

Siemens 6ES7416-3ER05-0AB0 Manual

Brand	Siemens
Product Series	Siemens
Product Type	SFB

Description

6ES7416-3XR05-0AB0

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SIMATIC S7-400,
CPU 416-3 CENTRAL PROCESSING UNIT WITH: 11.2 MB
WORKING MEMORY,
(5.6 MB CODE, 5.6 MB DATA),
1. INTERFACE MPI/DP 12 MBIT/S,
2. INTERFACE PROFIBUS DP,
3. IF IFM MODULES PLUGGABLE

General information

Hardware product version 04

Firmware version V5.3

Engineering with

Programming package STEP7 V 5.3 SP2 or higher with HW update

CiR - Configuration in RUN

CiR synchronization time, basic load 100 ms

CiR synchronization time, time per I/O slave 10 µs

Supply voltage

24 V DC No ; Power supply via system power supply

Input current

from CPU, max. Not relevant for 400 series (300 series set)

from backplane bus 5 V DC, typ. 1.1 A

from backplane bus 5 V DC, max. 1.3 A

from backplane bus 24 V DC, max. 450 mA ; 150 mA per DP interface

from interface 5 V DC, max. 90 mA ; At each DP interface

Power losses

Power loss, typ. 5.5 W

Power loss, max. 6 W

Backup battery

Battery operation Not relevant

Backup current, typ. 125 µA ; (up to 40 °C)

Backup current, max. 550 µA

Backup time, max. See reference manual, module data, Chapter 3.3

Feeding of external backup voltage to CPU 5 to 15 VDC

Feeding of external backup voltage to CPU 5 to 15 VDC

Memory

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Work memory

integrated 11.2 Mbyte

integrated (for program) 5.6 Mbyte

integrated (for data) 5.6 Mbyte

expandable No

Load memory

expandable FEPR0M Yes ; with Memory Card (FLASH)

expandable FEPR0M, max. 64 Mbyte

integrated RAM, max. 1 Mbyte

expandable RAM Yes ; with Memory Card (RAM)

expandable RAM, max. 64 Mbyte

Backup

present Yes

with battery Yes ; all data

without battery No

CPU processing times

for bit operations, typ. 30 ns

for word operations, typ. 30 ns

for fixed point arithmetic, typ. 30 ns

for floating point arithmetic, typ. 90 ns

CPU-blocks

DB

Number, max. 10000 ; Number range: 1 to 16000

Size, max. 64 kbyte

FB

Number, max. 5000 ; Number range: 0 to 7999

Size, max. 64 kbyte

FC

Number, max. 5000 ; Number range: 0 to 7999

Size, max. 64 kbyte

OB

Number, max. see instruction list

Size, max. 64 kbyte

Number of free cycle OBs 1 ; OB 1

Number of time alarm OBs 8 ; OB 10-17

Number of delay alarm OBs 4 ; OB 20-23

Number of time interrupt OBs 9 ; OB 30-38 (shortest cycle that can be set = 500 µs)

Number of process alarm OBs 8 ; OB 40-47

Number of DPV1 alarm OBs 3 ; OB 55-57

Number isochronous mode OBs 4 ; OB 61-64

Number of multicomputing OBs 1 ; OB 60

Number of background OBs 1 ; OB 90

Number of startup OBs 3 ; OB 100-102

Number of asynchronous error OBs 9 ; OB 80-88

Number of synchronous error OBs 2 ; OB 121, 122

Nesting depth

per priority class 24

additional within an error OB 2

Counters, timers and their retentivity

S7 counter

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Number 2048

Retentivity

adjustable Yes

lower limit 0

upper limit 2047

preset Z 0 to Z 7

Counting range

lower limit 0

upper limit 999

IEC counter

present Yes

Type SFB

Number Unlimited (limited only by RAM capacity)

S7 times

Number 2048

Retentivity

adjustable Yes

lower limit 0

upper limit 2047

preset No times retentive

Time range

lower limit 10 ms

upper limit 9990 s

IEC timer

present Yes

Type SFB

Number Unlimited (limited only by RAM capacity)

Data areas and their retentivity

retentive data area, total Total working and load memory (with backup battery)

Flag

Number, max. 16 kbyte ; Size of bit memory address area

Retentivity available Yes

Retentivity preset MB 0 to MB 15

Number of clock memories 8 ; (in 1 memory byte)

Data blocks

Number, max. 10000 ; Number range: 1 to 16000

Size, max. 64 kbyte

Local data

adjustable, max. 32 kbyte

preset 16 kbyte

Address area

I/O address area

Inputs 16 kbyte

Outputs 16 kbyte

of which, distributed

MPI/DP interface, inputs 2 kbyte

MPI/DP interface, outputs 2 kbyte

DP interface, inputs 8 kbyte

DP interface, outputs 8 kbyte

Process image

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Inputs, adjustable 16 kbyte
 Outputs, adjustable 16 kbyte
 Inputs, default 512 byte
 Outputs, default 512 byte
 consistent data, max. 244 byte

Access to consistent data in process image Yes

Subprocess images

Number of subprocess images, max. 15

Digital channels

Inputs 131072

Outputs 131072

Inputs, of which central 131072

Outputs, of which central 131072

Analog channels

Inputs 8192

Outputs 8192

Inputs, of which central 8192

Outputs, of which central 8192

Hardware configuration

Expansion devices, max. 21

connectable OPs 63

Multicomputing Yes ; 4 CPUs

Interface modules

Number of connectable IMs (total) max. 6

Number of connectable IM 460s, max. 6

Number of connectable IM 463s, max. 4 ; IM 463-2

Number of DP masters

integrated 2

via IM 467 4

via CP 10 ; CP 443-5 Extended

Mixed mode IM + CP permitted No ; IM 467 not suitable for use with CP 443-5 Ext. and CP443-1

EX4x, EX20, GX20 (in PNIO mode)

via interface module 1

Number of pluggable S5 modules (via adapter capsule in central device), max.

6

Number of IO Controllers

integrated 0

via CP 4 ; No mixed operation of CP443-1 EX40 and CP443-1 EX

41/EX20/GX20, max. 4 in central controller

Number of operable FMs and CPs (recommended)

FM Limited by number of slots and number of connections

CP, point-to-point CP 440: Limited by number of slots; CP 441: limited by number of connections

PROFIBUS and Ethernet CPs 14 ; Of which 10 CPs max. or IMs as DP master, 4 PN controller maximum

Time of day

Clock

Hardware clock (real-time clock) Yes

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battery-backed and synchronizable Yes

Resolution 1 ms

Deviation per day (buffered), max. 1.7 s ; Power off

Deviation per day (unbuffered) max. 8.6 s ; For power On

Operating hours counter

Number 16

Number/Number range 0 to 15

Range of values SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2^{31} - 1 hours

Granularity 1 hour

retentive Yes

Clock synchronization

supported Yes

to MPI, master Yes

to MPI, slave Yes

to DP, master Yes

to DP, slave Yes

in AS, master Yes

in AS, slave Yes

on Ethernet via NTP No ; via CP

to IF 964 DP Yes

Time difference in system when synchronizing via

MPI, max. 200 ms

Digital outputs

integrated channels (DO) 0

Analog inputs

Integrated channels (AI) 0

Interfaces

Interfaces 1 x MPI/PROFIBUS DP, 1 x PROFIBUS DP, 1 x PROFIBUS DP

(optionally pluggable)

Number of USB interfaces 0

Number of parallel interfaces 0

Number of 20 mA interfaces (TTY) 0

Number of RS 232 interfaces 0

Number of RS 422 interfaces 0

Number of other interfaces 0

1st interface

Type of interface integrated

Physics RS 485 / PROFIBUS + MPI

Isolated Yes

Power supply to interface (15 to 30 V DC), max. 150 mA

Number of connection resources MPI: 44, DP: 32

Functionality

MPI Yes

DP master Yes

DP slave Yes

MPI

Number of connections 44 ; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1

Transmission rate, max. 12 Mbit/s

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Services

PG/OP communication Yes

Routing Yes

Global data communication Yes

S7 basic communication Yes

S7 communication Yes

S7 communication, as client Yes

S7 communication, as server Yes

DP master

Number of connections, max. 32 ; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1

Transmission rate, max. 12 Mbit/s

Number of DP slaves, max. 32

Services

PG/OP communication Yes

Routing Yes

Global data communication No

S7 basic communication Yes

S7 communication Yes

S7 communication, as client Yes

S7 communication, as server Yes

Equidistance mode support Yes

Isochronous mode Yes

SYNC/FREEZE Yes

Activation/deactivation of DP slaves Yes

Direct data exchange (slave-to-slave communication) Yes

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DPV1 Yes

Address area

Inputs, max. 2 kbyte

Outputs, max. 2 kbyte

User data per DP slave

User data per DP slave, max. 244 byte

Inputs, max. 244 byte

Outputs, max. 244 byte

Slots, max. 244

per slot, max. 128 byte

DP slave

Number of connections 32

Transmission rate, max. 12 Mbit/s

Automatic baud rate search No

Address area, max. 32 ; Virtual slots

User data per address area, max. 32 byte

User data per address area, of which consistent, max. 32 byte

Services

PG/OP communication Yes ; with interface active

Routing Yes ; with interface active

S7 routing Yes ; with interface active

Global data communication No

S7 basic communication No

S7 communication Yes

S7 communication, as client Yes
S7 communication, as server Yes
Direct data exchange (slave-to-slave communication) No
DPV1 No
Transfer memory
Inputs 244 byte
Outputs 244 byte
2nd interface
Type of interface integrated
Physics RS 485 / PROFIBUS
Isolated Yes
Power supply to interface (15 to 30 V DC), max. 150 mA
Number of connection resources 32
Functionality
DP master Yes
DP slave Yes
DP master
Number of connections, max. 32
Transmission rate, max. 12 Mbit/s
Number of DP slaves, max. 125
Services
PG/OP communication Yes
Routing Yes
Global data communication No
S7 basic communication Yes
S7 communication Yes
S7 communication, as client Yes
S7 communication, as server Yes
Equidistance mode support Yes
Isochronous mode Yes
SYNC/FREEZE Yes
Activation/deactivation of DP slaves Yes
Direct data exchange (slave-to-slave communication) Yes
DPV1 Yes
Address area
Inputs, max. 8 kbyte
Outputs, max. 8 kbyte
User data per DP slave
User data per DP slave, max. 244 byte
Inputs, max. 244 byte
Outputs, max. 244 byte
Slots, max. 244
per slot, max. 128 byte
DP slave
Number of connections 32
Transmission rate, max. 12 Mbit/s
Address area, max. 32
User data per address area, max. 32 byte
User data per address area, of which consistent, max. 32 byte
Services

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Routing Yes

Transfer memory

Inputs 244 byte

Outputs 244 byte

3rd interface

Type of interface Pluggable interface module (IF), technical data as for 2nd interface

Plug-in interface modules IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)

Physics RS 485 / PROFIBUS

Isolated Yes

Power supply to interface (15 to 30 V DC), max. 150 mA

Automatic detection of transmission speed No

Number of connection resources 32

Functionality

MPI No

DP master Yes

DP slave Yes

DP master

Number of connections, max. 32

Transmission rate, max. 12 Mbit/s

Transmission rate, min. 9.6 kbit/s

Number of DP slaves, max. 125

Services

PG/OP communication Yes

Routing Yes ; S7 routing

Global data communication No

S7 basic communication No

S7 communication Yes

S7 communication, as client Yes

S7 communication, as server Yes

Equidistance mode support Yes

Isochronous mode Yes

SYNC/FREEZE Yes

Activation/deactivation of DP slaves Yes

Direct data exchange (slave-to-slave communication) Yes

DPV0 Yes

DPV1 Yes

Address area

Inputs, max. 8 kbyte

Outputs, max. 8 kbyte

User data per DP slave

User data per DP slave, max. 244 byte

Inputs, max. 244 byte

Outputs, max. 244 byte

Slots, max. 244

per slot, max. 128 byte

DP slave

Number of connections 32

Transmission rate, max. 12 Mbit/s

Automatic baud rate search No

Address area, max. 32

User data per address area, max. 32 byte

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User data per address area, of which consistent, max. 32 byte

Services

PG/OP communication Yes

Routing Yes ; with interface active

S7 routing Yes ; with interface active

Global data communication No

S7 basic communication No

S7 communication Yes

S7 communication, as client Yes

S7 communication, as server Yes

Direct data exchange (slave-to-slave communication) No

DPV1 No

Transfer memory

Inputs 244 byte

Outputs 244 byte

Isochronous mode

Isochronous operation (application synchronized up to terminal)

Yes ; For PROFIBUS only

Number of DP masters with isochronous mode 3

User data per isochronous slave, max. 244 byte

equidistance Yes

shortest clock pulse 1 ms ; 0.5 ms without use of SFC 126, 127

max. cycle 32 ms

Communication functions

PG/OP communication Yes

Number of connectable OPs without message processing 63

Number of connectable OPs with message processing 63 ; When using alarm_S and alarm_D

Data record routing Yes

Global data communication

supported Yes

Number of GD loops, max. 16

Number of GD packets, transmitter, max. 16

Number of GD packets, receiver, max. 32

Size of GD packets, max. 54 byte

Size of GD packet (of which consistent), max. 1 variable

S7 basic communication

supported Yes

User data per job, max. 76 byte

User data per job (of which consistent), max. 1 variable

S7 communication

supported Yes

as server Yes

as client Yes

User data per job, max. 64 kbyte

User data per job (of which consistent), max. 462 byte ; 1 variable

S5-compatible communication

supported Yes ; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5

User data per job, max. 8 kbyte

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User data per job (of which consistent), max. 240 byte
Number of simultaneous AG-SEND/AG-RECV orders per
CPU, max.
64/64
Standard communication (FMS)
supported Yes ; Via CP and loadable FB
Open IE communication
ISO-on-TCP (RFC1006) Via CP 443-1 and loadable FB
Data length, max. 1452 bytes via CP 443-1 Adv.
Web server
supported No
Number of connections
overall 64
usable for PG communication
reserved for PG communication 1
Adjustable for PG communication, max. 0
usable for OP communication

reserved for OP communication 1
adjustable for OP communication, max. 0
usable for S7 basic communication
Reserved for S7 basic communication 0
adjustable for S7 basic communication, max. 0
usable for S7 communication
reserved for S7 communication 0

Adjustable for S7 communication, max. 0
usable for routing
Reserved for routing 0
adjustable for routing, max. 0

S7 message functions

Number of login stations for message functions, max. 63 ; Max. 63 with ALARM_S and ALARM_D (OPs); max. 12 with
ALARM_8 and ALARM_P (e.g. WinCC)

Symbol-related messages Yes

SCAN procedure Yes

Block related messages Yes

Process diagnostic messages Yes

simultaneously active Alarm-S blocks, max. 1000 ; Simultaneously active alarm_S/SQ blocks or alarm_D/DQ
blocks

Alarm 8-blocks Yes

Number of instances for alarm 8 and S7 communication
blocks, max.

4000

preset, max. 600

Process control messages Yes

Number of archives that can log on simultaneously (SFB 37
AR_SEND)

32

Number of messages

overall, max. 1024

in 100 ms grid, max. 128

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in 500 ms grid, max. 512

in 1000 ms grid, max. 1024

Number of additional values

with 100 ms grid, max. 1

with 500, 1000 ms grid, max. 10

Test commissioning functions

Status block Yes ; Up to 2 simultaneously

Single step Yes

Number of breakpoints 4

Status/control variable Yes ; Up to 16 variable tables

Variables Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters

Number of variables, max. 70 ; Status/control

Forcing

Forcing Yes

Force, variables Inputs, outputs, bit memories, peripheral inputs, peripheral outputs

Number of variables, max. 512

Diagnostic buffer

present Yes

Number of entries, max. 3200

adjustable Yes

preset 120

EMC

Emission of radio interference acc. to EN 55 011

Limit class A, for use in industrial areas Yes

Limit class B, for use in residential areas No

Configuration

Configuration software

STEP 7 Yes

programming

Command set see instruction list

Nesting levels 7

Access to consistent data in process image Yes

Programming language

LAD Yes

FBD Yes

STL Yes

SCL Yes

CFC Yes

GRAPH Yes

HiGraph® Yes

System functions (SFC) see instruction list

Number of simultaneously active SFCs

DPSYC_FR 2

D_ACT_DP 8

RD_REC 8

WR_REC 8

WR_PARM 8

PARM_MOD 1

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WR_DPARM 2

DPNRM_DG 8

RDSYSST 8

DP_TOPOL 1

System function blocks (SFB) see instruction list

Number of simultaneously active SFBs

RD_REC 8

WR_REC 8

Know-how protection

User program protection/password protection Yes

Dimensions

Width 50 mm

Height 290 mm

Depth 219 mm

Required slots 2

Weight

Weight, approx. 0.9 kg

Technical Specifications

Plug-in interface modules IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)

Physics RS 485 / PROFIBUS

Isolated Yes

Power supply to interface (15 to 30 V DC), max. 150 mA

Automatic detection of transmission speed No

Number of connection resources 32

Functionality

MPI No

DP master Yes

DP slave Yes

DP master

Number of connections, max. 32

Transmission rate, max. 12 Mbit/s

Transmission rate, min. 9.6 kbit/s

Number of DP slaves, max. 125

Services

PG/OP communication Yes

Routing Yes ; S7 routing

Global data communication No

S7 basic communication No

S7 communication Yes

S7 communication, as client Yes

S7 communication, as server Yes

Equidistance mode support Yes

Isochronous mode Yes

SYNC/FREEZE Yes

Activation/deactivation of DP slaves Yes

Direct data exchange (slave-to-slave communication) Yes

DPV0 Yes

DPV1 Yes

Address area

Inputs, max. 8 kbyte

Outputs, max. 8 kbyte

User data per DP slave

User data per DP slave, max. 244 byte

Inputs, max. 244 byte

Outputs, max. 244 byte

Slots, max. 244

per slot, max. 128

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