



SIMATIC NET

Configuration limits for products of the SIMATIC NET PC Software V12




Application manual

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Legal information

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 DANGER
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 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Communications partners and configuration limits for HARDNET-PB DP-Base software

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Communications processors

Note

The communications partners and configuration limits described in this section apply to the following communications processors:

CP 5603, CP 5613 A2, CP 5613 A3, CP 5613 FO, CP 5614 A2, CP 5614 A3, CP 5623 and CP 5624

Communications partners

The DP master of the CP 5603, CP 5613 A2 / CP 5614 A2, CP 5613 A3 / CP 5614 A3 and CP 5623 / CP 5624 can be operated with all certified DP slaves. The DP slave of CP 5614 A2, CP 5624 and the CP 5603 slave, CP 5613 A2 slave and CP 5623 slave can be operated with all certified DP master stations.

In the remaining sections, the modules listed above will simply be called CP 5613 / CP 5614.

1.1 Configuration limits for DP masters

Maximum length of the DP input data: 244 bytes per slave

Maximum length of the DP output data: 244 bytes per slave

Maximum length of the DP diagnostics data: 244 bytes per slave

Number of DP slaves: 124

Theoretical maximum (station addresses 0-127)	128
One address is occupied by the CP 5613 / CP 5614	-1
Address 127 is reserved for broadcast	-1
Reserve address 0 for DP master class 2 (recommended)	-1
Reserve address 126 for node initialization (recommended)	-1
Result	124

1.2 Configuration limits for DP slaves

Note

Keep to the maximum address range of STEP 7 Professional (TIA Portal).

Maximum number of simultaneous DPC1 jobs (read/write): 1 per slave

Maximum number of simultaneous DPC2 connections (read/write): 56

Note

In STEP 7 Professional (TIA Portal), the total number of slave inputs and outputs that can be configured is further restricted. The reason for this is the maximum memory space that STEP 7 Professional (TIA Portal) has available for a PC.

1.2 Configuration limits for DP slaves

The following applies to CP 5613 and CP 5614 slaves:

Maximum length of the DP input data: 244 bytes per slave

Maximum length of the DP output data: 244 bytes per slave

1.3 Configuration limits for FDL

Maximum number of simultaneous jobs (sum of requests and indications) that can be en route between two stations:

PROFIBUS profile	Maximum number of simultaneous jobs (sum of requests and indications)
1.5 Mbps DP	50
1.5 Mbps standard	50
1.5 Mbps universal DP/FMS	30
12 Mbps DP	80
12 Mbps standard	80

1.4 Other properties

Parallel operation of protocols

A maximum of two protocols can be operated at one time, for example PROFIBUS DP and PROFIBUS S7.

Data transmission speeds supported

9.6 Kbps
19.2 Kbps
45.45 Kbps
93.75 Kbps
187.5 Kbps
500 Kbps
1.5 Mbps
3 Mbps
6 Mbps
12 Mbps

Parallel operation of CP 5613/CP 5614

Up to four CP 5613 / CP 5614 modules can be operated at the same time.

Bus parameters for DP slaves

The bus parameters for the DP slave part of the CP 5614 and the CP 5603, CP 5613 A2, CP 5613 A3, CP 5623 slaves must be set using the PC station.

1.4 Other properties

Configuration limits, SOFTNET-PB DP

2.1 Configuration limits for DP masters

Maximum length of the DP input data: 244 bytes per slave

Maximum length of the DP output data: 244 bytes per slave

Maximum length of the DP diagnostics data: 244 bytes per slave

Number of DP slaves (CP 5612 / CP 5622 / CP 5711): max. 64 slaves

Note

Please keep to the maximum address range of STEP 7 Professional (TIA Portal).

Maximum number of simultaneous DPC1 jobs (read/write): 1 per slave

Maximum number of simultaneous DPC2 connections (read/write): 56

Note

In STEP 7 Professional (TIA Portal), the total number of slave inputs and outputs that can be configured is further restricted. The reason for this is the maximum memory space that STEP 7 Professional (TIA Portal) has available for a PC.

2.2 Configuration limits for DP slaves

Maximum length of the DP input data: 122 bytes

Maximum length of the DP output data: 122 bytes

2.3 Configuration limits for FDL

A maximum of 50 unprocessed FDL jobs can be en route between two stations.

2.4 Other properties

Parallel operation of protocols

A maximum of 1 protocol can be used alongside PG mode (use of STEP 7 Professional (TIA Portal)), for example PROFIBUS-S7 and PG mode.

2.4 Other properties

1 SOFTNET-CP is permitted in configured mode. An additional SOFTNET-CP can be used in unconfigured mode (PG mode).

Configuration limits, HARDNET-PB S7

S7 connections

A maximum of 207 S7 connections can be configured per configured application (max. 20) regardless of the number of configured modules (STEP 7 as of Version 5.1 Service Pack 4).

During configuration, the SIMATIC NET OPC server counts as a "user application". This means that the maximum number of configured S7 connections over OPC is fixed at 207.

Maximum number of S7 connections that can be operated at the same time

The maximum number of S7 connections depends on the PDU size and the number of credits. The following table shows the maximum number of open S7 connections per CP 5613 for the credit values 1 and 2:

PDU size	Number of S7 connections with credit 1	Number of S7 connections with credit 2
112	50	35
240	50	35
480	32	19
960	19	11

Maximum number of CPs with the S7 protocol on one PC

S7 allows operation of four CP 5613s per PC.

Parallel operation of protocols

A maximum of two protocols can be operated at one time, for example PROFIBUS DP and PROFIBUS S7.

Configuration limits, SOFTNET-PB S7

Number of S7 connections

Eight S7 connections can be operated with the SOFTNET-PB S7 product.

PDU size	Number of S7 connections with credit 1	Number of S7 connections with credit 2
112	8	8
240	8	8
480	8	8
960	8	8

Parallel operation of protocols

A maximum of 1 protocol can be used alongside PG mode (use of STEP 7 Professional (TIA Portal)), for example PROFIBUS-S7 and PG mode.

1 SOFTNET-CP is permitted in configured mode. An additional SOFTNET-CP can be used in unconfigured mode (PG mode).

Configuration limits, CP 1613 A2, CP 1623 and CP 1628

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A maximum of four CP 1613 A2 / CP 1623 / CP 1628 can be used simultaneously in a programming device/PC.

Configuration limits, HARDNET-IE S7

Data with connection establishment

When the connection is established actively with the SEND/RECEIVE job SEND_CONN_REQ, it is possible to transfer up to 32 bytes of data. This data can be received on the communications partner (passive connection establishment) with the AWAIT_CONN_REQ_TRAN or AWAIT_CONN_REQ_USER job types. This type of data transmission works only with the ISO protocol.

Connections with CP 1613, CP 1623 and CP 1628

A maximum of 207 S7 or S7-H connections can be operated per configured application (max. 20) regardless of the number of configured modules.

During configuration, the SIMATIC NET OPC server counts as a "user application". This means that the maximum number of configured S7 connections that can be operated over OPC is fixed at 207. This is only possible with STEP 7 as of Version 5.1 Service Pack 4.

The following table shows the maximum number of S7 connections depending on the number of inserted CP 1613 A2, CP 1623 or CP 1628 modules.

Number of CP 1613 A2 / CP 1623 / CP 1628 network adapters	Number of S7 connections **)	Number of SEND/RECEIVE connections
1	120	120
2	240 *)	240
4	480 *)	480

The following table shows the maximum number of S7 connections to the S7-1500 CPUs if these are established by an OPC server V12 (optimized S7 communication):

Number of CP 1613 A2 / CP 1623 / CP 1628 network adapters	Number of S7 connections with CP 1613 A2 / CP 1623 **)	Number of S7 connections with CP 1628 **)
1	40	64
2	80	128
4	160	256 *)

*) Note: In STEP 7 Professional (TIA Portal), a maximum of 207 S7 or S7-H connections can be configured per configured application. This means that the number of connections that can be operated over the OPC interface must also be restricted to 207.

**) Connections with PDU sizes 112, 240, 480 and 960 bytes and a credit of 1. Do not configure more connections than specified above with STEP 7 Professional (TIA Portal) otherwise trouble-free operation of all connections is not possible.

Parallel operation of protocols

To achieve the best possible performance in process communication, we recommend that you use a separate Ethernet module for office communication.

Configuration limits IE S7 REDCONNECT

Connections

A maximum of 207 S7 or S7-H connections can be operated per configured application regardless of the number of configured modules.

During configuration, the SIMATIC NET OPC server counts as a "user application". This means that the maximum number of configured S7 connections that can be operated over OPC is fixed at 207. This is only possible with STEP 7 as of Version 5.1 Service Pack 4.

The following table shows the maximum number of S7 connections depending on the number of CP 1613/CP 1623/CP 1628 modules inserted with credit 1 (1 SAPI-S7 job per connection).

Table 7- 1 HARDNET-IE S7 REDCONNECT

Number of CP 1613/ CP 1623/CP 1628 network adapters	Number of S7 connections	Number of S7 connections fault tolerant (2 paths)	Number of fault- tolerant S7 connections (4 paths)
1	120	60	30
2	240	120	60
4	480	240	120

In STEP 7, a maximum of 207 S7 or S7-H connections can be configured per configured application. This means that the number of connections that can be operated over the OPC interface must also be restricted to 207.

Connections with PDU sizes 112, 240, 480 and 960 bytes and a credit of 1. Do not configure more connections than specified above with STEP 7 otherwise trouble-free operation of all connections is not possible.

The following table shows the maximum number of S7 connections depending on the number of general IE modules inserted with credit 1 (1 SAPI-S7 job per connection).

Table 7- 2 SOFTNET-IE S7 REDCONNECT VM

Number of CP 1612 A2 / IE general network adapters	Number of S7 connections	Number of S7 connections fault tolerant (2 paths)
1	120	60
2	not permitted	120

In STEP 7, a maximum of 207 S7 or S7-H connections can be configured per configured application. This means that the number of connections that can be operated over the OPC interface must also be restricted to 207.

Connections with PDU sizes 112, 240, 480 and 960 bytes and a credit of 1. Do not configure more connections than specified above with STEP 7 otherwise trouble-free operation of all connections is not possible.

Monitoring times for operating fault-tolerant S7 connections using TCP/IP

Make sure that adequate monitoring times are configured for the fault-tolerant S7 connections using TCP/IP.

Recommended monitoring times are as follows:

up to 5 connections:	5 s
up to 30 connections:	10 s
up to 60 connections:	15 s
up to 90 connections:	20 s
up to 120 connections:	25 s

Set these monitoring times in the connection properties when you configure the fault-tolerant S7 connections using TCP/IP. Remember that the multiplier is 100 ms, so that, for example, you enter the value 100 a monitoring time of 10 s.

Setting values higher than 25 s is impractical since the TCP keepalive monitoring (30 s) causes the connection path to be terminated.

Configuration limits CP 1612 A2 and IE General

1 CP 1612 A2 or IE General is permitted in configured mode.

The configuration of up to two CP 1612 A2 devices or IE General in one PG/PC is permitted only for the operation of fault-tolerant S7 connections with SOFTNET IE S7 REDCONNECT VM.

Configuration limits, SOFTNET-IE S7

Connections

A maximum of 207 S7 connections can be operated per configured application regardless of the number of configured modules.

During configuration, the SIMATIC NET OPC server counts as a "user application". This means that the maximum number of configured S7 connections over OPC is fixed at 207.

The following table shows the maximum number of S7 and SEND/RECEIVE connections depending on the number of network adapters inserted with credit 1 or 2 (1 or 2 SAPI S7 jobs per connection).

Number of network adapters	Credit	Number of S7 connections	Number of SEND/RECEIVE connections
1	< 2	64 *)	64

*) Connections with PDU sizes 112, 240, 480 and 960 bytes and a credit of 1 or 2. Do not configure more connections than specified above with STEP 7 Professional (TIA Portal) otherwise trouble-free operation of all connections is no longer possible.

Communications parameters

The values of the following parameter sets are supported:

Parameter	Value for S7 protocol	Value for SEND/RECEIVE
Maximum frame length of a job	112, 240, 480 and 960 bytes depending on the partner	4096 bytes
Maximum number of simultaneous jobs per connection	2 jobs	2 jobs

If certain parameters deviate so that fewer system resources are required, this may mean that more system resources may be available for other parameters.

Remember that the actual user data length is less than the frame length and depends on the particular job type.

Parallel operation of protocols

A maximum of 1 protocol can be used alongside PG mode (use of STEP 7 Professional (TIA Portal)), for example SOFTNET S7 and PG mode.

If you use PG or office communication in addition to SOFTNET-S7, the configuration limits shown above are lower.

Configuration limits, SOFTNET-IE S7 Lean

Connections

The following table shows the maximum number of S7 and SEND/RECEIVE connections depending on the number of inserted network adapters.

Number of network adapters	Number of S7 connections	Number of SEND/RECEIVE connections
1	8	8

Connections with PDU sizes 112, 240, 480 and 960 bytes and a credit of 1 or 2. Do not configure more connections than specified above with STEP 7 Professional (TIA Portal) otherwise trouble-free operation of all connections is no longer possible.

Communications parameters

The values of the following parameter sets are supported:

Parameter	Value for SAPI-S7	Value for SEND/RECEIVE
Maximum frame length of a job/request	112, 240, 480 and 960 bytes depending on the partner	4096 bytes
Maximum number of simultaneous jobs/requests per connection	2 jobs	2 jobs

If certain parameters deviate so that fewer system resources are required, this may mean that more system resources may be available for other parameters.

Remember that the actual user data length is less than the frame length and depends on the particular job type.

Parallel operation of protocols

A maximum of 1 protocol can be used alongside PG mode (use of STEP 7 Professional (TIA Portal)), for example SOFTNET IE S7 and PG mode.

If you use PG or office communication in addition to SOFTNET-IE S7, the configuration limits shown above are lower.

Configuration limits, SOFTNET-IE PN IO

Process data

Maximum length of the IO input data: 4096 bytes

Maximum length of the IO output data: 4096 bytes

Maximum number of IO devices: 64

Maximum number of IO modules: 1024

Maximum module size: 254 bytes

Maximum length of the IO input data per device: < 1434 bytes (see formula)

Maximum length of the IO output data per device: < 1434 bytes (see formula)

Formula for calculating the maximum amount of IO data per device:

The maximum amount of process data in the configuration of an IO device is decided by the maximum frame size (net 1434 bytes) and the number of modules inserted in this IO device (configuration in HW Config).

The following applies to homogeneous modules:

- The maximum length is 1434 bytes of data minus the number of inserted modules.

The following applies to mixed modules (DI/DO):

- The maximum length is 1434 bytes of data minus twice the number of inserted modules.

Examples of the calculation outlined above:

- IO device with 16 inserted DI modules:

1434 minus 16 = maximum 1418 bytes of user data in total via 16 submodules.

IO device with 32 inserted DI/DO modules:

1434 minus $2 \cdot 32$ = maximum 1370 bytes of user data in total via 32 submodules.

- The following applies in general for n homogeneous and m mixed modules:

Amount of PROFINET IO data in bytes = $1434 - n - 2 \cdot m$

Data sets

- Maximum length of the data sets when reading: 4092 bytes
- Maximum length of the data sets when writing: 4096 bytes

Mode

SOFTNET-IE PN IO can only be operated in the 100 Mbps full duplex mode.

Number of network adapters

A maximum of 1 network adapter with SOFTNET-IE PN IO can be operated.

The following network adapters have been released for operation of SOFTNET IE PN IO:

- CP 1612 A2
- IE General

Update times for cyclic data exchange

The update time proposed by STEP 7 Professional (TIA Portal) must be increased as follows if you have a larger hardware configuration:

- Up to 16 IO devices: 8 ms
- Up to 32 IO devices: 16 ms
- Up to 64 IO devices: 32 ms

These values are guidelines.

Parallel operation of protocols

Apart from SOFTNET-IE PN IO, no other protocol may be operated at the same time otherwise the data will not be transferred within the cycle time.

With office communication alongside SOFTNET-IE PN IO, connections can abort if the NDIS communication does not leave enough resources for the SOFTNET-IE PN IO protocol.

It is advisable to handle additional communication via separate communications processors with separate subnets (logical or physical).

Configuration limits SIMATIC NET OPC server

The PCs used for the measurements had the following hardware configuration:

- CPU: 3 GHz
- RAM: 1 GB

To use a large configuration with the S7 / S7 optimized protocol, the following minimum requirements must be met:

- CPU: Dual core
- RAM: 4 GB

The configuration limits have been tested under the test configurations described in the following table. Configurations other than this test configuration are possible.

Protocol	max. enabled number of items/nodes	Test configuration
DP master class 1 DP master class 2	10 000	<ul style="list-style-type: none"> • 1 CP 5613 • Byte items
DP master class 1 with OPC UA	10 000	<ul style="list-style-type: none"> • 1 CP 5613 • Byte nodes
DP slave	7 808	<ul style="list-style-type: none"> • DP-Base-5614 slave with a maximum byte length of 244 bytes. • The items are written bit-oriented (VT_BOOL).
DP slave with OPC UA	7 808	<ul style="list-style-type: none"> • DP-Base-5614 slave with a maximum byte length of 244 bytes. • The nodes are written bit-oriented (VT_BOOL).
FDL	10 200	<ul style="list-style-type: none"> • All tests were performed with byte items. • 1.5 Mbps • Universal bus profile • 22 connections between 2 PCs alone on the bus.
PROFINET IO	100 000	bit items, of these 65 000 items for cyclic data and 35 000 items for data records. Distributed on 5 CP 1616 PROFINET IO devices.
PROFINET IO with OPC UA	50 000	Bit items, 50 000 cyclic data items. Distributed on 5 CP 1616 PROFINET IO devices.

Protocol	max. enabled number of items/nodes	Test configuration
S7 protocol	1 000 000	<ul style="list-style-type: none"> • 50 connections each with 20 000 linear successive byte items. • 1 000 000 items in 10 OPC groups. 100 000 items per OPC group. • Protocol selection only "S7" and "XML"; this means that the S7-OPC server is configured as an "outproc" server. • Configured job timeout 15 000 ms • Work memory utilization of the OPC server 1.3 Gbytes
S7 protocol with symbols	500 000	<ul style="list-style-type: none"> • Configuration and download or XDB import of 50 x 20 000 = 1 000 000 OPC symbols of the type ATI. • Configuration of 1 000 000 OPC symbols of the type ATI with the symbol editor, of which 100 000 are array items and 100 000 are items with deadband information (EU Low, EU High) • 50 connections each with 10 000 linear successive byte items. • 500 000 items in 5 OPC groups each with 100 000 items • Protocol selection only "S7" and "XML"; this means that the S7-OPC server is configured as an "outproc" server. • ATI symbols without prefix and without further STI symbol files • Configured job timeout 15 000 ms • Work memory utilization of the OPC server 1 Gbytes
S7 protocol with OPC UA	500 000	<ul style="list-style-type: none"> • 10 connections each with 50 000 linear successive byte nodes • 10 OPC UA clients each with 50 000 nodes • Protocol selection only "S7" and "UA" • Configured job timeout 15 000 ms
S7 protocol with symbols and OPC UA	200 000	<ul style="list-style-type: none"> • Configuration and download or XDB import of 50 x 20 000 = 1 000 000 OPC symbols of the type ATI. • Configuration of 1 000 000 OPC symbols of the type ATI with the symbol editor, of which 100 000 are array nodes and 100 000 are nodes with deadband information (EU Low, EU High) • 4 connections each with 50 000 linear successive byte nodes • 4 OPC UA clients each with 50 000 nodes • Protocol selection only "S7" and "UA" • Configured job timeout 15 000 ms • ATI symbols without prefix and without further STI symbol files

Protocol	max. enabled number of items/nodes	Test configuration
S7 protocol alarms	5 000 alarms	<ul style="list-style-type: none"> • 5 000 configured S7 messages • Message text in 2 languages, each with maximum 256 characters • 10 S7 connections each with 500 messages per S7-CPU
S7 protocol Data Access parallel to alarms	100 000 items/nodes 1 000 alarms	<ul style="list-style-type: none"> • 5 000 configured S7 messages • Message text in 2 languages, each with maximum 256 characters • 10 S7 connections each with 10 000 items and 100 messages per S7-CPU
S7 optimized protocol with OPC UA (optimized S7 communication)	500 000	<ul style="list-style-type: none"> • 5 S7 connections each with 100 000 linear, consecutive byte nodes distributed over 20 data blocks • 5 OPC UA clients each with 100 000 nodes • Protocol selection only "OPC UA" with "S7 optimized" • Configured job timeout 15 000 ms
S7 optimized protocol with symbols and OPC UA (optimized S7 communication)	200 000	<ul style="list-style-type: none"> • Configuration and download or XDB import of 5 x 40 000 = 200 000 OPC symbols of the type ATI (type-correct access or standard access). • 5 connections each with 40 000 linear, consecutive byte nodes (with standard access; cannot be set with type-correct access) • 5 OPC UA clients each with 40 000 nodes • Protocol selection only "OPC UA" with "S7 optimized" • Configured job timeout 15 000 ms • ATI symbols without prefix and without further STI symbol files
SEND/ RECEIVE	20 000	SEND and RECEIVE on ISO and RFC 1006 connections The items used are all bit items.
SEND/RECEIVE over OPC UA	20 000	SEND and RECEIVE on ISO and RFC 1006 connections The nodes used are all bit nodes.
SNMP	100 000	Communication with up to 200 SNMP devices via CP 1612 A2. If such configuration limits are used, this can cause interruptions on the connections. In this case, higher cycle and update times and timeouts to the SNMP devices must be set.
OPC UA	Up to 500 000	The maximum number of OPC UA clients / sessions is 100
XML	30 000	<ul style="list-style-type: none"> • S7 protocol, 1 S7 connection • Linear sorting of the items • With ATI-S7 symbols a maximum of 15 000 items, maximum length of the symbol names 128 bytes

Note

For the S7 protocol with symbols and the S7 / S7OPT protocol with symbols and OPC UA, you can configure up to 1 000 000 items/nodes but only operate 500 000 or 200 000 items/nodes at the same time.

Note

In the case of S7 protocol Data Access operated in parallel with alarms, you can configure up to 5 000 S7 messages but only operate with 1 000 messages at the same time.

Configuration limits, SOFTNET-IE RNA

Ethernet networks with up to 1024 participants are supported.

A maximum of eight network adapters that can be configured to four RNA adapters are supported per PC with SOFTNET IE RNA.

The following network adapters have been released for operation of SOFTNET IE RNA:

- CP 1612 A2
- IE General

The duplicates buffer can be set to up to 1024 input and output packets.

Operation of the SIMATIC NET PC software with VMware ESXi / vSphere 5.1

During operation of the SIMATIC NET PC software in a virtual machine with ESXi / vSphere 5.1, it was discovered that the latency periods can fluctuate significantly. This depends on the PC, the slot, the CP and the type of operating system.

Monitoring times, for example with PROFIBUS CPs or with SOFTNET-IE PN IO, therefore need to be significantly longer than with operating systems without virtualization. Due to the huge differences between the various platforms, no values are specified here.

CP 1623 and CP 1628

With VMware ESXi / vSphere 5.1, a maximum of two CP 1623 devices or two CP 1628 devices (without security) in one server have been released.

S7 RedConnect

With VMware ESXi / vSphere 5.1, 2-path connections have been released. 4-path connections are not supported.

Virtual Standard Switch (vSS)

Depending on the network load, it may be necessary to use more than one virtual standard switch to ensure trouble-free operation when using several virtual machines for SIMATIC NET communication.

