

Inline bus coupler for Sercos with digital inputs and outputs

R911170560
Edition 05

Data sheet R-IL S3 BK DI8 DO4-PAC

Sercos controller board
8 digital inputs
4 digital outputs

01 / 2022



1 Description

The bus coupler with integrated I/Os is intended for use within a Sercos® network and represents the link to the Inline I/O system.

Up to 63 Inline devices can be connected to the bus coupler.

The bus coupler supports a maximum of 16 PCP devices.

A corresponding SDDML file is available for integrating the Inline station into the programming system.

This file can be downloaded at www.boschrexroth.com/electrics.

Features

- Sercos specification V1.3.1
- Sercos diagnostic LED S and communication phase LED CP
- Minimum Sercos cycle time of 250 µs
- FSP-IO (Function Specific Profile-IO) for modular I/O devices
- Maximum of 6 realtime connections
- Hot plugging of participants in Sercos network
- Diagnostics trace

- Internet Protocol Services (IPS)
- 2 Ethernet ports
- 8 digital inputs, 4 digital outputs (on-board)

Valid from index GK1.



This data sheet is only valid in association with the "Automation terminals of the Inline product range" application description (DOK-CONTRL-ILSYSINS***-AW..-EN-P, MNR R911317021).



Make sure you always use the latest documentation.

It can be downloaded under www.boschrexroth.com/electrics.

2 Table of contents

1	Description	1
2	Table of contents	2
3	Ordering data	3
4	Technical data	4
5	Internal circuit diagram	8
6	IT security	9
7	Connecting Sercos, power supply, actuators, and sensors	9
7.1	Connecting Sercos	9
7.2	Connecting the supply, actuators, and sensors - terminal point assignment.....	10
8	Connection example.....	10
9	Local diagnostic and status indicators	11
10	Sercos	13
10.1	Sercos address	13
10.2	Sercos profile, classes and function groups.....	13
10.3	Realtime connections	14
10.4	Electronic rating plate	14
10.5	Mapping of I/O modules in Sercos	15
10.6	Terminal point assignment of local inputs and outputs to the process data	18
10.7	Behavior in the event of an error	18
10.8	Bus coupler diagnostic register	23
11	Sercos parameter	24
12	Reset button	29
12.1	Restarting the bus coupler	29
12.2	Restoring the default settings.....	29
13	Startup	30
13.1	Starting the firmware	30
13.2	Basic configuration.....	30
13.3	Modifying IP parameters.....	31
14	IPS: Internet Protocol Services	32
15	Supplementary notes.....	32

3 Ordering data

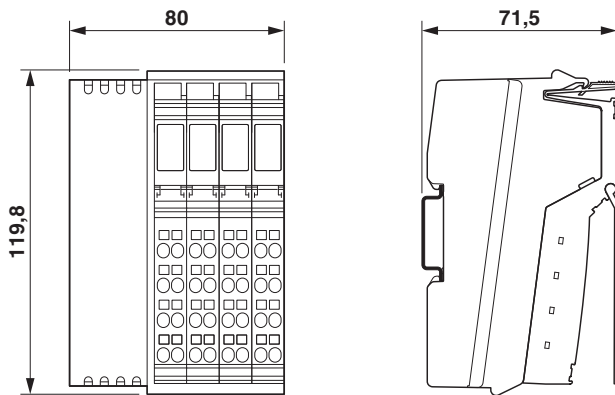
Description	Type	MNR	Pcs./Pkt.
Inline bus coupler for Sercos III with eight digital inputs and four digital outputs, complete with accessories (Inline connectors, marking fields, and end plate)	R-IL S3 BK DI8 DO4-PAC	R911170875	1
Accessories	Type	MNR	Pcs./Pck.
Sercos III cabel, 100-Base-T, CAT5E, S/STP RJ-45 <-> RJ-45 connector, 8-wire, twisted pair			
Length: 0.25 m	RKB0013/00,25 (*****_*****_*****)	R911317797	1
Length: 0.35 m	RKB0013/00,35 (*****_*****_*****)	R911317800	1
Length: 0.55 m	RKB0013/00,55 (*****_*****_*****)	R911317801	1
Sercos III cabel, 100-Base-T, CAT5E, shielded RJ-45 <-> RJ-45 connector, 4-wire			
Length: 2 m	RKB0011/002,0 (RBS0016- REB0400-RBS0016)	R911342087	1
Length: 5 m	RKB0011/005,0 (RBS0016- REB0400-RBS0016)	R911321548	1
Length: 10 m	RKB0011/010,0 (RBS0016- REB0400-RBS0016)	R911338772	1
Length: 20 m	RKB0011/020,0 (RBS0016- REB0400-RBS0016)	R911342096	1
Additional lengths available on request			
Documentation	Type	MNR	Pcs./Pkt.
Application description Automation terminals of the Inline product range	DOK-CONTRL-ILSYSINS***- AW..-EN-P	R911317021	1
Project planning manual Security manual	DOK-IWORKS- SECURITY***-PR..-EN-P	R911342562	1

Additional ordering data

For additional ordering data (accessories), please refer to the product catalog at www.boschrexroth.com/electrics.

4 Technical data

Dimensions (nominal sizes in mm)



Width	80 mm
Height	119.8 mm
Depth	71.5 mm
Note on dimensions	Specifications with connectors

General data

Color	light grey RAL 7035
Weight	280 g (with connectors, marking fields, and end plate)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	10 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	10 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Mounting type	DIN rail mounting

Connection data: Inline connector

Connection method	Spring-cage connection
Conductor cross section, rigid	0.2 mm ² ... 1.5 mm ²
Conductor cross section, flexible	0.2 mm ² ... 1.5 mm ²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Interface: Sercos

Number of interfaces	2
Connection method	RJ45 jack
Transmission length	max. 100 m

Interface: Inline local bus

Number of interfaces	1
Connection method	Inline data jumper
Transmission speed	500 kbps

System limits of the bus coupler

Amount of process data	max. 512 Byte (per station)
Number of local bus devices that can be connected	max. 63
Number of devices with parameter channel	max. 16



Observe the logic current consumption of each device when configuring an Inline station! It is specified in every terminal-specific data sheet. The current consumption can differ depending on the individual terminal. The permissible number of devices that can be connected therefore depends on the specific station structure.

Sercos

Equipment type	Sercos slave
Device profile	FSP_IO
Cycle Time	≥ 250 µs

Bus coupler supply U_{BK} ; Communications power U_L (7.5 V) and the analog supply U_{ANA} (24 V) are generated from the bus coupler supply.

Supply voltage	24 V DC (via Inline connector)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Current consumption	typ. 60 mA (without connected I/O terminal blocks) max. 1 A (with max. number of connected I/O terminal blocks)
Power consumption	typ. 1.44 W (without connected I/O terminals, without sensors or actuators at the onboard I/Os)

Communications power (U_L)

Supply voltage	7.5 V DC
Power supply unit	max. 0.8 A DC

Supply of analog modules (U_{ANA})

Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 0.5 A DC

Main circuit supply (U_M)

Supply voltage	24 V DC (via Inline connector)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 8 A DC (sum of $U_M + U_S$)
Current consumption	min. 3 mA (without connected peripherals) max. 8 A DC

Segment circuit supply (U_S)

Supply voltage	24 V DC (via Inline connector)
Supply voltage range	19.2 V DC ... 30 V DC (including all tolerances, including ripple)
Power supply unit	max. 8 A DC (sum of $U_M + U_S$)
Current consumption	min. 3 mA (without connected peripherals) max. 8 A DC

Protection**NOTICE Electronics may be damaged when overloaded**

Provide external protection for the 24 V areas U_{BK} , U_M , and U_S . If you are using an external fuse, the power supply unit must be able to supply four times the nominal current of the fuse. This ensures that it trips in the event of an error.

Digital inputs

Number of inputs	8
Connection method	Inline connector
Connection technology	3-conductor
Description of the input	EN 61131-2 type 1
Nominal input voltage	24 V DC
Nominal input current	typ. 3 mA
Current flow	Limited to 3 mA, maximum
Input voltage range "0" signal	-30 V DC ... 5 V DC
Input voltage range "1" signal	15 V DC ... 30 V DC
Signal delay	< 11 μ s (t_{on} , 24 V) < 140 μ s (t_{off} , 24 V)
Permissible conductor length to the sensor	100 m
Reverse polarity protection	Suppressor diode

Digital outputs

Number of outputs	4
Connection method	Inline connector
Connection technology	3-conductor
Nominal output voltage	24 V DC
Voltage difference with nominal current	< 1 V
Output current per channel	max. 500 mA
Output current of the device	max. 2 A
Nominal load, ohmic	12 W
Nominal load, inductive	12 VA (1.2 H, 48 Ω)
Nominal load, lamp	12 W
Signal delay	< 40 μ s (t_{on} , no load) < 50 μ s (t_{on} , load = 0.5 A) < 350 μ s (t_{off} , no load) < 235 μ s (t_{off} , load = 0.5 A)
Signal delay when switching on an ohmic nominal load	max. 50 μ s (in the case of 0.5 A load)
Signal delay when switching off an ohmic nominal load	max. 250 μ s (in the case of 0.5 A load)
Maximum operating frequency with inductive nominal load	0.5 Hz (1.2 H, 48 Ω)
Behavior at voltage switch-off	The output follows the power supply without delay
Limitation of the voltage induced on circuit interruption	approx. -30 V
Output voltage when switched off	max. 500 mV
Output current when switched off	max. 500 μ A (When not loaded, a voltage can be measured even at an output that is not set.)
Behavior with overload	Auto restart
Behavior with inductive overload	Output can be destroyed
Reverse voltage resistance to short pulses	Reverse voltage proof
Resistance to permanent reverse voltage	max. 2 A
Overcurrent shut-down	min. 0.7 A

Digital outputs

Output current with ground connection interrupt when switched off	max. 25 mA
Switching capacity with ground connection interrupt	typ. 100 mW (at 1 kΩ load resistance)
Short-circuit and overload protection	Freewheeling circuit in the output driver

Error messages to the higher level control or computer system

Short-circuit or overload of the digital outputs	Yes
Sensor supply failure	Yes
Failure of the actuator supply	Yes

Protective circuit

Surge protection, protection against polarity reversal of the supply voltage	35 V suppressor diode
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Mechanical tests

Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	Operation: 25g, 11 ms duration, semi-sinusoidal shock impulse

Conformance with EMC Directive 2014/30/EU**Immunity test in accordance with EN 61000-6-2/IEC 61000-6-2**

Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion A, all interfaces 1 kV Criterion B, all interfaces 2 kV
Transient overvoltage (surge) EN 61000-4-5/IEC 61000-4-5	Criterion B, supply lines DC: 0.5 kV/0.5 kV (symmetrical/asymmetrical), fieldbus cable shield 1 kV
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A, Test voltage 10 V

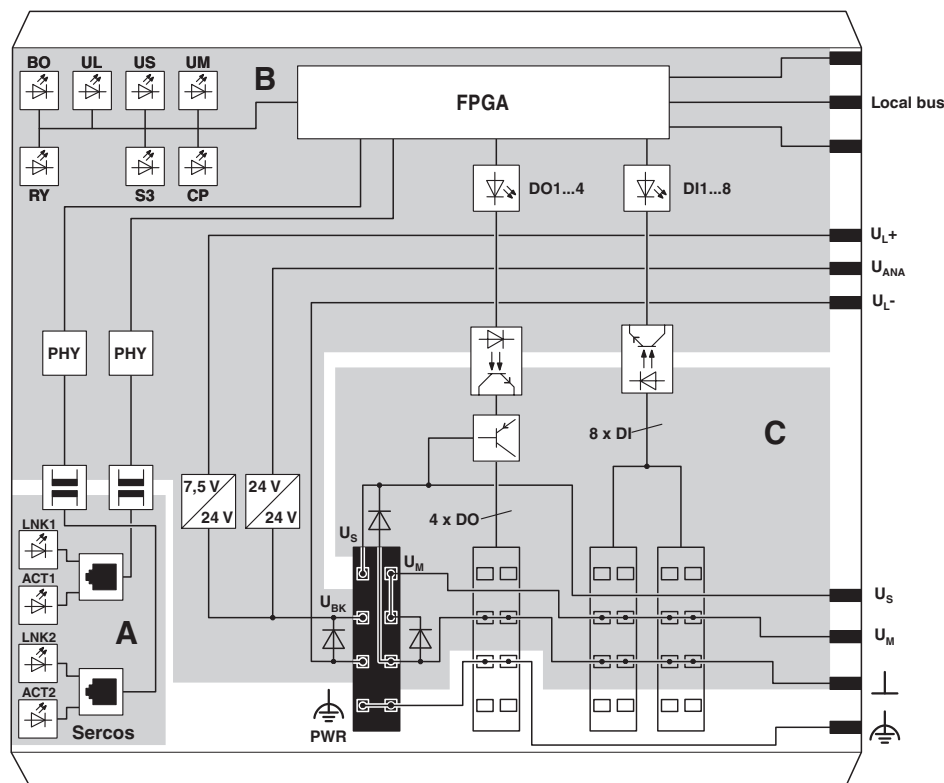
Noise emission test in accordance with EN 61000-6-4/IEC 61000-6-4

Class A

ApprovalsFor the latest approvals, please visit www.boschrexroth.com/electrics.

5 Internal circuit diagram

Fig. 1 Internal wiring of the terminal points



Key:

	FPGA
	Optocoupler
	PNP transistor
	PHY
	Transmitter with electrical isolation
	LED
	Power supply unit without electrical isolation
	Electrically isolated area

- A Sercos interface
 B Logic
 C I/O devices

Other symbols used are explained in the application description for the Inline system, material number R911317021.

The module contains components that can be damaged or destroyed by electrostatic discharge. When handling the module, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and IEC 61340-5-1.

Only personnel authorized by Bosch are permitted to open the housing.

6 IT security



NOTE: Risk of unauthorized network access

Connecting devices to a network via Ethernet entails the danger of unauthorized access to the network.

To prevent unauthorized network access, please read the following notes.

If possible, deactivate unused communication channels.

Assign passwords such that third-parties cannot access the bus coupler and make changes without authorization.

Due to its communication interfaces, the bus coupler should not be used in safety-critical applications without additional security appliances.

Therefore, please take additional protective measures in accordance with the IT security requirements and the standards applicable to your application (e.g. virtual networks (VPN) for remote maintenance access, firewalls, etc.) for protection against unauthorized network access.

The operation of installations, systems and machines requires the implementation of an integral concept for state-of-the-art IT security. Bosch Rexroth products are part of this integral concept. Bosch Rexroth product characteristics

have to be taken into consideration in an integral IT security concept. The relevant characteristics are documented in the IT security guideline DOK-IWORKS-SECURITY***-PR..-EN-P (R911342562) dokumentiert.

7 Connecting Sercos, power supply, actuators, and sensors

7.1 Connecting Sercos

Connect Sercos to the bus coupler via an RJ45 connector.



Install Sercos in accordance with the specifications in the current "Planning and Installation Guide" (see www.sercos.com).



Shielding

The shield of the connected twisted pair cables is electrically connected to the socket. When connecting network segments, avoid ground loops, potential transfers, and equipotential bonding currents via the braided shield.



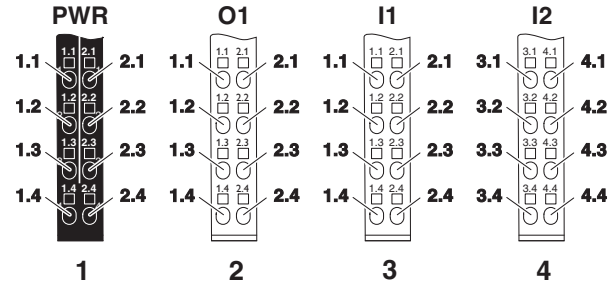
Observe bending radii

The housing dimensions specified under "Dimensions" refer to the bus coupler with I/O connectors without Ethernet connection. When installing the bus coupler in a control box, observe the bending radii of the cables and the connectors used.

If required, use angled RJ45 connectors to maintain these bending radii.

7.2 Connecting the supply, actuators, and sensors - terminal point assignment

Fig. 2 Terminal point assignment



Terminal point assignment of the power connector (1)

Terminal point	Assignment	Terminal point	Assignment
1.1	U_S	2.1	U_M
1.2	U_{BK}	2.2	U_M
1.3	GND U_{BK}	2.3	GND U_M , U_S
1.4	Functional ground FG	2.4	Functional ground FG

For information on the power supplies, please refer to the application description of the Inline system, material number R911317021.

If you wish to use the same reference potential for communications power and segment voltage, you can bridge terminal points 1.3 and 2.3 on the connector.

Make sure that the maximum total current flowing through the potential jumpers is 8 A.

Connect the functional ground via the power connector.

Terminal point assignment of the output connector (2)

Terminal point	Assignment	Terminal point	Assignment
1.1	OUT01	2.1	OUT02
1.2	GND	2.2	GND
1.3	FE	2.3	FE
1.4	OUT03	2.4	OUT04

Terminal point assignment of the input connector (3)

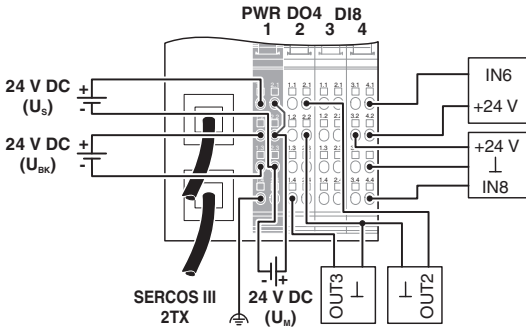
Terminal point	Assignment	Terminal point	Assignment
1.1	IN01	2.1	IN02
1.2	U_M	2.2	U_M
1.3	GND	2.3	GND
1.4	IN03	2.4	IN04

Terminal point assignment of the input connector (4)

Terminal point	Assignment	Terminal point	Assignment
3.1	IN05	4.1	IN06
3.2	U_M	4.2	U_M
3.3	GND	4.3	GND
3.4	IN07	4.4	IN08

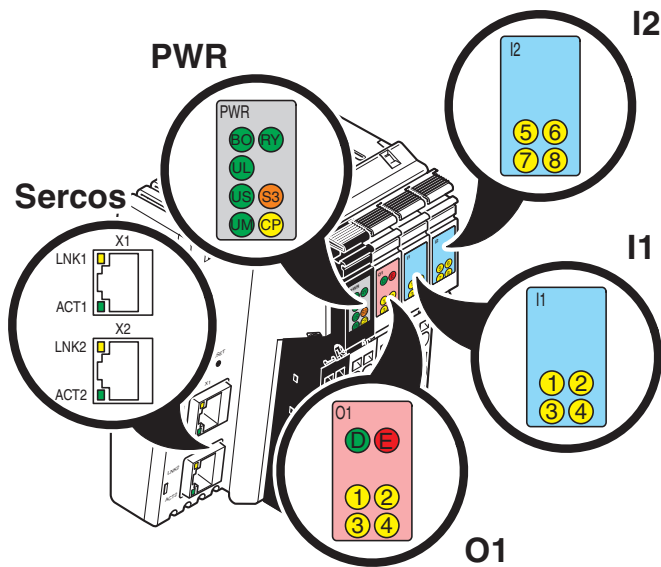
8 Connection example

Fig. 3 Connection example



9 Local diagnostic and status indicators

Fig. 4 Local diagnostic and status indicators



Designation	Color	Meaning	State	Description
Sercos				
LNK 1/2	Green	Link port 1/2	On	Connection via Ethernet to a module via port 1/2 established
			Off	No connection established via port 1/2
ACT 1/2	Yellow	Activity port 1/2	Flashing	Transmission or reception of Ethernet telegrams at port 1/2
			Off	No transmission or reception of Ethernet telegrams at port 1/2
PWR/Sercos				
BO	Green	Boot	Off	System startup completed
			On	System startup active
BO (together with RY)			Flashing (2 Hz)	Firmware download is in progress.
			Flashing (8 Hz)	Firmware update has failed or valid firmware is not available. Only the bootloader is active.
BO (together with RY and CP)			Flashing (4 Hz)	Firmware update (Flash programming) is in progress. Do not switch off the power.
			On	Firmware update has been completed successfully.
UL	Green	U _{Logic}	Off	24 V bus coupler supply/7.5 V communications power not present
			On	24 V bus coupler supply/7.5 V communications power present
US	Green	U _{Segment}	Off	24 V segment supply not present
			On	24 V segment supply is present
UM	Green	U _{Main}	Off	24 V supply is not present in the main circuit
			On	24 V supply is present in the main circuit
RY	Green	Ready	On	A valid Inline configuration has been detected and connected to the Sercos configuration (after the first transition to CP2).
			Flashing	A valid Inline configuration has been detected but not yet connected to the Sercos configuration (<CP2).
			Off	Device is not ready for operation.

Designation	Color	Meaning	State	Description
S3	Red/or- ange/ green	Sercos diag- nostics	Off	NRT mode; no Sercos communication
			Orange on	CP0
			Flashing green/or- ange	CP1: 250 ms green, 2750 ms orange
				CP2: 250 ms green, 250 ms orange, 250 ms green, 2250 ms orange
				CP3: 250 ms green, 250 ms orange, 250 ms green, 250 ms orange, 250 ms green, 1750 ms orange
			Green on	CP4
			Flashing orange/ green	HP0
				HP1: 250 ms orange, 2750 ms green
				HP2: 250 ms orange, 250 ms green, 250 ms orange, 2250 ms green
			Flashing green	Loop back activated
			Flashing red/orange	User error
			Flashing green/red	MST loss
			Red on	Communication error
Flashing orange	Identification (bit 15 in device control); is used for ad- dress assignment and configuration errors.			
Flashing red	Watchdog error			
CP	Yellow	Communica- tion phase	Off	CP0 or NRT mode; no Sercos communication
			Flashing	At two-second intervals
				CP1: 250 ms on, 1750 ms off
				CP2: 250 ms on, 250 ms off 250 ms on, 1250 ms off
				CP3: 250 ms on, 250 ms off 250 ms on, 250 ms off 250 ms on, 750 ms off
			On	CP4
O1: diagnostics of the Inline station/diagnostics and status of the outputs				
D	Green	Diagnostics	On	Data transmission active within the station
			Flashing	The Inline configuration is being read in (started up) or no module is plugged in.
			Off	Data transmission not active within the station
E	Red	Error	On	Short circuit/overload at one of the outputs
			Off	No short circuit/overload at one of the outputs
1 ... 4	Yellow	Status of out- puts 1 ... 4	On	Output is set.
			Off	Output is not set.
I1, I2: status of the inputs				
1 ... 8	Yellow	Status of the in- puts 1 ... 8	On	Input is active.
			Off	Input is inactive.

10 Sercos

10.1 Sercos address

The bus coupler supports remote address assignment of the Sercos address according to the Sercos specification.

There is no switch for setting the Sercos address.

The Sercos address is saved retentively.



For an automatic address assignment description, please refer to the documentation of your Sercos master.

10.2 Sercos profile, classes and function groups

The following Sercos profile, classes and function groups are implemented in the module:

10.2.1 Sercos communication model (SCP: Sercos Communication Profiles)

S-0-1000.0.00 List of SCP classes & versions

Supported classes:

Class code and version (hex)	Class name	Meaning
0201	SCP_VarCFG	Variable configuration of homogeneous connections
0301	SCP_Sync	Synchronization
0302	SCP_Sync_0x02	Synchronization + IFG
0401	SCP_WD	Watchdog of connection
0501	SCP_Diag	Communication diagnoses
0C01	SCP_ListSeg	Segmented list transfer via the SVC
0D01	SCP_HP	Support of S/IP Sercos internet protocol using the UC channel
0E01	SCP_TFTP	Support of TFTP in the UC channel
1301	SCP_SysTime	Set Sercos Time using MDT Extended field
1801	SCP_NRTPC	Network parameters activated with procedure command
1802	SCP_NRTPC_0x02	List of IPS classes and IP activation control
1A01	SCP_WDCon	Watchdog of connection with tPcyc & data losses

10.2.2 Sercos Internet protocol services (IPS: Internet Protocol Services)

S-0-1049.0.00 List of IPS classes & version

Supported classes:

Class code and version (hex)	Class name	Meaning
0201	IPS UDP Basic	Support of basic UDP services
0301	IPS Device Management	Firmware management via TFTP
0501	IPS Sercos Parameter access	Services for parameter access

10.2.3 Sercos device profile (GDP: Generic Device Profile)

S-0-1301 List of GDP classes & versions

Supported classes:

Class code and version (hex)	Class name	Meaning
0101	GDP_Basic	Basic profile V01
		The generic profile shall be supported by each sub-device
0201	GDP_Basic_0x02	Basic profile V02
		The generic profile shall be supported by each sub-device
0401	GDP_Rev	Version
0B01	GDP_DiagT	Diagnosis Trace
0C01	GDP_DiagTAdv	Diagnosis Trace Advance
0D01	GDP_PWD	Password
1001	GDP_RST	Restart

10.2.4 Sercos IO function model (FSP: Function Specific Profile IO)

S-0-1500.0.00 List of FSP IO classes & versions

Supported classes:

Class code and version (hex)	Class name	Meaning
0101	IO_Basic	Mandatory Class of the FSP IO
0201	IO_Diag	Diagnostic functions
0401	IO_Rep	Replace mechanism
0501	IO_Ins	Insert mechanism

10.3 Realtime connections

The bus coupler supports a maximum of six realtime data connections (S-0-1050.0.xx to S-0-1050.5.xx), of which two for master/slave connections and four for cross communication.

Each connection can be configured as an IDN list (S-0-1050.x.01; bit 5...4 = 00_{bin}) or fixed as a container (S-0-1050.x.01; bit 5...4 = 01_{bin}).

Up to a maximum of 40 IDNs per connection can be entered in S-0-1050.x.06 when configured as an IDN list.

10.4 Electronic rating plate

The electronic rating plate comprises the IDNs S-0-1300.x.y. See the table in the "Sercos parameter" section.

10.5 Mapping of I/O modules in Sercos

The local bus devices are assigned to the I/O function groups and structure instances according to the Sercos I/O profile.

A structure instance (slot) can consist of an I/O function group or several I/O function groups (for example devices with inputs and outputs).

Slot 0 (structure instance 0) is occupied by the bus head and the two I/O function groups of the local inputs and outputs. The first Inline device occupies slot 1 (structure instance 1), the second device occupies slot 2, and so on.



The local inputs and outputs on the bus coupler operate independently of the IO status (S-0-1500.0.02).

When assigning the inputs and outputs to the container input data (S-0-1500.0.09) or to the container output data (S-0-1500.0.05), the input and output process data is always mapped in byte limits in the container according to the Sercos I/O profile.

The number of bytes of the containers is always even.

The following function groups are defined:

Function group (FG_IO)	Name
S-0-1501	I/O function group unknown
S-0-1502	I/O function group digital output
S-0-1503	I/O function group digital input
S-0-1504	I/O function group analog output
S-0-1505	I/O function group analog input
S-0-1506	I/O function group counter
S-0-1507	I/O function group complex protocol
S-0-1508	I/O function group sub bus master
S-0-1509	I/O function group sub bus slave
S-0-1512	I/O function group PLC module
S-0-1513	I/O function group motor starter
S-0-1514	I/O function group PWM (pulse width modulation)
S-0-1515	I/O function group positioning
S-0-1516	I/O function group passive

The bus coupler supports the following IDNs as configurable data:

In a producer connection	In a consumer connection
S-0-1500.0.02	S-0-1500.0.01
S-0-1500.0.09	S-0-1500.0.05
S-0-1500.0.32	IO_FG.x.5
S-0-1500.0.33	IO_FG.x.13
IO_FG.x.9	
IO_FG.x.17	
This information is stored in the IDNs:	
S-0-0187	S-0-0188

Example: Mapping I/O modules without an engineering tool that uses SDDML files

Without an engineering tool that uses SDDML files, the local bus process data of the I/O modules is mapped 1:1 to the Sercos process data. This means that a distinction is not made between status or control words and input or output data. Status and control words are not mapped to structure elements DIAGIN (IO_FG.x.17) and DIAGOUT (IO_FG.x.13).

Since the bus coupler identifies the I/O modules by their ID codes and unique identification is not always assured, some dedicated input or output modules are still shown as input/output modules on the Sercos side. The I/O modules are configured from within the application program.



Please refer to the I/O module documentation for the process data assignment.

Slot	Device	IO_FG	Local bus [byte]		Sercos			
			Output process data	Input process data	Channel number	Channel width [bit]	Byte off-set in S-0-1500.0.05	Byte off-set in S-0-1500.0.09
0	Local inputs and outputs of the bus coupler	S-0-1502.0.05	-	-	4	1	0	-
		S-0-1502.0.17			8	1	-	0
		S-0-1503.0.09			8	1	-	1
1	R-IB IL 24 DO 8-PAC (8 digital OUT)	S-0-1502.1.05	1	0	8	1	1	-
2	R-IB IL 24 DI 4-PAC (4 digital IN)	S-0-1503.2.09	0	1	4	1	-	2
3	R-IB IL AO 2/U/BP-PAC (2 analog OUT)	S-0-1504.3.05	4	4	2	16	2	-
		S-0-1505.3.09			2	16	-	3
4	R-IB IL TEMP 4/8 RTD-PAC (4/8 analog IN)	S-0-1504.4.05	10	10	5	16	6	-
		S-0-1505.4.09			5	16	-	7
5	R-IB IL 24 DO 4-PAC (4 digital OUT)	S-0-1502.5.05	1	0	4	1	16	-

Assignment of input and output process data to the IDNs S-0-1500.0.05 and S-0-1500.0.09
S-0-1500.0.05 (OutputData Container)

Byte	0	1	2	...	5	6	...	15	16	17
Slot	0	1	3			4			5	-
PDOUT	0	1	3			4			5	-

S-0-1500.0.09 (InputData Container)

Byte	0	1	2	3	...	6	7	...	16	17
Slot	0		2	3			4			-
PDIN	-	0	2	3			4			-
DIAGIN	0	-	-	-			-			-

DIAGIN: see bus coupler diagnostic register

Example: Mapping I/O modules with an engineering tool that uses SDDML files

With an engineering tool that uses SDDML files, the I/O modules are clearly identified with the help of the respective SDDML file. The local bus process data is mapped and the I/O modules are configured in accordance with the rules stored in the SDDML files.



Inline devices are not parameterized with cyclic process data, but with the engineering tool used in CP2.



Make sure you always use the latest SDDML file version. It can be downloaded at www.boschrex-roth.com under "Products - I/O".

Slot	Device	IO_FG	Local bus [byte]		Sercos			
			Output process data	Input process data	Channel number	Channel width [bit]	Byte offset in S-0-1500.0.05	Byte offset in S-0-1500.0.09
0	Local inputs and outputs of the bus coupler	S-0-1502.0.05	-	-	4	1	0	-
		S-0-1502.0.17			8	1	-	0
		S-0-1503.0.09			8	1	-	1
1	R-IB IL 24 DO 8-PAC (8 digital OUT)	S-0-1502.1.05	1	-	8	1	1	-
2	R-IB IL 24 DI 4-PAC (4 digital IN)	S-0-1503.2.09	-	1	4	1	-	2
3	R-IB IL AO 2/U/BP-PAC (2 analog OUT)	S-0-1504.3.05	4	-	2	16	2	-
4	R-IB IL TEMP 4/8 RTD-PAC (4/8 analog IN)	S-0-1505.4.09	-	16	8	16	-	3
5	R-IB IL 24 DO 4-PAC (4 digital OUT)	S-0-1502.5.05	1	-	4	1	6	-

Assignment of input and output process data to the IDNs S-0-1500.0.05 and S-0-1500.0.09
S-0-1500.0.05 (OutputData Container)

Byte	0	1	2	...	5	6	7
Slot	0	1	3			5	-
PDOOUT	0	1	3			5	-

S-0-1500.0.09 (InputData Container)

Byte	0	1	2	3	...	18	19
Slot	0	1	2	4			-
PDIN	-	0	2	4			-
DIAGIN	0	-	-	-			-

DIAGIN: see bus coupler diagnostic register

10.6 Terminal point assignment of local inputs and outputs to the process data



The local inputs and outputs on the bus coupler operate independently of the IO status (S-0-1500.0.02).

Terminal point assignment of the local outputs to the output process data in S-0-1502.0.05

Byte	0							
Bit	7	6	5	4	3	2	1	0
Connector	Not used				2 (O1)			
Terminal point (signal)					2.4	1.4	2.1	1.1
Terminal point (GND)					2.2	1.2	2.2	1.2
Terminal point (FE)					2.3	1.3	2.3	1.3
Status indicator, LED					4	3	2	1

Terminal point assignment of the local inputs to the input process data in S-0-1503.0.09

Byte	0							
Bit	7	6	5	4	3	2	1	0
Connector	4 (I2)				3 (I1)			
Terminal point (signal)	4.4	3.4	4.1	3.1	2.4	1.4	2.1	1.1
Terminal point (GND)	4.3	3.3	4.3	3.3	2.3	1.3	2.3	1.3
Terminal point (24 V)	4.2	3.2	4.2	3.2	2.2	1.2	2.2	1.2
Status indicator, LED	8	7	6	5	4	3	2	1



IDNs S-0-1501 to S-0-1516 are added to the station accordingly together with the corresponding modules. See also "Sercos, mapping of I/O modules in Sercos".

10.7 Behavior in the event of an error

In accordance with the Sercos specification, errors and messages are mapped in the following diagnostic IDNs:

Type of IDN	IDN	Meaning
Diagnostics IDNs:	S-0-0095	Diagnostic message
	S-0-0390	Diagnostic number
	S-1500.0.32	IO diagnostic message
	S-1500.0.33	Current IO diagnostic message
Diagnose-Trace-IDNs:	S-0-1303.0.10	Diagnostic trace buffer no 1 (IDN S-0-0390 Diagnostic number)
	S-0-1303.0.11	Diagnostic trace buffer no 2 (IDN S-0-1305.0.01 Sercos current time)
	S-0-1303.0.12	Diagnostic trace buffer no 3 (IDN S-0-1500.0.33 Current IO diagnostic message)

10.7.1 S-0-1500.0.128 Local bus error continue mode

Use the IDN to establish how the bus coupler should behave following the elimination of a local bus error.

See the "Sercos parameter" section.

10.7.2 S-0-0390 Diagnostic number

The IDN contains diagnostic information for bus and user errors in accordance with the Sercos specification with the following structure:

Contents	General interpretation	Source type	Reserved	Disappeared	Class	Status code
Number of bits	2	6	3	1	4	16

Description	Bit	Value	Meaning
General interpretation	31 ... 30	00	Manufacturer specific status codes
		01	Fully manufacturer specific
		10	Reserved
		11	Standard
Source type	29 ... 24	00 _{hex}	FSP Drive
		01 _{hex}	FSP IO
		02 _{hex}	GDP
		03 _{hex}	SCP
		04 _{hex}	CSoS
		05 _{hex}	FSP Encoder
		06 _{hex}	Safety Application
		07 _{hex}	FSP Power Supply
		08 _{hex} ... 20 _{hex}	Reserved
		21 _{hex}	FSP IO sub-bus IO-Link
		22 _{hex} ... 2F _{hex}	Reserved for further FSP IO sub-busses
		30 _{hex} ... 3E _{hex}	Reserved
		3F _{hex}	Unknown
Reserved	23 ... 21		
Disappeared	20		
Class	19 ... 16	0 _{hex} ... 9 _{hex}	Reserved
		A _{hex}	Operational state (priority 4 (lowest))
		B _{hex}	Reserved
		C _{hex}	Procedure command specific state (priority 3)
		D _{hex}	Reserved
		E _{hex}	Warning (C2D, priority 2)
		F _{hex}	Error (C1D, priority 1 (highest))
Status code	15 ... 00		See "Status codes" section.

10.7.3 S-0-1500.0.32 IO diagnostic message, S-0-1500.0.33 Current IO diagnostic message

The IDNs contain information about periphery and channel errors.

Periphery and channel error can only occur once for each I/O module or channel.

The IDNs contain detailed information about the IO diagnostic message in the following structure:

Contents	General interpretation	Reserved	Disappeared	IO Diagnosis class	Status code	Number of IO function group	Slot number	Sub-bus slave index	Channel number
Number of bits	2	1	1	4	16	16	8	8	8
Example	0			E	B002	05DF	09	00	FF

Description	Bit	Value	Meaning	Example meaning	
General interpretation	63 ... 62	00	Standard IO status codes	0	Active (future) standard I/O status code
		01	Reserved		
		10	Manufacturer specific codes		
		11	Sub-bus specific codes		
Reserved	61				
Disappeared	60	0	Diagnostic state is active.		
		1	Diagnostic state is no longer active.		
IO Diagnosis class	59 ... 56	A _{hex}	Operational state (priority 4 (lowest))	E	Warning, priority 2
		C _{hex}	Procedure command specific state (priority 3)		
		E _{hex}	Warning (C2D, priority 2)		
		F _{hex}	Error (C1D, priority 1 (highest))		
		Other	Reserved		
Status code	55 ... 40		See "Status codes" section.	B002	Wrong device
Number of IO function group	39 ... 24	05DD ... 05EC _{hex}	= 1501 ... 1616, I/O function group ..., see table "Sercos Parameter"	05DF	= 1503 _{dec} : Digital output
Slot number	23 ... 16	0 ... 63	Module number	09	Module 9
Sub-bus slave index	15 ... 8	0	Sub-bus systems are currently not supported.	00	No sub-bus
Channel number	7 ... 0	00 ... FE _{hex}	= 0 ... 254: Channel in the function group	FF	Entire device
		FF _{hex}	= 255: Entire device		

10.7.4 Status codes

The main status codes used, which are reported in these IDNs, are listed in the table below:

S-0-0390	Diagnostic number
S-0-1500.0.32	IO diagnostic message
S-0-1500.0.33	Current IO diagnostic message

If a status code is reported that is not in the table, it will be included in the Sercos specification.

Code	Meaning	Corrective
I/O error and channel error		
1000	General fault	Eliminate the fault.
2300	Fault in the power supply or signals for the I/O devices connected to the device (device output side)	
2344	Overload of a signal output	
2345	Overload of initiator supply	
2360	Signal line break/cable break (output signal)	
3100	Fault affecting the supply voltage of the device or “de-vice input side” signals	
3120	Supply undervoltage	
3300	Fault on signals for the I/O devices connected to the device (device output side)	
3400	Fault in the supply voltage for the I/O devices	
3410	Fault in the initiator supply – general	
5010	Component fault	
5150	Fault in the supply (power supply unit) of the initiator	
5450	Fuses defective	
6300	User parameter (data record) not OK	
6310	Loss of internally stored user parameters	
6320	Inconsistency between internally stored user paramet-ers (e.g., identified by CRC)	
7200	Fault in measuring circuit	
7300	Fault in the sensor (as a component connected perma-nently to the device)	
7500	Error in communication with additional assembly	
8600	Fault on position controller	
8900	Fault on external sensor (separate device)	
8910	Measuring range overrange	
8920	Measuring range underrange	
9000	Faults on external devices	
Configuration errors		
B000	Local bus error	Check and correct the configuration
B001	Device not present	Install the device or check the contacts and replace a defective device, if necessary.
B002	Wrong device	An incorrect device was detected at the specified loca-tion. Check the contacts, replace a defective device, if necessary or adapt the configuration.
B004	More devices than expected	Check and correct the configuration
B012	Error in a local bus device	See corresponding data sheet.

Code	Meaning	Corrective
Device error		Read out via IDN 1500.0.32 to ascertain which device and possibly which channel is affected and check the contact, parameterization and function.
B012	Application on device not ready	Check the specified channel of the device, the devices connected to the module, the parameters of the specified device as well as the connected sensors and actuators. Delay the start after power on or replace the device. See corresponding data sheet.
B013	Local bus devices causes a restart	The specified device executed a reset due to a fault or insufficient voltage supply. Check the power supply. Find the cause by checking the power supply to the devices and check whether they conform to the nominal value of the permissible AC component. Check the power supply unit of the bus coupler for overload (see corresponding data sheet).
Transmission error		Check the system and replace devices, if necessary.
B021	Timeout error	Check the system, shielding of the bus cables, connectors, grounding/equipotential bonding, voltage supply of the periphery and the voltage supply of the inputs/outputs. Replace devices if necessary.
B022	Multiple transmission error	Bus errors occurred. The system has transmission errors. Check the segment, shielding of the bus cables, grounding/equipotential bonding, connectors, communications power (for power drops), FO assembly, as well as the remote bus devices and whether the devices are aligned correctly.
B023	I/O communication error	Check the system, shielding of the bus cables, connectors, grounding/equipotential bonding, voltage supply of the periphery and the voltage supply of the inputs/outputs. Replace devices if necessary.
B024	Strong interference in local bus communication	Check the system, shielding of the bus cables, connectors, grounding/equipotential bonding, voltage supply of the periphery and the voltage supply of the inputs/outputs. Replace devices if necessary.
Configuration errors		
B030	Configuration errors	The configuration is invalid. Replace device or modify configuration.
General errors		
B041	Hardware fault	Replace the device.
B042	Firmware error	Replace the device.

10.8 Bus coupler diagnostic register

The diagnostic register of the bus coupler (PF_DIAG) is mapped in S-0-1502.0.17 (DIAGIN for local outputs of the bus coupler).

Bit	Value	Description
0	0	Supply voltage U_M present
	1	Supply voltage U_M not present
1	0	Supply voltage U_S present
	1	Supply voltage U_S not present
2	0	Local outputs report no short circuit/overload
	1	Local outputs report short circuit/overload
3 ... 7		Reserved

11 Sercos parameter

The following table lists all Sercos parameters (S parameters) with important features that have been implemented into the bus coupler.

IDN	Name	Default values	Unit
S-0-0000	Dummy IDN	-	-
S-0-0014	Interface status	-	-
S-0-0017	IDN-list of all operation data	-	-
S-0-0021	IDN-list of invalid operation data for CP2	-	-
S-0-0022	IDN-list of invalid operation data for CP3	-	-
S-0-0025	IDN-list of all procedure commands	-	-
S-0-0095	Diagnostic message	-	-
S-0-0099	Reset class 1 diagnostic (process command)	-	-
S-0-0127	CP3 transition check (process command)	-	-
S-0-0128	CP4 transition check (process command)	-	-
S-0-0187	IDN-list of configurable data as producer	S-0-1500.0.02, S-0-1500.0.09	IDN
S-0-0188	IDN-list of configurable data as consumer	S-0-1500.0.01, S-0-1500.0.05	IDN
S-0-0267	Password	PW170875	-
S-0-0279	IDN-list of password protected data	-	-
S-0-0390	Diagnostic number	-	-
S-0-0394	List IDN	-	-
S-0-0395	List index	-	-
S-0-0396	Number of list elements	-	-
S-0-0397	List segment	-	-
S-0-1000	SCP type & version	0201 _{hex} 0301 _{hex} 0302 _{hex} 0401 _{hex} 0501 _{hex} 0C01 _{hex} 0D01 _{hex} 0E01 _{hex} 1301 _{hex} 1801 _{hex} 1802 _{hex} 1A01 _{hex}	-
S-0-1000.0.01	List of active SCP classes & versions	-	-
S-0-1002	Communication cycle time (t_{Scyc})	-	μs
S-0-1003	Allowed MST losses in CP3/CP4	10	-
S-0-1005	Minimum feedback processing time (t_5)	250 000	μs
S-0-1006	AT0 transmission starting time (t_1)	-	μs
S-0-1007	Feedback acquisition capture point (t_4)	-	μs
S-0-1008	Command value valid time (t_3)	-	μs
S-0-1009	Device control (C-Dev) offset in MDT	-	-
S-0-1010	Length of MDTs	-	-
S-0-1011	Device status (S-Dev) offset in AT	-	-
S-0-1012	Length of ATs	-	-
S-0-1013	SVC offset in MDT	-	-
S-0-1014	SVC offset in AT	-	-
S-0-1015	Ring delay	-	μs

IDN	Name	Default values	Unit
S-0-1016	SYNCCNT (P&S)	-	µs
S-0-1017	NRT transmission time	650 000 950 000	µs
S-0-1019	MAC address	00-60-34-xx-xx-xx	-
S-0-1020	IP address	192.168.1.5	-
S-0-1020.0.01	Current IP address	192.168.1.5	-
S-0-1021	Subnet mask	255.255.255.0	-
S-0-1021.0.01	Current subnet mask	255.255.255.0	-
S-0-1022	Gateway address	0.0.0.0	-
S-0-1022.0.01	Current gateway address	0.0.0.0	-
S-0-1023	SYNC jitter	1000	µs
S-0-1024	SYNC delay measuring procedure command (process command)	-	-
S-0-1026	Version of communication hardware	-	-
S-0-1027.0.01	Requested MTU	-	-
S-0-1027.0.02	Effective MTU	-	-
S-0-1028	Error counter MST	-	-
S-0-1031	Test pin assignment port 1 and port 2	-	-
S-0-1032.0.00	Communication control	-	-
S-0-1032.0.01	Communication status	-	-
S-0-1035	Error counter port1 and port2	-	-
S-0-1035.0.01	Error counter P&S	-	-
S-0-1036	Inter frame gap	-	octets
S-0-1037	Slave jitter	-	-
S-0-1039	Host name	-	-
S-0-1039.0.01	Current hostname	-	-
S-0-1040	Sercos address	1	-
S-0-1041	AT command value valid time (t9)	-	µs
S-0-1044	Device control (C-DEV)	-	-
S-0-1045	Device status (S-Dev)	-	-
S-0-1047	Maximum consumer processing time (t11)	-	µs
S-0-1048	Activate network settings	-	-
S-0-1049.0.00	List of IPS classes & version	0201 _{hex} 0301 _{hex} 0501 _{hex}	-
S-0-1050.x.01	Connection setup	-	-
S-0-1050.x.02	Connection number	-	-
S-0-1050.x.03	Telegram assignment	-	-
S-0-1050.x.04	Max. length of connection	-	-
S-0-1050.x.05	Current length of connection	-	-
S-0-1050.x.06	Configuration list	-	-
S-0-1050.x.08	Connection control (C-CON)	-	-
S-0-1050.x.10	Producer cycle time	-	µs
S-0-1050.x.11	Allowed data losses	-	-
S-0-1050.x.12	Error counter data losses	-	-
S-0-1051	Image of connection setups	-	-
S-0-1061	Maximum TSref-Counter	-	-
S-0-1300.0.01	Component name	Sercos Inline Bus Coupler	-

IDN	Name	Default values	Unit
S-0-1300.0.02	Vendor name	Bosch Rexroth AG	-
S-0-1300.0.03	Vendor code	100	-
S-0-1300.0.04	Device name	R-IL S3 BK DI8 DO4-PAC	-
S-0-1300.0.05	Device ID	R911170875	-
S-0-1300.0.06	Connected to sub-device	-	-
S-0-1300.0.07	Function revision	-	-
S-0-1300.0.08	Hardware revision	-	-
S-0-1300.0.09	Software revision	-	-
S-0-1300.0.10	Firmware loader revision	-	-
S-0-1300.0.11	Order number	R911170875	-
S-0-1300.0.12	Serial number	xxxx...	-
S-0-1300.0.13	Manufacturing Date	-	-
S-0-1300.0.20	Operational hours	-	h
S-0-1300.0.134	IPMS4 version information	IBS Agent: 1.40; IBS IP-Core (IPMS4): 3.8	-
S-0-1300.x.01	Component name	xxxx...	-
S-0-1300.x.02	Vendor name	Bosch Rexroth AG	-
S-0-1300.x.03	Vendor code	100	-
S-0-1300.x.04	Device name	xxxx...	-
S-0-1300.x.05	Device ID	xxxx...	-
S-0-1300.x.07	Function revision	-	-
S-0-1300.x.11	Order number	xxxx...	-
S-0-1300.x.20	Operational hours	-	h
S-0-1301	List of GDP classes & version	0101 _{hex} 0201 _{hex} 0401 _{hex} 0B01 _{hex} 0C01 _{hex} 0D01 _{hex} 1001 _{hex}	-
S-0-1302.0.01	FSP type & version	00010001 _{hex}	-
S-0-1302.0.02	Function groups	S-0-1500.0.00	-
S-0-1302.0.03	Application type	Modular IO station	-
S-0-1303.0.01	Diagnosis trace configuration	-	-
S-0-1303.0.02	Diagnosis trace control	-	-
S-0-1303.0.03	Diagnosis trace state	-	-
S-0-1303.0.10	Diagnosis trace buffer no1	-	-
S-0-1303.0.11	Diagnosis trace buffer no2	-	-
S-0-1303.0.12	Diagnosis trace buffer no3	-	-
S-0-1305.0.01	Sercos current time	-	-
S-0-1305.0.02	Sercos current fine time	-	µs
S-0-1305.0.03	Sercos current coarse time	-	s
S-0-1350	Reboot device	-	-
S-0-1500	I/O bus coupler	-	-

IDN	Name	Default values	Unit
S-0-1500.0.00	List of FSP IO classes & versions	0101 _{hex} 0201 _{hex} 0401 _{hex} 0501 _{hex}	-
S-0-1500.0.01	IO control	-	-
S-0-1500.0.02	IO status	-	-
S-0-1500.0.03	List of module type codes	-	-
S-0-1500.0.04	List of inserted function groups	-	-
S-0-1500.0.05	Container output data	-	-
S-0-1500.0.09	Container input data	-	-
S-0-1500.0.11	List of replaced function groups	-	-
S-0-1500.0.12	Rearrangement of IO resource (process command)	-	-
S-0-1500.0.21	Local bus reconfiguration procedure command	-	-
S-0-1500.0.23	Local bus cycle time	-	µs
S-0-1500.0.32	IO diagnostic message	-	-
S-0-1500.0.33	Current IO diagnostic message	-	-
S-0-1500.0.128	Local bus error continue mode	-	-
S-0-1500.0.129	Debug/startup settings	-	-
S-0-1502.0.01	Name of IO FG	-	-
S-0-1502.0.02	Configuration of IO FG	-	-
S-0-1502.0.03	Channel quantity PDOOUT	-	-
S-0-1502.0.04	Channel width PDOOUT	-	-
S-0-1502.0.05	PDOOUT	-	-
S-0-1502.0.15	Channel quantity DIAGIN	-	-
S-0-1502.0.16	Channel width DIAGIN	-	-
S-0-1502.0.17	I/O FG.x.17 DIAGIN	-	-
S-0-1502.0.22	Fallback value output	-	-
S-0-1502.0.23	Min. delay time	-	ns
S-0-1502.0.24	Max. delay time	-	ns
S-0-1502.0.33	Module type code	-	-
S-0-1503.0.01	Name of IO FG	-	-
S-0-1503.0.02	Configuration of IO FG	-	-
S-0-1503.0.07	Channel quantity PDIN	-	-
S-0-1503.0.08	Channel width PDIN	-	-
S-0-1503.0.09	PDIN	-	-
S-0-1503.0.23	Min. delay time	-	ns
S-0-1503.0.24	Max. delay time	-	ns
S-0-1503.0.33	Module type code	-	-
S-0-1501	I/O function group unknown	-	-
S-0-1502	I/O function group digital output	-	-
S-0-1503	I/O function group digital input	-	-
S-0-1504	I/O function group analog output	-	-
S-0-1505	I/O function group analog input	-	-
S-0-1506	I/O function group counter	-	-
S-0-1507	I/O function group complex protocol	-	-
S-0-1508	I/O function group sub bus master	-	-
S-0-1509	I/O function group sub bus slave	-	-
S-0-1512	I/O function group PLC module	-	-

IDN	Name	Default values	Unit
S-0-1513	I/O function group motor starter	-	-
S-0-1514	I/O function group PWM (pulse width modulation)	-	-
S-0-1515	I/O function group positioning	-	-
S-0-1516	I/O function group passive	-	-
P-0-1007	Slave stack identification	Sercos III Slave Driver V04.06 #2 (2019.01.23)	
P-0-1500.0.01	Reconfigure local bus	-	-
P-0-3000.0.00	Local bus cycle count	-	-
P-1-<i>.x.<s>	PCP handling	-	-

S-0-1050.x.1 (Connection setup)

The bus coupler supports the following connection types (bit 0 and 1 of IDN S-0-1050.x.1):

- Producer cycle, synchronous operation (clock synchronous, 00_{bin})
- Asynchronous operation without watchdog (non-cyclic type 2, 10_{bin})

S-0-1500.0.128 (Local bus error continue mode)

This IDN defines the behavior after a bus error.

- = 0: (default)
Once the diagnostics has been acknowledged with procedure command IDN S-0-0099, the local bus starts.
- = 1: Once the error has been eliminated, the local bus starts automatically.
The diagnostic message in IDN S-0-0390 is again acknowledged with procedure command IDN S-0-0099.

S-0-1500.0.129 (Debug/startup settings)

You can switch the bus coupler to Debug mode via this IDN, in which it ignores errors that occur, where at all possible, and displays them only after startup in CP4.

P-0-3000.0.00 (Local bus cycle count)

The IDN specifies the total number of local bus cycles.

P-0-1500.0.01 (Reconfigure local bus)

Procedure command

When this command is executed the connected bus configuration is read in again and the internal data-base rebuilt.

This makes it possible, for example, to read in a modified local bus configuration without a voltage reset.



Do not use this manufacturer-specific command for new applications.

Use the standard Sercos command instead: Local bus reconfiguration procedure command (S-0-1500.0.21).

P-1-<i>.x.<s> (PCP handling)

If Inline modules feature PCP objects, you can gain read or write access to these via this IDN.

P-1-<i>.x.<s>

Where:

- i Index of the PCP object
- x Number of the module
- s Subindex of the PCP object

Elements of function groups

Element	Meaning
IO_FG.x.01	Name of IO FG
IO_FG.x.02	Configurations of IO FG
IO_FG.x.03	Channel quantity PDOOUT
IO_FG.x.04	Channel width PDOOUT
IO_FG.x.05	PDOOUT
IO_FG.x.06	Channel quantity PDOOUT
IO_FG.x.07	Channel quantity PDIN
IO_FG.x.08	Channel width PDIN
IO_FG.x.09	PDIN
IO_FG.x.10	Channel qualifier PDIN
IO_FG.x.11	Channel quantity DIAGOUT
IO_FG.x.12	Channel width DIAGOUT
IO_FG.x.13	DIAGOUT
IO_FG.x.14	Channel information output
IO_FG.x.15	Channel quantity DIAGIN
IO_FG.x.16	Channel width DIAGIN
IO_FG.x.17	DIAGIN
IO_FG.x.18	Channel information input
IO_FG.x.19	Parameter channel receive
IO_FG.x.20	Parameter channel transmit
IO_FG.x.22	Fallback value output
IO_FG.x.23	Min. delay time
IO_FG.x.24	Max. delay time
IO_FG.x.33	Module type code
IO_FG.x.129	Diagnostic info
IO_FG.x.130	Channel diagnostic info (total)

12 Reset button

The reset button is on the front of the bus coupler.

The reset button has two functions:

- Restarting the bus coupler
- Resetting of the default settings

12.1 Restarting the bus coupler

Restart the bus coupler by pressing the reset button during ongoing operation.

The outputs of the station are reset.

The process image of the inputs is not re-read.

The bus coupler restarts.

12.2 Restoring the default settings

The bus coupler is supplied with the following default settings:

Default values (default settings)		
S-0-1020	192.168.1.5	IP address
S-0-1021	255.255.255.0	Subnet mask
S-0-1022	0.0.0.0	Gateway address
S-0-1039.0.00	R-IL S3 BK DI8 DO4-PAC	Host name
S-0-1040	1	Sercos address
S-0-0267	PW170875	Password
S-0-1302.0.03	Modular IO station	Application type

If you wish to restore the default settings, proceed as follows:

- Disconnect the power to the module.
- Press and hold the reset button.
- Switch on the power.
- Release the button when the orange CP LED flashes briefly for the **first** time (after max. 1 second).

The default settings are restored.

The boot process is continued. To confirm the restoration to default settings, the orange CP LED lights up the second time for 5 seconds.

13 Startup

13.1 Starting the firmware

The firmware is started after you have supplied power to the bus coupler.

The LEDs flash with the following sequence:

	Display	Meaning
After max. 1 s	CP flashes briefly	FPGA is initialized
		The boot loader is activated. It checks the validity of the firmware, the availability of links to the Ethernet ports, and the presence of update conditions.
After max. 5 s	CP flashes briefly	The boot loader has completed its work.
	BO on	Initializing firmware
		Startup of the connected bus
	BO off	Initialization complete
	RY flashing (1 Hz), CP off	The Inline station is ready for operation and is not in NRT mode.
	D on	Data transmission active within the station
	or D flashing	There is no module connected to the bus coupler.

13.2 Basic configuration

When you perform one of the following actions, the bus coupler executes the basic configuration.

- Bus coupler switch-on
- Reset with the reset button
- Execution of command P-0-1500.0.01 (Reconfigure local bus)

These means:

- List S-0-1500.0.03 "List of module type codes" is available and valid.
If the list is invalid due to a local bus error, for example, service error code 7015_{hex} "operation data is not yet created completely" is returned in the event of service channel access to this IDN. This attempt to start up the local bus is aborted. A corresponding error message is provided in the Sercos diagnostic IDNs.
- The corresponding I/O function groups and the structure elements are generated for all devices detected on the local bus.
- Channel number and width correspond to the detected data widths of the devices.
- The input and output process data of all I/O function groups are configured via IO_FG.x.02 for mapping in S-0-1500.0.05 (container output data) and S-0-1500.0.09 (container input data).
- The content and lengths of the input and output process data on the local bus are mapped to Sercos according to the Sercos profile.
- Local bus devices are not parameterized. The devices can be parameterized in CP2 or CP3.

You will recognize the basic configuration by the flashing RY LED.

When transitioning to CP2 for the first time, the connected local bus configuration is permanently applied and the RY LED is steady green.

By switching over the communication phases to CP3 and subsequently CP4, the Sercos master now has the possibility to accept this configuration for realtime operation unchanged or to make changes and to activate them before switching to CP3 via process command S-0-1500.0.12 (Rearrangement of IO resource).

13.3 Modifying IP parameters

The following IDNs for IP parameters are implemented on the bus coupler:

IP parameters		Current IP parameters		Default setting
S-0-1020	IP address	S-0-1020.0.01	Current IP address	192.168.1.5
S-0-1021	Subnet mask	S-0-1021.0.01	Current subnet mask	255.255.255.0
S-0-1022	Gateway address	S-0-1022.0.01	Current gateway address	0.0.0.0
S-0-1039	Host name	S-0-1039.0.00		R-IL S3 BK DI8 DO4-PAC

The default settings of the relevant IDNs are identical.

The bus coupler functions with the IP parameters stored in IDNs S-0-1020.0.01, S-0-1021.0.01, and S-0-1022.0.01

If you wish to change one or more IP parameters, proceed as follows in accordance with Sercos specification 1.3.1:

- Adjust the IP parameters in IDNs S-0-1020, S-0-1021, and S-0-1022.
- Execute procedure command S-0-1048 (Activate network settings).

In doing so, at the same time, all modified IP parameters are applied as current IP parameters and the bus coupler now functions with the modified settings.

14 IPS: Internet Protocol Services

The bus coupler has an IPS server. You can therefore operate it in phases smaller than CP3 via an IPS client (e.g., the SIP client that is available for free at sercos.org).

The bus coupler supports the following UDP services:

- BrowseRequest (91)
- IdentifyRequest (93)
- NameplateBroadcastRequest (99)
- NameplateRequest (89)
- ReadDataStatusRequest (87)
- ReadDescriptionRequest (73)
- ReadEverythingRequest (69)
- ReadOnlyDataRequest (71)
- ReadSegmentResponse (110)
- ResetRequest (97)
- SupportedIpsClassesRequest (49)
- WriteAttributeRequest (77)
- WriteDataBitsRequest (85)
- WriteDataRequest (83)
- WriteMinMaxRequest (81)
- WriteNameRequest (75)
- WriteUnitRequest (79)

15 Supplementary notes

Ping

Ping only works in NRT, CP0, and CP1. This function is not included in the scope of functions of the NRT implementation and therefore only works in the specified phases, as an update can also be triggered via TFTP in these phases.

Diagnostics

The information contained in PCP object 0018_{hex} is mapped correctly to the Sercos diagnostic mechanism, i.e. IDNs S-0-0390, S-0-1500.0.32, and S-0-1500.0.33.

Sercos master stack CoSeMa version ≤ 04Vxx



Use the workaround described below only in order to get around this restriction associated with the Sercos master stack CoSeMa 04Vxx.

Otherwise, we do not recommend changing the scope of functions.

The Sercos master stack CoSeMa in the version up to 04Vxx checks the contents of object S-0-1000-0-00 "SCP type & version" in a very restrictive way.

This check worked for the SCP scope of functions up to index **GH1** of the bus coupler.

IDN S-0-1000.0.00

Name	SCP type & version
Elements	
Current:	6
Maximum:	10
0	0201 _{hex}
1	0301 _{hex}
2	0401 _{hex}
3	0501 _{hex}
4	0E01 _{hex}
5	1801 _{hex}

From index **GH1**, a current stack with an extended scope of SCP functions was installed in the bus coupler.

IDN S-0-1000.0.00

Name SCP type & version

Elements

	Current:	12
	Maximum:	14
0		0201 _{hex}
1		0301 _{hex}
2		0401 _{hex}
3		0501 _{hex}
4		0E01 _{hex}
5		1801 _{hex}
6		0302 _{hex}
7		1A01 _{hex}
8		0C01 _{hex}
9		1802 _{hex}
10		1301 _{hex}
11		0D01 _{hex}

On routine reading of the IDN S-0-1000 during startup by the CoSeMa stack, an error occurs because the check by the CoSeMa stack did not envisage that the scope of functions would be extended. Startup is aborted and error code 0002002D_{hex} is generated. The bus coupler cannot be started up.

To get around this restriction in the Sercos master stack CoSeMa $\leq 04Vxx$, a workaround has been implemented in the current index GK1 of the bus coupler. This returns the scope of functions of the current firmware displayed in IDN S-0-1000 to the scope of functions of index GH1.

To do this, the displayed scope of functions must be changed by means of a hidden IDN.

Proceed as follows to reduce the entries in IDN S-0-1000 "SCP type & version" to the index GH1 equivalent:

1. Access the bus coupler using one of these methods:
 - Sercos master with stack version 05V00 or later
 - Sercos IP client
 - MDT parser
 - Any other tool
2. Activate the reduction via IDN "Customer application configuration", which is no longer documented.

Write IDN P-0-4000.0.01 0000.0001
(1: enable, 0: disable)

3. Store the setting retentively with ProcedureCommand "Save application configuration".

Exec IDN P-0-4000.0.00

4. Perform a power reset (switch supply voltage off and on again).

After the power reset, the contents of IDN S-0-1000 "SCP type & version" are reduced to the index GH1 equivalent.

The setting is stored retentively, i.e., it is retained until it is changed again.