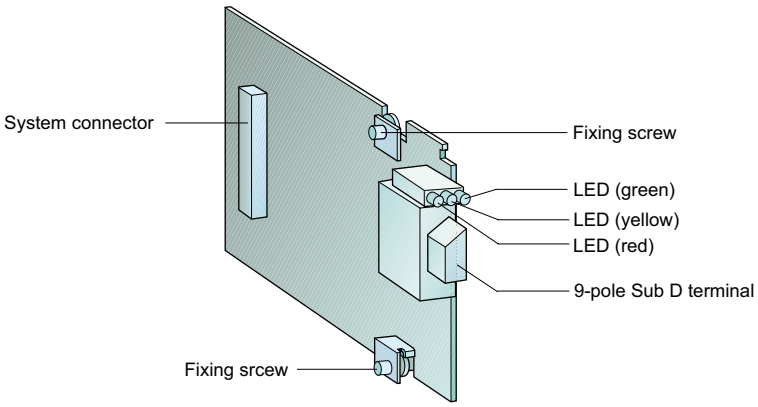
The PZD area contains all of the necessary signals which are required for process control. These include control words and setpoints from the automation to the drive and status words and actual values from the drive to the automation system.

Both areas together result in the net data block (PPO).

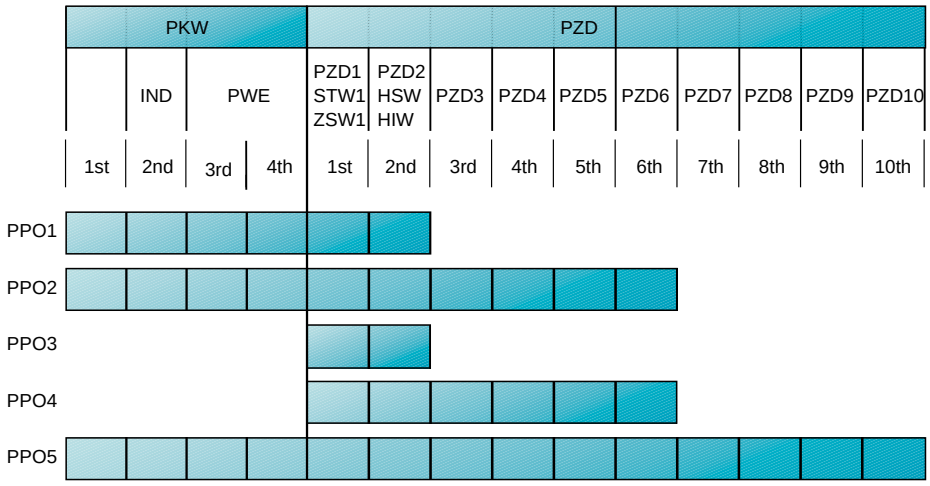
The advantage in this case is that in a telegram, both the cyclically required process data can be transferred, and it is also possible to simultaneously access parameters (reading/writing).

[1] Cyclical data can be freely-configured by using the communication board CBP2 with the Engineering Tool DriveES (no PPO-type). There are up to 16 process data words configurable. Independent from the amount of process data a parameter area (PKW) is configurable. So you are not dependent on the 5 predetermined PPO types.

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CBP communications board



PWE: Parameter ID value
PZD: Process data
PKE: Parameter ID
IND: Index
PWE: Parameter value

STW: Control word 1
ZSW: Status word 1
HSW: Main setpoint
HIW: Main actual value

Net-data structure in the "PROFIBUS Profile for PROFIDRIVE Variable-Speed Drives"

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1.5 Communications within the drive units

The data transfer within the "slave modules", i.e. between the drive converter and CB, is realized using internal SIEMENS data transfer mechanisms, the so-called device response. The data is transferred between the communications module and drive converter via the DUAL PORT RAM (DPR).

Data transfer between the communications module CB and the basic drive is realized via a dual port RAM coupling (DPR). Both sides, CB and basic drive can access the memory of the dual port RAM writing and reading. The dual port RAM chip is provided on the CB.

If an additional TB technology module is provided, then this is switched between the CB and the basic drive. In this case, the dual port RAM of the CB is the interface to the TB and dual port RAM on the TB is the interface to the basic drive (configuration TB-CB basic drive).

The initialization data transferred between CB and the basic drive is not influenced by the TB, i.e. the technology module copies the data from its dual port RAM one-to-one into the dual port RAM of the CB and vice versa. The function must be appropriately configured in the TB.

16 pieces of process data can be transferred in both directions between the TB and basic drive.

1.6 Communications between two drive units

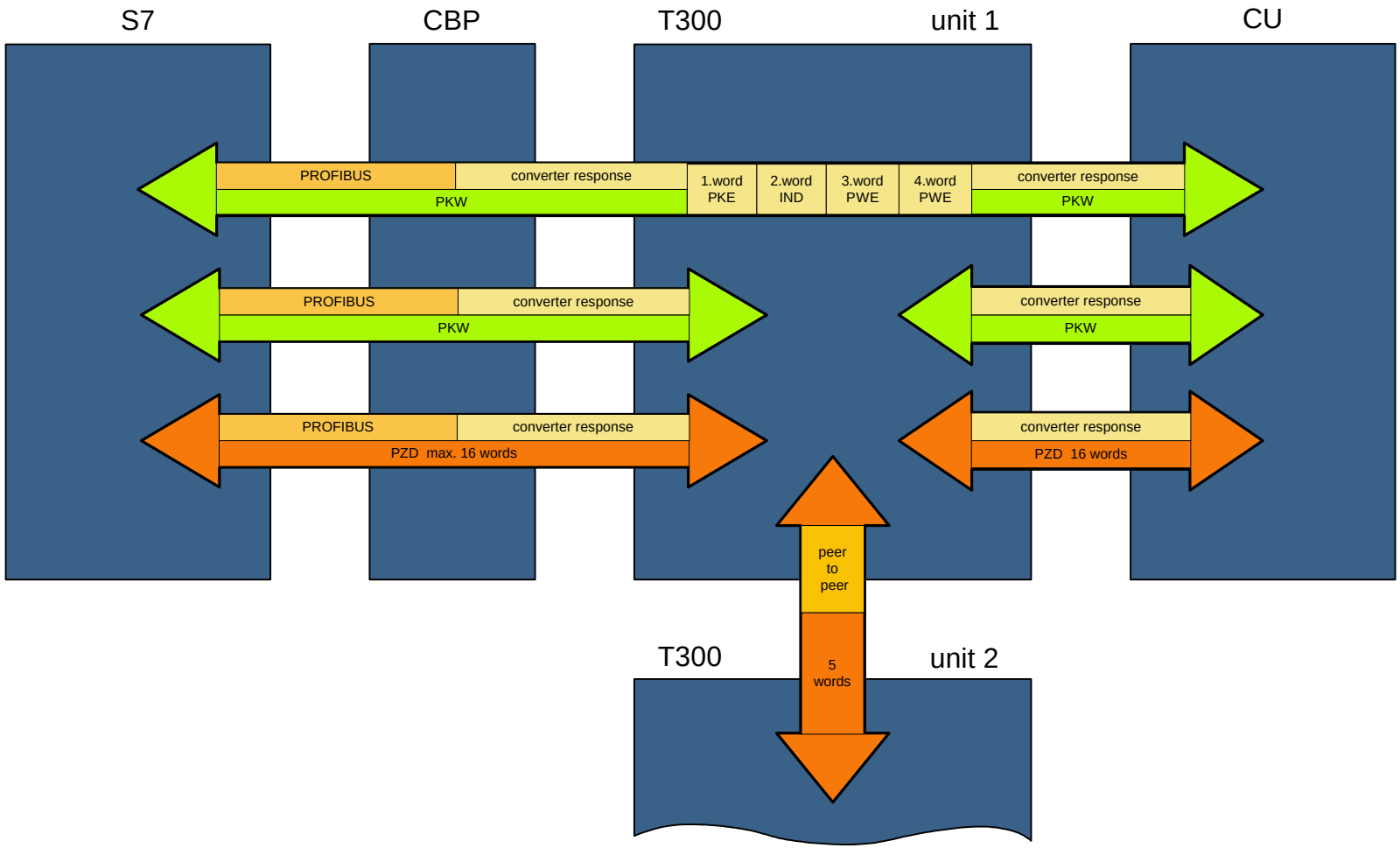
This communications connection is generally used for master-slave drives, where the master setpoint for the slave drive(s) is (are) entered from the master drive.

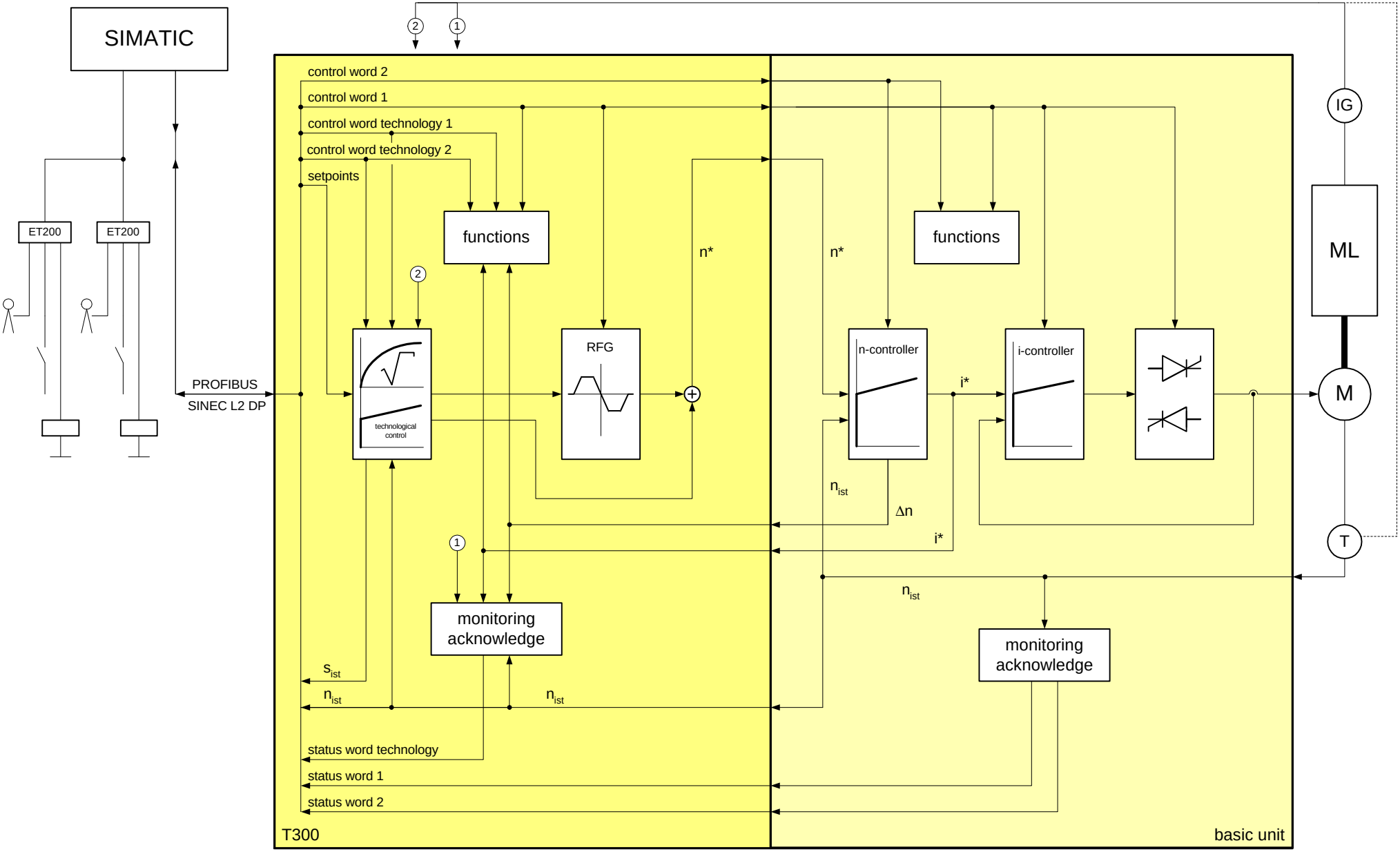
This is also the case for holding- and closing gears of a grab crane where the speed setpoint for the closing gear and the current setpoint for the current equalization control is transferred to the closing gear via this coupling.

This coupling is realized using a fast peer-to-peer connection between the technology modules.

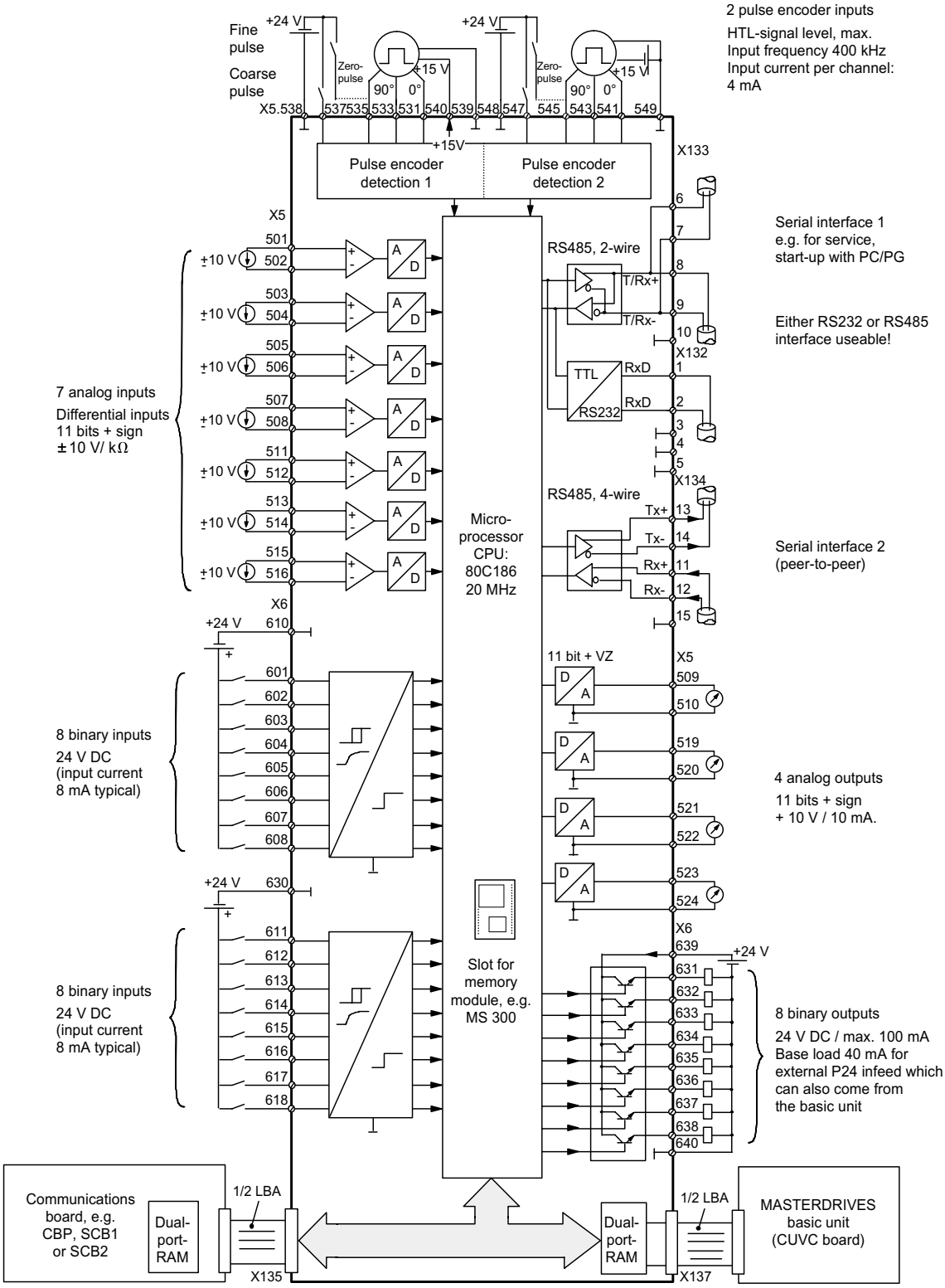
A maximum of 5 PZD data words can be transferred in both directions via this interface.

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S7
CBP
T300
unit 1
CU
PROFIBUS
converter response
PKW
1.word
PKE
2.word
IND
3.word
PWE
4.word
PWE
converter response
PKW
PROFIBUS
converter response
PKW
converter response
PKW
PROFIBUS
converter response
PZD max. 16 words
converter response
PZD 16 words
peer
to
peer
5
words
T300
unit 2


SIMATIC
ET200
ET200
PROFIBUS
SINEC L2 DP
control word 2
control word 1
control word technology 1
control word technology 2
setpoints
functions
functions
n*
n*
RFG
technological control
n-controller
i-controller
i*
n_{ist}
Δn
i*
n_{ist}
monitoring acknowledge
monitoring acknowledge
s_{ist}
n_{ist}
n_{ist}
status word technology
status word 1
status word 2
T300
basic unit
IG
ML
M
T

1.9 Connecting-up diagram for the T300



Terminals X5, X6: Connect to terminal block SE300.
Terminals X132, X133, X134: Connect to the T300.

VZ = sign

T300 technology board connection diagram

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1.10 Basic drive converter parameters required

In order to establish error-free communications and functionality between SIMATIC and the drive unit, the following parameter settings must be made in the basic drive of the converter or inverter. Depending on the selected BICO data set, these settings are made in index 1 or 2. These are:

1.10.1 SIMVOVERT MASTER DRIVE CUVC

Enter the Profibus address

P60 = 4 select the "module configuration" menu

P918.1 or .2 = ? enter the CB bus address

P60 = 1 return to the parameter menu

Interlocking the receive data

PZD1: Control word 1

The bits assigned by the SIMATIC must be interlocked with the appropriate parameters (refer to the Compendium Vector Control, function chart 180). The following parameterization must be made if, for example, all control bits are assigned by the SIMATIC.

P554.1 or 2 = 3100
P555.1 or 2 = 3101
P558.1 or 2 = 3102
P561.1 or 2 = 3103
P562.1 or 2 = 3104
P563.1 or 2 = 3105
P564.1 or 2 = 3106
P565.1 or 2 = 3107
P568.1 or 2 = 3108
P569.1 or 2 = 3109
P571.1 or 2 = 3111
P572.1 or 2 = 3112
P573.1 or 2 = 3113
P574.1 or 2 = 3114
P575.1 or 2 = 3115

Otherwise, the parameters which are to be not controlled from the SIMATIC, should be left in the factory setting.

PZD2: Speed setpoint

P443.1 or 2 = 3002

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PZD3: Control word 2

The bits assigned by the SIMATIC should be interlocked with the appropriate parameters (refer to the Compendium Vector Control, function chart 190). The following parameterization must be made, if for example, all control bits are to be assigned by the SIMATIC.

P576.1 or 2 = 3300
P577.1 or 2 = 3301
P578.1 or 2 = 3302
P579.1 or 2 = 3303
P580.1 or 2 = 3304
P581.1 or 2 = 3305
P582.1 or 2 = 3306
P583.1 or 2 = 3307
P584.1 or 2 = 3308
P585.1 or 2 = 3309
P586.1 or 2 = 3310
P587.1 or 2 = 3311
P588.1 or 2 = 3312
P589.1 or 2 = 3313
P590.1 or 2 = 3314
P591.1 or 2 = 3315

Otherwise, the parameters which are not to be controlled from the SIMATIC, should be left in the factory setting.

PZD4: Start pulse

P506.1 or 2 = 3004[2]

Interlocking the send data

PZD1: Status word 1

P734.1 = 32

PZD2: Speed actual value

P734.2 = 148

PZD3: Status word 2

P734.3 = 33

PZD4: Current setpoint

P734.4 = 168

PZD5: System deviation

P734.5 = 152

The remaining available process data can be connected and used individually.

[2] The start pulse has to be parameterized just for hoisting gear, holding gear and closing gear (modules 1-3) because it is only relevant for these gears

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