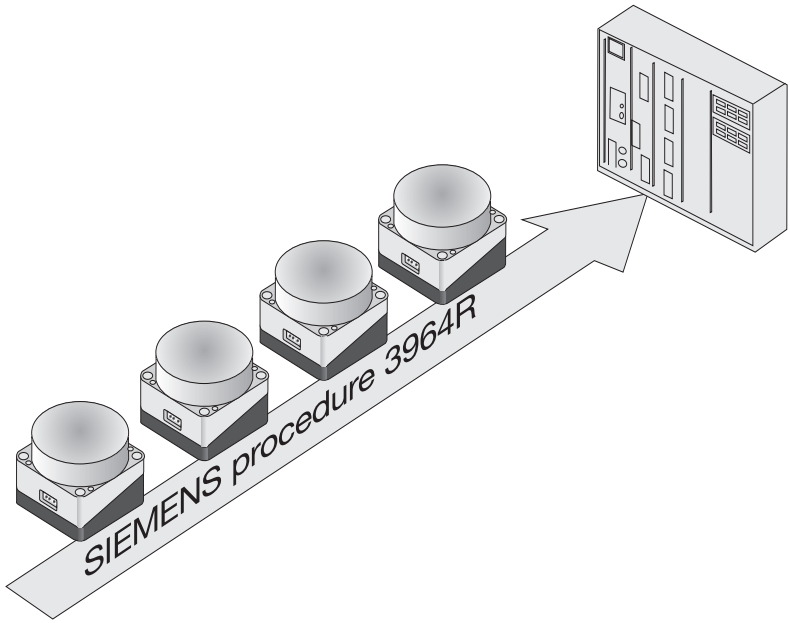
FACTORY AUTOMATION

IDENT-I read station IRT-FP3-IS for Siemens - procedure 3964R with RK512

Operating instructions



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Read station IRT-FP3-IS

The IDENT-I system with read station IRT-FP3-IS

This system enables the direct identification of objects. It consists of 2 components:

1. Code carrier

The code carrier contains the durable stored information. In this case it is an unequivocal value consisting of a 64-bit-code. 20-bits are reserved for code security. The residual 44 bits are usable for carrying information i.e. totaly $2^{44} = 17{,}5 \times 10^{12}$ possiblilities. The fixed code is allocated during manufacturing and exists ***only one time***.

2. Read station

The read station has three functions:

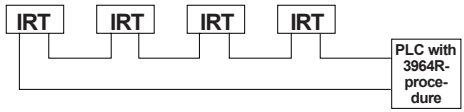
- Inductively exciting energy into the code carrier.
- Contactless reading and preprocessing of information.
- Preparing of information (decoding, code security) and transmitting via serial interface (20 mA - current loop) to the superset host.

Requirements

Up to four IRT-FP3-IS read terminals, a programmable controller with communications processor and procedure 3964R with the RK512 interpreter, a connection cable and of course a code carrier. A 24 V power supply will be required for the 20 mA current loop and to supply the device.

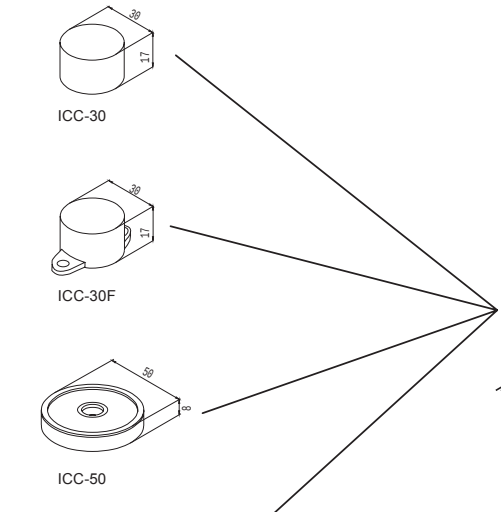
Connection

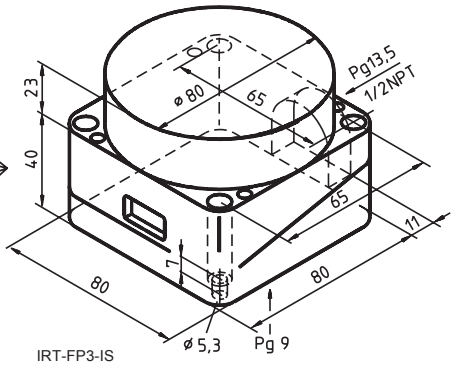
The read station can be connected to programmable control systems unproblematically. The computer procedure 3964R from Siemens is assisted (and also compatible control systems). The maximum cable length is 300 m!



Advantages

- Combined read head and interpreter unit
- Up to **4** read stations in one current loop
- Often used Siemens log 3964R
- Compact housing with clamp room
- Selectable addresses





IRT-FP3-IS

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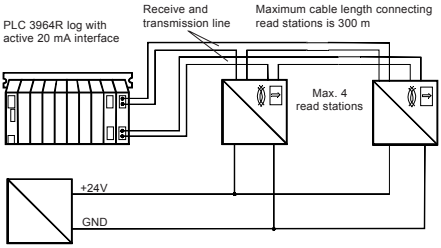
1. Device description

1.1 General

The device consists of an interface unit with integrated read head and a passive bidirectional current interface (20mA). The interface structure enables the PLC of up to 4 read stations in one current loop, using a PLC with procedure 3964R and interpreter RK512. Data transmission between read stations and PLC takes place via fetch telegrams of the PLC.



System structure IRT-FP3-IS to PLC

Each read station has to be marked. To each device connected to the loop an address via DIP-switch is set. Additionally the read station with the highest address has to be marked as the last read station. This is necessary, because one of the read stations has to transmit the log specific parts of communication to the host.
After switching-in of power supply each read station is in continuous read mode, it must not be initialized through the PLC.
If there is a command from the PLC to send data (fetch telegram) the read stations answer in order of their addresses. The "last" read station is responsible for handshaking and calculation of checksum of all sent data.

After an effectual reading of code carriers the data of each read station consists of the address (4 bit) of the read station, a fixed code (28 bit) and a reading number (8 bit). The reading number increases, if two successively red codes are different or if two successivly red codes are identical and the first one is transmitted to host via fetch telegram. The data format is hexadecimal. If reading number reaches the maximum value 255, again counting begins with zero.

It is possible to initialize the read station via DIP-switch 5, so that code carrier can be red from both sides (front and back). The DIP-switch has to be set before switching on power supply.

1.2 Data

1.2.1 File structure after reading code carriers

Structure of utility data of read station:

Byte	Bit	Meaning
1	1..4	Number of read station
	5..8	Bit 1.. 4 Code data
2	1..8	Bit 5.. 12 Code data
3	1..8	Bit 13.. 20 Code data
4	1..8	Bit 21.. 28 Code data
5	1..8	Reading number

Number of read station:

Bit 1..4	Read station
0000	1
0001	2
0010	3
0011	4

Data format for the individual read terminals:

28 bit of usable data is stored digitally per read head. Furthermore, the address of the read terminal (4 bit) and the read count (8 bit) is entered.

Byte no.	0		1		2		3		4
	Addr	C_6	C_5	C_4	C_3	C_2	C_1	C_0	LNr

LNr: Read count (8 bit)
C_0 ... C_6: Hexadecimal characters 0 ... 6 (each 4 bit)
Addr: Read station address (4 bit)
C_6, C_5, C_4,: Wafer number
C_3, C_2, C_1, C_0: Chip number

To convert this code representation into data format 10, the chip number (C_3 ... C_0) must be converted in to a four character decimal figure. The wafer number (C_6 ... C_4) can be used directly. To convert back, the chip number must be converted from decimal to hexadecimal. The code printed on the bigger code carriers is given in data format 10.

Example:

Byte no.	0	1	2	3	4
	2A	65	09	51	0D

Station address: 3
Read count: 0Dh
Wafer number: 0A65h
Chip number: 0951h = 2385
⇒ Code in data format 10: A652385

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1.2.2 Telegram utility data depending on number of connected read stations

The record of the reaction telegram of read stations consists using

1 read station of	6 data bytes,
2 read stations of	10 data bytes,
3 read stations of	16 data bytes,
4 read stations of	20 data bytes.

When operating uneven numbers of read terminals in one loop, the length of the usable data byte of the last read terminal is increased by 1 byte. The byte value is always 00h.

1.2.3 File stucture in error case

Structure of utility data of a read station after finding a read station specific error:

Byte	Bit	Meaning (Content)
1	1..4	'M'
	5..8	Error code
2	1..8	00h
3	1..8	00h
4	1..8	00h
5	1..8	Previous reading number

1.3 Trouble shooting

1.3.1 Log specific errors

If the read station receives a faulty initialization telegram, it will be broken through output of characters 'NAK'. The error code of occured error is written into error byte of the following reaction telegram of the read station.

Error code	Meaning (Content)
14h	Telegram starts not with 00h
16h	Error in telegram head 1. character is not 'E' (fetch telegram)
36h	Sequence in telegram is confused

1.3.2 Specific errors read station

Specific errors of read station are transmitted hexadecimal in the first and second byte of utility data of the actual read head.

Error code	Meaning
M1	memory error (RAM) in the read station
M2	memory error (PROM) in the read station
M6	Reading part of read station is defect
M7	No code carrier existing
M8	No code carrier existing

M7, M8 are not errors depending on defect read stations but errors of faulty transmisssion between code carrier and read station.

1.4 Reading number, management of code data inside read station

A read code is temporary stored inside read station and will only be overwritten, if it is transmitted to coupling partner or if a new code occures.
The read station specific reading number will be increased for each valid read code (maximum reading number is 255).
If a code is twice or more read between two cycles of procedure (code carrier is not moved away from the read head) the reading number is increased only after transmitting the code to the coupling partner.
A valid reading is displayed by a yellow LED; this is independent of transmitting code to read station.

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2. Installation of read station

2.1 Interface

The configuration of interface parameters is set via DIP-switches inside clamp room

2.1.1 Character format

Character frame11 bit

Start bit	1
Data bit	8
Parity check	even parity
Stop bit	1

2.1.2 Baud rate

	BAUD			
	1200	2400	4800	9600
S1	ON	OFF	ON	OFF
S2	ON	ON	OFF	OFF

2.2 Address of read station

	Address			
	1	2	3	4
S3	ON	OFF	ON	OFF
S4	ON	ON	OFF	OFF

2.3 Initialization of last read station

	last	not last
S5	ON	OFF

2.4 Double sided reading

	double sided reading	
	yes	no
S6	ON	OFF

2.5 DIP-switches without description (do not change setting)

S7	open
S8	open

2.6 The current interface of host

Using system with four read stations it is necessary for the host to work with 24 V to 30 V power supply at his interfaces.
The maximum length of current loop depends on the amount of power supply, because voltage decreases at the devices and over the lines.

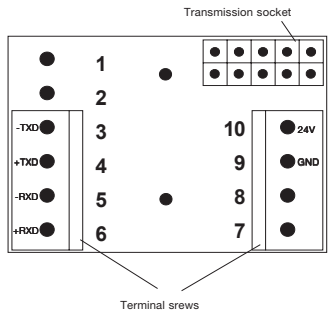
Voltage decrease depending on receivers and senders is displayed in the ratings.

2.7 Specification of interface cable

Specification of cable using 4 read stations, maximum line length and maximum baud rate:

Maximum resistance of one line:	100 Ω/Km
Maximum capacity between lines:	90 pF/m

2.8 Pin configuration (clamp room)



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3. Hints to Siemens procedure 3964R

3.1 Data transmission between read station and host

3.1.1 Initialization telegram

The read stations are initialized with a fetch telegram (fetch data) from the coupling partner.
The telegram head of the fetch telegram consists of 10 bytes and will be checked:

Byte	Code	Meaning	Check
1	00	Identification for	yes
2	00	telegram	yes
3	E	Telegram 'Enter'	yes
4	X	Type of data	no
5	xx	Address high byte of data	no
6	xx	Address low byte of data	no
7	yy	Highbyte number of data	no
8	yy	Lowbyte number of data	no
9	FF	Coordination marker Low	no
10	FF	Coordination marker High	no

The number of required data (words) have to get the following values dependent of number of connected read stations in a system loop:

Number of connected read stations	Data	Data
1	00	03
2	00	05
3	00	08
4	00	10

3.1.2 Answer telegram

Example for a correct procedure using 4 read stations:

Coupling partner		Read station
	STX —>	Initialization
<—	DLE	Handshake
00	—>	Telegram identification
00	—>	
E	—>	Fetch telegram
D	—>	Data block
00	—>	
00	—>	
00	—>	
10	—>	10 words
FF	—>	No coordination marker
FF	—>	
DLE	—>	Identification end 1. character
ETX	—>	Identification end 2. character
BCC	—>	Block check character
<—	DLE	Handshake
<—	STX	Initialization
DLE	—>	Handshake
<—	00	
<—	00	
<—	00	
<—	00	Error byte
		20 Data bytes
<—	DLE	Identification end 1. character
<—	STX	Identification end 2. character
<—	BCC	Block check character
DLE	—>	Handshake

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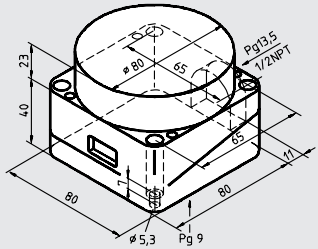
4. Data sheet



Part identification: **Part number:**	**IRT-FP3-IS** **22789**
Ratings:	
Read distance with ICC-30 in air	5 mm ... 50 mm
Read distance with ICC-50 in air	5 mm ... 100 mm
Potential separation	TTY signals
Serial interface	TTY (20 mA current loop)
Type of transmission	asynchron
Baud rate	1200, 2400, 4800, 9600
Maximum cable length TTY passive	300 m at 9600 Baud
Maximum number of read station in one loop	4
Maximum wire cross section per terminal screw	6 mm^2
Displays:	
LED green	"Power on"
LED yellow	"detected"
Electrical data:	
Operation voltage U_B	20 V DC ... 30 V DC
Residual ripple	± 10 %, at U_B = 30 V
Maximum current at U_B= 24 V	160 mA
Interface TTY passive:	
Maximum voltage supply over loop of connected read stations	30 V
Voltage decrease sender at I=20 mA	2.5 V
Voltage decrease receiver at I=20 mA	2.0 V
Mechanical data:	
Operating temperature	248 Kelvin ... 343 Kelvin (-25°C ... +70°C)
Storage temperature	233 Kelvin ... 358 Kelvin (-40°C ... +85°C)
Protection by DIN 40050	IP 65 using PG-screwing
Type of connection	Terminal screws
Interface cable	6 x 0.14 mm^2 shielded, max. resistance 100 Ω/km

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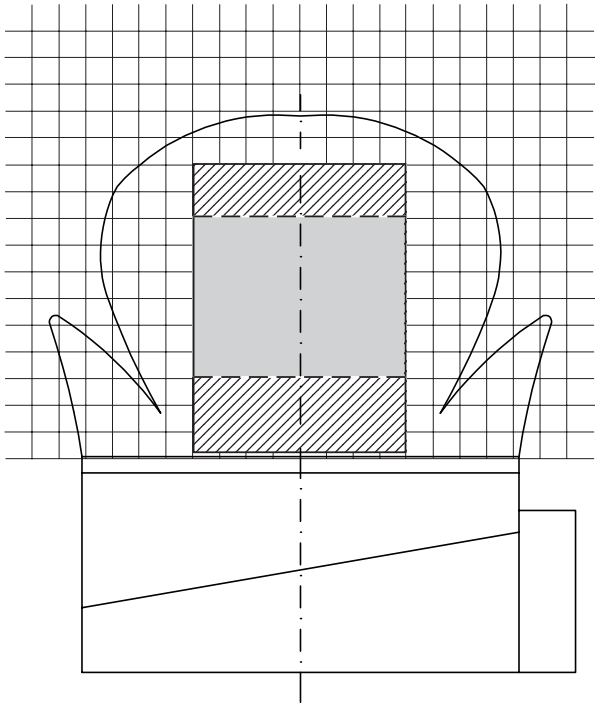
5. Reading range IRT-FP3-IS

Inductive code carrier ICC-30 (F) / Inductive read station IRT-FP3-IS

Reading range for code carrier not mounted in steel:

Reading range statical	1 ... 55 mm
Reading range dynamical	15 ... 45 mm 3.2 m/s
Guaranteed reading range statical	
Guaranteed reading range dynamical	
Maximum offset	± 20 mm
Ambient temperature	25 °C (298 Kelvin)



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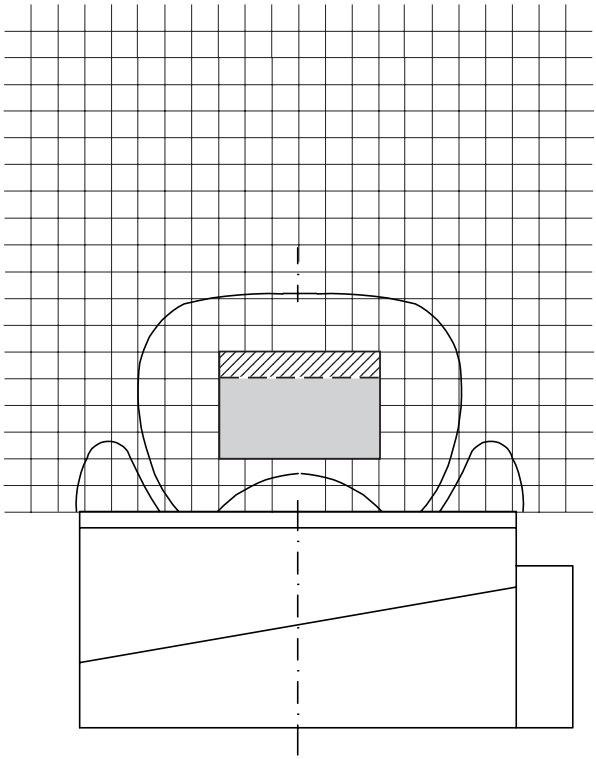
Inductive code carrier ICC-30 (F) / Inductive read station IRT-FP3-IS

Reading range for code carrier flush mounted in steel:

Reading range statical	10 ... 30 mm
Reading range dynamical	10 ... 25 mm 2.4 m/s
Guaranteed reading range statical	
Guaranteed reading range dynamical	
Maximum offset	± 15 mm
Ambient temperature	25 °C (298 Kelvin)



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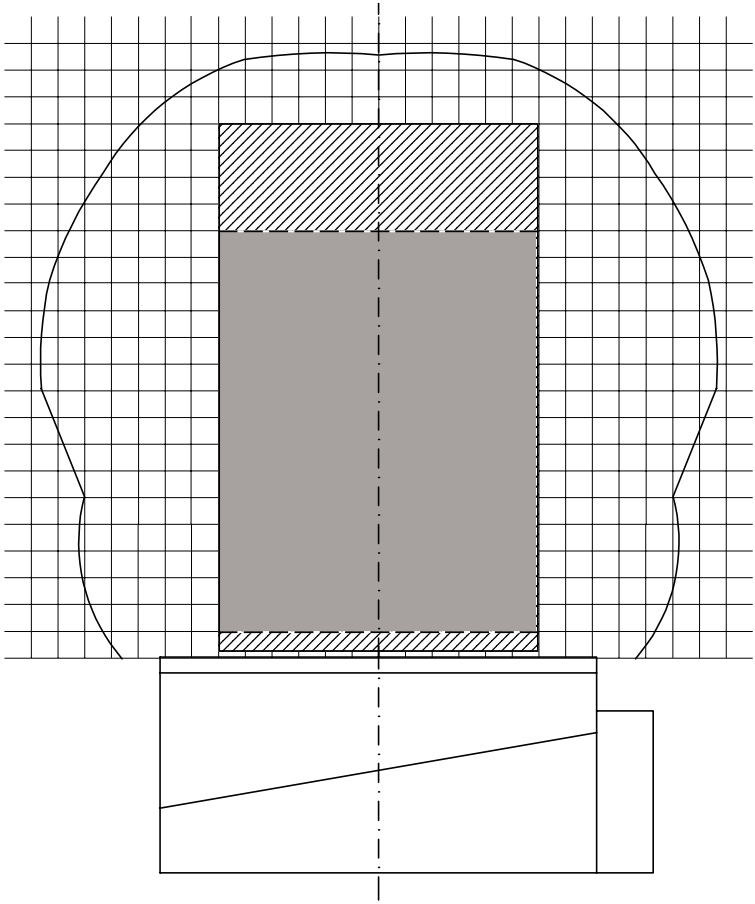
Inductive code carrier ICC-50 (F) / Inductive read station IRT-FP3-IS

Reading range for code carrier not mounted in steel

Reading range statical	1 ... 100 mm
Reading range dynamical	5 ... 80 mm 6.5 m/s
Guaranteed reading range statical	
Guaranteed reading range dynamical	
Maximum offset	± 30 mm
Ambient temperature	25 °C (298 Kelvin)



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6. Connecting examples

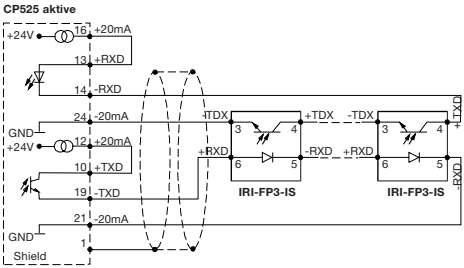
6. Connecting examples

Hardware configuration:

PLC SIMATIC S5-115U with CPU 943

6.1 Coupling via module CP525

Connection CP525 – IRT-FP3-IS.



Connection IRT-FP3-IS to SIMATIC CP525

Standard parameters for CP525:

Baud rate	:	9600 Baud
Number of data bits	:	8
Number of stop bits	:	1
Parity	:	even
Priority	:	high

Programming of CP525 :

Parameters of job block

Job number (see FB80)	1
Job	FETCH
Job type	Data blocks
CPU-No.	—
DB-No.	DB12
Source word address	00
Coordination marker	—

Parameters of interpreter and procedure:

Interpreter	RK512			
Procedure	P3964R	Baud rate	:	9600
		Character length	:	8Bit
		No. of stop bits	:	1
		Priority	:	higher
		Parity	:	even

Programming of automation device:

For restarting the automation device parameters of synchron blocks e.g. OB21 und OB22 have to be set.

```
BLOCK   # OB21
        :
        : SPA FB249     ABSOLUTE JUMP INTO
                        BLOCK
NAME    # FB249        SYNCHRON
SSNR    = KY0,0       INTERFACE NUMBER 0
BLGR    = KY0,6       BLOCK SIZE
PAFE    = MB90        PARAMETER ERROR
                      IN MB90
        :
        : BE

BLOCK   # OB22
        :
        : SPA FB249
NAME    # FB249
SSNR    = KY0,0
BLGR    = KY0,6
PAFE    = MB90
        :
        : BE
```

With organisation block OB1 the user program FB80 is called.

```
BLOCK   # OB1
        : SPA FB80      ABSOLUTE JUMP INTO
                        FB80
NAME    # FB80
        : BE
```

In the function block FB80 a fetch order is send to the CP525 every second cycle. In every cycle data are fetched with block FB245 (RECEIVE ALL), if they are available from the CP525 and put into data block DB12.

```
BLOCK   # FB80
BSTNAME# IRTFP
BIB     # 0
        : UN M 3.7      ISSUE TRANSMISSION
                        COMMAND
        : = M 3.7       BLOCK PULSE
        : UN M 3.7      ISSUE PULSE
        :
        : SPA FB246
NAME    # FETCH
SSNR    = KY 0,0        INTERFACE NUMBER 0
A-NR    = KY 0,1        COMMAND NUMBER 1
ANZW    = MW 192        DISPLAY WORD
ZTYP    = KC DB         TARGET TYPE
                        DATA BLOCK
DBNR    = KY 0,12       TARGET DATA BLOCK
12
ZANF    = KF +0         TARGET START
                        ADDRESS 0
ZLAE    = KF +yy        LENGHT yy WORD
```

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```
PAFE    = MB 200        PARAMETISE ERROR
                        BYTE
        :
        : SPA FB245
NAME    # RECEIVE
SSNR    = KY 0,0        INTERFACE NUMBER 0
A-NR    = KY 0,0        COMMAND RECEIVE
ALL
ANZW    = MW 92         DISPLAY WORD
ZTYP    = KC DB         TARGET TYPE
                        DATA BLOCK
DBNR    = KY 0,0
ZANF    = KF +0
ZLAE    = KF +0
PAFE    = MB 96         PARAMETISE ERROR
                        BYTE
        :
        : BE
```

The fetched data from CP525 with address 0 to address yy (depending on number of connected read stations in loop) are put into data block DB12 (to be programmed).

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