SIEMENS

MOBY
ES 030-K Acquisition Station

Manual **Release 08/2000**

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1 System Overview

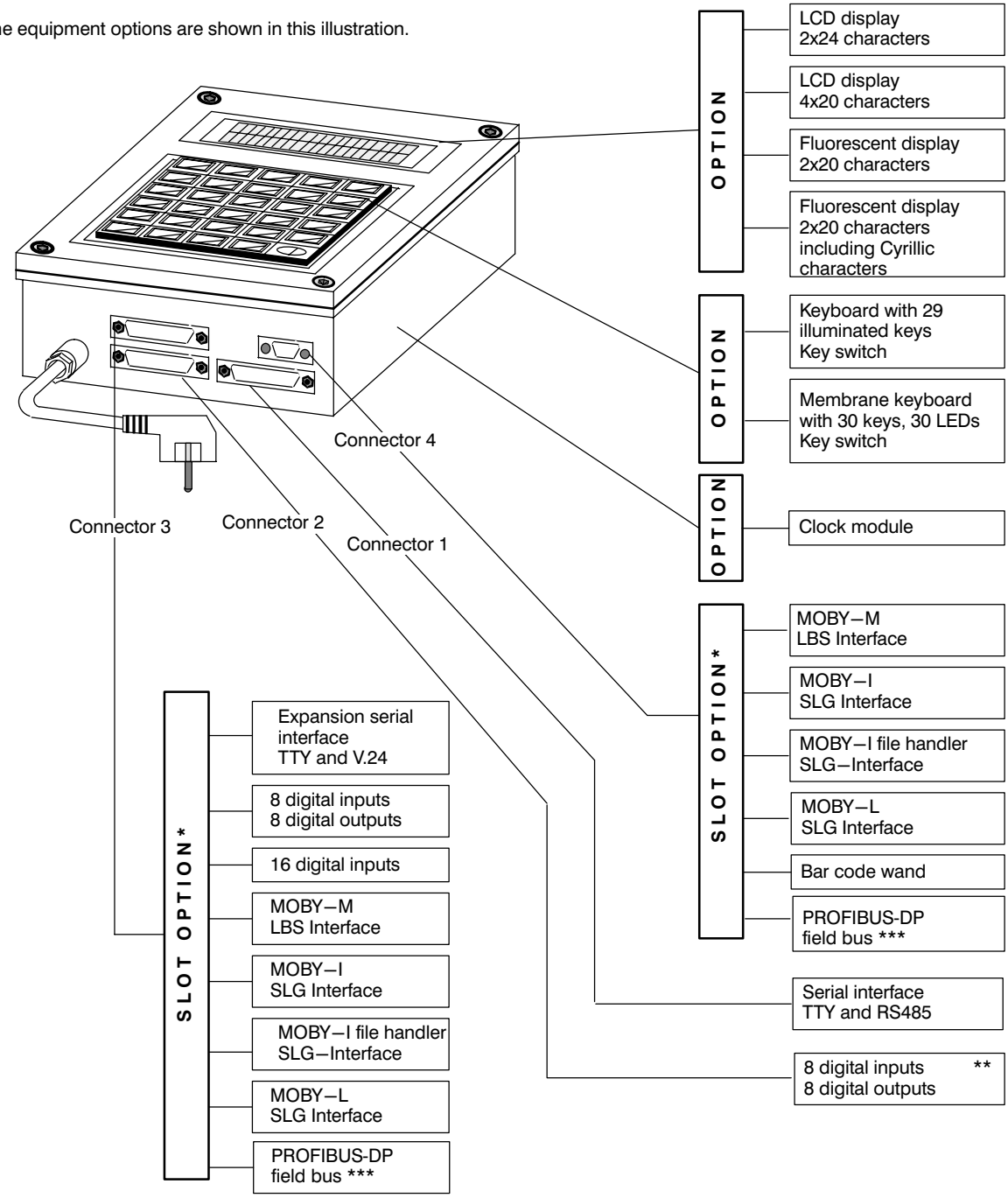
1.1 Field of Application

The ES 030−K Acquisition Station is used in various branches of industry. Here, it can perform a diversified range of tasks:

- Controlling by means of digital inputs and outputs
- Acquisition of user data via the function keys on numeric or alphanumeric keyboards
- User−friendly operation
- Display of masks and user data on display
- Identification by means of MOBY or bar code
- Control of lower or higher level systems via serial interface
- Connection to PROFIBUS-DP field bus system

1.2 System Configuration

The equipment options are shown in this illustration.



* Each slot option consists of a hardware module that requires one slot in the ES 030.
** In a special configuration, the options expansion serial interface and 16 digital inputs can be lead out through connector 2.
*** PROFIBUS−DP can be connected to connector 3 or connector 4 instead. Connector 4 is preferred.

1.2.1 Basic Equipment

1.2.1.1 Power Supply

The power source for the equipment is the 230 V AC mains. Transients on the mains voltage are suppressed by a filter.
A 24 V DC model is also available. The power supply section supplies 5 V and 24 V DC to the motherboard and all options.

1.2.1.2 Central Processor

The powerful microprocessor SAB 80C32, with a clock pulse frequency of 14.7 MHz, performs the function of the central processor.

1.2.1.3 Memory

64 Kbyte EPROM memory is available as system memory, 128 Kbyte RAM is available for DBs; and 32 Kbyte EEPROM memory is available for application programs.
The RAM is buffered by a backup battery (lifespan of 8 years).

1.2.1.4 Serial Interface

A serial interface (TTY or RS485) with the procedures LAUF, 3964R and SINEC L1 is available for the data exchange with a higher level computer, a PLC, or for connection to a printer or a monitor, for example.

On the ES 030−K, this interface is also used for loading the application program (see Chapter 9, ESCOPY).

1.2.1.5 Digital Input/Output

In the basic equipment, there are 8 digital inputs (DI) and outputs (DQ) each. 4 of the DQs can be loaded with 100 mA and 4 with 50 mA (24 V).

1.2.1.6 Slots

The ES 030−K contains three unused slots. These slots may be used with slot options. At the present time, the following slot options are available: MOBY−M, MOBY−I, MOBY−L, bar code wand, 8 DI/8 DQ, 16 DI, and expansion serial interface and PROFIBUS-DP.

Remember: The respective sales department must be consulted in all cases before slot options are configured that do not obviously follow from the system configuration.

1.2.2 Options

1.2.2.1 Keyboard

Two keyboards with key switches are available:
- Membrane keyboard with 30 keys, 30 LEDs, key switch
- Keyboard with 29 illuminated keys, key switch

1.2.2.2 Display

Four types are available:
- LCD display containing 2 lines with 24 characters each, illuminated
- LCD display containing 4 lines with 20 characters each, illuminated
- Fluorescent display (bright, self−luminous) containing 2 lines with 20 characters each
- Fluorescent display containing 2 lines with 20 characters each and additional Cyrillic character set

  Each character (alphanumeric) is designed as 5x7 matrix.

1.2.2.3 Clock Module

A hardware clock module is available in which the date (year, month, day) and time (hours, minutes, seconds) can be set. The clock module is buffered by a backup battery, and is parameterized via a data block.

1.2.2.4 MOBY

Three MOBY systems are available:
MOBY−M, MOBY−I, and MOBY−L.

MOBY−I is the successor product to MOBY−M. New systems should therefore be designed using MOBY−I.

The essential differences between MOBY−M and MOBY−I are:
- Transfer rate:
  MOBY−M 12 ms/byte
  MOBY−I 0.8 ms/byte
- Data memory capacity:
  MOBY−M 2 bytes to 8 Kbytes
  MOBY−I 62 bytes to 32 Kbytes
- Memory types:
  MOBY−M RAM or ROM
  MOBY−I RAM or EEPROM

The transfer rate of MOBY−L lies between that of MOBY−M and MOBY−I. It has a data memory capacity of 128 byte/512 byte EEPROM. The system finds its application in storage technology, in the transport of dangerous goods, container identification, or in access control.

In general, two MOBY interface modules can be connected; it is up to the user to use two identical or two different systems.

1.2.2.5 Bar Code

A bar code interface module can be connected to which a reading pen, a hand scanner, or a bar code slot reader may be connected.

1.2.2.6 Expansion Serial Interface

As expansion interface, a second serial interface (V.24 or TTY) with the procedures Lauf, 3964R, and PREMID is possible. It serves to connect a printer or a monitor, for example. It can also be used as second interface to the computer or to a PLC.

1.2.2.7 Digital Input/Output (DI/DQ)

The digital input/output module (24 V) contains 8 digital inputs and 8 short circuit proof, floating digital outputs. The addressing range is variable. Two DI/DQ modules or one DI/DQ and one DI module can be inserted in addition.

1.2.2.8 Digital Input (DI)

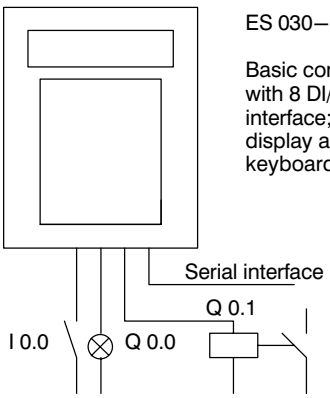
The digital input module (24 V) contains 16 digital inputs. The addressing range is pre−set. One DI module and one DI/DQ module can be inserted.

1.2.2.9 PROFIBUS-DP

When the optional PROFIBUS-DP module is used, the ES 030-K can be connected to the field bus system as a slave. The module is certified in accordance with part 3 of DIN 19245 and can be operated at speeds up to 1.5 Mbaud.

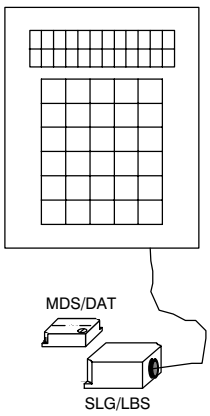
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1.3 Application Examples



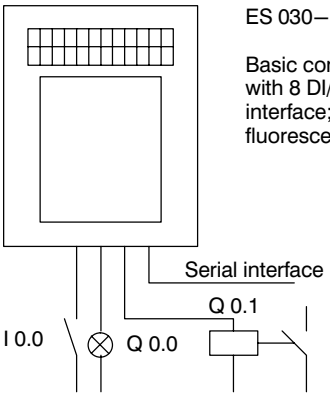
ES 030−K

Basic configuration with 8 DI/DQ and serial interface; without display and without keyboard.



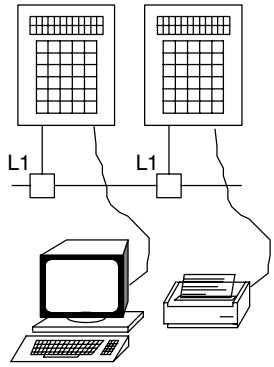
ES 030−K

Basic configuration with 8 DI/DQ and serial interface; with LCD or fluorescent display, as well as standard keyboard or membrane keyboard and MOBY−M, −I, or −L.



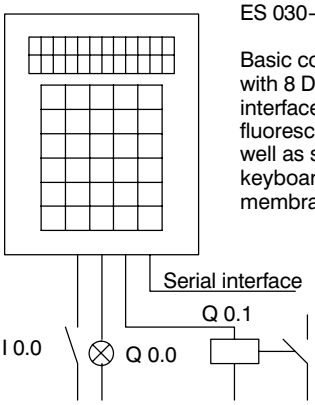
ES 030−K

Basic configuration with 8 DI/DQ and serial interface; with LCD or fluorescent display.



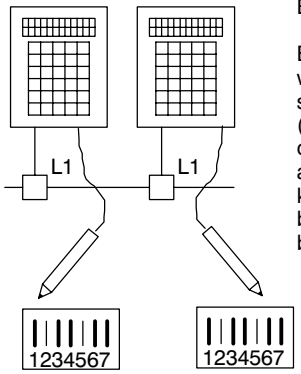
ES 030−K

Basic configuration with 8 DI/DQ and serial interface (SINEC L1); with LCD or fluorescent display, as well as standard keyboard or membrane keyboard, expansion serial interface (for instance monitor or printer connection).



ES 030−K

Basic configuration with 8 DI/DQ and serial interface; with LCD or fluorescent display, as well as standard keyboard or membrane keyboard.



ES 030−K

Basic configuration with 8 DI/DQ and serial interface (SINEC L1); with LCD or fluorescent display, as well as standard keyboard or membrane keyboard and bar code.

The linking and communications of several ES 030s is implemented via the SINEC L1 bus system.

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2 System Design

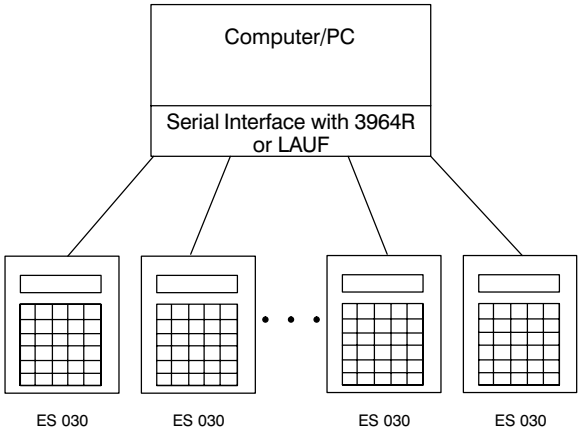
2.1 Integration into the General Concept

The following illustrations show how one or more Acquisition Stations are linked to a process computer or a programmable logic controller.

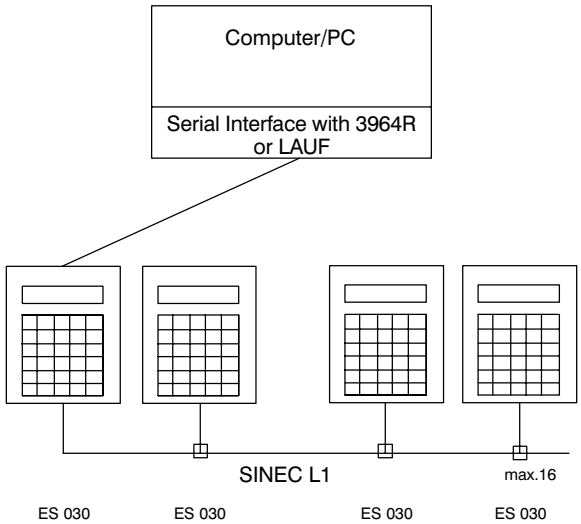
2.1.1 Hardware

2.1.1.1 Interfacing to a Computer/PC

Configuration 1: The Acquisition Stations are connected in a star configuration via PROMEAs DU04 to the computer or the PC (procedure 3964R or LAUF):

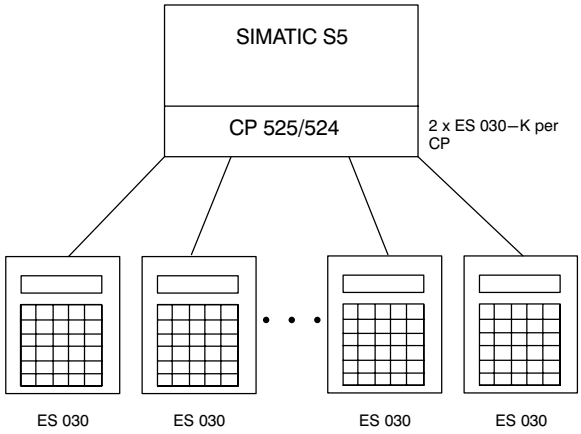


Configuration 2: The Acquisition Stations are connected collectively to a SINEC L1 bus and serially connected to the computer/PC via an ES 030–K master terminal.



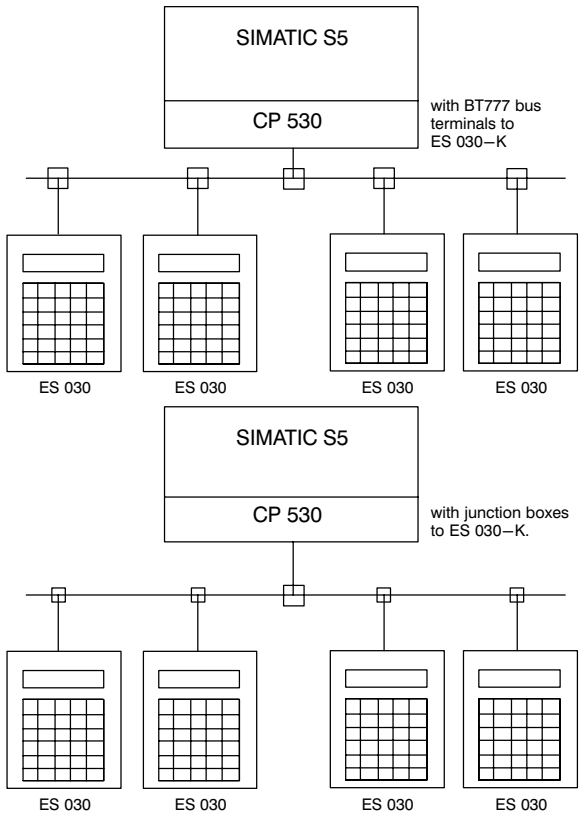
2.1.1.2 Interfacing to a SIMATIC S5

Configuration 1: The Acquisition Stations are connected in a star configuration via CP524/525 interfaces to a programmable logic controller.



Note: On the CP524/525 with the standard RK driver, the user must process the response telegram of the CP.
This is not required when using the special driver 3964R S06 in the CP.

Configuration 2: The Acquisition Stations are connected via a SINEC L1 bus to the PLC, whereby this PLC acts as bus master via a CP530 interface.



2.2 Configuration of the Individual Devices

2.2.1 Keyboard

There are two keyboard versions.

Version 1: 29 standard keys, illuminated, and one key switch.

Version 2: Membrane keyboard with 30 keys, 30 LEDs, and one key switch.
The keys can be freely parameterized and may be designated as function keys, as alphanumeric keys, or as cursor control keys by parameterization or programming.
Using the key switch, the keyboard can be switched to a second logical keyboard level. Each key may be individually labelled. The LEDs built into the keys can be addressed individually as DQs.

2.2.2 Display

Four versions are available:

- LCD display containing 2 lines with 24 characters each, built−in illumination which can be switched on from the keyboard for one minute at a time.
- LCD display containing 4 lines with 20 characters each, built−in illumination which can be switched on from the keyboard for one minute at a time.
- Fluorescent display (bright, self−luminous) containing 2 lines with 20 characters each.
- Fluorescent display containing 2 lines with 20 characters each and additional Cyrillic character set.

  The character set includes hexadecimal 20 to 7F, each character (alphanumeric) being displayed in a 5 x 7 matrix.

  The display text to be programmed by the user may consist of fixed text or input fields. The input fields can be overwritten with the keyboard.

2.2.3 Digital Inputs/Outputs

The digital input/output module consists of 8 floating digital inputs and 8 floating digital outputs. The low end of the inputs and the 24 V supply of the outputs are connected respectively. The digital outputs are short circuit proof.
The basic configuration of the ES 030−K includes 8 digital inputs/outputs. The outputs Q 0.0−Q 0.3 can be loaded with 100 mA, and the outputs Q 0.4−Q 0.7 can be loaded with 50 mA.

The voltage to the DI and DQ may be internally or externally supplied. The external supply voltage may vary from 16 to 33 V. In order to keep the potentials separated, note that the internal voltage is only supplied once for all DI/DQs, serial interfaces and MOBY interface modules.
On the special configuration ES 030−K supplied with 24 V DC, this voltage will be used directly as the internal supply voltage (without separation of potential) mentioned here. On inductive loads free−wheeling diodes must be used.

Digital input levels:	“0” = −2 to 2 V
	“1” = 16 to 33 V
	Ri = approx. 5 KOhm
Digital outputs:	Switch to 24 V, max. 100 mA
	Ri = approx. 25 Ohm

2.2.4 Digital Inputs

The input module contains 16 floating digital inputs. The DI may be supplied internally or externally. For levels see Chapter 2.2.3.

2.2.5 Serial Interface

The ES 030−K in its basic configuration already contains one serial interface (TTY or RS485; a special model for V.24 is available) which can be operated with the procedures LAUF, 3964R or in the SINEC L1 bus mode.

The 20 mA supply for a TTY application can be taken from the available floating 24 V available in the ES 030−K or from the connected device.

A second serial interface can be installed in the ES 030 as expansion interface. A V.24 and a 20 mA interface are available in the module. The procedures are 3964R, the extended version of LAUF, and PREMID.

The second interface cannot be operated on the SINEC L1 bus.

SINEC L1

SINEC L1 is a SIMATIC S5 bus system.
A four wire cable is used as the transferring medium. The ES 030−K can be connected to the bus using BT777 bus terminals or junction boxes. Also see Chapter 2.3.3.3.
Each bus user is addressed on a cyclic basis.

Metal type connectors must be used; the shield must be connected at all points. The junction boxes listed in Chapter 2.3.3.4 are to be used as distribution boxes and as terminal box (last box) with built−in terminating resistor and supply voltage.
The SINEC L1 Bus−System manual, order no.
6ES5 998−7LA11 contains further information about the SINEC L1 bus system .

SINEC L1 Master

If no SIMATIC S5 master is available, an ES 030−K can be operated as a master (e.g., several ES 030−Ks connected to one ES 030−K master; this master is then linked to a computer via the expansion interface of the ES 030−K).
Only ES 030 slaves may be connected to an ES 030 master. Interrupt telegrams and lateral communications (slave to slave) are not possible.

The SINEC L1 master also always includes slave number 1.

2.2.6 Bar Code

The ES 030−K can include a bar code interface as expansion to which a reading pen or a bar code slot reader is connected. If a bar code hand scanner is to be used, the interface and the current consumption of the scanner must be checked beforehand (the Data Logic types DL 80-21, DL 65-21 and DL 910-21 have been tested and may be connected directly to the bar code interface). Power is supplied by the ES 030.

The following codes can be read: Code 39, Interleaved 2 of 5, Industrial 2 of 5, Codabar, EAN, JAN, UPC, and UPC−E. Modulo check and automatic code recognition are possible.

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2.2.7 MOBY−M

Up to two MOBY−M options can be plugged into the ES 030−K. The various LBS (reader/transmitter stations) can then be connected to these options.

Data carriers with capacities of 64 bytes, 2 Kbytes, 8 Kbytes, as well as mixed code and ROMs are available. (On the 8−Kbyte data carrier, only 2 Kbytes can be read/written to; on the mixed code data carrier, only the variable part can be read/written to). Further information about MOBY−M components can be found in the manual (order no. 6AW5450−8XX00−0K).
The LBS can be supplied internally or externally with 24 V. If supplied internally, the 24 V voltage separation is cancelled.

2.2.8 MOBY−I

Up to two MOBY−I options can be plugged into the ES 030−K. The various SLGs (write/read devices) can then be connected to these options.

Data carriers with capacities of 62 byte RAM, 32 Kbyte RAM, 128 byte EEPROM, and 8 Kbyte EEPROM are available. Further information about MOBY−I components can be found in the MOBY−I catalogue (order no. E86060−K6910−A101−A2). The SLG can be supplied internally or externally with 24 V. If supplied internally, the 24 V voltage separation is cancelled.

File Handler

The MOBY−I option “F” contains the MOBY−I file handler. With this option, the user data to the MDS can be processed using logical filenames. The user does not have to administrate the physical addresses on the MDS. The file handler in the ES 030−K is compatible with the MOBY−I interface modules ASM 421 and ASM 401.

2.2.9 MOBY−L

Up to two MOBY−L options can be plugged into the ES 030−K. The SLG (write/read device) is then connected to these options.

Data carriers with capacities of 128 byte EEPROM and 512 byte EEPROM are available.

Further information about MOBY−L components can be found in the MOBY−L catalogue (order no. E86060−K6920−A101−A1). The SLG can be supplied internally or externally with 24 V. If supplied internally, the 24 V voltage separation is cancelled.

2.2.10 PROFIBUS-DP

A PROFIBUS-DP module can be connected to either connector 3 or connector 4 of the ES 030-K.
A standard, 9-way, subminiature D plug connector is used for the connection to the bus system.
The connector of the ES 030-K also provides the voltage supply for the bus connection.
The baud rate of the PROFIBUS-DP is recognized automatically. A baud rate of up to 1.5 Mbaud is possible.
Additional information on the subject of the PROFIBUS-DP and its configuration is available in various catalogues and manuals. Examples: SINEC Industrial Communication Networks (IK10 catalogue), (E86060-K-6710-A101-A5-7600) and ET 200 Distributed I/O System (6ES5 895-6SE22).

2.2.11 Power Supply

The power supply of the ES 030−K has been designed for connection to either 230 V AC or, in a special version, to 24 V DC. The AC version contains a filter in order to suppress voltage transients on the mains voltage.

Calculating the Current Requirements −24V

The ES 030−K provides a floating voltage of 24 V/400 mA. This voltage is used to internally supply the MOBY, the digital inputs/outputs, and the serial interfaces.

The following current capacities are required:

MOBY−M	LBS 11, 21, 41 LBS 31, 32, 71	100 mA 50 mA	
MOBY−I	SLG 41 SLG 42 SLG 43 SLG 44	90 mA 180 mA 250 mA 80 mA	
MOBY−L	SLG 52	120 mA	
Serial interface TTY	active passive	40 mA 0 mA	
Digital input Digital output		5 mA max. 100 mA	each input depending on load

It must be observed that the maximum current is not exceeded.

2.2.12 Memory Expansion

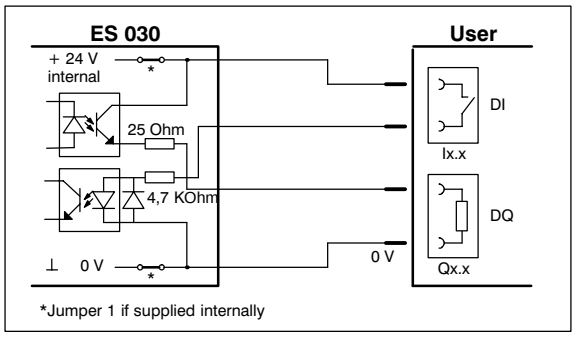
The user has an EEPROM area of 16 K available for instructions. The programs and data blocks (data blocks which do not require presettings do not have to be programmed) to be loaded share this area.

The RAM area is designated for data blocks and includes DB 1 to DB 120, containing 256 data words each.

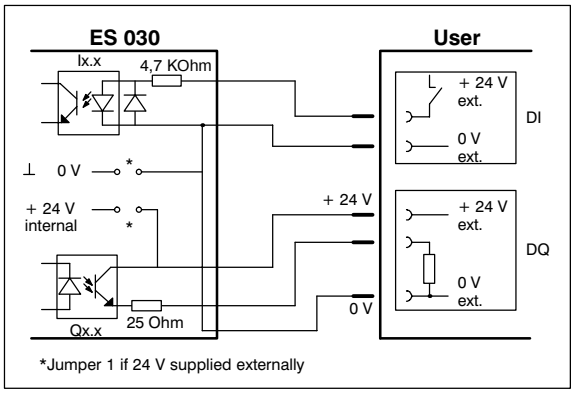
2.3 Cable Connection

2.3.1 Digital Inputs/Outputs

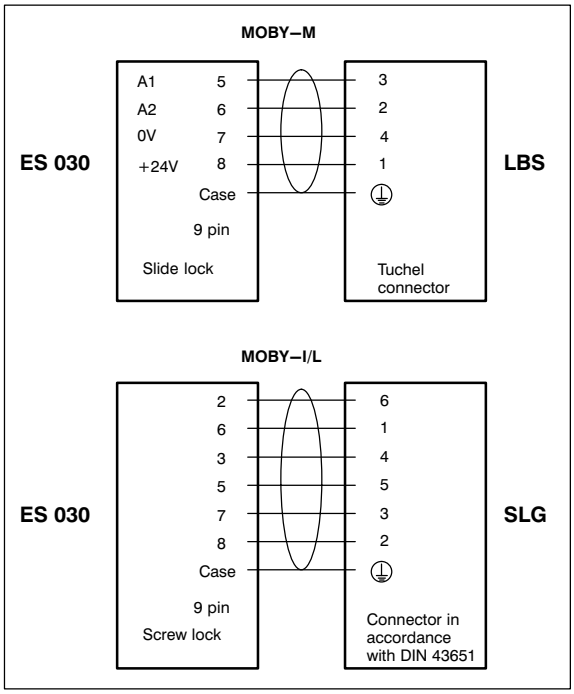
Voltage supplied by ES 030−K



Voltage supplied externally

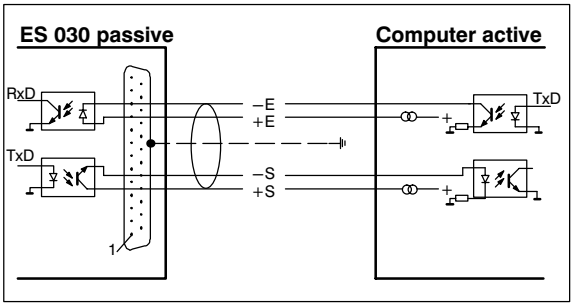


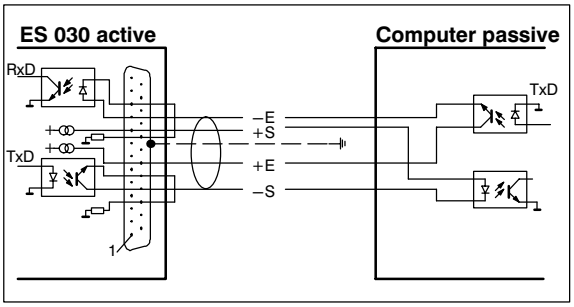
2.3.2 MOBY



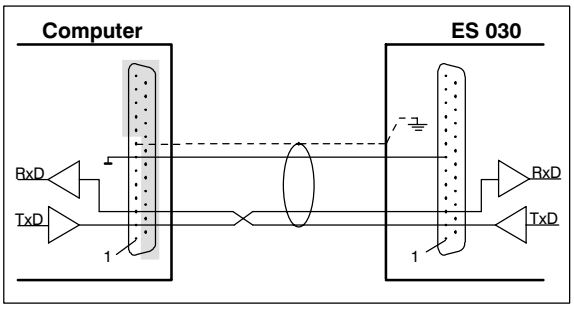
2.3.3 Serial Interface

2.3.3.1 TTY





2.3.3.2 V.24

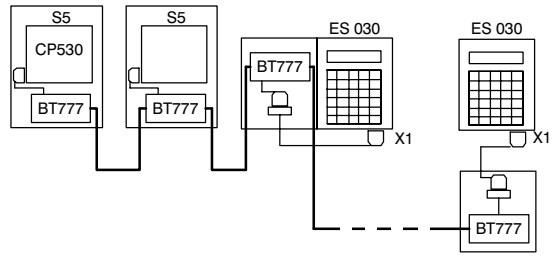


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2.3.3.3 SINEC L1

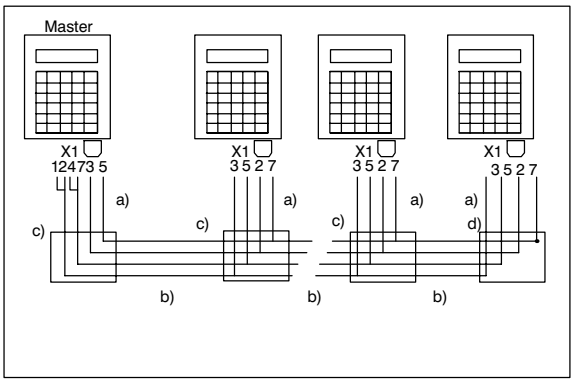
The illustrations show the various cable connections used for the connection to the SINEC L1 bus.

Connection of ES 030−K to the SINEC L1 bus via BT777

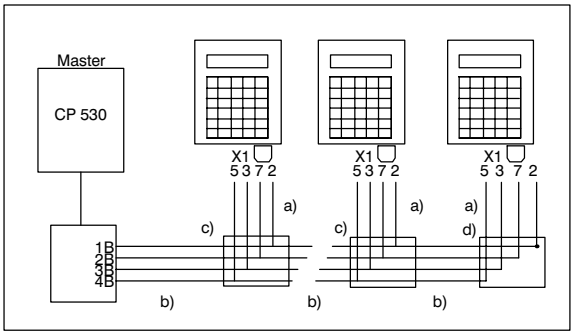


Interface set to TTY, transmitter and receiver are passive

Connection of ES 030−K to the SINEC L1 bus without BT777 (4−wire) (without S5 user, no laterial communication possible)



Connection of ES 030−K to the SINEC L1 bus without BT777 (4−wire) (without S5 user except bus master, no laterial communication possible)



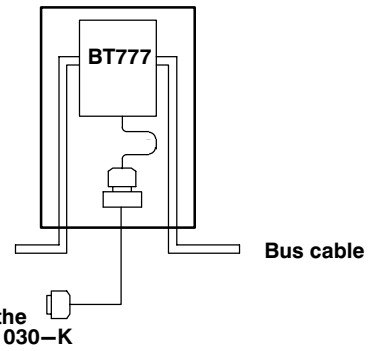
The interface must be set to the RS485 mode by installing jumpers 9−10 and 11−21.

a) JE−LiYCY 2x2x0.5 bd si
b) Je−Y(ST)Y2x2x0.8 bd si, max. total length of the sum of all sections (a to c) is 1000 m.
c) L1 junction box (see Chapter 2.3.3.5)
d) L1 last terminal box (see Chapter 2.3.3.5)

2.3.3.4 SINEC L1 Bus Terminal

Ready−made cables are available for connecting to the PC/computer and to the S5 CP524/525 module.

In order to connect to the CP530 (SINEC L1), the cabling of the bus terminals BT777 must be carried out in accordance with the description of the SINEC L1.
A case with the dimensions of the ES 030 is available for installing the bus terminal on the ES 030−K.



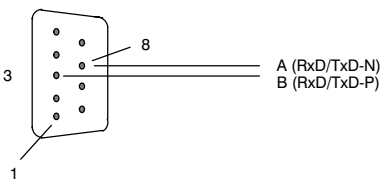
With a total length of less than 1000 m and no other devices on the CP530, the RS485 connection (4−wire) may be used instead of the BT777 bus terminals on the ES 030−K. In this case, the special distribution boxes described in Chapter 2.3.3.5 must be utilised.

2.3.3.5 SINEC L1 Junction Box/Last Terminal Box

The L1 junction boxes are required at all points where an ES 030−K is to be connected to the SINEC L1 bus. They consist of a metal case with circuit board to which the SINEC L1 bus as well as the ES 030 can be connected. Each cable shield must be connected to the case using a large surface area.
The last terminal box contains a built−in terminating resistor. Therefore, wiring the terminating resistor on the ES 030−K is not required; also, the last unit on the SINEC L1 bus can be exchanged without problems.

2.3.4 PROFIBUS-DP

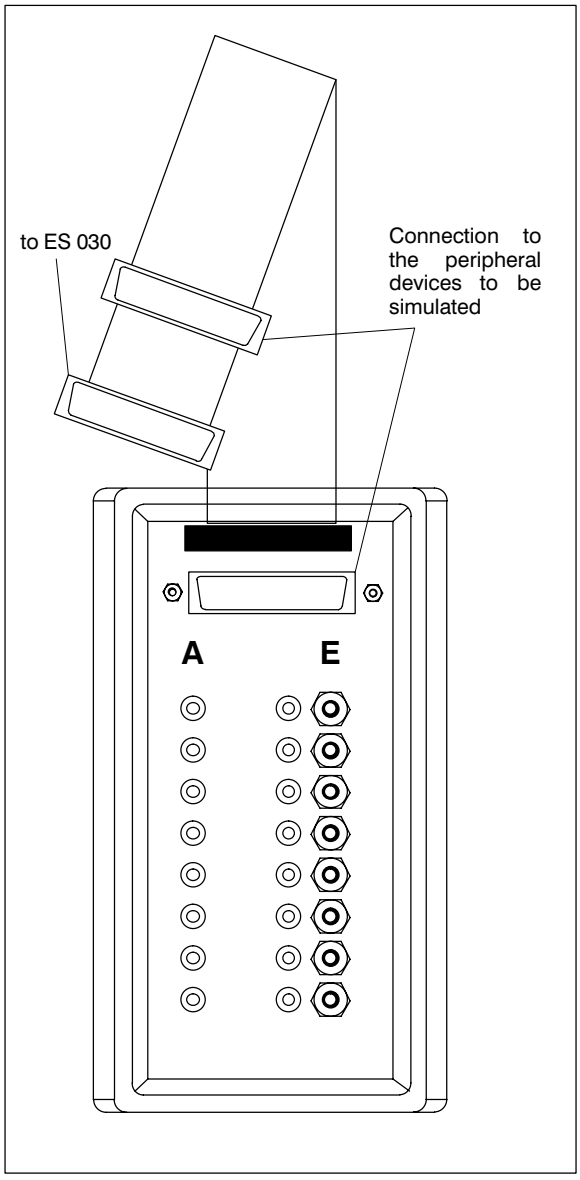
The following figure shows the standardized PROFIBUS-DP connection to a 9-way, subminiature D plug connector.
We recommend using standard components for bus cables and connection plugs (cf. ET 200 manual).



2.4 Program Configuration and Testing Aids

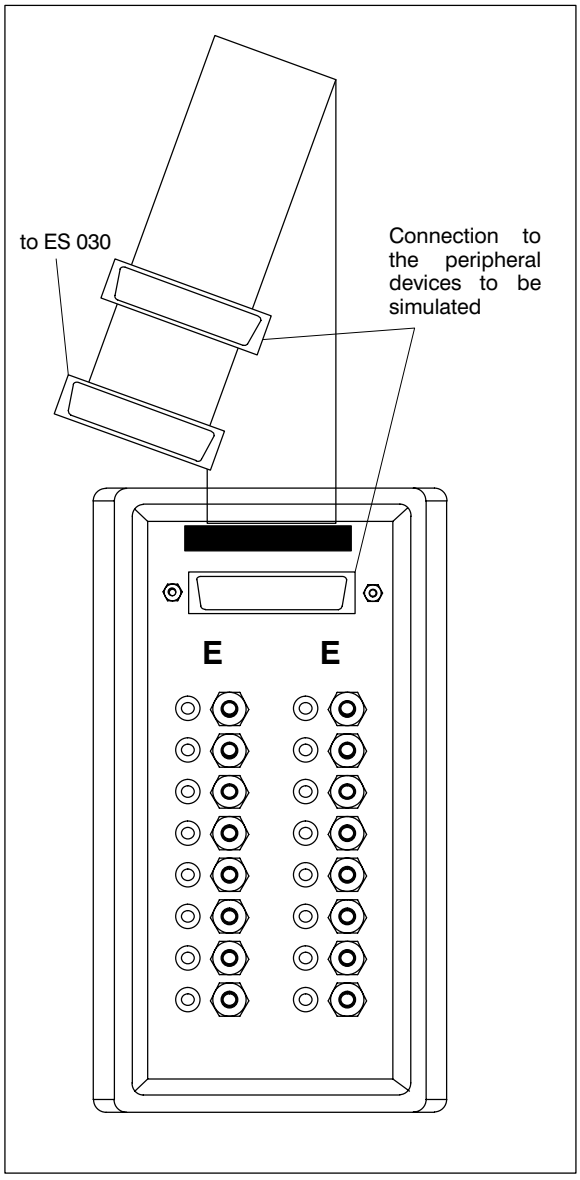
2.4.1 Digital Input/Output Simulation

6AW5451−8KA for 8 DI/DQ on the ES 030−K X2, X3



2.4.2 Digital Input Simulation

6AW5451−7KA for 16 DI on the ES 030−K X2, X3



The simulators can be connected directly to connectors X2 or X3. The 2 x 8 LEDs can be used to indicate the status of the digital inputs and outputs or 16 digital inputs only when the 16 DIs are used.
The simulators are an important, as well as a helpful tool for programming and initial operation. They are simply connected into the loop leading to the peripheral devices.

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3 Programming the ES 030−K

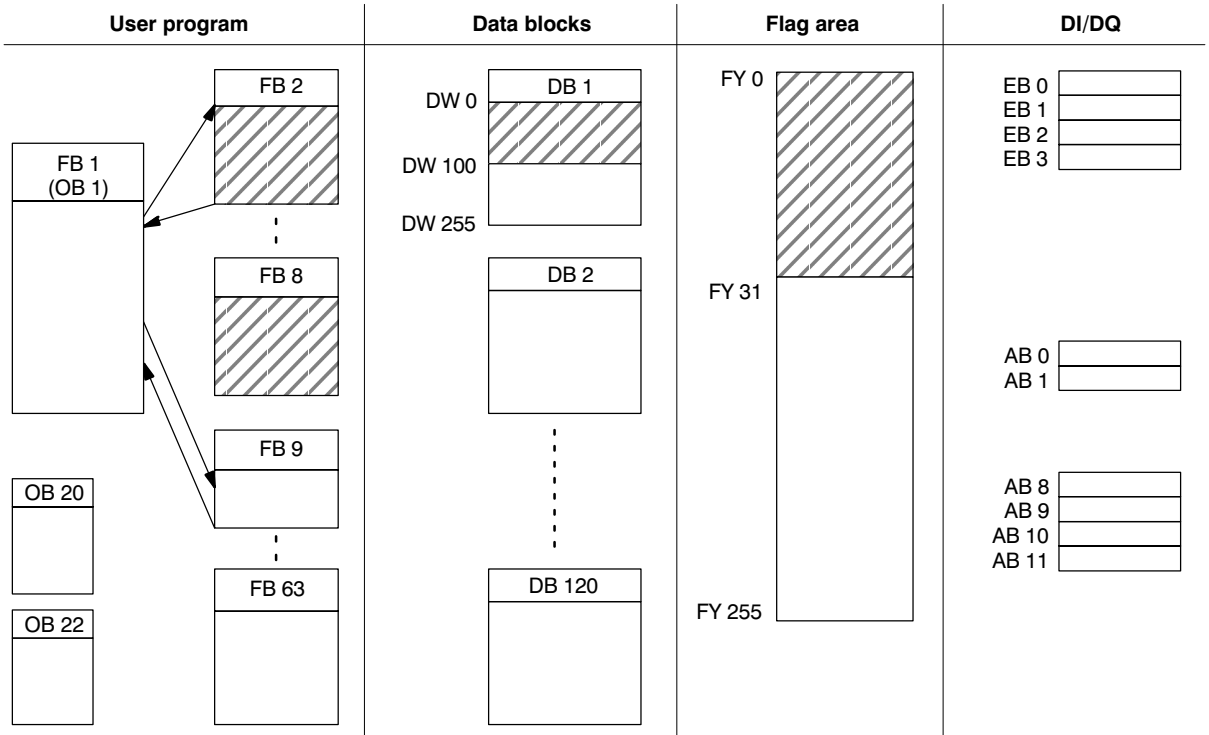
3.1 General

STEP 5, the programming language for the programmable logic controller SIMATIC S5, is used in programming the ES 030−K. The operational instructions are described in Chapter 8.5.

3.1.1 Programming the ES 030−K

The OBs, FBs and DBs are generated with the PG under DOS and loaded into the ES 030−K (EEPROM) using the program ESCOPY (see also Chapter 9).

3.1.2 Memory Configuration and Programming



Cyclic execution of the user program begins in FB 1. Function blocks FB 2 to FB 8 are standard blocks of the operating system. These FBs provide the user with very useful auxiliary programs (e.g., recoding, copying, etc. – see chapter 3.2.2).

Blocks FB 9 to FB 63 are available to the user for programming as desired. The blocks can be nested up to a depth of 10.

As with SIMATIC, OBs 20 and 22 are available to the user for system start and return of power.

The standard ES 030−K has 120 data blocks each with 256 data words. All data blocks are cleared when a system start occurs.

DW 0 to DW 99 of data block 1 (DB 1) contain internal system data (e.g., time, keyboard code table; parameterization of the serial interface; command structure of MOBY; see chapter 3.2.1). DBs which the user has preset and programmed in the EEPROM are automatically copied to the RAM when the system starts.

As with SIMATIC, the ES 030−K has a flag area of 256 bytes. This area can be addressed by bit, byte and word.

The area from FY 0 to FY 30 is already permanently assigned. It is used for I/O control (see chapter 3.3).

The digital inputs and digital outputs of the ES 030−K are assigned to fixed addresses. The DIs are at addresses 0 to 3, and the DQs are at addresses 0 to 1. The lamps of the keyboard can be controlled with addresses 8 to 11.

3.2 Description of the Blocks

3.2.1 Data Block (DB)

Following a system start, there are 120 DBs each containing 256 DWs present in the ES 030−K RAM (DB1 − DB120). These DBs can be utilised by the user program without having been parameterized in the program (e.g. as input buffer for MOBY, bar code, etc.). While receiving data, block limits can be exceeded; i.e. with a telegram length of more than 512 byte user data, the user data will automatically be written into the following DB. The data blocks which have been parameterized in the user program, are transferred into RAM after system start; they may not exceed 256 data words.
The data block 1 up to DW 99 is allocated to the system; beginning with DW 100 it can be utilised by the user. The allocation for data block DB1 is described in the following.

Allocation of Data Block 1

Data Word No.	Data Word Left Byte	Data Word Right Byte	Meaning	
0 1 2	Res. Res. Position of DIP switch	Res. Res.	S1 on motherboard (see also Chapter 5.1) (Entry after voltage return)	DIP−switch
3 4 5 6 7 8	Year Month Day Hours Minutes Seconds	Year Month Day Hours Minutes Seconds	Hardware clock (in ASCII format)	Clock
9 10	DB	DW Number of bytes	Mask to be displayed (see also Chapter 3.4.2)	Display
11 − 40	Key 1 − 30	Key 1s − 30s	Keyboard / s = Shift level (see also Chapter 3.4.1)	Keyboard
41 42 43 (43 44 (44 45 46 (46	Baud r./Bus−No. DB Error max. number actual number DB Error Number of bytes	Driver DW max. number actual number DW Number of bytes	Receive serial interface or SINEC L1 slave with extended buffer length; error in DW 74) with extended buffer length) transmit with extended buffer length; error in DW 74)	serial interface
47 48 49 (49 50 (50 51 52 (52	Baud rate DB Error max.number actual number DB Error Number of bytes	Driver DW max. number actual number DW Number of bytes	Receive expansion serial interface with extended buffer length; error in DW 75) with extended buffer length) transmit with extended buffer length; error in DW 75)	Expansion serial interface

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Data Word No.	Data Word Left Byte	Data Word Right Byte	Meaning	
53 54 55 56	DB Error DB Error	DW Error MOBY module DW Error MOBY module	List of commands MOBY module 1 List of commands MOBY module 2	MOBY
53 54 55 56	DB Error DB Error	DW Error DB Error	List of commands MOBY module file handler 1 See Chapter 3.2.1.9 and 3.2.1.12 List of commands MOBY module file handler 2 See Chapter 3.2.1.9 and 3.2.1.12	MOBY–I file handler
57 58 59 60 61 62 63 64	Sender number Sender number DB DB Error DB Error	Receiver number Receiver number DW DW max. number Actual number DW Number of bytes	SINEC L1 bus user no. slave (see also Chapter 3.4.5.1) SINEC L1 bus user number master Circulation list for SINEC L1 bus master Master: Telegram receiving data address Reception SINEC L1 bus master Send SINEC L1 bus master	SINEC– master
65 66 67	MONTH YEAR MOBY 1	MOBY 2	Firmware status of the ES 030–K (ASCII format) Firmware status of MOBY slot option (Hexadecimal format)	System
68 69	DB Error	DW	Magnecode	Magnecode
70 71 72 73	Bar code type DB Error	Driver selection DW Max. number Actual number	Bar code	Bar code
74 75	Input error Input error	Transmit error Transmit error	with extended buffer serial interface with extended buffer expansion serial interface (PREMID or LAUF)	serial interface
76 77	Start character Receiver, checksum	Stop character Transmitter checksum	for expansion interface (LAUF driver) for expansion interface (LAUF driver)	expansion serial interface
78 79 80 81 82 83 84 85 86 87	MDS 507 MDS 507 SLG – No. Priority Error number see Chapter 3.2.1.17 SLG – No. Priority Error number see Chapter 3.2.1.17	t_{SCAN} t_{SCAN} EAKO EAKO	MDS 507 operation for channel 1 MDS 507 operation for channel 2 Definition see Chapter 3.4.4.3	MOBY–I file handler
88 89 90 91 92 93 94 95 96	Station address Sending length DB Reserved Reserved DB Reserved Byte 1 Byte 3	FW version Receiving length DW Reserved Reserved DW Reserved Byte 0 Byte 2	Bus address, can be set from 3 to 124 Address of receiving buffer Address of sending buffer } 4 bytes of user diagnostics	PROFIBUS-DP
97-99	Reserved			Reserved
100 and above	Free for user			

3.2.1.1 DL 2 Switch 1 on the Motherboard

Bit 7 6 5 4 3 2 1 0

Bit 4 — Available for parameterization by user

Without keyboard, bit 7 is used to switch to download mode on ON and voltage return

3.2.1.2 DL 41, DL 47 Baud Rate, Procedure Parameter

Bit 7 6 5 4 3 2 1 0

Bit 3 2 1 0 — Baud rate

1 =	150 Baud	5 =	2400 Baud
2 =	300 Baud	6 =	4800 Baud
3 =	600 Baud	7 =	9600 Baud
4 =	1200 Baud	8 =	19200 Baud

Bit 2 — 0/1 8/7 data bit

Bit 1 — 0/1 odd/even parity

Bit 0 — 0/1 1/2 stop bit

3.2.1.3 DL 41 for SINEC L1 Address

Bit 7 6 5 4 3 2 1 0

Bit 4 3 2 1 0

0 = ES 030 is master
Control carried out via FY 18 and FY 19.

1 = Reserved for the ES 030 master terminal
The master terminal (Addr. = 0) is simultaneously the slave terminal with address = 1.

2 − 30 = Address of the ES 030 as slave

3.2.1.4 DR 41 Driver Standard Interface

Bit 7 6 5 4 3 2 1 0

Bit 2 1 0 — Driver

0 =	no driver	2 =	3964R procedure
1 =	LAUF procedure	3 =	SINEC L1

Bit 3 — 0/1 master/slave on 3964R

Bit 4 — 0/1 XON/XOFF off/on (only with LAUF and transmit)

Bit 5 — 0/1 Extended buffer length off/on (only on 3964R)

3.2.1.5 DR 47 Driver Expansion Interface

Bit 7 6 5 4 3 2 1 0

Bit 2 1 0 — Driver

0 =	no driver	3 =	no driver
1 =	LAUF procedure	4 =	PREMID (always with expanded buffer length; setting bit 5 is not required)
2 =	3964R procedure		

Bit 3 — 0/1 master/slave on 3964R

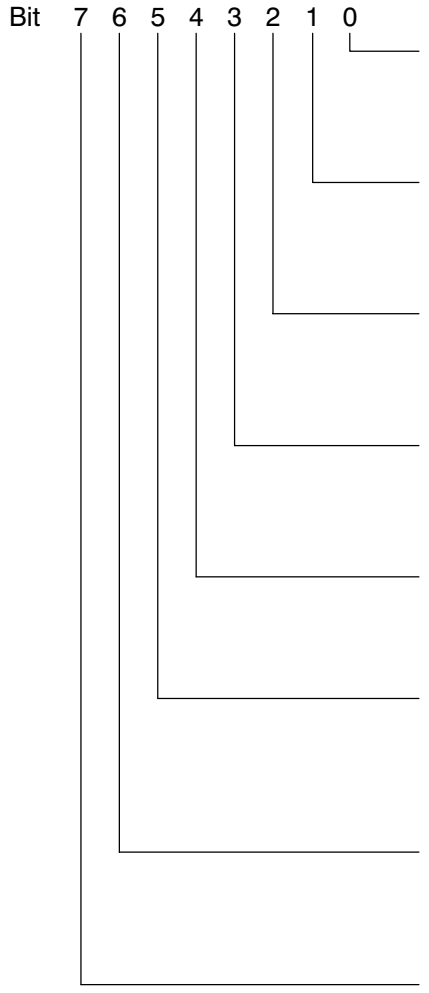
Bit 4 — 0/1 XON/XOFF off/on (only with LAUF and transmit)

Bit 5 — 0/1 Extended buffer length off/on for LAUF driver

Bit 6 — 0/1 Checksum off/on for LAUF driver

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3.2.1.6 DL 43, 46, 49, 52, 61, 72; DW 74, 75 Error Message



Parity error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
–	R	R/T	R/T	R	R/T	R

Length error/ protocol error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
R	S	R/T	R/T	R/T	R/T	R/T

BCC–error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
–	–	R	R/T	–	R	R

Acknowledge/ timeout error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
–	–	R/T	R/T	–	R/T	–

Character/ timeout error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
–	–	R	R/T	–	R	–

Unknown/ no acknowledge controller defective

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
R unknow	–	T (NAK)	R/T (NAK)	–	T (NAK)	–

RESET

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
R	R	R	R	R	R	R

Parameter error

Bar	serial interface			serial exp. interface		
	LAUF	3964R	L1	LAUF	3964R	PREMID
–	–	–	R/T	–	–	–

Bar = bar code; R = receive; T = transmit

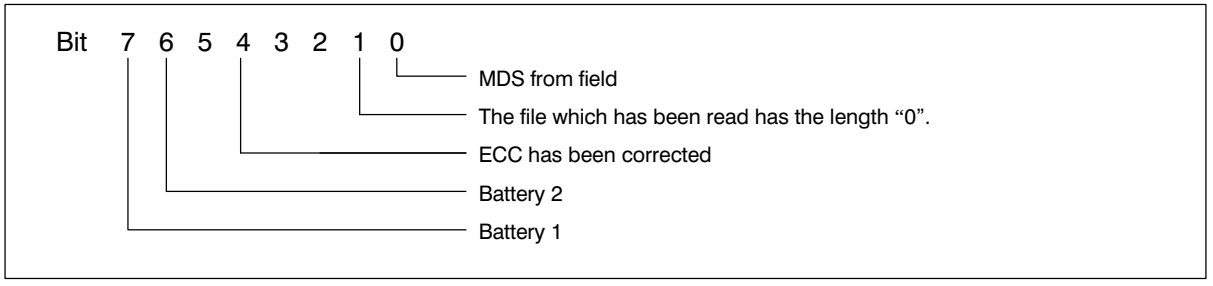
3.2.1.7 DR 54, DR 56 Error Messages from the MOBY−M Module

Code	Description	Cause
00	No error	User program
08	Unknown command for the module	User program
10	Error in data carrier type; unknown data carrier type or write command on ROM	User program
18	Error in the designated data carrier addresses	Cable, user program
40	Error in the connection to LBS, wrong DAT type in field of LBS or mutual interference of two LBSs	Positioning
48	Loss of data on data carrier	Battery empty, hardware (DAT defective)
50	A 64 byte DAT was addressed as 2 K DAT	User program
58	A write command was cancelled by a RESET	User program
60	Same as 58; but probably defective byte on DAT causes F 48 when reading this byte	User program

3.2.1.8 DR 54, DR 56 Error Messages from the MOBY−I Module without File Handler

Code	Description	Cause
00	No error	
01	Optional board has not yet communicated with ES 030	User program
02	Presence error; no MDS present	User program
03	Error in the connection to the SLG	Hardware: Channel module, cable
04	Error in RAM of MDS (not initialised)	MDS: User program
05	Command from optional board cannot be interpreted	User program
06	Too many SYNCH attempts; infected environment	SLG environment, hardware: SLG, MDS
07	Too many transmit errors	SLG environment, hardware: SLG
08	CRC transmit error	SLG environment, test connector on option
09	INIT: CRC error on receiving final acknowledge	SLG environment
0A	INIT: MDS cannot be initialised	MDS
0B	INIT: Timeout while waiting for acknowledge	MDS, SLG environment
0C	INIT: MDS could not be initialised	MDS
0D	CMD: address error	User program
0E	ECC operation: Incorrect data from MDS	MDS, user
19	CMD: previous command still active	User program
1A	MDS type has been parameterized incorrectly	User program
1D	CMD: not enough RAM on optional board	User program
1E	CMD: wrong “AB” byte; wrong data byte at RESET	User program

3.2.1.9 DR 54, DR 56 Error Messages from MOBY−I Module with File Handler

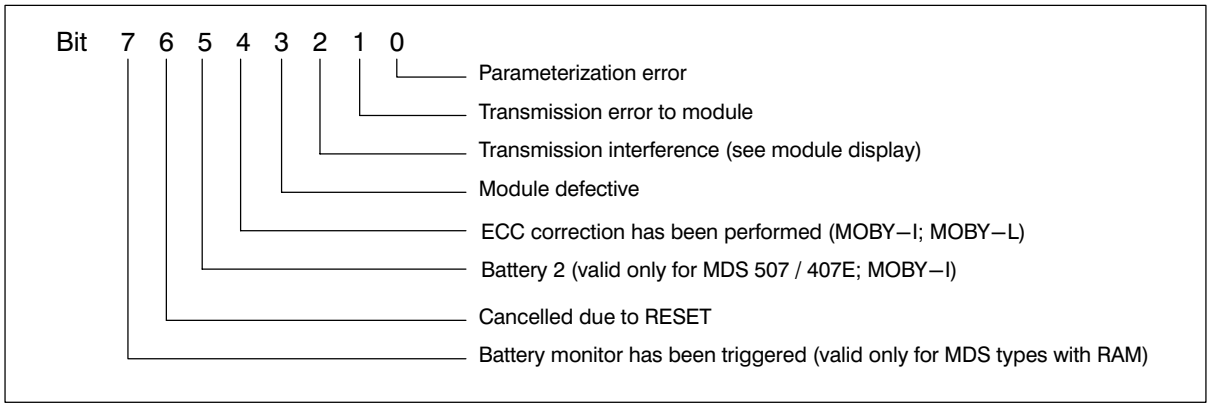


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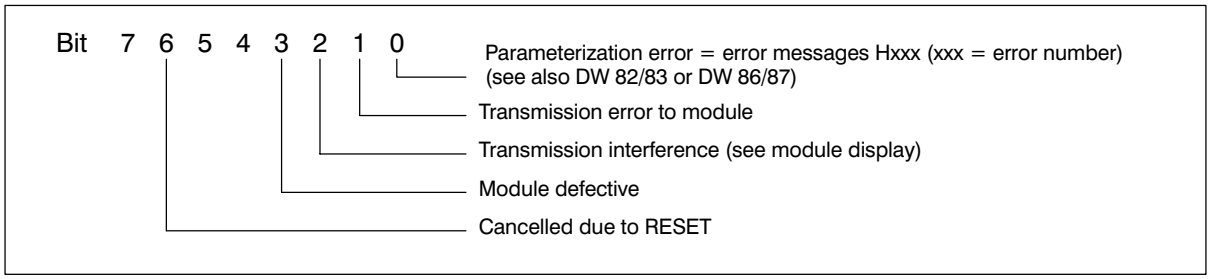
3.2.1.10 DR 54, 56 Error Messages from the MOBY–L Module

Code	Description	Cause
00	No error	
02	Presence error; no MDS present	User program
03	Error in the connection to the SLG	Hardware: Channel module, cable
05	Command from optional board cannot be interpreted	User program
06	Wrong data on read–after–write	SLG environment, hardware: SLG, MDS
07	Wrong MDS type; field error (e.g. due to other SLG)	SLG environment, hardware: SLG
08	CRC transmit error	SLG environment, test connector on option
09	Incorrect write acknowledge from MDS	SLG environment
0A	No read data, no write acknowledge	MDS
0C	Field error due to radiated interference	SLG environment
0D	CMD: address error	User program
0E	ECC operation: Incorrect data from MDS	MDS, user
19	CMD: previous command still active	User program
1A	MDS type has been parameterized incorrectly	User program
1D	CMD: not enough RAM on optional board	User program
1E	CMD: wrong “AB” byte; wrong data byte at RESET	User program

3.2.1.11 DR 54, 56 General MOBY Errors



3.2.1.12 DR 54, 56 Error Messages from the MOBY–I Module with File Handler

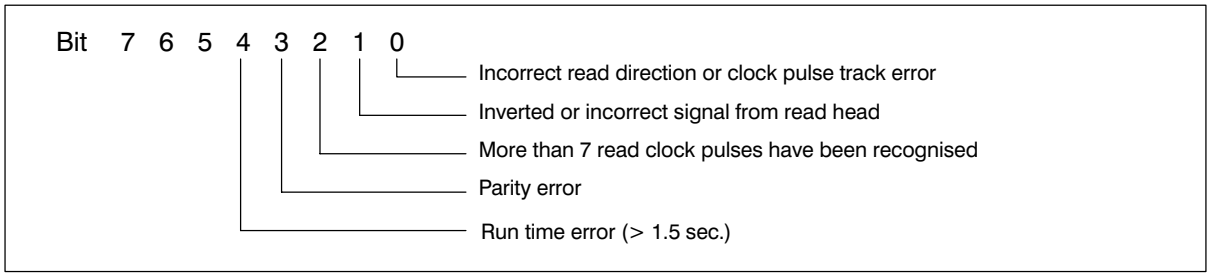


3.2.1.13 DL 67, DR 67 MOBY Firmware Status

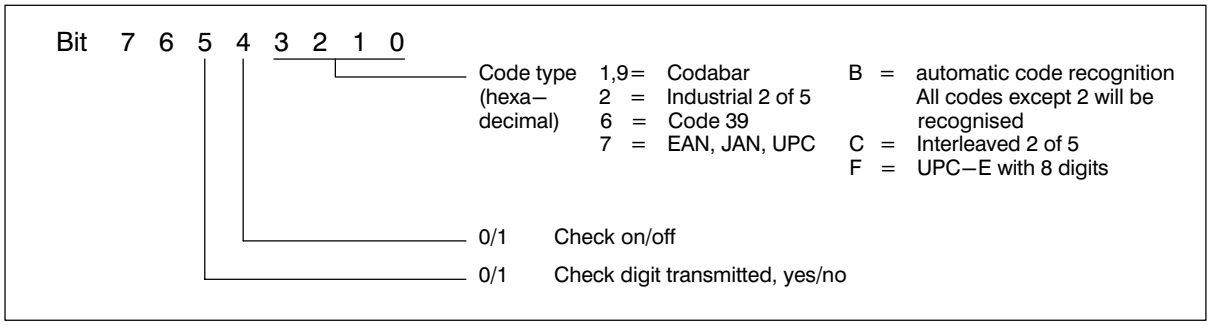
The same code is valid for both channels:

00	=	no MOBY
01 ... 7F	=	MOBY–I without file handler or MOBY–L
80 ... FE	=	MOBY–I with file handler
FF	=	always MOBY–M

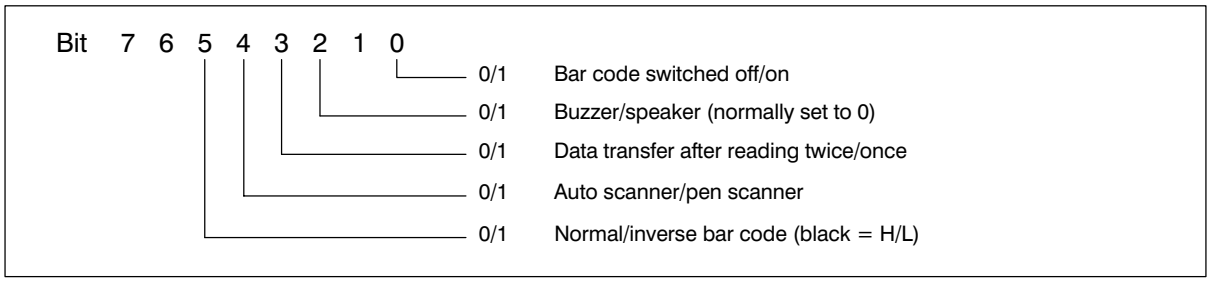
3.2.1.14 Error for Magnecode



3.2.1.15 DL 70 Bar Code Type



3.2.1.16 DR 70 Bar Code Driver Selection



Subject to change without prior notice
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(4)J31069−D0136−U001−A0−7618

3.2.1.17 Error Codes

Channel 1: DW 82/83
Channel 2: DW 86/87

A0 06 **A0 11** **A0 15** **A0 16**	Unknown command, the command designation KK is not valid. DBN not 1 on first command block; subsequent block has incorrect KK or DBN. Check byte error on reception from S5. Command from another sender is being processed.	**PROTOCOL ERRORS**
B0 01 **B0 02**	Error in connection to SLG (red LED blinks 3 x). 1. Command on EAKO = 1; but no MDS present (timeout). 2. New MDS in field; no NEXT command, but command has been started (EAKO 0) 3. New MDS has left station without NEXT (EAKO 0).	**SLG ERRORS**
C0 02 **C0 06** **C0 07** **C0 08** **C0 09** **C0 10** **C0 11** **C0 12** **C0 13** **C0 14** **C0 15** **C0 16** **C0 17**	Error in the RAM of the MDS (red LED blinks 4 x). Presence error (red LED blinks 2 x). Parameterization error on TRACE or FORMAT/command cannot be interpreted (red LED blinks 5 x). Too many SYNCH attempts (red LED blinks 6 x). Too many transmission errors (red LED blinks 7 x). CRC transmission error (red LED blinks 8 x). FORMAT, CRC error on reception (red LED blinks 9 x). FORMAT, MDS cannot be initialized (red LED blinks 10 x). FORMAT, timeout (red LED blinks 11 x). FORMAT, not initialized (red LED blinks 12 x). CMD addressing error (red LED blinks 13 x). ECC error (red LED blinks 14 x). General driver error (red LED blinks 15 x).	**MDS ERRORS**
D0 01 **D0 05** **D0 07** **D0 09** **D0 14** **D0 15** **D0 18** **D0 22** **D0 23**	Only RESET command permitted (red LED blinks 1 x). Invalid parameter on FORMAT, CREATE, WRITE, UPDATE, ATTRIB, QUEUE–WRITE, or COVER. 1. Incorrect data on LOAD command or LOAD command parameterized incorrectly. 2. MOVE command cannot be executed because checksum does not correspond to DIR + FAT. RESET command parameter incorrect. CREATE and WRITE: The user data area on the MDS is fully occupied. Only FORMAT command possible; MDS has not been identified. Start address in command is outside data area (start address > file length). Directory and/or FAT changing access to MDS protected by COVER is not permitted. COVER: MDS name incorrect.	**JOB–RELATED ERRORS**
E0 01 **E0 02** **E0 03** **E0 05**	Wrong MDS type or not consistent with active operational mode (ECC). CREATE command: no directory entry available. CREATE command: File already exists in directory. 1. FAT block sequence error has been detected during READ or WRITE, FAT defective. 2. Incorrect address specified on TRACE command.	**DIRECTORY–RELATED ERRORS**
F0 01 **F0 05**	Addressed file does not exist. WRITE/UPDATE/DELETE command on file protected with applicable attribute.	**FILE–RELATED ERRORS**
H0 04 **H1 07** **H1 12** **H1 15** **H1 19**	Command designation “KK” not permitted. DATDB not present in ES 030. “KK” of command and acknowledge do not correspond. DATDB/DATDW parameters incorrect DATDB too short (preset length of command shorter than actually acknowledged).	**PARAMETERI–ZATION ERRORS**
Kx xx	1. xxx = Number of the file entry which is wrong 2. QUEUE–WRITE command is parameterized incorrectly. 3. The file to be created already exists.	**QUEUE parameter assignment**

3.2.1.18 DW 88 to DW 96 for PROFIBUS-DP

DL 88	The user must enter the PROFIBUS address of the ES 030-K here (value range: 3 to 124).
DR 88	The operating system of the ES 030-K enters the firmware version of the PROFIBUS-DP module here.
DW 89	Length of the data to be sent or the data received
DW 95 **DW 96**	} The user can enter any identifiers here. When sending a diagnosis, these bytes are sent to the bus master as “external diagnostics”.

3.2.2 Function Block (FB)

The user has 56 FBs (FB 1, FB 9 − 63) available for use. FB 2 − FB 8 are system FBs which can be parameterized and utilised by the user. The parameters are KY, FW and DW. They can be mixed and utilised in an FB parameterization. The FB 1 is to be treated like the OB 1 in the SIMATIC, (i.e., the FB 1 or the OB 1 must exist).

Overview Table of All System FBs:

Remember:
Before being called, a system FB must first be programmed by the user. Examples are given in the appendix (Chapter 8.8).

FB 2	Code conversion, ASCII to binary
FB 3	Code conversion, binary to ASCII
FB 4	Designating text area as input field
FB 5	Deleting designation as input fields
FB 6	Copy data areas
FB 7	Reserved
FB 8	Reserved

3.2.2.1 Code Conversion, ASCII to Binary

Data is entered into the display in ASCII. In order to use these numbers in a computation, they must be re−coded into a binary number. In the ES 030−K, the function block FB 2 is already available to perform this conversion.

Parameterization:

```
        :JC FB2
NAME    :ASCI−DU
QUEL    :KY a,b
ZIEL    :KY c,d
ANZ     :KY e,f
```

a,b = DB,DW address of the data to be converted
c,d = DB,DW address where the binary number is to be stored
e = Beginning of data 0 = DL; 1 = DR
f = Amount of data in bytes
Values permitted for recording: 30H to 39H
Maximum amount of data: 5 bytes + sign

The parameterization is possible using KY, FW, or DW.
Leading zeroes or leading blanks are permitted in the ASCII data. The first character may also be a + or a −. A blank in an ASCII character stops the conversion, whether ANZ has been reached or not.

The set bit 7 in the ASCII digits (input field of the display) does not influence the conversion.
Errors are signalled by flag byte 8. An error bit is not set when parameterization is incorrect.

3.2.2.2 Code Conversion, Binary to ASCII

The ES 030−K contains function block FB3 for the conversion of binary numbers to ASCII characters.

Parameterization:

```
        :JC FB3
NAME    :DU−ASCII
QUEL    :KY a,b
ZIEL    :KY c,d
ANZ     :KY e,f
```

a,b = DB,DW address of the data to be converted
c,d = DB,DW address where the ASCII number is to be stored
e = Beginning of ASCII character 0 = DL; 1 = DR
f = Number of ASCII characters in bytes (ANZ)
Permitted values for recording: −32767 to +32767

The parameterization is possible using KY, FW, or DW.
Errors are signalled by flag byte 8.

3.2.2.3 Designating a Text Area as Input Field

FB 4 can be used to set bit 7 (designation as input field on the display).

Parameterization:

```
        :JC FB4
NAME    :SET7
FELD    :KY a,b
ANZ     :e,f
```

a,b = DB, DW address of the field
e = Beginning of field 0 = DL; 1 = DR
f = number (length of field) in bytes

The parameterization is possible using KY, FW, or DW.

3.2.2.4 Deleting the Designation as Input Field

FB 5 can be used to reset bit 7 (cancelling the designation as input field on a display).

Parameterization:

```
        :JC FB5
NAME    :LOE7
FELD    :KY a,b
ANZ     :e,f
```

a,b = DB, DW address of the field
e = Beginning of field 0 = DL; 1 = DR
f = number (length of field) in bytes

The parameterization is possible using KY, FW, or DW.

3.2.2.5 Copying of Data Areas

The function block FB 6 is available in the ES 030−K, in order to be able to quickly copy areas of data. It copies the data from a source to a designated destination. Exceeding the data block limits is functionally correct.

Parameterization:

```
        :JC FB6
NAME    :COPY
QUEL    :KY a,b
ZIEL    :KY c,d
ANZ     :KY e,f
```

a,b = DB, DW address of source field
c,d = DB, DW address of destination field
e = Beginning of fields (Bit 0 = for source;
Bit 1 = for destination; 0 = DL; 1 = DR)

Source	Destination	Value
DL	DL	0
DR	DL	1
DL	DR	2
DR	DR	3

f = number of bytes to be transferred

The parameterization is possible using KY, FW, or DW.

3.2.3 Organisation Block (OB)

In the ES 030−K, four OBs can be programmed or called up.

- OB 1 corresponds to FB 1, see chapter 3.2.2
- OB 20 system start, see chapter 3.4.8.1
- OB 22 functions as on voltage failure, see chapter 3.4.8.2
- OB 39 immediate processing of system flag, see chapter 3.4.8.4

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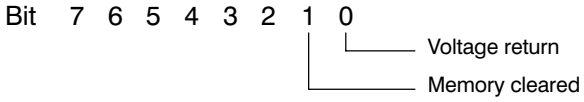
3.3 System Flags

3.3.1 Assigning the System Flags

FY	Meaning
0	Reserved
1	New start, re−start
2	Test mode
3	Reserved
:	Reserved
6	Reserved
7	Set date/time
8	Error message for ASCII/binary conversion, start program, copy program
9	Reserved for keyboard image of the function keys (at the present time)
10	Keyboard/key switch
11	Display
12	Standard serial interface/SINEC L1 slave, input
13	Standard serial interface/SINEC L1 slave, output
14	Expansion serial interface, input
15	Expansion serial interface, output
16	MOBY Interface 1
17	MOBY Interface 2
18	Standard serial interface/SINEC L1 master, input
19	Standard serial interface/SINEC L1 master, output
20	Bar code
21	Automatic MOBY recognition
22	Receive via PROFIBUS-DP
23	Send via PROFIBUS-DP
24	Reserved
25	Keyboard image of the function keys (stored)
26	Magnecode driver
beginning 31	Available for user

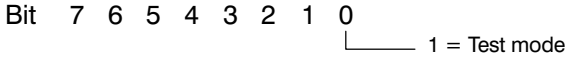
3.3.2 Description of System Flag Areas

3.3.2.1 FY 1 New Start/Re−Start



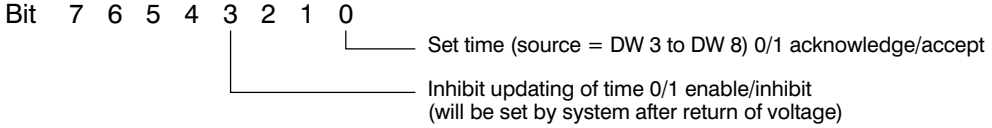
Bit 0 = Flag is “1”, if supply voltage is switched off, then on again.
Bit 1 = Flag is “1”, if user performs system start.
Both flags can be reset by the user program. They can be used as new start or re−start flags.

3.3.2.2 FY 2 Test Mode

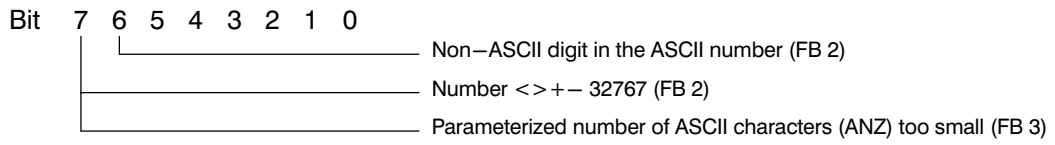


The flag 2.0 can be set by the user to access the test mode (see also Chapter 6.2.2).
The program will be stopped at the next breakpoint.
Setting flag 2.0 also cancels cycle time monitoring. The error “timeout interpreter” is no longer reported (cf. chap 7.1).

3.3.2.3 FY 7 Date/Time



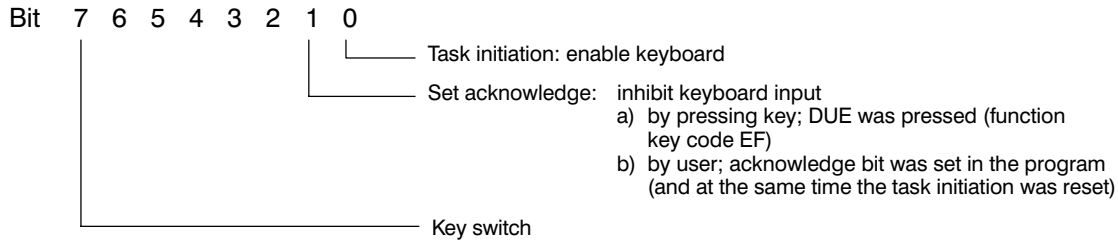
3.3.2.4 FY 8 Error Message While Processing FBs



3.3.2.5 FY 9 Keyboard Image of the Function Keys

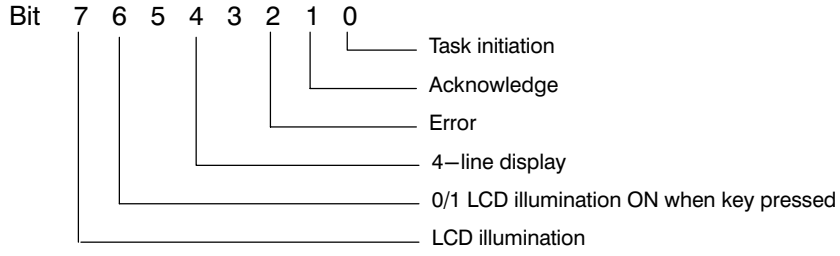
Reserved for hexadecimal value of the function keys. While function key is pressed, the hexadecimal value is entered by the system. The stored hexadecimal value of a function key is stored in FY 25. If no function key is pressed, the contents of FY 9 are 00H. This function is currently not supported.

3.3.2.6 FY 10 Keyboard and Key Switch



The flag 10.7 can be used to scan the position of the key switch.
Vertical = 0
Horizontal = 1

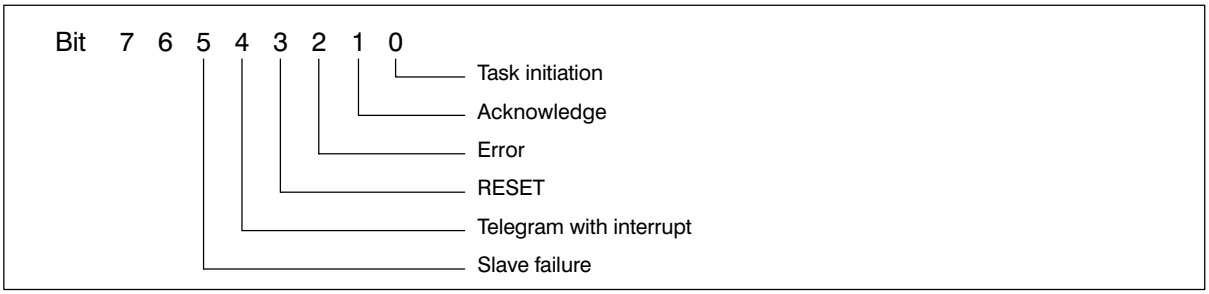
3.3.2.7 FY 11 Display



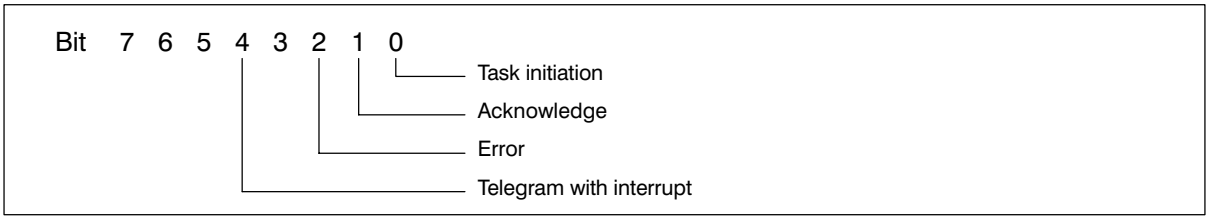
When using the 4−line display, the flag 11.4 must be set for at least one cycle after voltage return has occurred. The LCD illumination can be switched on for one minute by setting flag 11.7.

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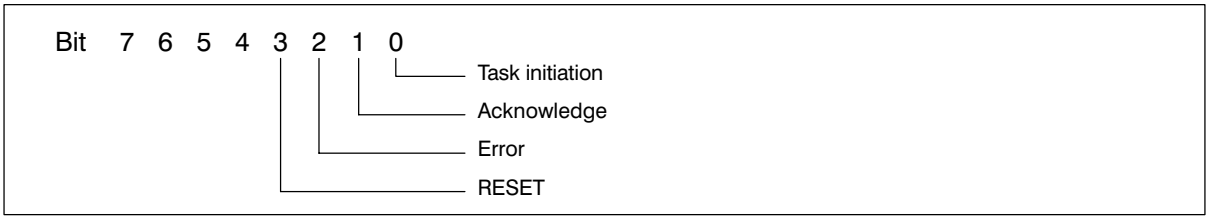
3.3.2.8 FY 12 Standard Serial Interface / SINEC L1 Slave, Input



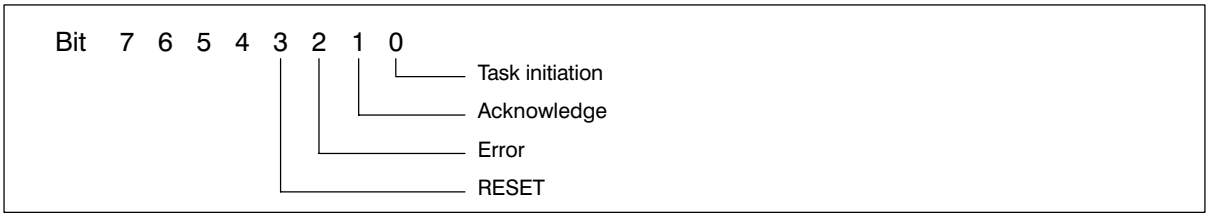
3.3.2.9 FY 13 Serial Interface/ SINEC L1 Slave, Output



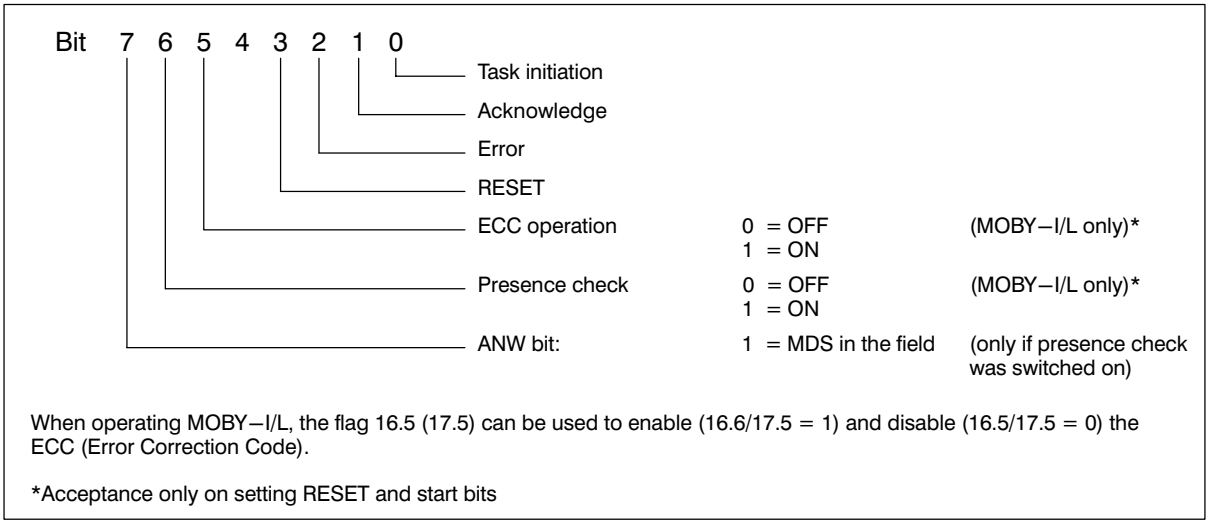
3.3.2.10 FY 14 Expansion Serial Interface, Input



3.3.2.11 FY 15 Expansion Serial Interface, Output



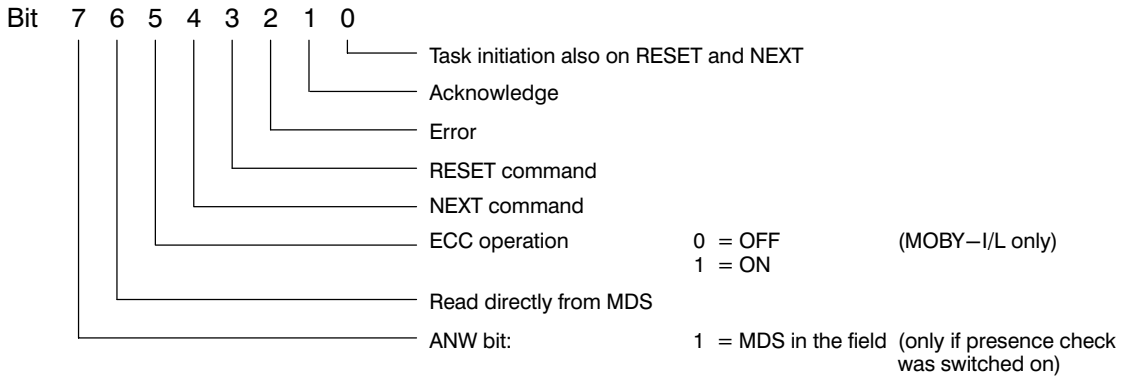
3.3.2.12 FY 16/17 MOBY–Interface 1 and 2 for MOBY–M/I/L



When operating MOBY–I/L, the flag 16.5 (17.5) can be used to enable (16.6/17.5 = 1) and disable (16.5/17.5 = 0) the ECC (Error Correction Code).

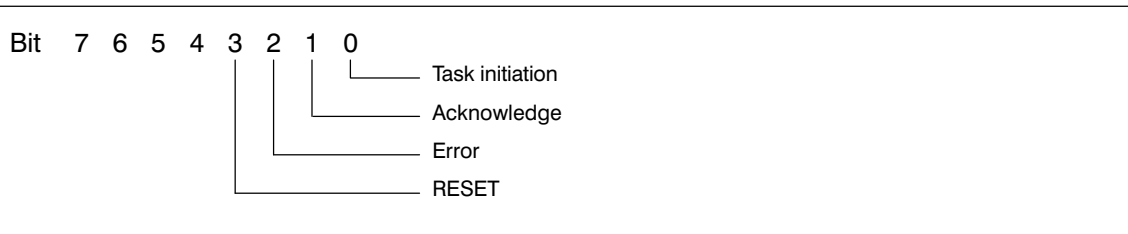
*Acceptance only on setting RESET and start bits

3.3.2.13 FY 16/17 MOBY−Interface 1 and 2 for MOBY−I File Handler

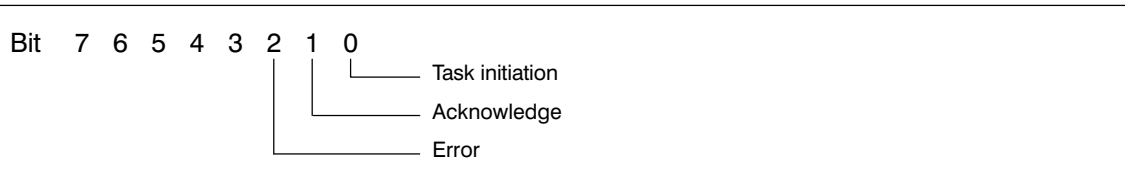


When operating MOBY−I/L, the flag 16.5 (17.5) can be used to enable (16.6/17.5 = 1) and disable (16.5/17.5 = 0) the ECC (Error Correction Code).

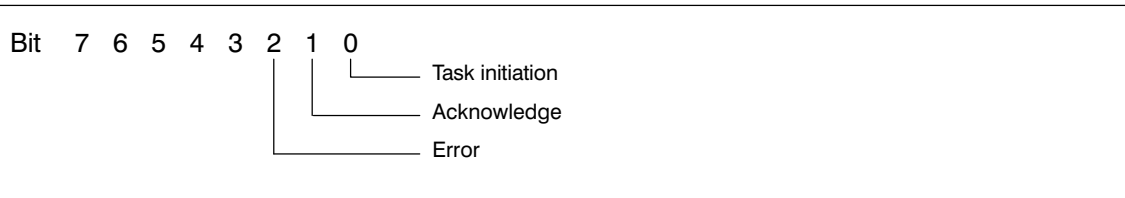
3.3.2.14 FY 18 Standard Serial Interface as SINEC L1 Master, Input



3.3.2.15 FY 19 Standard Serial Interface as SINEC L1 Master, Output

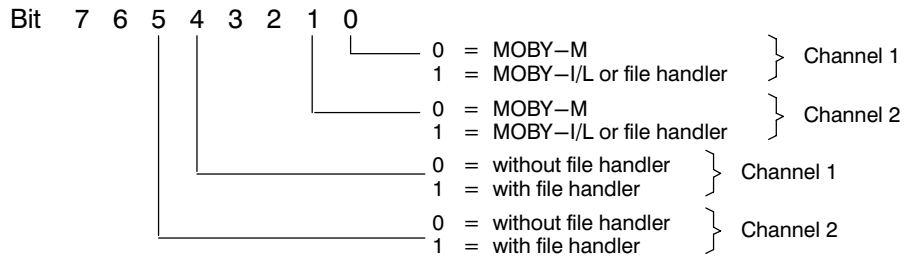


3.3.2.16 FY 20 Bar Code



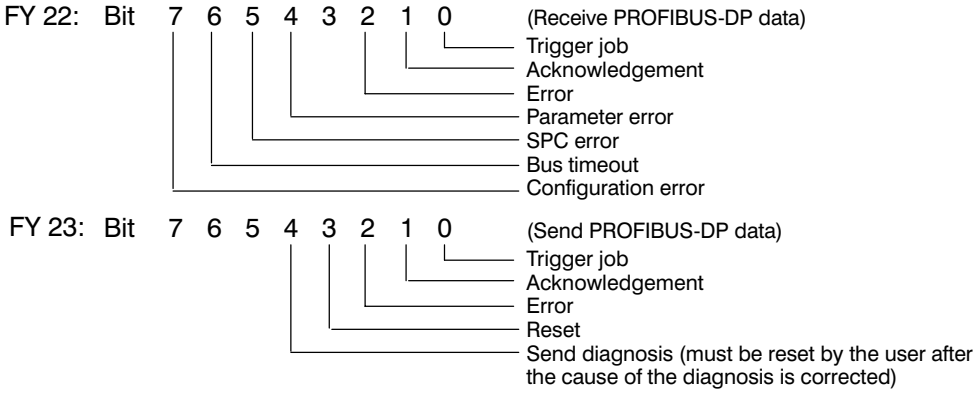
Subject to change without prior notice
RD: 08.2000
(4)J31069−D0136−U001−A0−7618

3.3.2.17 FY 21 MOBY–Identification



The MOBY identifications will automatically be entered by the system upon return of voltage. FY 21 may not be altered by the user.

3.3.2.18 FY 22 and FY 23 PROFIBUS-DP

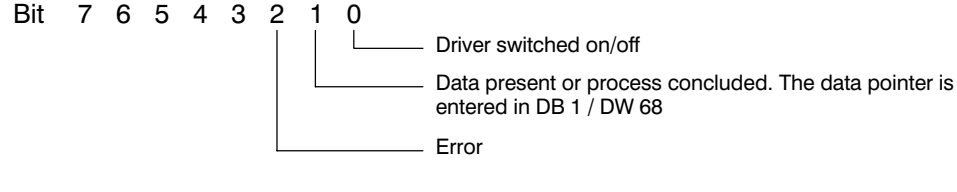


3.3.2.19 FY 25 Keyboard Image of the Function Keys (Stored)

Hexadecimal value of the function keys. The hexadecimal value of a function key will be entered by the system. The user must overwrite the flag byte with 00H after evaluation.

Special feature:
If a second function key is pressed before FY 25 has been reset, the value of the second function key will also stay stored. Immediately upon resetting FY 25, the value of the second function key will appear in FY 25. All further function keys that are pressed will be ignored as long as FY 25 is not reset.

3.3.2.20 FY 26 Magnetic Code Driver



3.3.2.21 Definitions Relating to Flag Bytes 10 to 20

Initiation:	Set by the user. The system will reset the flag and set the acknowledge flag.
Acknowledge:	Set by the system after task has been performed. Reset by the user and by the system upon new initiation.
Error:	Set by the system. Exact description of errors is in the respective DW of DB 1.
RESET:	Set by the user. Reset by the system after execution. A command being executed will be cancelled by the error message “RESET executed” in the respective DW of the DB 1.

3.4 Programming the Interfaces

3.4.1 Keyboard

The assignment of the keyboard can be freely parameterized. The parameters must be stored in DB 1 and DW 11 to DW 40. The definition of the normal level of the keyboard is stored in the DL. The definition of the keys with switched on key switch (key in horizontal position) is stored in the respective DR. The code FFH assigns “no key function”.

Assignment of the keys to the data word of DB 1 and the key lamps to the outputs.

Keyboard with illuminated keys and membrane keys; all keys can be illuminated.

DR 11 DL 11 Q 8.0	DR 17 DL 17 Q 8.6	DR 23 DL 23 Q 9.4	DR 29 DL 29 Q 10.2	DR 35 DL 35 Q 11.0
DR 12 DL 12 Q 8.1	DR 18 DL 18 Q 8.7	DR 24 DL 24 Q 9.5	DR 30 DL 30 Q 10.3	DR 36 DL 36 Q 11.1
DR 13 DL 13 Q 8.2	DR 19 DL 19 Q 9.0	DR 25 DL 25 Q 9.6	DR 31 DL 31 Q 10.4	DR 37 DL 37 Q 11.2
DR 14 DL 14 Q 8.3	DR 20 DL 20 Q 9.1	DR 26 DL 26 Q 9.7	DR 32 DL 32 Q 10.5	DR 38 DL 38 Q 11.3
DR 15 DL 15 Q 8.4	DR 21 DL 21 Q 9.2	DR 27 DL 27 Q 10.0	DR 33 DL 33 Q 10.6	DR 39 DL 39 Q 11.4
DR 16 DL 16 Q 8.5	DR 22 DL 22 Q 9.3	DR 28 DL 28 Q 10.1	DR 34 DL 34 Q 10.7	DR 40 DL 40 Q 11.5

On illuminated keys DR 40 and DL 40 as well as Q11.5 are not required. This position is occupied by the key switch. On membrane keyboards the key switch is positioned outside the keyboard field, and the key can therefore be parameterized using DR 40 and DL 40 as well as Q11.5.

The keyboard can be partitioned at will into
- alphanumeric keys
- function keys
- display function keys

The partitioning is done by the user by parameterization of DB 1, DW 11 ... DW 40 with the corresponding hexadecimal codes.

Alphanumeric Keys

The alphanumeric character (20H − 5FH), (00H − 1FH for Cyrillic characters, see Chapter 8.6) corresponding to each key must be stored in the respective data byte.
In order to enable the keyboard for the display input, the flag F10.0 must be set to 1 and F10.1 to 0. When a key with alphanumeric parameterization is pressed, the parameterized character is written into the cursor position on the display and into the original text in the data block.
After pressing the DUE key, the alphanumeric input will be disabled, F10.0 will be reset, and F10.1 will be set. Setting of F10.1 and resetting of F10.0 can also be done through the user program.
It is not possible to enter lower case alphanumeric letters.

Function Keys

The assignment of the function keys is defined with 60H − 7EH in DB1, DW 11 − 40.
The parameterized code of the function keys that have been pressed is entered into FY25 by the system (one time for the duration that the key is pressed). The user must clear FY 25 before a new code can be entered the next time a key is pressed.
While the key is being pressed, the function key code is entered into flag byte 9.

Display − Function Keys

Switch to display mode	E0H
Switch on LCD display illumination for 1 minute	E1H
Switch to download mode	E2H
Cursor to next input field	ECH
Cursor one input character to the right	EDH
Cursor one input character to the left	EEH
DUE key (entry complete):	EFH

Set keyboard enable F10.0 to “0”
and F10.1 to “1”

The display function keys are not sent on to the user. The remaining hexadecimal codes which have not been described, are not used.

Key Switch

The position of the key switch is stored in flag F10.7. Key switch vertical F10.7=0, key switch horizontal F10.7 = 1.

Keyboard Illumination

The display lamps in the keyboard with illuminated keys can be addressed via outputs Q 8.0 to Q 11.4; on membrane keyboards for 30 LEDs via Q 8.0 to Q 11.5.

3.4.1.1 Example Program

```
FB 1: KEYBOARD
Segment 1
        :AN F 1.0     Voltage return
        :JC=ANF
        :A F 1.0
        :R F 1.1      System start
        :R F 1.0      Voltage return
        :S F 10.0     Keyboard enable
ANF     :
        :BE

DB 1:

        0: KH = 0000
        .
        .
        .
        11:    KS  = 'A '     Alphanumeric assignment
        12:    C   = 'B '     Alphanumeric assignment
        13:    KS  = 'C '     Alphanumeric assignment
        14:    KH  = 6000     freely defined function key
        .
        .
        .
        40:    KH  = EF00     DUE function key
        41:    C   = ' '
```


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3.4.2 Display

The display consists of 2 lines of 20 characters each (fluorescent display), of 2 lines of 24 characters each (LCD display), or of 4 lines of 20 characters each.
The LCD display has a built−in illumination. It can be switched on for one minute with the keyboard or by setting F 11.7 (re−triggerable). At the end of the cycle, F 11.7 will be reset by the system.

The display text will be stored in a data block by the user.

Supply of DB

The display text can consist of fixed text and input fields. Fixed text consists of alphanumeric characters (20H − 5FH), (00H − 1FH for Cyrillic characters). On the input fields, alphanumeric characters are used as pre−setting. However, the respective bit 2^7 must be set in the character (thus, A0H − DFH and 80H − 9FH).

Setting of the Parameters in DB 1

Parameter	Address		Supplied by
Address of display text	DB 1	DW 9	User
Text length (number of bytes)	DB 1	DW 10	User

Actions/Reactions

Outputting text on the display is initiated by setting flag 11.0. After the initiation with flag 11.0, the text will be output and acknowledged within 30 ms, independent of the user program cycle. After the output has been completed, the system will reset F11.0, and set F11.1.
Inputs can be entered into the input fields by using the alphanumeric keys. Prior to this, keyboard input must have been enabled by setting F 10.0. When using the LCD display with 4 lines x 20 characters, F 11.4 must be set once after voltage return.
After a text has been output and the keyboard has been enabled, the cursor is always positioned on the first character in the first input field.
The cursor can be positioned within an input field using the keyboard codes EC, ED and EE.

3.4.2.1 Example Program

FB 1: DISPLAY

```
Segment 1
        :AN F 1.0    Voltage return
        :JC=ANF
        :A F 1.0
        :R F 1.1     System start
        :R F 1.0     Voltage return
        :S F 11.0    Display enable
ANF     :
        :BE


        DB 1:

        0:      KH = 0000
        .
        .
        .
        9:      KY = 001,100  Display parameter DB,DW
        10:     KY = 000,040  Display parameter
        .                     number of bytes
        .
        100:    KS = 'This is a test for '
        110:    C  = 'the display output'
```

3.4.3 Digital Inputs/Outputs

3.4.3.1 Digital Inputs/Outputs

The digital input/output can be accessed via input/output 0.0 to max. 2.7.
The maximum expansion is described in Chapter 1.2.2.7.
The addresses of the DI/DQ will be set by jumpers during the initial startup (see chapter 5.3.5) (basic configuration on the ES 030−K corresponds to address 0).

3.4.3.2 Digital Inputs

The 16 digital inputs can be called with input I2.0 − 3.7. The maximum expansion is described in Chapter 1.2.2.8.

3.4.4 MOBY

After a system start or an OB 20 (simulation OB system start), as well as after a voltage return or OB 22 (simulation OB power failure), the MOBY card may not be addressed until the identifier is entered in DB 1, DW 67 (approx. 1.5 sec.).

3.4.4.1 MOBY−M

- **Connection 1**

The tasks for MOBY are to be defined in a command list compiled by the user. Each task can consist of a command or a command chain. On a command chain, the commands will continue to be processed as long as the identifier "further command follows" is set. The flag byte 16/17 initiates the commands.

Setting the Parameters in DB 1

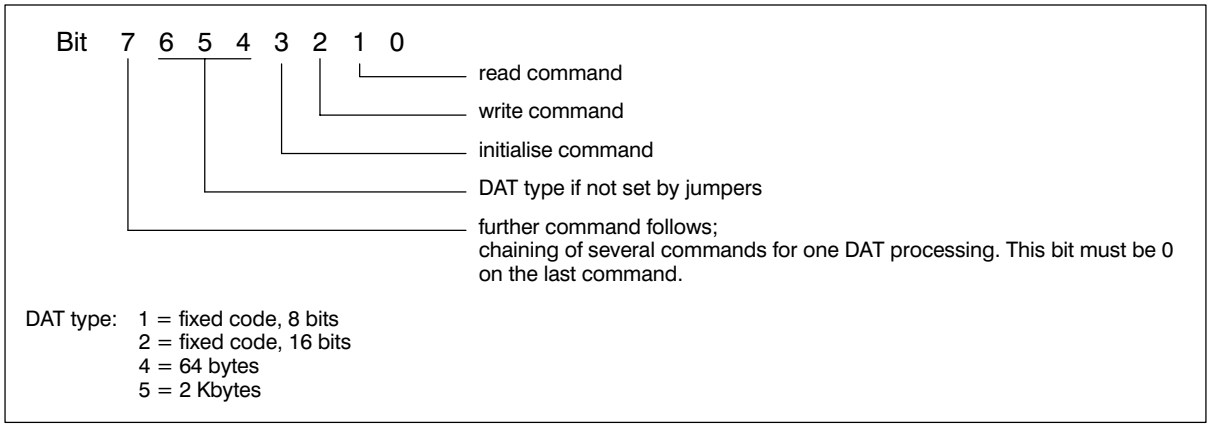
Parameter	Address		Supplied by
Address of the list of commands	DB 1	DW 53	User
Error (general)	DB 1	DL 54	System
Error in MOBY module	DB 1	DR 54	System

Structure of a Task

Command (1)	Byte count (1)
DAT address (1)	
DB (1)	DW (1)
Command (2)	Byte count (2)
DAT address (2)	
DB (2)	DW (2)

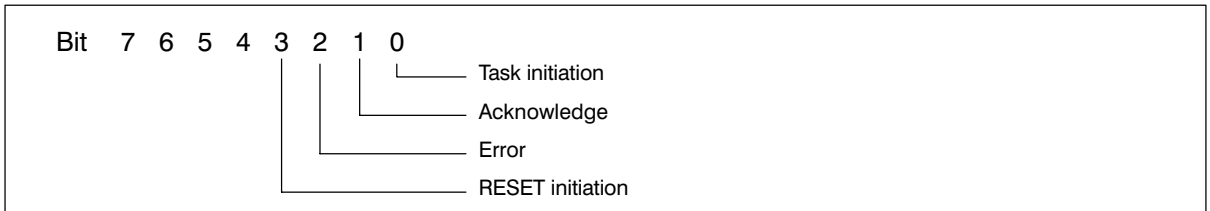
Byte count	1 to 250; number of bytes that are to be transferred with this command.
DAT address	0 to 2044; address of the beginning of the data on the DAT.
DB, DW	Address at which the data begins on the ES 030−K.

Structure of a Command



DAT type: 1 = fixed code, 8 bits
2 = fixed code, 16 bits
4 = 64 bytes
5 = 2 Kbytes

FY 16/17 Assignment



Initiation:	Set by the user. The system will reset the flag and set the acknowledge flag.
Acknowledge:	Set by the system after task has been performed. Reset by the user and by the system upon new initiation.
Error:	Set by the system. Exact description of errors is in DB 1 DW 54/56 (see also chapter 3.2.1). When an error occurs, the acknowledgement bit is set at the same time.
RESET:	Set by the user. Reset by the system after execution. A command being executed will be cancelled by the error message "RESET executed" in DW 54/56.

- **Connection 2**

The structure of the MOBY−M connection 2 is analogous to the structure of connection 1. DW 53 and 54 are simply replaced by DW 55 and 56, and FY 16 is replaced by FY 17.

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3.4.4.2 MOBY–I

- **Connection 1**

The tasks for MOBY are to be defined in a command list compiled by the user. Each task can consist of a command or a command chain. On a command chain, the commands will continue to be processed as long as the identifier “further command follows” is set.

Setting the Parameters in DB 1

Parameter	Address		Supplied by
Address of the list of commands	DB 1	DW 53	User
Error (general)	DB 1	DL 54	System
Error in MOBY module	DB 1	DR 54	System

Structure of a Task

Command (1)	Byte count (1)
MDS address (1)	
DB (1)	DW (1)
Command (2)	Byte count (2)
MDS address (2)	
DB (2)	DW (2)

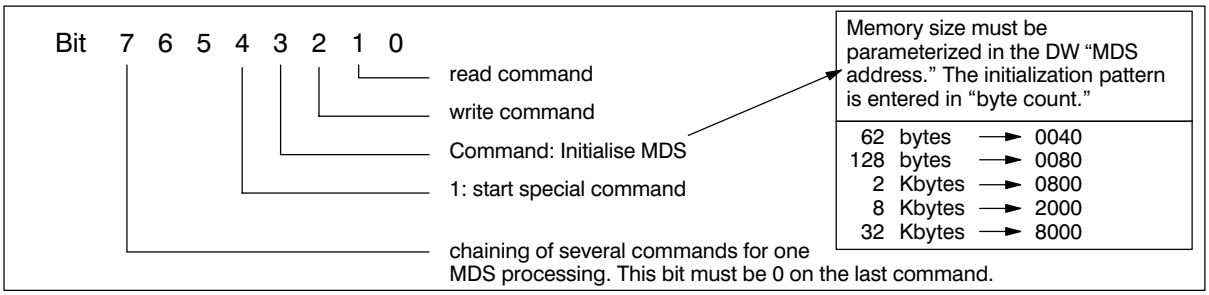
If special command = 1:

Command	Length
Sub code	
DB	DW

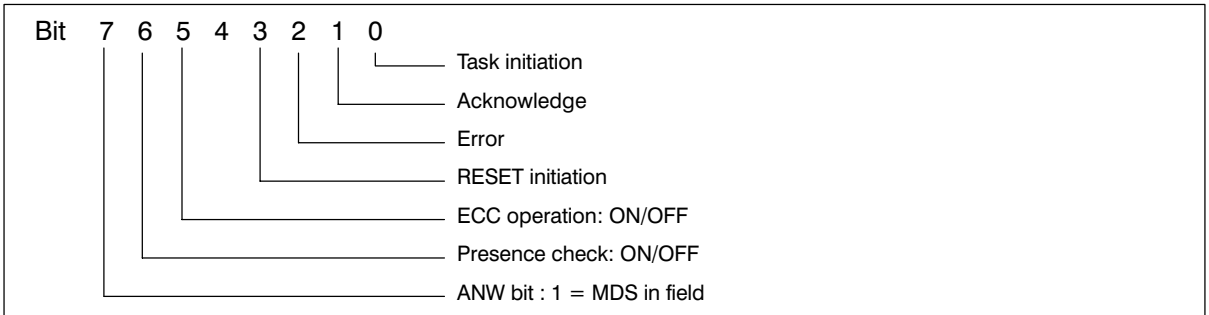
Sub code = 00 and length = 01
⇒ DB/DW = t_{SCAN}

Byte count	1 to 250; number of bytes that are to be transferred with this command.
MDS address	0 to 2044; address of the beginning of the data on the MDS.
DB, DW	Address where the data begins on the ES 030–K.
t_{SCAN}	When $t_{SCAN} \neq 0$, MDS 507 operating mode is switched on (t_{SCAN}: cf. chap. 3.4.4.3).

Structure of the Command



FY 16/17 Assignment



Initiation:	Set by the user. The system will reset the flag and set the acknowledge flag.
Acknowledge:	Set by the system after task has been performed. Reset by the user and by the system upon new initiation.
Error:	Set by the system. Exact description of errors is in DB 1 DW 54/56 (see also chapter 3.2.1). When an error occurs, the acknowledgement bit is set at the same time.
RESET:	Set by the user. Reset by the system after execution. A command being executed will be cancelled by the error message “RESET executed”. For a RESET command, the flags 16.3 (17.3) and 16.0 (17.0) must be set simultaneously. The RESET signal is always acknowledged with the acknowledgement flag 16.1 (17.1).
ECC operation:	Set by the user. If flag 16.5 (17.5) is set to “1”, processing will be carried out with ECC (Error Correction Code); if set to “0”, processing will be without ECC.
ANW:	Set by user. If Flag 16.6 (17.6) is set to “1”, processing will be carried out with presence; if reset to “0”, without presence. At the same time, bit 16.0 (17.0) as well as bit 16.3 (17.3) must be set (with presence: program FY 16/17 = 49H).
ANW bit:	Set by the system. If flag 16.6 (17.6) is set, flag 16.7 (17.7) indicates whether data memory (MDS) is present in the field or not.

- **Connection 2**

The structure of the MOBY–I connection 2 is analogous to the structure of connection 1. DW 53 and 54 are simply replaced by DW 55 and 56, and FY 16 is replaced by FY 17.

3.4.4.3 MOBY−I File Handler

- **Connection 1**

By providing the file management system "File Handler", the ES 030−K with MOBY−I board and file handler function simplifies the data management on the mobile data storage (MDS) for the user of the MOBY−I Identification System. This program (firmware on the options board), appears to the user like an operating system for MDS with the following features:

− The user addresses his data using logical names (file names) that consist of up to 8 alphanumeric characters. Thus, absolute addressing is not required.

− Contiguous data are called files.

− Administration of different file lengths.

Further information is contained in the description of MOBY−I FB 230.

Setting the Parameters in DB 1

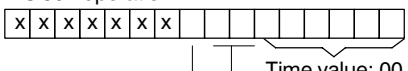
Parameter	Address		Supplied by
Address of the command list	DB 1	DW 53 (DW 55)	User
Error	DB 1	DR 54 (DR 56)	System
Error	DB 1	DL 54 (DL 56)	System

- **Parameterization and Error Code**

DW78(DW79)*	MDS 507 operation		KH
DW80(DW84)*	SLG no.		KH
DW81(DW85)*	Priority	EAKO	KS
DW82(DW86)*	Error number		KS
DW83(DW87)*			KS

*Data words for channel 2

MDS 507 operation: t_{SCAN}



Time value: 00 to 3F

Time factor:
00 = 0.01 sec, 01 = 0.1 sec,
10 = 1 sec, 11 = 10 sec

MDS 507 operation
1: switched on ⇒ evaluate t_{SCAN}
0: switched off, ⇒ t_{SCAN} is irrelevant

SLG no.: Number of the SLG station. This number is written to the MDS before every processing procedure. This tells the file handler whether a "new MDS" has actually arrived in the field.
Priority: Must always be ASCII "0"
EAKO: See FB 230 description.
Error number: Axxx−Hxxx. See chapter 3.2.1.17.

FB 230 Commands

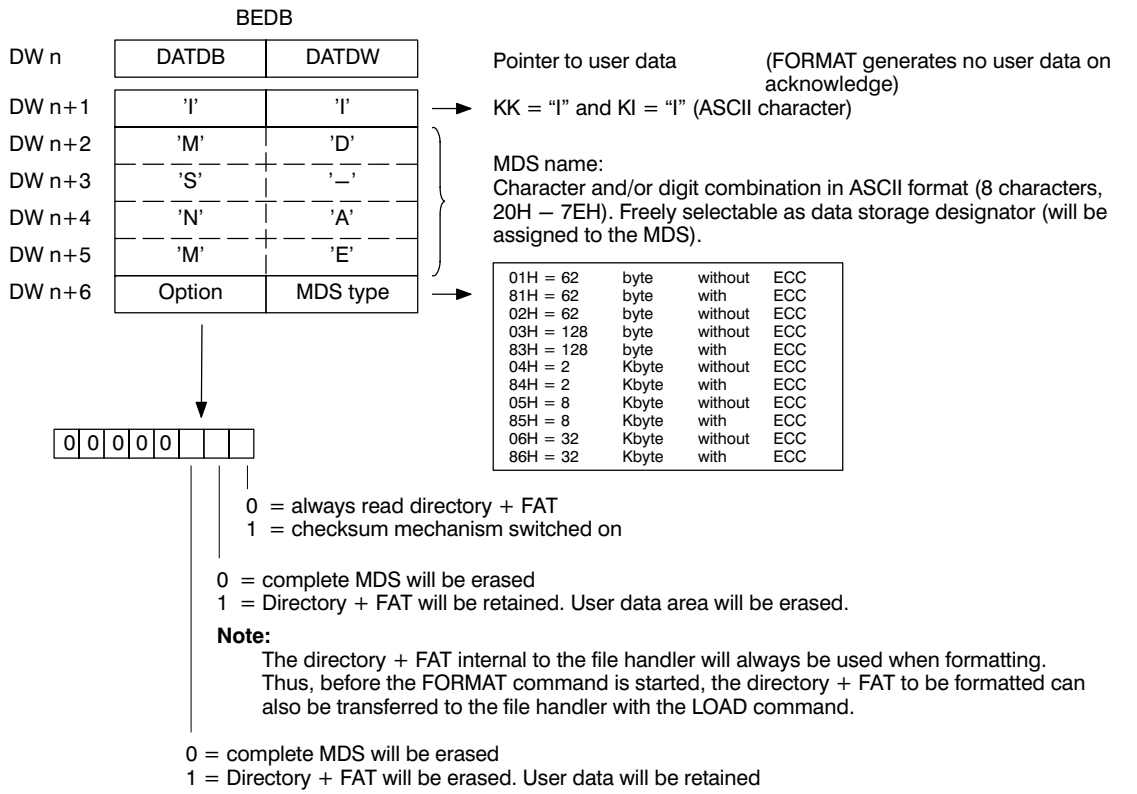
Command	Meaning	Command Identifier KK	Command index KI	Access authorisation RWD
FORMAT	formatting of the MDS	"I"	"I"	D
CREATE	create new file on formatted MDS	"B"	"I"	W, D
QUEUE−WRITE	complete setup of data carrier	"Q"	"I"	D
UPDATE	write data to file (update file length)	"U"	"I"	W, D
WRITE	write data to file	"W"	"I"	W, D
READ	read data from file	"R"	"I"	R, W, D
DELETE	delete file on MDS	"D"	"I"	D
ATTRIB	set attribute for file	"Y"	"I"	W, D
COVER	protect MDS structure	"C"	"I"	W, D
DIR	read MDS directory	"G"	"I"	R, W, D
MDS−STATUS	request MDS status	"F"	"I"	R, W, D
TRACE	read MDS absolute	"T"	"I"	R, W, D
MOVE	store system data (DIR + FAT + checksum) in data block	"M"	"I"	R, W, D
LOAD	transfer system data to ES 030-K	"O"	"I"	R, W, D
ASM−STATUS	request ASM status	"S"	"I"	R, W, D
RESET	reset ASM/file handler	"X"	"I"	R, W, D
NEXT	process next MDS	"N"	"I"	R, W, D

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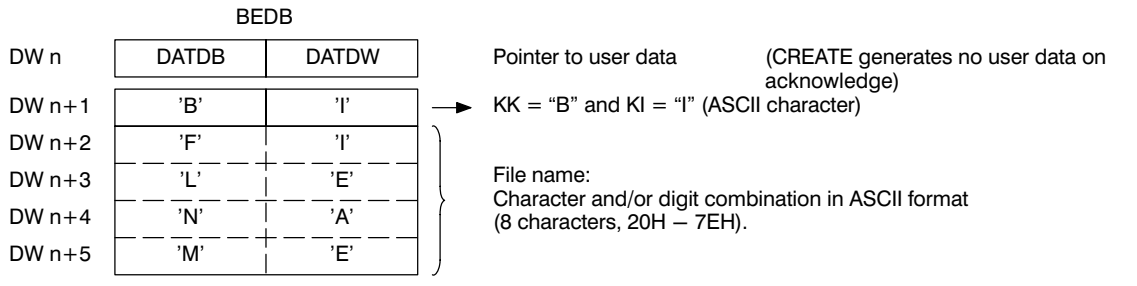
Structure of a Task

- **FORMAT**



As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

- **CREATE**



As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

- **QUEUE−WRITE**

BEDB

	DATDB	DATDW	
DW n			Pointer to user data that are to be transferred to the ES 030-K. The data are located in the DATDB beginning with “address” DATDW.
DW n+1	’Q’	’I’	→ KK = “Q” and KI = “I” (ASCII character)
DW n+2	Option		→ see*)
DW n+3	xx	xx	This information has no meaning for this command. xx: any characters
DW n+4	xx	xx	
DW n+5	xx	xx	
DW n+6	DLNG		→ Length of the data to be transferred in bytes (sum of all file entries in bytes)

As a result of the started command, the user will receive the set “acknowledgement bit”. The user data area of the user (DATDB) will not be changed.

Representation of the Data in the DATDB:

DATDW:		
	’F’	’I’
	’L’	’E’
	’0’	’0’
	’0’	’1’
	attribute	length (H)
	length (l)	length (L)
	reserved	skip
	data	data
	data	data
	’F’	’I’
	’L’	’E’
	’0’	’0’
	’0’	’2’
	attribute	length (H)
	length (l)	length (L)
	reserved	skip
	data	data
	data	data
	data	xx
	’F’	’I’
	’L’	’E’
	’0’	’0’
	’0’	’3’

Data entry 1

Data entry 2

Data entry 3

etc.

*) The following applies if the data memory is already formatted and contains an existing file structure:
Option=0000H: The file structure will be overwritten or erased by QUEUE−WRITE.
Option=0001H: The file structure will be appended to the existing file structure. A check if the file to be created already exists will be carried out at this time.

File name: File name (as up to now)
Attribute: Attribute for this file. The attribute will not be set until the data have been written.
Reserved: 1 byte is reserved.
Skip: The Skip indicates how many bytes are skipped between the end of an entry and before the next file entry begins.
Example:
Skip = 0, (i.e., the file name of the next file entry) immediately follows the data of the previous entry.
Length: Length in bytes of the data to be written for the indicated file. The data are located beginning after the parameter “skip”.
Data: The data to be written. They may also be a fill pattern. The amount of data in bytes must agree with the parameter “length”.

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- **WRITE/UPDATE**

BEDB

	DATDB	DATDW
DW n		
DW n+1	'W' / 'U'	'I'
DW n+2	'F'	'I'
DW n+3	'L'	'E'
DW n+4	'N'	'A'
DW n+5	'M'	'E'
DW n+6	DLNG	

Pointer to user data that are to be written into the file. The data are located in the DATDB beginning with "address" DATDW.

KK = "D" and KI = "I" (ASCII character)

File name:
Character and/or digit combination in ASCII format (8 characters, 20H – 7EH).

Length of the user data to be written into the file (max. length 32752 (7FF0H) bytes)

Representation of the Data to be Written in the DATDB

DATDW:

1st byte	2nd byte
3rd byte	4th byte
5th byte	6th byte
7th byte	———

From here on available for further file data

The figure illustrates a file with a length of 7 bytes

As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

- **READ**

BEDB

	DATDB	DATDW
DW n		
DW n+1	'R'	'I'
DW n+2	'F'	'I'
DW n+3	'L'	'E'
DW n+4	'N'	'A'
DW n+5	'M'	'E'
DW n+6	max. length	

Pointer to user data that are to be read from the file. The data are located in the DATDB beginning with "address" DATDW.

KK = "R" and KI = "I" (ASCII character)

File name:
Character and/or digit combination in ASCII format (8 characters, 20H – 7EH).

Representation of the Data to be Read in the DATDB

DATDW:

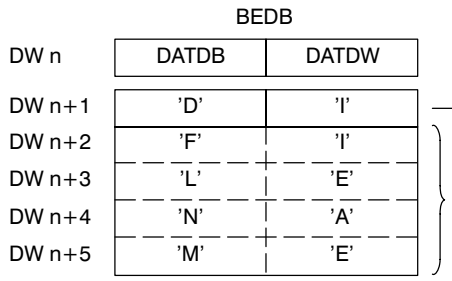
1st byte	2nd byte
3rd byte	4th byte
5th byte	6th byte
7th byte	———

From here on available for further file data

The figure illustrates a file with a length of 7 bytes

As a result of the started command, the user will receive the set "acknowledgement bit" (bit 15 in BEST). The file data that have been read are located in the DATDB beginning with "address" DATDW. DW n+6 contains the length of the read user data (read file length) in bytes.

- **DELETE**



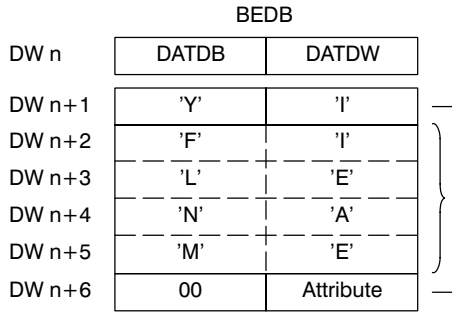
Pointer to user data (DELETE generates no user data on acknowledge)

KK = "D" and KI = "I" (ASCII character)

File name:
Character and/or digit combination in ASCII format (8 characters, 20H − 7EH).

As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

- **ATTRIB**



Pointer to user data (ATTRIB generates no user data on acknowledge)

KK = "Y" and KI = "I" (ASCII character)

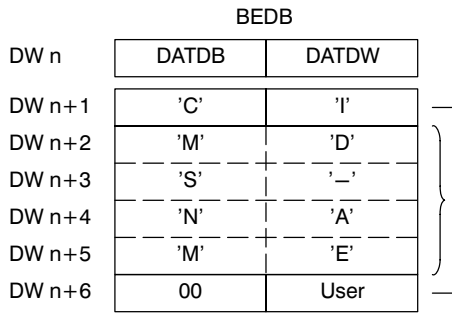
File name:
Character and/or digit combination in ASCII format (8 characters, 20H − 7EH).

Attribute:

- **00H:** no attribute for the declared file or delete existing attribute
- **01H:** attribute "read only"
  The file can only be read (no DELETE or WRITE or UPDATE is permitted).
- **02H:** attribute "write once"
  The file can only be read (no DELETE or WRITE or UPDATE is permitted).
- **04H:** attribute "fixed length"
  The length of the file cannot be altered by writing commands such as UPDATE, WRITE, or APPEND.
- **05H:** Same as 04H except the file can only be read.

As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

- **COVER**



Pointer to user data (COVER generates no user data on acknowledge)

KK = "C" and KI = "I" (ASCII character)

MDS name:
Character and/or digit combination in ASCII format (8 characters, 20H − 7EH).
Corresponds to the MDS name allocated with FORMAT

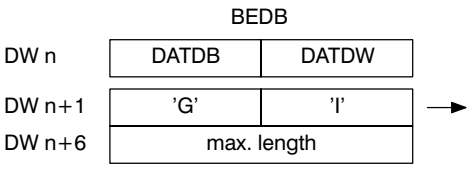
User:

- **00H:** Change of the MDS file structure is permitted again.
- **01H:** The MDS is to be protected from unauthorised access.

As a result of the started command, the user will receive the set "acknowledgement bit". The user data area of the user (DATDB) will not be changed.

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- **DIR**



Pointer to user data that are available to the user in the acknowledge telegram. The data are located in the DATDB beginning with “address” DATDW.

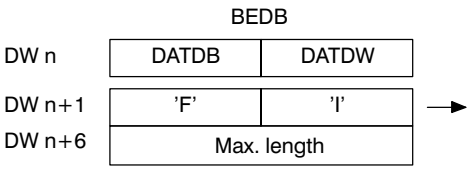
KK = “G” and KI = “I” (ASCII character)

As a result of the started command, the user will receive the set “acknowledgement bit”. The requested data are located in the DATDB beginning with “address” DATDW. DW n+6 contains the length of the read user data in bytes.

Representation of the File Directory in the DATDB:

Meaning	Length in Bytes	Type	Explanation
MDS name Checksum Available space	8 2 4	ASCII Binary Binary	MDS name Checksum remaining available memory space (user data) on the MDS in bytes
Once per file:			
File name File length Attribute	8 3 1	ASCII Binary Binary	File name (8 characters) Absolute length of file in bytes File attribute

- **MDS–STATUS**



Pointer to user data that are available to the user in the acknowledge telegram. The data are located in the DATDB beginning with ”address” DATDW.

KK = “F” and KI = “I” (ASCII character)

As a result of the started command, the user will receive the set “acknowledgement bit”. The requested data are located in the DATDB beginning with “address” DATDW. DW n+6 contains the length of the read user data in bytes.

Representation of the MDS Parameters in the DATDB:

Meaning	Length in Bytes	Type	Explanation
MDS name	8	ASCII	MDS name (ASCII characters)
MDS type	1	Binary	MDS type entered with FORMAT
MDS capacity	3	Binary	Complete user data area
Free capacity	3	Binary	User data area still available
Free directory entries	2	Binary	This number of files can still be created
Display	1	Binary	Bit 2 = 0: Battery OK Bit 2 = 1: Battery bad Bit 3 = 1: Battery of the MDS 507/407E is empty Bit 7 = 0: MDS is unprotected Bit 7 = 1: MDS is protected (COVER)
Write cycles	3	Binary	Number of SLG stations that have been passed through by the MDS
ECC corrections	1	Binary	Number of ECC corrections

- **TRACE**

BEDB

	DATDB	DATDW	
DW n			Pointer to user data that have been read. The data are located in the DATDB beginning with “address” DATDW.
DW n+1	’T’	’I’	→ KK = “T” and KI = “I” (ASCII character)
DW n+2	00	Addr. (high)	Start address on the MDS (hexadecimal)
DW n+3	Addr. (inner)	Addr. (low)	
DW n+6	Length (high)	Length (low)	→ Length of the data to be read (max. length 7FF0 hexadecimal).

Representation of the Data to be Read in the DATDB

DATDW:

1st byte	2nd byte
3rd byte	4th byte
5th byte	6th byte
7th byte	———

The figure illustrates the absolute read data with a length of 7 bytes.

As a result of the started command, the user will receive the set “acknowledgement bit”. The requested data are located in the DATDB beginning with “address” DATDW. DW n+6 contains the length of the read user data in bytes.

- **MOVE**

BEDB

	DATDB	DATDW	
DW n			Pointer to user data available in the acknowledge telegram for the user. The data are located in the DATDB beginning with “address” DATDW.
DW n+1	’M’	’I’	→ KK = “M” and KI = “I” (ASCII character)
DW n+6	max. length		

As a result of the started command, the user will receive the set “acknowledgement bit”. The requested data are located in the DATDB beginning with “address” DATDW. DW n+6 contains the length of the read user data in bytes.

Note: After the MOVE command has been carried out, the corresponding DATDB may not be altered (no writing access to the data in the DATDB). When using the LOAD command, this data block must be parameterized in DWn.

Representation of the Data in the DATDB

DATDW:

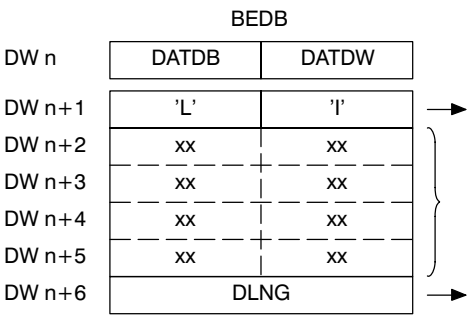
1st byte	**2nd byte**
3th byte	4th byte
5th byte	6th byte
7th byte	8th byte
9th byte	10th byte
11th byte	———

→ The **1st byte** and **2nd byte** correspond to the parameter DLNG when setting up the LOAD command.

The figure illustrates the arrangement of the user data in the DATDB

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- **LOAD**



Pointer to user data which are to be transferred to the ES 030-K. The data are located in the DATDB beginning with "address" DATDW.

KK = "O" and KI = "I" (ASCII character)

This information has no significance for this command.
xx: any characters

Contents of the DATDW: **1st byte** and **2nd byte** (correspond to the length of the data to be transferred).

As a result of the started command, the user will receive the set "acknowledgement bit". The user data area (DATDB) will not be changed.

Caution: The DATDB parameterized in DWn must correspond to the data block of the MOVE command.

Representation of the Data in the DATDB

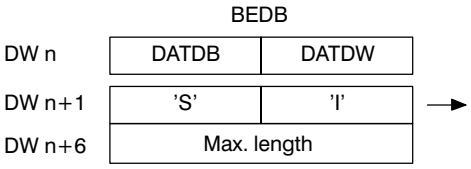
DATDW:

1st byte	**2nd byte**
3th byte	4th byte
5th byte	6th byte
7th byte	8th byte
9th byte	10th byte
11th byte	———

→ entered into DLNG

The figure illustrates the arrangement of the user data in the DATDB

- **ASM–STATUS**



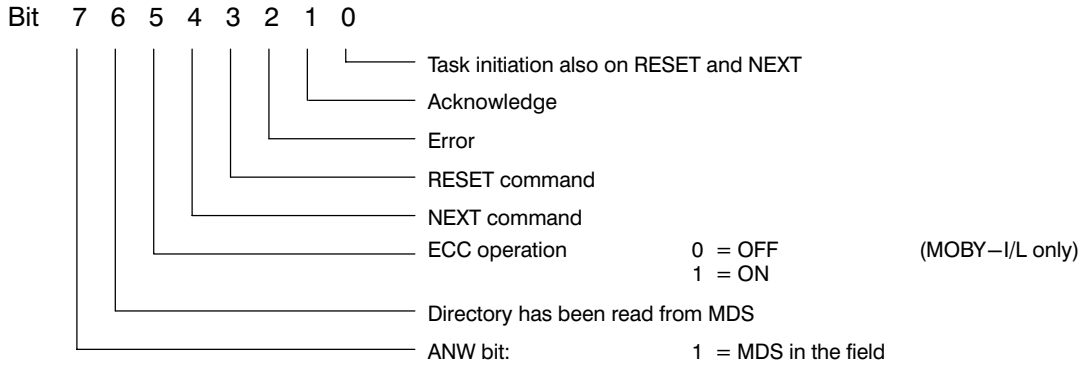
Pointer to user data available in the acknowledge telegram for the user. The data are located in the DATDB beginning with "address" DATDW.
KK = "S" and KI = "I" (ASCII character)

As a result of the started command, the user will receive the set "acknowledgement bit". The requested data are located in the DATDB beginning with "address" DATDW. DW n+6 contains the length of the read user data in bytes.

Representation of the Data in the DATDB:

Meaning	Length in Bytes	Type	Explanation
Version number	8	ASCII	Version number
Last task	26	ASCII/binary	Last task to ASM
Last acknowledge	26	ASCII/binary	Last acknowledge from ASM
Connection status between SLG and ES 030-K	1	Binary	00H = connection OK 01H = connection not OK

- **FY 16/17 Assignment**



Initiation:	Set by the user. The system will reset the flag and set the acknowledge flag.
Acknowledge:	Set by the system after the task has been performed. Reset by the user and by the system upon new initiation.
Error:	Set by the system. Exact description of errors is in DB 1 DW 54/56 (see also chapter 3.2.1.9 and 3.2.1.12). When an error occurs, the acknowledgement bit is set at the same time.
RESET command:	Set by the user. Reset by the system after execution. A command being executed will be cancelled by the error message “RESET executed”. The flags 16.3(17.3) and 16.0(17.0) must be set simultaneously for the RESET command. The RESET indication will always be acknowledged by acknowledgement flag 16.1 (17.1). The length of the user data in BEDB is over written with “0”.
NEXT command:	NEXT terminates the processing of an MDS (current MDS is still in the field or has already left the field), which may consist of several commands. The next/following command will only be processed with the next/new MDS. (System command; no dialogue is carried out with the MDS).
ECC command:	Set by the user. When flag 16.5 (17.5) is set to “1”, processing will be carried out with ECC (Error Correction Code); when set to “0”, without ECC.
DIR has been read:	Will be set when the directory has been read by the MDS.
ANW−bit:	Set by the system. Flag 16.7 (17.7) indicates whether there is a data memory (MDS) in the field or not.

- **Connection 2**

The structure of the MOBY−I connection 2 is analogous to the structure of connection 1. DW 53, 54, 80, 81, 82, and 83 are simply replaced by DW 56, 84, 85,86, and 87; FY 16 is replaced by FY 17.

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3.4.4.4 MOBY–L

- **Connection 1**

The tasks for MOBY are to be defined in a command list compiled by the user. Each task can consist of a command or a command chain. On a command chain, the commands will continue to be processed as long as the identifier ”further command follows” is set.

Setting the Parameters in DB 1

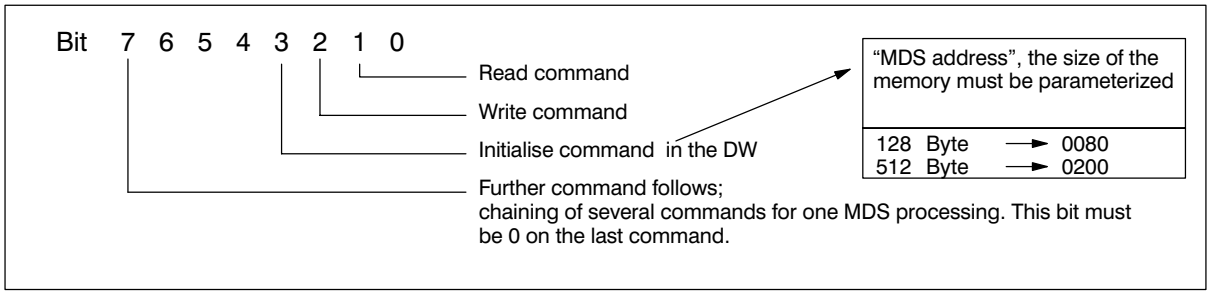
Parameter	Address		Supplied by
Address of the list of commands	DB 1	DW 53	User
Error (general)	DB 1	DL 54	System
Error in MOBY module	DB 1	DR 54	System

Structure of a Task

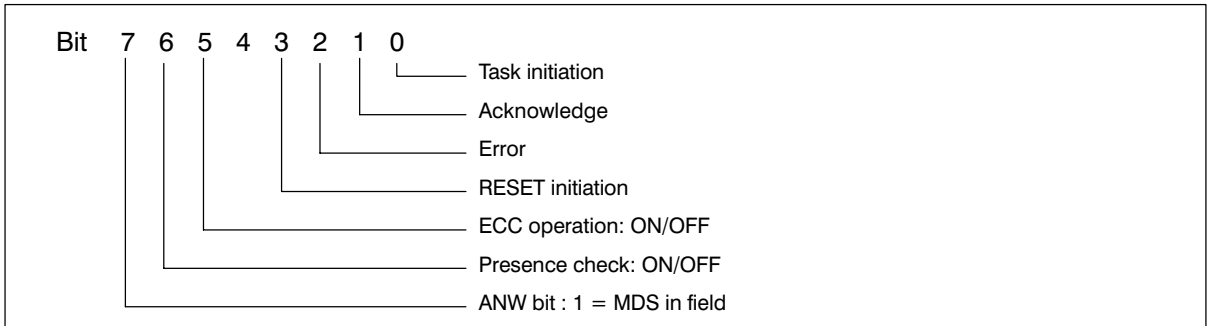
Command (1)	Byte count (1)
MDS address (1)	
DB (1)	DW (1)
Command (2)	Byte count (2)
MDS address (2)	
DB (2)	DW (2)

Byte count	1 to 250; number of bytes that are to be transferred with this command.
MDS address	0 to 506; address of the beginning of the data on the MDS.
DB, DW	Address where the data begins on the ES 030–K.

Structure of the Command



FY 16/17 Assignment



Initiation:	Set by the user. The system will reset the flag and set the acknowledge flag.
Acknowledge:	Set by the system after task has been performed. Reset by the user and by the system upon new initiation.
Error:	Set by the system. Exact description of errors is in DB 1 DW 54/56 (see also chapter 3.2.1).
RESET:	Set by the user. Reset by the system after execution. A command being executed will be cancelled by the error message “RESET executed”. For a RESET command, the flags 16.3 (17.3) and 16.0 (17.0) must be set simultaneously. The RESET signal is always acknowledged with the error flag 16.2 (17.2).
ECC operation:	Set by the user. If flag 16.5 (17.5) is set to “1”, processing will be carried out with ECC (Error Correction Code); if set to “0”, processing will be without ECC.
ANW:	Set by user. If flag 16.6 (17.6) is set to “1”, processing will be carried out with presence; if reset to “0”, without presence. At the same time, bit 16.0 (17.0) as well as bit 16.3 (17.3) must be set.
ANW bit:	Set by the system. If flag 16.6 (17.6) is set, flag 16.7 (17.7) indicates whether data memory (MDS) is present in the field or not.

- **Connection 2**

The structure of the MOBY–L connection 2 is analogous to the structure of connection 1. DW 53 and 54 are simply replaced by DW 55 and 56, and FY 16 is replaced by FY 17.

3.4.4.5 Example Program

```
FB 1: MOBY−M
Segment 1
      :AN F 1.0          Voltage return
      :JC=ANF
      :A F 1.0
      :R F 1.1           System start
      :R F 1.0           Voltage return
      :S F 16.1          Acknowledge for MOBY
ANF   :
      :A F 16.1
      :A −START
      :S F 16.0          Start MOBY
      :R F 16.1
      :
      :
      :A F 16.2          MOBY error
      :S −Fehler
      :
      :
      :BE
```

```
FB 1: MOBY−I/L
Segment 1
      :AN F 1.0          Voltage return
      :JC=ANF
      :A F 1.0
      :R F 1.1           System start
      :R F 1.0           Voltage return
      :S F 16.1          Acknowledge for MOBY
ANF :
      :A F 16.1
      :A −START
      :S F 16.0          Start MOBY
      :R F 16.1
      :
      :
      :A F 16.2          MOBY error
      :S −Fehler
      :
      :
      :BE
```

```
DB 1:

      0:  KH = 0000
      .
      .
      .
     53:  KY = 001,100   List of commands
     54:  KY = 000,040   Error code
      .
      .
      .
    100:  KH = 020A      Read 10 bytes from 2K DAT
    101:  KH = 0000      Start address
    102:  KY = 002,000   Data beginning with DB, DW
```

```
DB 1:

      0:  KH = 0000
      .
      .
      .
     53:  KY = 001,100   List of commands
     54:  KY = 000,040   Error code
      .
      .
      .
    100:  KH = 020A      Read 10 bytes
    101:  KH = 0000      Start address
    102:  KY = 002,000   Data beginning with DB, DW
```


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3.4.5 Serial Interface

3.4.5.1 Standard Serial Interface

The procedures LAUF (STX, data, ETX), 3964R (STX, DLE from the partner, data, DLE ETX, BCC, DLE from the partner), and SINEC L1 are available for the serial interface.

Setting of the Parameters in the DB1 for LAUF and 3964R

Parameter	Address	Supplied by
Baud rate	DL 41	User
Procedure selection	DR 41	User
Receiving data address	DW 42 (DB, DW)	User
Length of the receiving buffer	DR 43 (DW 43)*	User
Actual length	DR 44 (DW 44)*	System
Error number for the input	DL 43 (DL 74)*	System
Transmitting data address	DW 45 (DB, DW)	User
Length of transmitting buffer	DR 46 (DW 46)*	User
Error number for the output	DL 46 (DR 74)*	System
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5)		

* For expanded buffer size

Actions/Reactions

The input will be enabled by setting flag 12.0 (waiting for a telegram). After the telegram arrives, the system resets F 12.0, sets F 12.1, and enters in DR44 the number of characters (amount of data without STX or ETX) which actually arrived. The telegram is stored in DB (DL 42) beginning with DW (DR 42), as indicated in DW 42. In case of an error condition, F 12.2 will be set and the error indication will be entered in DL 43 (DL 74).
The telegram to be output will be stored in a data block (without STX, without ETX) by the user. Setting F 13.0 will cause the system to output the telegram. Subsequently, the system will set F 13.1 and reset F 13.0. In case of an error (with 3964R after two retries), F 13.2 will also be set and the error code will be entered in DL 46 (DR 74). Flag overview in Chapters 3.3.2.8 and 3.3.2.9.

Using the procedure LAUF, "XON/XOFF" can be switched on from the transmitting side.
The 3964R procedure allows increasing the buffer size by setting the parameters in DB 1, DR 41. Two bytes are then available to indicate the length. Error messages are then located in DW 74.

Remember: The start of a transmitting telegram will begin on the next cycle. The same applies to the ready message of a received telegram.

Caution: Changes in DW 41 will only be recognised after a voltage return.

SINEC L1 Operation via a Standard Serial Interface

The ES 030–K can be operated as a SINEC L1 bus user via the standard serial interface.
The following explains how to operate the ES 030–K as a bus user; master/slave operation will be explained in the next section.

Setting of the Parameters in DB1 as SINEC L1 Slave

Parameter	Address	Supplied by
Procedure selection	DR 41=3	User
Bus user number	DL 41	User
Receiving data address	DW 42 (DB, DW)	User
Length of the receiving buffer	DR 43	User
Actual length	DR 44	System
Error number for the input	DL 43	System
Transmitting data address	DW 45 (DB, DW)	User
Length of transmitting buffer	DR 46	User
Error number for the output	DL 46	System
Sender number	DL 57	System
Receiver number	DR 57	User
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5)		

In case of an error, the telegram will not be repeated; this must be done by the user.

A telegram that is to be sent to all bus users requires a receiver address "31" for the telegram to be sent.

Actions/Reactions

If a telegram has arrived with an interrupt, F 12.4 will be set. If a telegram is to be sent with an interrupt, F 13.4 must also be set for each transmission.

SINEC L1 Master Operation via the Standard Serial Interface

An ES 030–K can be operated as master for up to 16 secondary ES 030–K slaves. The user number 0 designates the master.

Setting of the Parameters in DB1 as SINEC L1 Master

System Parameters

Parameter	Address	Supplied by
Procedure selection	DR 41=3	User
Bus user number (master)	DL 41=0	User
Circulation list	DW 59 (DB,DW)	User
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5)		

Slave 1 Reception

Parameter	Address	Supplied by
Receiving data address	DW 42 (DB,DW)	User
Length of the receiving buffer	DR 43 (byte)	User
Actual length	DR 44 (byte)	System
Error number for the input	DL 43	System
Transmitter number	DL 57	System
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5		

Slave 1 Transmit

Parameter	Address	Supplied by
Transmitting data address	DW 45 (DB,DW)	User
Length of transmitting buffer	DR 46 (byte)	User
Error number for output	DL 46	System
Receiver number	DR 57	User
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5		

Master Reception

Parameter	Address	Supplied by
Receiving data address	DW 60 (DB,DW)	User
Length of the receiving buffer	DR 61 (byte)	User
Actual length	DR 62 (byte)	System
Error number for input	DL 61	System
Transmitter number	DL 58	System
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5		

Master Transmit

Parameter	Address	Supplied by
Transmitting data address	DW 63 (DB,DW)	User
Length of transmitting buffer	DR 64 (byte)	User
Error number for output	DL 64	System
Receiver number	DR 58	User
(For the description of the data contents see Chapter 3.2.1.1 to 3.2.1.5		

The bus master requires a circulation list to determine the order in which the slaves are scanned. A slave can be entered in the list more than once. The respective slave numbers (1 to 31) must be entered in one byte. Slave number 0 ends the circulation list. Also, the SINEC L1 master always contains the slave 1 (data exchange master <−> slave directly without bus). Receiver number 31 sends a telegram to all slaves.

Actions/Reactions

The basic sequence of the data exchange has already been explained in the section ”Actions/Reactions Standard Serial Interface”.
The following deviations occur during SINEC L1 operation:

A telegram that has been sent to all bus users will not be acknowledged by them.
Interrupt telegrams and laterial communication (SLAVE −−> SLAVE) are not possible.
Flag bytes 18 and 19 are to be used as flags (see Chapter 3.3.2.20 and 3.3.2.21).

3.4.5.2 Expansion Serial Interface

The structure of the expansion serial interface is analogous to the structure of the standard interface; with PREMID driver, but without SINEC L1.
The flags to be used are FY 14 and 15 (see Chapter 3.3.2.10 and 3.3.2.11).
Using the procedure LAUF, “XON/XOFF” can be switched on from the transmitting side.

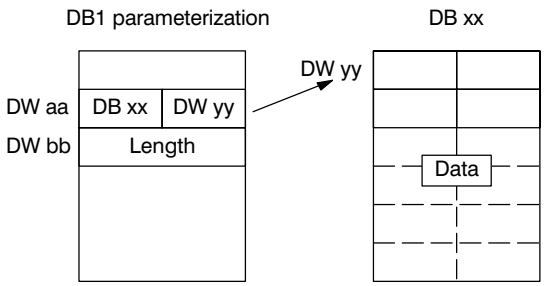
Additional Functions with LAUF:

Using the expansion serial interface, a start and a stop character can be freely defined by setting DR 47 bit 5. The start character is stored in DL 76; the stop character is stored in DR 76. If FFH is used as start character, no start character will be sent.
In addition, a checksum byte can be switched on with DR 47 bit 6. The checksum byte for reception is stored in DL 77; the checksum byte for transmitting in DR 77. Before transmitting, the checksum byte must be calculated by the user or checked after the receipt of a telegram, respectively.

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Structure of the Procedure for Serial Interfaces:

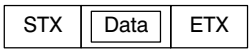
Pointer scheme to the user data



DW aa, DW bb: Different values of data for transmitting and receiving, or for different procedures.

Procedures

LAUF:



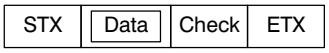
Extended LAUF procedure:



3964R:



PREMID:



Data : The data can contain structures freely defined by the user (e.g., definitions of addresses, commands, and lengths, etc.). They are stored by the user in the data block (DB xx, DW yy). All other control bytes are provided by the respective procedure. They do not have to be taken into account during the programming by the user.

3.4.5.3 Example Program

```
FB 1:   SERIAL

        :AN F 1.0               Voltage return
        :JC=ANF
        :A F 1.0
        :R F 1.1                System start
        :R F 1.0                Voltage return
        :S F 12.1               Acknowledge for receiving flag
        :R F 12.0
        :S F 13.1               Acknowledge transmitting flag
        :R F 13.0
        :L KY 001,100           Display
        :T DW 9
        :L KY 000,040
        :T DW 10
:S F 11.0                       Display
        ANF :
        :A F 12.2               Receiving error
        :BEB
        :A F 12.1
        :S F 12.0               Start reception
        :R F 12.1
        :S F 11.0
        :
        :A F 13.2               Transmitting error
        :BEB
        :A–START                Auxiliary flag
        :A F 13.1
        :S F 13.0               Start transmitting
        :R F 13.1
        :
        :BE


DB 1    :

        0:      KH = 0000
        .
        .
        .
        41:     KH = 1C02
        42:     KY = 001,100    Pointer to receiving buffer
        43:     KY = 000,040
        44:     KY = 000,000
        45:     KY = 001,150    Pointer to transmitting buffer
        46:     KY = 000,040
        .
        .
        .
        100:    KS = 'XXXXXXXXXXXXXXXXXXXX'
        101:    C  = 'XXXXXXXXXXXXXXXXXXXX'
        102:    KH = 0000
        .
        .
        .
        150:    KS = 'THIS IS A TEST      '
        160:    C  = 'OF THE SER. INTRFACE'
        171:    KH = 0000
```

3.4.6 Bar Code

Description

A bar code interface is available for connecting bar code reading devices.

Setting the Parameters in DB 1

Parameter	Address	Supplied by
Bar code type	DL 70	User
Driver selection	DR 70	User
Bar code−receiving data address	DW 71 (DB,DW)	User
Bar code−receiving buffer size	DR 72	User
Bar code−actual length of the data	DR 73	System
Error number during command processing	DL 72	System
(For the description of the data contents, see Chapters 3.2.1.13 and 3.2.1.14)		

Actions/Reactions

The input is enabled by setting flag 20.0 (waiting for an input). Independent of the user program cycle, F 20.0 will be reset, F 20.1 will be set, and the actual number of received characters entered into DR 73 by the system within 50 ms after an input has occurred. The characters read will be stored in DB(DL 71) beginning with DW(DR71) indicated in DW 71.
Additionally, in case of an error, F 20.2 will be set and the error number will be entered in DL 72.

Caution: Changes in DW 70 will only be recognised after voltage return.

Special Features for Bar Code

The minimum number of bar code characters to be read is 3.

After reading a bar code, the reader is disabled for 1 second in order to avoid reading the same code twice.

When setting “data transfer after reading twice” (DR 70 bit 3 = 1), a pause of longer than 1/2 seconds is not permitted between two readings (for instance, reading in the forward direction and immediately reading in the backward direction is permissible). The two readings will be compared and found to be valid if they coincide.

The automatic bar code recognition (type 11) can lead to reading errors if the reading pen is positioned incorrectly (for instance, placing the pen in the middle of the bar code).

DL 70 bit 4 switches on a checkbyte (cross−check sum)
DL 70 bit 5 determines, if switched on, whether the check byte is included in the transmission to the user or not.

The actual number in DR 73 is calculated without the check byte for the setting “check on”, “transmission off”.

3.4.6.1 Example Program

FB 1: BAR CODE

```
Segment 1
      :AN F 1.0              Voltage return
      :JC=ANF
      :A F 1.0
      :R F 1.1               System start
      :R F 1.0               Voltage return
      :S F 20.0              Start bar code
ANF :
      :A F 20.0              Acknowledge bar code has
                             been read
      :S F 20.0              Start bar code
      :R F 20.1
      :S F 11.0              Enable display
:BE

DB 1  :

      0:    KH = 0000
      .
      .
      .
      9:    KY = 001,100     Display parameter DB,DW
      10:   KY = 000,040     Display parameter number of
      .                      bytes
      .
      70:   KH = 3B29        Bar code type, driver
      71:   KY = 001,100     Bar code parameter DB, DW
      72:   KY = 000,010     Error code, max. number of
                             bytes
      73:   KY = 000,000 −−−, actual number
```

Description of the Example:

The bar code is processed without check, with automatic code recognition of all codes except industrial 2 of 5, normal bar code, single reading, and ”signal tone on”. With this setting, a maximum of 10 bytes can be read. The data are stored in DB 1 beginning at DW 100.
Also, a bar code that has been read will be shown on the display.

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3.4.7 PROFIBUS–DP

Description

An optional module with PROFIBUS-DP interface is available for operation of the ES 030-K on the PROFIBUS-DP. The interface operates “word by word”. Two words (minimum) of user data to 122 words (maximum) can be exchanged in one cycle. Transmission speeds of 9.6 Kbaud to 1.5 Mbaud are automatically recognized by the interface.

Setting of the L2 Parameters in DB 1

Parameter	Address	Provided By
Station address	DL 88	User
Version of the option	DR 88	System
Sending length in words	DL 89	User
Receiving length in words	DR 89	User
Receiving buffer address Outputs, master	DW 90 (DB, DW)	User
Sending buffer address Inputs, slave	DW 93 (DB, DW)	User
User diagnostics	DW 95/DW 96	User

Actions/Reactions

The reset takes effect even when the job is not triggered. It applies to receiving and sending. A reset deletes all other commands.
All commands are concluded with an acknowledgement. Triggering of sending and/or receiving, and diagnostics can be processed simultaneously.
An error is always indicated simultaneously in bit 2 of FY 22 and FY 23.
Receiving is enabled by setting bit 0 in FY 22. The receiving buffer always contains new data when acknowledgement bit 1 is set in FY 22.
Sending to the master is activated by setting bit 0 in FY 23. Transmission to the master is performed when the system resets bit 0 and sets bit 1.
A knowledge of the PROFIBUS-DP is required if you are working with diagnostic evaluation. See chapter 12.3 of the manual on the ET 200 decentralized I/O system for a detailed description.

3.4.7.1 Sample Program

```
NAME: PROFIBUS

      :AN F 1.0
      :
      :JC=ANF
      :R F 1.0
      :R F 1.1
      :S F 10.0          Enable keyboard
      :S F 11.0          Enable display
      :
      :L KY 1,100
      :T DW 9
      :L KY 0,40
      :T DW 10
ANF   :                  For test only
      :L FY 22           Load the flag byte for
      :T QB 9            receiving in output byte 9
      :                  = LED of the keyboard display
      :L FY 23           Load the flag byte for
      :T QB 10           sending in output byte10
      :                  = LED of the keyboard display
      :
      :A F 22.2          Receiving error
      := Q 8.0
      :
      :A F 22.1          Acknowledge receiving
      :S F 22.0          Trigger job
      :R F 22.1          Reset receiving
      :S F 11.0          Trigger job on display
      :
      :A I 0.5           Execute RESET
      := F 23.3          Sending and receiving
      :                  are terminated when the
      :                  flag is set
      :
      :A F 23.2          Send error
      := Q 8.1
      :
      :AN I 0.7          Start sending
      :JC =M001
      :A DB 1
      :L KY 1,152
      :T DW 93
      :S F 23.0          Job trigger 1
      :
M001  :AN I 0.6
      :JC =M002
      :A DB 1
      :L KY 1,176
      :T DW 93
      :S F 23.0          Job trigger 2
      :
      M002  :BE


DB 1

  .
  .
  .
  88:  KY = 003,000; Station number, version number
  89:  KY = 016,016; Length of sending and receiving buffer
  90:  KY = 001,100; Receiving buffer, master, DB1, DW100
  91:  KY = 000,000; Reserved
  92:  KM = 00000000 00000000; Reserved
  93:  KY = 001,152; Sending buffer, slave, DB1, DW152
  .
  .
  .
  100: KS='XXXXXXXXXXXXXXXXXXXXXXXX'; Display indi-
  112: KS='XXXXXXXXXXXXXXXXXXXXXXXX'; cation for
  .                                    new start and
  .                                    receiving buffer
  .
  152: KS='ES030K sends telegram'; Send. buffer of 1st tele-
  164: C = 'to S5 123456789012345678'; gram to master
  176: KS='ES030K sends telegram'; Send. buffer of 2nd
  188: C = 'to S5 098765432109876543'; telegram to master
```

3.4.7.2 DIagnosis

In special error situations the ES 030 user can send a diagnostic message to the PROFIBUS master.

Action/reaction

The user stores his message in DB 1 DW 95/96. The user then sets bit 4 in FY 23 and the message is sent to the PROFIBUS master.The diagnostic status remains in the PROFIBUS master until the user resets this status on the ES 030−K. The user resets the diagnosis by resetting bit 4 of FY 23.

3.4.8 System Characteristics

3.4.8.1 System Start

There are two methods to perform a system start:

- By the user
  Remove supply voltage from the ES 030−K (pull mains connector).
  Initiate a voltage return (re−insert mains connector) while holding the test mode key depressed (key 1, upper left and key switch horizontal). The ES 030−K will be in the hardware test mode.
  Remove voltage to the ES 030−K again and initiate voltage return.

- By the user program
  By calling up OB 20 in the user program, whereby the OB must only be called up once. After executing OB 20, the cycle in progress will be interrupted and the user program (FB 1, OB 1) will be re−started.

The system start will reset all flags and data block to their original values.

3.4.8.2 Power Failure

There are two methods to generate a voltage failure:

- Power failure
  By removing the supply voltage (220 V).

- Through the user program
  By calling up OB 22 in the user program, whereby the OB must only be called up once. After executing OB 22, the cycle in progress will be interrupted and the user program (FB 1, OB 1) will be re−started.

Data blocks will not be altered by a voltage failure. The following flags will be altered: F 1.0, F 11.4.

Remember: On MOBY applications, the parameterization for presence (F 16.6/17.6) must be re−initiated after voltage return and system start.
After a system start or OB 20 (simulation OB system start), or after a voltage return or OB 22 (simulation OB power failure), the MOBY card may not be addressed until the identifier is entered in DB 1, DW 67 (approx. 1.5 sec.).

3.4.8.3 Updating the System Flags

By calling OB 39 from the user program, FY 12 to FY 19 will be processed immediately by the system.

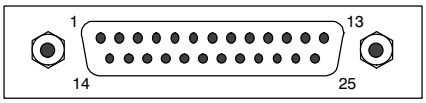
3.4.8.4 Cyclic Processing

After execution of OB 1 (FB 1) (end of cycle), the digital outputs of the process image will be transferred to the digital output of the slot cards. The digital inputs will be scanned and transferred into the process image. Commands with PB/PY ... are not processed at the end of the cycle, but will be processed immediately, by-passing the process image (T PB/PY .. will also be transferred to the process image). This must be considered in the test mode when setting breakpoints because the scan of the inputs and the setting of the outputs in the program affects only the process image.
Keyboard inputs will be processed independently of the cycle (the entry into the flag 25 will only be performed at the beginning of a cycle, however).
The serial interfaces and MOBY will be processed at the beginning of a cycle.
Updating of the date and the time also occurs at the beginning of a cycle.

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(4)J31069−D0136−U001−A0−7618

4 Connector Assignment and Pin Designation ES 030–K

4.1 Connector X1



X1 25 pin D–Sub , screw lock

• RS485, RS422 Assignment

X1 25 pin D–Sub, male	Signal	
1	R+	Resistor +
2	E+	E + 4–wire
4	R–	Resistor –
3	A+	A + 4–wire
7	E–	E – 4–wire
5	A–	A – 4–wire
15	0 V	Signal ground

E = Receiver
A = Transmitter for L1 4–wire

Caution: For RS485 and for RS422 operation, install jumpers 9–10 and 11–21.

• TTY Assignment

X1 25 pin D–Sub, male	Signal	
18	S–	Transmit, negative
17	S+	Transmit, positive
11	E–	Reception, negative
10	E+	Reception, positive
9	+ 20mA	
19	+ 20mA	
16	– 20mA	
21	– 20mA	

• For external applications

X1 25 pin D–Sub, male	Signal	
14	5.2 V	max. 160 mA
15	0 V	

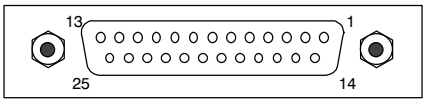
• V.24 Assignment (special version Z03; cf. chap. 8.3.2)

X1 25 pin D–Sub male	Signal	
2	TxD	
3	RxD	
4	RTD *	
1, 7	GND	

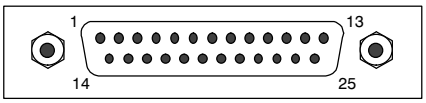
* Level is adjustable using jumper on the module.
± 10 V for the enable signal of the partner device.

Note: Connect cable shield to connector casing.

4.2 Connector X2



X2 25 pin D−Sub, female , screw lock, DI/DQ



X2 25 pin D−Sub, male , screw lock, TTY/V.24

• DI/DQ Assignment

X2 25 pin D−Sub, female	Signal 8DI / 8DQ	I_{max} [mA]
1	I 0.0	
2	I 0.1	
3	I 0.2	
4	I 0.3	
5	I 0.4	
6	I 0.5	
7	I 0.6	
8	I 0.7	
9	+24 V external 24 V	
10	0V external 0V	
11	internal 0V	
12	internal 24 V	400
13		
14	Q 0.0	100
15	Q 0.1	100
16	Q 0.2	100
17	Q 0.3	100
18	Q 0.4	50
19	Q 0.5	50
20	Q 0.6	50
21	Q 0.7	50
22	+24 V external 24 V	
23	0V external 0V	
24	internal 0V	
25	internal 24 V	

Switching from internal to external voltage supply:
a) Switch jumpers on the ES 030−K (see chapter 5.1)
b) If the jumpers on the ES 030−K (see chapter 5.1) are on external, jumpers can be inserted in connector X2 (10−11; 9−12) to switch to internal.

= Jumpered on the ES 030

Factory setting:
The voltage to the DI/DQ is supplied internally.

• TTY Assignment (special version Z03; cf. chap. 8.3.2)

X2 25 pin D−Sub, male	Signal	
18	S−	
17	S+	
11	E−	
10	E+	
9	+ 20mA	
19	+ 20mA	
16	− 20mA	
21	− 20mA	

• V.24 Assignment(special version Z03; cf. chap. 8.3.2)

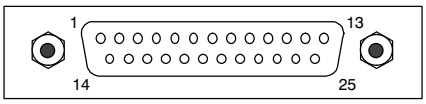
X2 25 pin D−Sub, male	Signal	
2	TxD	
3	RxD	
4	RTS	Output
5	CTS	Input
7	0 V	

To switch between TTY and V.24:
Different pin assignment
Switching active <−> passive on TTY:
Use jumpers on connector X3

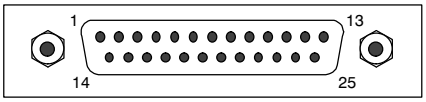
Note: Connect cable shield to connector casing.

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4.3 Connector X3



X3 25 pin D–Sub, female, screw lock, DI/DQ



X3 25 pin D–Sub, male on TTY/V.24; screw lock

• Assignment of the DI/DQ

X3 25 pin D–Dub, female	Signal 8DI/8DQ **	Signal 16DI
1	I x.0	I 2.0
2	I x.1	I 2.1
3	I x.2	I 2.2
4	I x.3	I 2.3
5	I x.4	I 2.4
6	I x.5	I 2.5
7	I x.6	I 2.6
8	I x.7	I 2.7
9	+24V *	+24V
10	0V *	0V
11		
12		
13		
14	Q x.0	I 3.0
15	Q x.1	I 3.1
16	Q x.2	I 3.2
17	Q x.3	I 3.3
18	Q x.4	I 3.4
19	Q x.5	I 3.5
20	Q x.6	I 3.6
21	Q x.7	I 3.7
22	+24V *	+24V
23	0V *	0V
24		
25		

= jumpered in the ES 030

* Switching from internal to external voltage supply is done on the options board (see also Chapter 5.3.5/5.3.6)

** Factory setting of addressing: I1.0 to I1.7; Q1.0 to Q1.7

• TTY Assignment

X3 25 pin D–Sub, male	Signal	
18	S–	
17	S+	
11	E–	
10	E+	
9	+ 20mA	
19	+ 20mA	
16	– 20mA	
21	– 20mA	

• V.24 Assignment

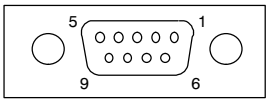
X3 25 pin D–Sub, male	Signal	
2	TxD	
3	RxD	
4	RTS	Output
5	CTS	Input
7	0 V	

To switch between TTY and V.24:
Different pin assignment
Switching active <–> passive on TTY:
Use jumpers on connector X3

Note: Connect cable shield to connector casing.
If a second MOBY system is connected, the 25 pin connector on the cover plate must be replaced by a 9 pin connector.
The pin assignment is the same as on connector X4 (see also Chapter 4.4).

4.4 Connector X4

4.4.1 Bar Code Reading Wand



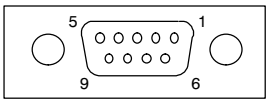
X4 9 pin D−Sub, female, slide lock

● Pin Assignment

X4 9 pin D−Sub, female	Signal	
1	+ 5 V	
2	V_{scan}*	
4	Ground (0 V)	
6	Buzzer	
7	Data	
9	Cable shield	

* only on ZA 14(connection for the reading gun)

4.4.2 MOBY−M

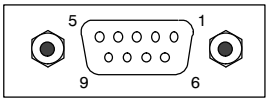


X3/X4 9 pin D−Sub, female, slide lock

● Pin Assignment

X3/X4 9 pin D−Sub, female	Signal	LBS Connection
5	A1	3
6	A2	2
7	Ground (0 V)	4
8	+ 24 V	1
⏚	Cable shield	⏚

4.4.3 MOBY−I/L

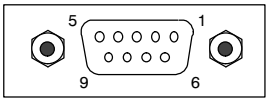


X3/X4 9 pin D−Sub, female, screw lock

● Pin Assignment

ES 0 30−K		SLG	
X3/X4 Pin No.	Signal	Pin No.	Signal
5	− Receive	5	− Send
8	+ 24 volt	2	+ 24 volt
7	Ground (0 V)	3	Ground (0 V)
2	+ Send	6	+Receive
6	− Send	1	− Receive
3	+Receive	4	+Send
⏚	Cable shield	⏚	Cable shield

4.4.4 PROFIBUS−DP



X3/X4 Sub D, 9−socket, screw-type lock

● Pin Assignment

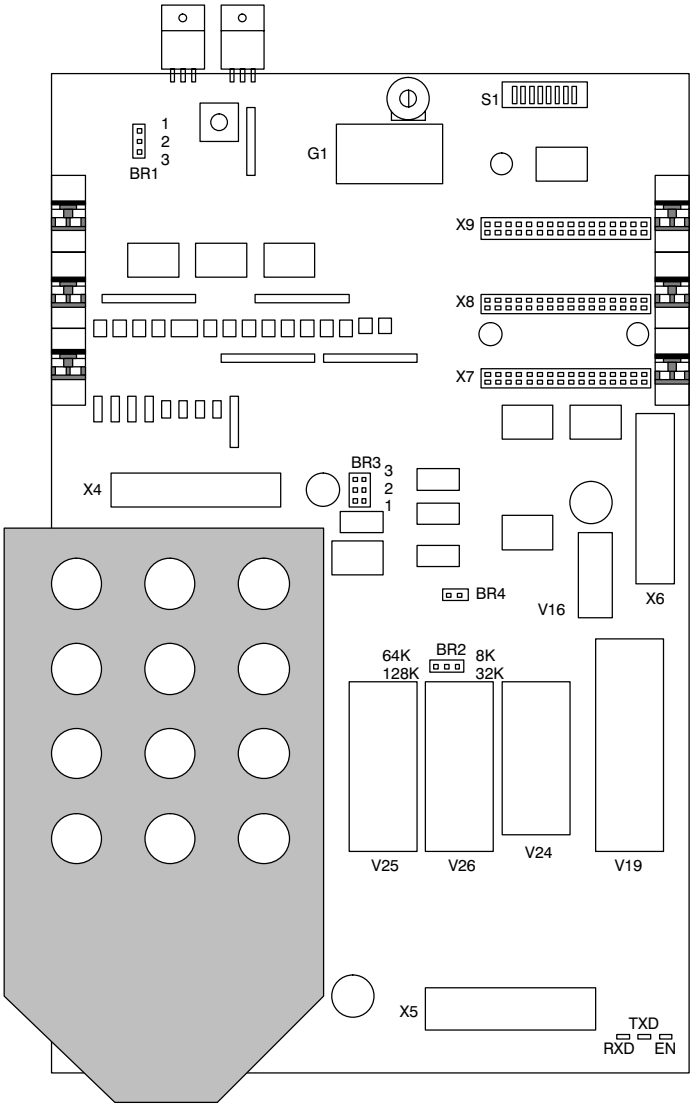
Pin No.	Signal	Designation
1	PE	Protective ground
3	RxD/TxD−P	Data line B
4	RTS	Request to send
5	M5V2	Data reference potential
6	P5V2	Supply − plus I_{max} = 100 mA
8	RxD/TxD−N	Data line A

Note: Connect cable shield to connector casing.

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(4)J31069−D0136−U001−A0−7618

5 Jumper Setting

5.1 Motherboard



BR1

	internal 24 V is floating
	internal 24 V is connected to PE (protective conductor/casing)

BR2

	8 – 32 K memory on V26
	64 – 128 K memory on V26

BR3 For supply of the DI/DQ:

	24 V from ES 030
	external 24 V

BR4

	always on

internal connectors

X4	8 DI/8 DQ
X5	serial interface (status indication by the LEDs: RXD, TXD, and EN)
X6	display/keyboard
X7–X9	slot for optional modules

Switch

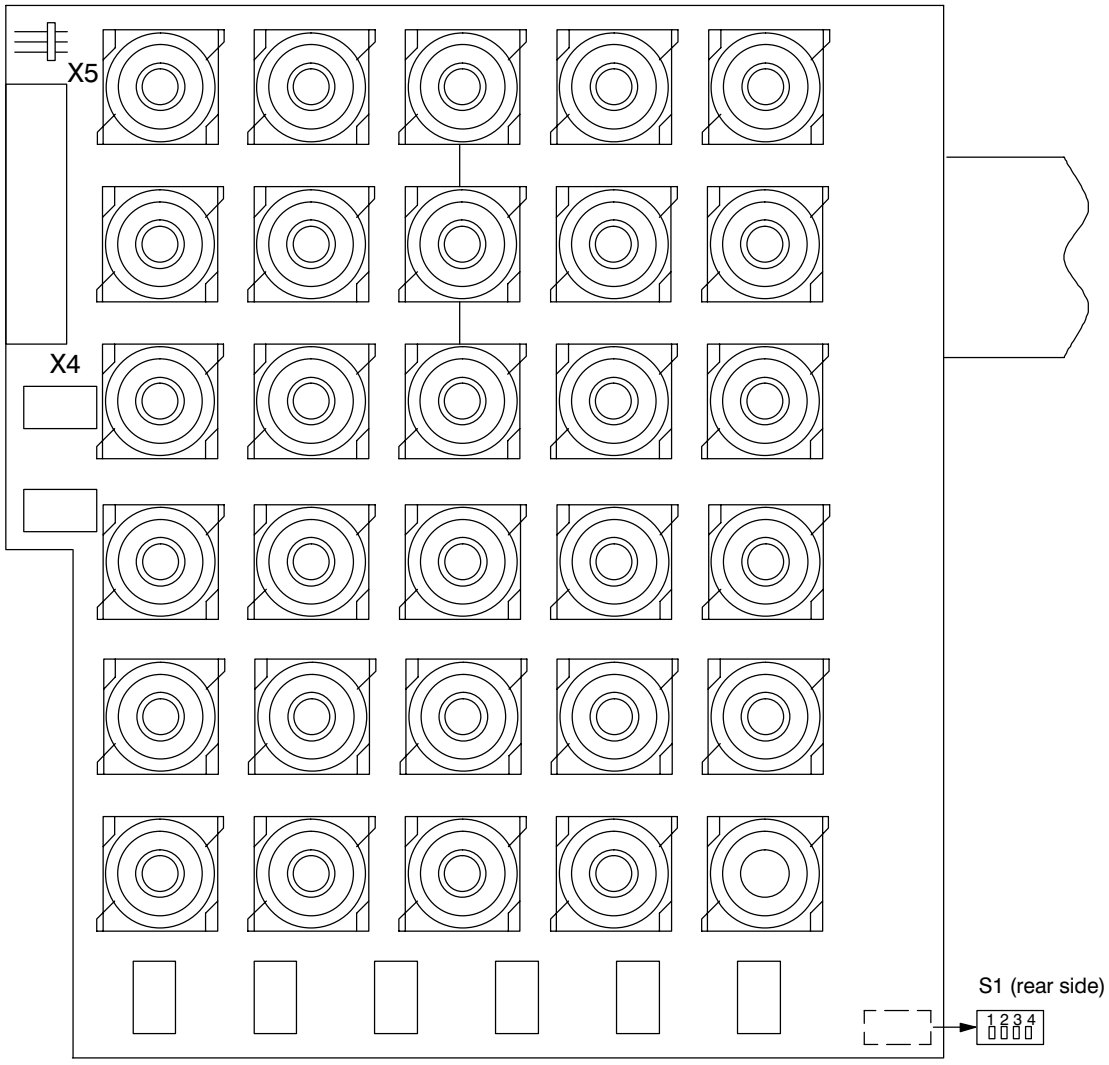
S1	DIL for user as well as display and keyboard parameterization.

Hardware components

V16	clock module (optional)
V19	80C32 processor
V24	EPROM firmware
V25	RAM
V26	EEPROM user memory
G1	lithium battery 3.6 V / 800 mAh

5.2 Keyboard

6AW5458−7KB (keyboard with illuminated keys)



X4 Display connection

X5 Display illumination (LCD)

S1 (Switch on rear side)

Switch S1				Meaning
S1.1	S1.2	S1.3	S1.4	
1	0	0	x	Display = LCD
1	1	0	x	Display = VFD (Cyrillic)
1	0	1	x	Display = VFD (standard)
0	x	x	x	no keyboard present*
x	x	x	0	Key switch is active (normal operation)
x	x	x	1	Key switch is horizontal (the normal key switch is inactive)

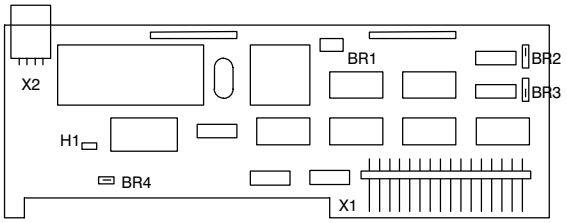
* The DIP switch 8 on the motherboard is now reserved for DOWNLOAD operation: switch 8 = ON → DOWNLOAD

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(4)J31069−D0136−U001−A0−7618

5.3 Optional Board

5.3.1 MOBY–M

6AW5458–7DB
The data carrier type and the voltage supply of the LBS must be set.



Jumper settings:

BR1 Setting the DAT type

- set by software
- 8 byte fixed code
- 16 byte fixed code
- 64 byte slow
- 64 byte fast
- 2 Kbyte

BR2 / BR3

MOBY Channel 1

BR2 / BR3

MOBY Channel 2

BR4

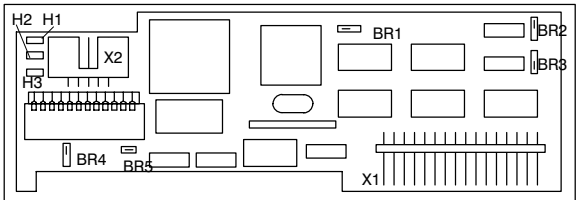
- internal 24 V
- external 24 V*

LED H1: Command waiting (connection to LBS is uninterrupted, program is waiting for data carrier)

*) BR1 on motherboard is to be set to non–floating voltage

5.3.2 MOBY–I

6AW5458–7VB (without file handler)
6AW5458–7DH (with file handler)



BR 1

- Test mode of operation; on interference, the dialogue to the mobile data memory will be interrupted sooner. Thus, weak points and interference can be detected during initial startup.
- normal operation

BR2 / BR3

MOBY Channel 1

BR2 / BR3

MOBY Channel 2

BR4

- interface to the SLG is RS422
- Interface to SLG is TTY (currently not available)

BR5

- internal 24 V*
- external 24 V

LED H1: RED; The last detected error is indicated as a flashing pattern. The error indication is not deleted until the ES 030-K is switched off.

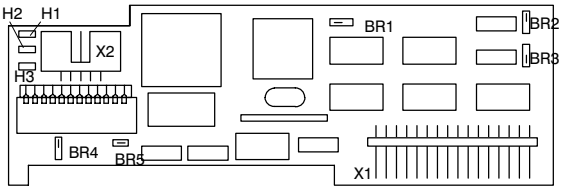
LED H2: GREEN; Indicates the presence (ANW) of an MDS (same meaning as bit 7 of FY 16/17)

LED H3: YELLOW; Irregular flashing indicates a running dialog to the SLG.

*) BR1 on motherboard is to be set to non–floating voltage

5.3.3 MOBY−L

6AW5458−7DG



BR 1

Test mode of operation; on interference, the dialogue to the mobile data memory will be interrupted sooner. Thus, weak points and interference can be detected during initial startup.

normal operation

BR2 / BR3

MOBY Channel 1

BR2 / BR3

MOBY Channel 2

BR4

interface to the SLG is RS422

Interface to SLG is TTY
(currently not available)

BR5

internal 24 V*

external 24 V

LED H1: RED; The last detected error is indicated as a flashing pattern. The error indication is not deleted until the ES 030-K is switched off.

LED H2: GREEN; Indicates the presence (ANW) of an MDS (same meaning as bit 7 of FY 16/17)

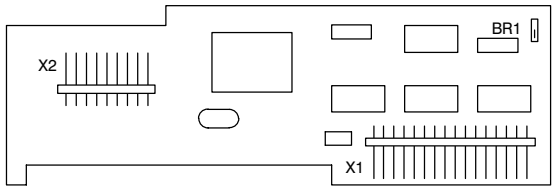
LED H3: YELLOW; Irregular flashing indicates a running dialog to the SLG.

*) BR1 on motherboard is to be set to non−floating voltage

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5.3.4 Bar Code

6AW5458–7DC



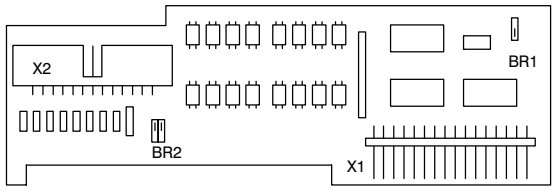
BR 1

Channel 1

not possible

5.3.5 Digital Inputs/Outputs 8 DI/8 DQ

6AW5458–7AB



BR 1

Option 1 (Address = Q 1.0–Q 1.7)

Option 2 (Address = Q 2.0–Q 2.7)

BR2

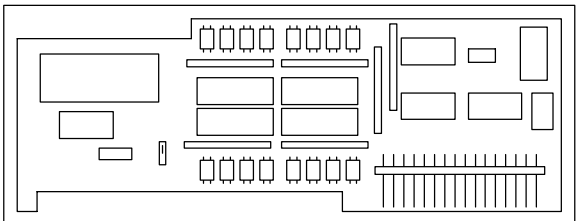
internal 24 V*

external 24 V

The voltage supply of the DI/DQ can be set to internal or to external.

5.3.6 Digital Inputs 16 DI

6AW5458–7CB



BR 1

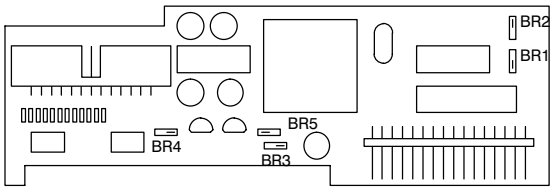
internal GND

external GND

The addresses on the module are fixed EB2/EB3.
Floating design.

5.3.7 Serial Interface TTY/V.24

6AW5458−7BB



BR 1 BR2

Channel 1

BR 3

normal operation

data reception line is jumpered for CTS (pin 3 − pin 5)

BR 4

TTY

V.24

BR 5

jumpered for RTS − CTS (pin 4 − pin 5)

open

Control of data output:

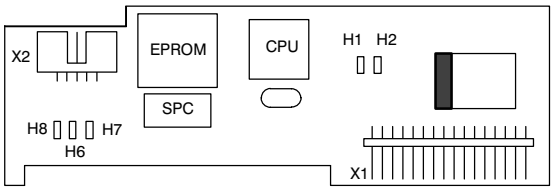
Use of a V.24 interface on connector X2. X3 with serial expansion module: ES 030−K only evaluates the CTS control line.

Caution: CTS is not designed for dynamic operation (output stop on precise bit).
When CTS = 0, data output is stopped on ES 030−K.
When CTS = 1, interface of the ES 030−K is processed again.

In addition, the data communication of two partners can be coordinated with the XON/XOFF software handshake when the LAUF procedure is used.
XON = 11H = ready
XOFF = 13H = busy

5.3.8 PROFIBUS−DP

6AW5458−7AE



This module does not require jumper adjustments. Parameterisation is performed by the software.

Meaning of the LEDs:

LED H1: RED = Bus error by PROFIBUS−DP
LED H2: GREEN = PROFIBUS−DP is running.

LED		
H1	H2	
On	Off	Profibus−DP not initialized − Master does not address ES 030−K. DB1/DL88 contains the wrong bus address − Wrong parameterisation of the ES 030−K on bus master − Bus cable not connected to the ES 030−K or is defective
Off	Off	Initialization running
Flashing	Off	Error during initialization
On	On	PROFIBUS−DP timeout
Off	Flashing	Error in configuration of master
Off	On	PROFIBUS−DP is okay and running.

LED H6: RED = PROFIBUS−DP interface TxD (sending data)
LED H7: RED = PROFIBUS−DP interface RTS (request to send)
LED H8: RED = PROFIBUS−DP interface RxD (receiving data)

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(4)J31069−D0136−U001−A0−7618

6 Test Methods

6.1 Hardware

- **Jumping to the Hardware Selftest**

  Connect mains connector while pressing test mode switch (key in upper left), with key switch in the horizontal position.

System message:

```
HW–TEST ES 030–K V0394
EXTERNAL RAM XXK OK
```

With built–in LCD display, the display illumination will be switched on.

Press key DUE

System message:

```
HARDWARE TEST NUMBER
OR 0 = DOWNLOAD ?
```

- **Leaving the Hardware Selftest**

  Pull and re–insert mains connector

- **Keyboard Assignment for the Hardware Test Function**

7	8	9		
4	5	6		
1	2	3		
	0		DUE	

- **DOWNLOAD Function**

0 DOWNLOAD
By pressing the key “0”, the ES 030–K will enter into DOWNLOAD mode of operation

System message:

```
ONLINE (END = DUE)
READY
```

Online mode of operation with ESCOPY on PG/PC under MS–DOS (see Chapter 9).

- **Hardware Test Function**

Input of the number of the test

1 Keyboard Test

Each pressed key will be indicated by a lit LED key.

2 Display Test

The same alphanumeric character is indicated in all display positions simultaneously, followed by the next higher character and so on at one–second intervals.

3 LED Test

All LEDs on the keyboard will be switched on.

4 Interfaces – Testing the Standard Interface

A test adapter (TTY or RS422) must be connected to the interface connector.

Message: *SUCCESS*
or *TIME ERROR* (interference to the connection)
or *CHARACTER ERROR*

5 Interfaces – Testing the Expansion Interface

A test adapter (TTY or V.24) must be connected to the interface connector. Message as under 4.

6 Test of the Digital Input/Output

Enter the byte number of the input/output byte. The outputs will be addressed and the inputs will be displayed. (A simulator can be ordered for this test – see Chapter 2.4.1).
The third byte will indicate the position of the DIP switch on the motherboard.

7 Test of the Digital Input 16 DI

The byte number for the input bytes is pre–set.
(A simulator can be ordered for this test – see Chapter 2.4.2)

8 Keyboard Test

Each pressed key will be identified by the line number as well as the column number of the key indicated in the display.

- **Leaving the Hardware Test Function**

The active test section is terminated by pressing the key DUE in the selection mask. All other keys, including “0”, have no function.

6.2 Software

The ES 030−K can be tested in the display mode or in the test mode while operating.

6.2.1 Display Mode

- **Display Mode (control variable)**

The display mode is used to test while in operation (similar to status on the PG). In the display mode, the keys have a fixed assignment. The parameterization by the user will be ignored.

- **Key Assignment**

U	SPR	➡	DL	DR
E	A	M	T	Z
7	8	9	E	F
4	5	6	C	D
1	2	3	A	B
+	0	−	DUE	

U = Switch between display mode and user operation for keyboard and display.

SPR = Jump from display mode into the test mode, as well as within test mode
- − from NOP1 to NOP1(with key switch vertical)
- − from command to command (with key switch horizontal)

➡ = Moving the cursor to the next input field

DL = Selecting data left

DR = Selecting data right

E,A,M,T,Z = Selecting inputs/outputs, flags, times, counters

0 to F = Input keys

\+ = Increasing the address, flags, ...

− = Decreasing the address, flags, ... in the change mask

DUE = Acceptance of the input

- **Display Definition**

Actual value mask:
IST: x nnn DB yy
vv mmmm mmmm hhH aA

Flags, input byte numbers, etc. are selected with the keys 0 to 9. The value in the actual value mask is always updated.

SETPOINT VALUE mask (change mask):
SOLL: x nnn DB yy
hhH

Inputs to the SETPOINT VALUE mask will only be entered after the DUE key has been pressed. The keys +/− can be used to increase/decrease nnn. ➡ moves the cursor to the next input field.
The display will be maintained until a different pattern is entered.

x = E,A,M,T,Z,DL,DR

nnn = Byte number of the input, output, flag, number of the data word, counters, the time

yy = DB number (only relevant with DL, DR)

vv = RLO 0 or 1 (only displayed in the test mode)

m.. = value as bit pattern

hh = value in hexadecimal representation (H = hexadecimal)

a = value in alphanumeric representation (A = alphanumeric)

- **Jump into the Display Mode**

Press the key parameterized with HEXADECIMAL E0
See Chapter 3.4.1

- **Working in the Display Mode (control variable)**

Selection of E (inputs), A (outputs), M (flags), T (times), Z (counters), DL (data byte left), and DR (data byte right), by pressing the appropriate key. By pressing the keys again, the mask will be switched from ACTUAL VALUE to SETPOINT VALUE mask.

- **Leaving the Display Mode**

The display mode will be terminated by pressing the key designated “U” (see keyboard allocation). The user mask or a system message on a breakpoint will appear in the display.

Caution:
- Changes in the contents (change mask) are to be done in hexadecimal.
- Inputs will only be updated at the beginning of a cycle. Outputs will only be output at the end of a cycle; operations during the cycle will only be carried out on the image. The pressing of a function key will be entered into flag byte 25 only at the beginning of a cycle. FY 9 will not be altered in the test mode.
- All times will be stopped during a program halt.

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6.2.2 Test Mode

The test mode serves to test the user software by means of breakpoints. The program will be halted at those points at which a NOP 1 has been programmed. The user can then check and alter the status of E, A, M, etc.

- **Entering the Test Mode**

– Connect mains connector while pressing test mode switch (Key 1 to the upper left), with key switch in the horizontal position.
  – Set flag 2.0 in the user program.

System message:
(does not appear when setting flag 2.0)

```
HW–TEST ES 030–K V0394
EXTERNAL RAM XXK OK
```

Press DUE key

System message:
(does not appear when setting flag 2.0)

```
HARDWARE TESTNUMBER
OR 0=DOWNLOAD?
```

Press due key

System message:

```
BREAKPOINT: XXXX
            yy :zz
```

xxxx is the address of the next PG program printout (hexadecimal) command to be processed.
yy = block type (FB or OB)
zz = block number (hexadecimal indication)

- **Working in the Test Mode**

By pressing the SPR key (see Chapter 6.2.1) while the key switch is in the vertical position, it is possible to jump from NOP1 to NOP1, when the key switch is in the horizontal position, from command to command.

- **Leaving the Test Mode**

Disconnect and re–connect mains connector.
(Set flag 2.0 must be reset by the user).

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7 Error Evaluation

7.1 ES 030 Error Messages

The following error messages can be displayed:

- **System Message:**



Cause:

– EEPROM was changed without subsequently performing a system start.
– The EEPROM contains an incorrect block
– EEPROM is not inserted or empty
– EEPROM is defective

Remedy:

Check the EEPROM

- **System Message:**



Cause:

– EEPROM was changed without Subsequently performing a System start.
– The program contains an illegal command.
– EEPROM contains an incorrect block.

Remedy:

Insert breakpoints in the user program in order to isolate the erroneous command in the test mode.

- **System Message:**



Cause:

– User program is running in a loop (cycle is longer than 1 second).

Remedy:

Switch voltage off/on; correct user program.

- **ES 030 does not respond.**

Cause:

– Display identifier set incorrectly or clock has been addressed although not present.

Remedy:

Correct switch for selection of display, do not address clock (do not reset F 7.3, do not set F 7.0).

7.2 Serial interface Errors

In case of an error during the input, the flag 12.2 (14.2) will be set. The exact error description is contained in DB 1 DL 43 (DL 49).
In case of an error during the output, the flag 13.2 (15.2) will be set. The exact error description is contained in DB 1 DL 46 (DL 52).
With the extended buffer length, the error descriptions will be placed at other locations in DB 1.
The following error indications are identical
(see also Chapter 3.2.1.6):
DL 43 → DL 74 (standard serial interface)
DL 46 → DR 74 (standard serial interface)
DL 49 → DL 75 (expansion serial interface)
DL 52 → DR 75 (expansion serial interface)

7.3 Bar Code Errors

A set flag 20.2 will indicate that an error has occurred. The exact error description is contained in DB 1 DL 72 (see Chapter 3.2.1.6).

7.4 MOBY Errors

An error in channel 1 will be indicated by setting Flag F 16.1 and F 16.2. Set flags F 17.1 and F 17.2 indicate an error on channel 2. The exact error description is contained in DB 1 DW 54 (channel 1) and DW 56 (channel 2) (see chapter 3.2.1.6 to 3.2.1.8).

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8 Appendix

8.1 Technical Data

Basic Configuration	
Compact casing (industrial version)	
Microprocessor	SAB 80C32
Clock frequency	14.7 MHz
User memory	
EEPROM	32 Kbytes = 16 K instructions
RAM	128 Kbytes (DB 1 to DB 120 with 256 DW each) with battery backup for approx. 8 years
Programming language	STEP 5
Serial interface	TTY, RS485
Procedures	LAUF, 3964R, SINEC L1
Speed	150 to 19200 baud
8 digital inputs/outputs	digital input (floating) logical 0: −2 to +2 V logical 1: +16 to +33 V common ground for all DI/DOs digital output (floating) logical 1: +24 V 4 DQs load = 100 mA 4 DQs load = 50 mA short circuit proof, common 24 V to all DQs common ground to all DI/DQs
Slots for options	3

Electrical Characteristics	
Supply voltage	230V
Optionally	external 24 V DC
Frequency	48 − 62 Hz
Power consumption	approx. 20VA
Floating auxiliary voltage for DI/DQs and MOBY	24 V / 400 mA

Mechanical Characteristics	
Dimensions (H x W x D)	280 x 180 x 95 (mm)
Material	zinc die casting
Weight	approx. 5 kg

Authorisation	VDE 0871 Class B

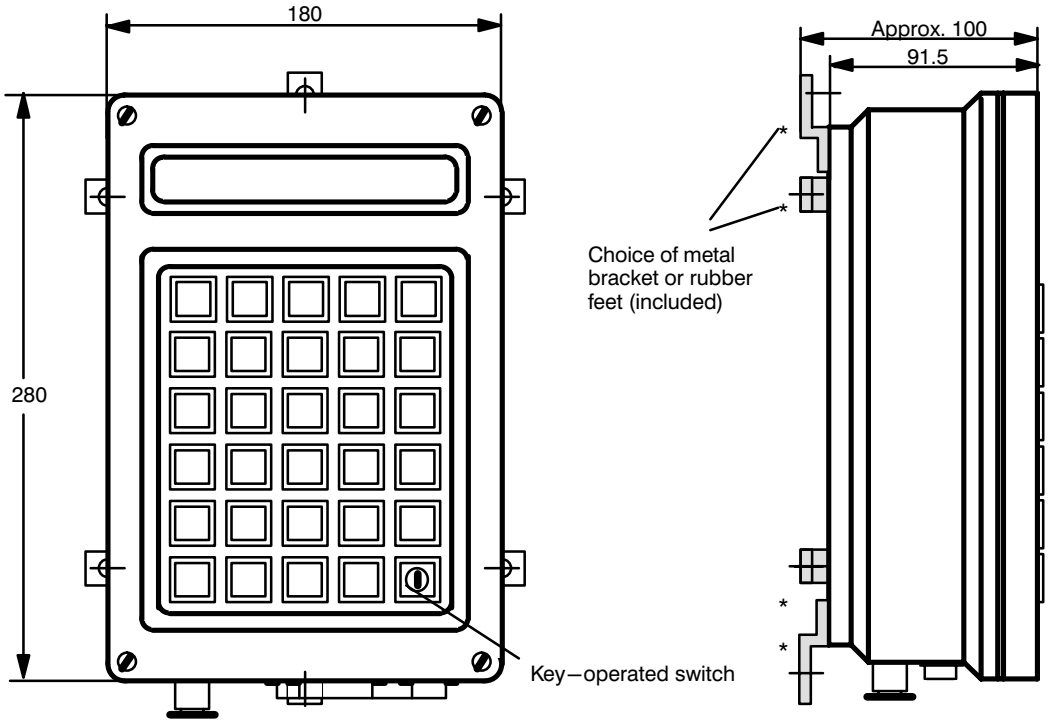
Protection rating	IP 54

Ambient Temperature	
Operational	0 °C to +40 °C
Storage	−40 °C to +70 °C

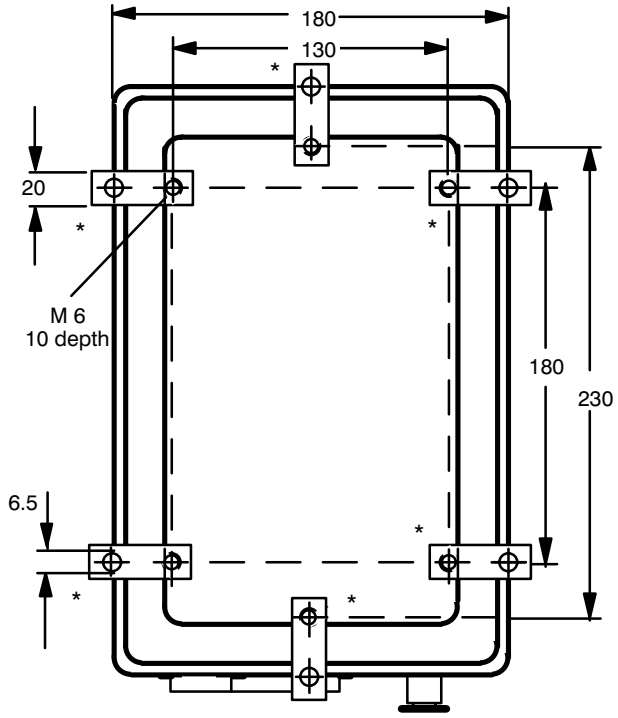
Relative humidity	up to 95% without condensation

Options	
Display	2x20 char. fluorescent display 2x20 char. fluorescent display with Cyrillic character set 2x24 character LCD 4x20 character LCD
Keyboard	− 29 standard keys, illuminated, key switch − 30 key membrane keyboard, 30 LEDs, key switch
Clock module	type: RTC 72421A in socket on IC position V16) backup battery , lifespan approx. 8 years
DI/DQ:	
8 digital inputs/outputs	Floating digital input logical 0: −2 to +2 V logical 1: +16 to +33 V common ground for all DI/DQs digital output Active 1: +24 V 8 DQs load = 100 mA short circuit proof, common 24 V to all DQs common ground to all DI/DQs
16 digital inputs	Floating logical 0: −2 to +2 V logical 1: +16 to +33 V common ground to all DIs
Expansion serial interface	TTY, V.24
Procedures	LAUF, 3964R, PREMID
Speed	150 to 19200 baud
Identification Systems:	
MOBY−M	connections for LBS 11−71
MOBY−I	connections for SLG 41−44
MOBY−L	connections for SLG 52
Bar code	
type	Codabar, Industrial 2 of 5, Coda 39,EAN, JAN, UPC, Interleaved 2 of 5, UPC−E with 8 numerals, all codes except Industrial 2 of 5
Supply voltage	5,2 max. 250 mA from the ES 030 power supply
Connections for:	Pen, scanner
PROFIBUS-DP	In accordance with part 3 of DIN 19245; slave module up to a max. of 1.5 Mbaud data transmission speed
For terminal resistance:	5.2 V/50 mA (floating, not short-circuit proof, on pin 6 of subminiature D plug connector

8.2 Dimensional Drawing and Mounting Diagram for the ES 030-K



Dimensions of the Mounting Points



Methods of Mounting

1) Secure with screws from the back in the threaded holes provided
2) Secure from the front using the metal bracket (on side or top, bottom)
3) Direct installation in the door of a mounting cabinet (request drawings)

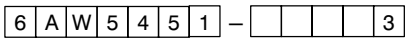
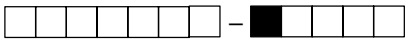
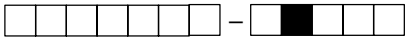
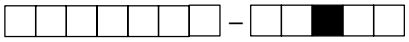
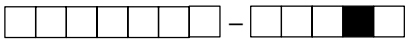
* Choose one of these points, not both.

(All dimensions in mm)

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8.3 Order Number

8.3.1 Order Numbers for ES 030−K

Order number	Explanation
	Acquisition Station ES 030−K Connector 1: serial interface TTY / RS 485 Connector 2: 8 DI and 8 DQ
	Display 0 no display 1 2 x 24 character LCD display 2 4 x 20 character LCD display 3 2x 20 character fluorescent display 5 2x 20 character fluorescent display (with Cyrillic character set)
	Connector 3 A not used C MOBY−I interface D 8 inputs/outputs E 16 inputs F MOBY−I file handler L MOBY−L interface M MOBY−M interface P PROFIBUS-DP* S TTY / V.24
	Connector 4 A not used B Bar code (incl. reading pen) C MOBY−I interface F MOBY−I file handler L MOBY−L interface M MOBY−M interface N Bar code (without pen) P PROFIBUS-DP*
	Keyboard 0 not used 2 Membrane keyboard with 30 keys, 30 LEDs, key switch 3 Keyboard with 29 illuminated keys, key switch
6 A W 5 4 5 1 − 8 A A	Clock module for the ES 030−K
6 A W 5 4 5 1 − 8 A U	Loading kit for the ES 030−K

The combination of “with display” and “keyboard not used” is not available at this time. If required, consult A&D SE MI4.

* PROFIBUS−DP can be connected to connector 3 or 4 instead. This simplifies cabling the standard bus connector with the bus cable.

8.3.2 Order Numbers for Special Models

Order number		Explanation
6AW5451−XXXX3−Z	Z03	V.24 interface on connector 1 (X1)
6AW5451−XXBX3−Z	Z04	Connection of hand scanner DL8110 instead of bar code pen to connector 4
6AW5451−XXXX3−Z	Z06	Including 24 V DC power supply connection (all other features are identical to the basic configuration of the ES 030−K)

8.3.3 Order Numbers for Accessories

Options Board	
8 digital inputs/outputs, floating, short circuit proof	**6AW5458−7AB**
Serial interface TTY / V.24	**6AW5458−7BB**
16 floating digital inputs	**6AW5458−7CB**
MOBY−M	**6AW5458−7DB**
MOBY−I	**6AW5458−7VB**
MOBY−I (with file handler)	**6AW5458−7DH**
MOBY−L	**6AW5458−7DG**
Bar code	**6AW5458−7DC**
PROFIBUS-DP (incl. upgrade set)	**6AW5458−7AE**
Connector (from ES 030−K casing to options board)	
X3 for the MOBY−M connection including connecting cable to the MOBY board	**6AW5458−8XC**
X3 for the MOBY−I/L connection including connecting cable to the MOBY board	**6AW5458−8DD**
X2/X3 with TTY/V.24 connection (expansion serial interface)	**6AW5458−7YC**
X3 for the DI/DQ connection including connecting cable to the DI/DQ board	**6AW5458−7QB**
X3 for the 16 DI connection including connecting cable to the DI board	**6AW5458−7QB**
X4 for the MOBY−M connection including connecting cable to the MOBY board	**6AW5458−8AC**
X4 for the MOBY−I/L connection including connecting cable to the MOBY board	**6AW5458−8DF**
X4 for the bar code reader connection including connecting cable to the bar code board and including audio signalling device	**6AW5458−8BC**
Test Connector	
Serial interface active TTY	**6AW5458−8RC**
Serial interface V.24	**6AW5458−8UB**
Serial interface for X1, RS422, 4−wire RS485	**6AW5458−8SC**
Simulator	
For testing the 8 DI/8 DQ module on X2/X3	**6AW5451−8KA**
For testing the 16 DI module on X2/X3	**6AW5451−7KA**
Display	
2 x 24 character LCD	**6AW5458−7UC**
4 x 20 character LCD	**6AW5458−7GC**
2 x 20 characters fluorescent, Cyrillic	**6AW5458−7FB**
2 x 20 characters fluorescent	**6AW5458−7CC**
Bar Code Reading Pen	**6AW5458−8EC**
Connector Set (without cables)	
25 pin, female for X1, X2, X3 serial interface, screw lock, solder connection	**6AW5418−4F**
25 pin, male for X2, X3 DI/DQ, screw lock, solder connection	**6AW5458−8NA**
9 pin, male for X3, X4 MOBY−M, bar code, slide lock, solder connection	**6AW5418−4E**
9 pin, male for X3, X4 MOBY−I/L, bar code, screw lock, solder connection	**6GT2090−0BB00**
PROFIBUS-DP, connector	**(See COM ET 200 manual)**
Connection Cable (ready−made)	
For connecting an LBS to X3, X4	**6AW5461−0A...**
For connecting an SLG to X3, X4	**6GT2091−0A...**
For connecting X1, X2, X3 TTY to DU04	**6XV1093−4A...**
For connecting X1, X2, X3 TTY to CP 525	**6XV1093−5A...**

For connection cables whose length is freely selectable, the empty spaces in the order number must be completed in accordance with the length key listed in Chapter 8.3.4.

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8.3.4 Length Key

Length of the Connection Cable	Order Number Supplement for the Connection Cable
	6XV1 ... — .. □□□
0.8 m	E80
1.2 m	H12
1.6 m	H16
2.0 m	H20
2.5 m	H25
2.8 m	H28
3.2 m	H32
3.6 m	H36
5.0 m	H50
8.0 m	H80
10.0 m	N10
12.0 m	N12
16.0 m	N16
20.0 m	N20
32.0 m	N32
50.0 m	N50
80.0 m	N80
120.0 m	T12

8.3.5 Order Numbers for Replacement Parts

Keyboard PCB, including the contact switches screwed to the board	**6AW5458—7KB**
Complete set of keys, consisting of 10 contact switches and 10 key activators	**6AW5458—7LB**
Membrane keyboard with casing cover	**6AW5458—8JC**
Keyboard PCB for membrane keys with 30 LEDs	**6AW5458—7PC**
Key switch insert for illuminated keys	**6AW5458—7MB**
Key switch insert for membrane keys	**6AW5458—8LC**
Connector X2 for digital inputs/outputs and connecting cable to motherboard	**6AW5458—7MC**
Connector X1 with TTY connection and connecting cable to the standard interface on the motherboard	**6AW5458—8NC**
Connector X1 with V.24 connection and connecting cable to the standard interface on the motherboard	**6AW5458—8YB**

8.4 Table of Commands

Explanations to the List of Instructions

Abbr.	Explanation
ACCU 1	Accumulator 1 (when loading ACCU 1, the original contents will be shifted to ACCU 2)
ACCU 2	Accumulator 2
STL	STEP 5 code for statement list
CSF	STEP 5 code for control system flow chart
LAD	STEP 5 code for ladder diagram
PII/PIQ	Process image of the inputs/outputs
RLO	Result of logical operation
PLO dependent Y	The statement will be carried out only if the result of the RLO = ”1”.
Y↑	The statement will be carried out only if the change of the RLO had a positive leading edge.
N	The statement will always be carried out.
RLO affecting Y/N	The status of the RLO will be affected/not be affected by this operation.
FS	Indication for First scan
FS affecting	Indicator will be set on first scan
FS dependent	The carrying out of the command is dependent on FS
ANZ 0 / 1	Display of the result 0 / 1
OV	Overflow. This indicator will be set if the result of a mathematical operation exceeds the limits of the number range.

Special Features

The selected data block will stay selected outside of the block range.

Calling the blocks OB 20 and 22 will have the same function as a system start or voltage return.

FB 2 to 8 are reserved as system FBs.

Explanation of the Operands

Abbr.	Explanation	Valid range of operand values
Q	Output	0.0 to 2.7 8.0 to 11.4
QB	Output byte	0 to 2; 8−11
QW	Output word	0 to 2; 8−10
DL	Data word (left byte)	0 to 255
DR	Data word (right byte)	0 to 255
DW	Data word	0 to 255
I	Input	0.0 to 3.7
IB	Input byte	0 to 3
IW	Input word	0 to 2
KS	Constant (2 characters)	ASCII set of characters
KF	Constant (fixed−point)	−32768 to 32767
KH	Constant (hexadecimal code)	0 to FFFF
KM	Constant (2 byte bit pattern)	any bit pattern
KT	Constant (time value)	0.0 to 999.3
KY	Constant (2 bytes)	0 to 255 (each byte)
KB	Constant (1 byte)	0 to 255
KC	Constant (count)	0 to 999
F	Flag	0.0 to 255.7
FY	Flag byte	0 to 255
FW	Flag word	0 to 254
PB	PB Peripheral byte: − digital inputs − digital outputs (with PIQ)	 0 to 3 0 to 2 8 to 11
T	Time	0 to 15
C	Counter	0 to 15
DB	Data block	1 to 120
FB	System FB	2 to 8
FB	User FB	1 to 63

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8.5 Summary of Instructions

In–struc–tion (STL)	Operand					1 RLO dependent 2 RLO affected 3 FS dependent 4 FS affected				Execution time in µs					Function description
	I	Q	F	T	C	1	2	3	4	I	Q	F	T	C	
Logic Operations															
A	●	●	●	●	●	N	Y	Y	Y	82					AND operation: Query for a signal state of “1”
AN	●	●	●	●	●	N	Y	Y	Y	88					AND operation: Query for a signal state of “0”
O	●	●	●	●	●	N	Y	Y	Y	82					OR operation: Query for a signal state of “1”
ON	●	●	●	●	●	N	Y	Y	Y	87					OR operation: Query for a signal state of “0”
O						N	Y	Y	Y						OR operation of an AND function
A(						N	Y	Y	Y						AND operation of expressions in parentheses (6 levels of parentheses)
O(						N	Y	Y	Y						OR operation of expressions in parentheses (6 levels of parentheses)
)						N	Y	Y	Y						Close parentheses (conclusion of an expression in parenthesis)
Storage Operations															
S	●	●	●			Y	N	N	Y	96					Set operand to a value of “1”
R	●	●	●			Y	N	N	Y						Reset operand to a value of “0”
=	●	●	●			N	N	N	Y						The operand is assigned the value of the RLO
Read Operations															
L	IB					N	N	N	N	74					Load an input byte from the PII into ACCU 1
L	QB					N	N	N	N	73					Load an output byte from the PIQ into ACCU 1
L	IW					N	N	N	N	81					Load an input word from the PII into ACCU 1: byte n –> ACCU 1 (bit 8 to 15); byte n+1 –> ACCU 1 (bit 0 to 7)
L	QW					N	N	N	N	79					Load an output word from the PIQ into ACCU 1: byte n –> ACCU 1 (bit 8 to 15); byte n+1 –> ACCU 1 (bit 0 to 7)
L	PB					N	N	N	N	68					Load a peripheral byte of the digital/analogue inputs into ACCU 1 (bypassing the PII)
L	FY					N	N	N	N	71					Load flag byte into ACCU 1
L	FW					N	N	N	N	79					Load a flag word into ACCU 1: byte n –> ACCU 1 (bit 8 to 15); byte n+1 –> ACCU 1 (bit 0 to 7)
L	DL					N	N	N	N	79					Load a data word (left byte) from the current data block into ACCU 1
L	DR					N	N	N	N	79					Load a data word (right byte) from the current data block into ACCU 1

In−struc−tion (STL)	Operand					1 RLO dependent 2 RLO affected 3 FS dependent 4 FS affected				Execution time in µs					Function description
	I	Q	F	T	C	1	2	3	4	I	Q	F	T	C	
Load Operations (continued)															
L	DW					N	N	N	N	85					Load a data word from the current DB into ACCU 1: byte n −> ACCU 1 (bit 8 − 15); byte n+1 −> ACCU 1 (bit 0 to 7)
L	KS					N	N	N	N	71					Load a constant (2 characters in ASCII format) into ACCU 1
L	KF					N	N	N	N						Load a constant (fixed−point number) into ACCU 1
L	KH					N	N	N	N						Load a constant (hexadecimal code) into ACCU 1
L	KM					N	N	N	N						Load a constant (bit pattern) into ACCU 1
L	KY					N	N	N	N						Load a constant (2 byte number) into ACCU 1
L	KT					N	N	N	N						Load a constant (time value) into ACCU 1 (BCD coded)
L	KC					N	N	N	N						Load a constant (count) into ACCU 1
L	KB					N	N	N	N	60					Load a constant (1 byte number) into ACCU 1
L				•	•	N	N	N	N				85		Load a time value or a count (binary coded) into ACCU 1
LC				•	•	N	N	N	N				128		Load a time value or a count (BCD coded) into ACCU 1
Transfer Operations															
T	IB					N	N	N	N	66					Transfer the contents of ACCU 1 to an input byte (into the PII)
T	QB					N	N	N	N	67					Transfer the contents of ACCU 1 to an output byte (into the PIQ)
T	IW					N	N	N	N	73					Transfer the contents of ACCU 1 to an input word (into the PII): ACCU 1 (bit 8 to 15) → byte n; ACCU 1 (bit 0 to 7) → byte n+1
T	QW					N	N	N	N	73					Transfer the contents of ACCU 1 to an output word (into the PIQ): ACCU 1 (bit 8 to 15) → byte n; ACCU 1 (bit 0 to 7) → byte n+1
T	PB					N	N	N	N	70					Transfer the contents of ACCU 1 to the peripheral byte of the digital or analogue outputs
T	FY					N	N	N	N	64					Transfer the contents of ACCU 1 to a flag byte
T	FW					N	N	N	N	71					Transfer the contents of ACCU 1 to a flag byte: ACCU 1 (bit 8 to 15) → byte n; ACCU 1 (bit 0 to 7) → byte n+1
T	DL					N	N	N	N	70					Transfer the contents of ACCU 1 to a data word (left byte)
T	DR					N	N	N	N	73					Transfer the contents of ACCU 1 to a data word (right byte)
T	DW					N	N	N	N	78					Transfer the contents of ACCU 1 to a data word
LIR	Register number 0 to 15					N	N	N	N						Load register with the contents of a word in storage (addressed by ACCU 1)
TIR	Register number 0 to 15					N	N	N	N						Load the contents of a register into the word in storage (addressed by ACCU 1)

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In–struc–tion (STL)	Operand					1 RLO dependent 2 RLO affected 3 FS dependent 4 FS affected				Execution time in µs					Function description
	I	Q	F	T	C	1	2	3	4	I	Q	F	T	C	
Timing Operations															
SP				•		Y↑	N	N	Y	70					Start a time (stored in ACCU 1) as pulse (signal limiting)
SE				•		Y↑	N	N	Y	79					Start a time (stored in ACCU 1) as extended pulse (signal limiting/ extension)
SR				•		Y↑	N	N	Y	73					Start a time (stored in ACCU 1) as start delay
SS				•		Y↑	N	N	Y	73					Start a time (stored in ACCU 1) as stored start delay
SF				•		Y↑	N	N	Y	81					Start a time (stored in ACCU 1) as turn–off delay
R				•		Y	N	N	Y	79					Reset a time
Count Operations															
CU					•	Y↑	N	N	Y	73					Counter increments by 1
CD					•	Y↑	N	N	Y	73					Counter decrements by 1
S					•	Y	N	N	Y	81					Set a counter
R					•	Y	N	N	Y	81					Reset a counter
Arithmetic Operations															
+ F						N	N	N	N	70					Add two fixed–point numbers: ACCU 1 + ACCU 2 Result can be evaluated using ANZ 1 / ANZ 0
– F						N	N	N	N						Subtract two fixed–point numbers: ACCU 2 – ACCU 1 Result can be evaluated using ANZ 1 / ANZ 0
ADD BF	BF –128 to +127					N	N	N	N						Add a byte constant (fixed–point) to ACCU 1 (extended sign) ACCU 2 remains unchanged.

Comparison Instructions

! = F		N	Y	N	Y	92		Compare two fixed–point numbers for equality: If ACCU 1 = ACCU 2, then RLO = "1"
>< F		N	Y	N	Y			Compare two fixed–point numbers for inequality: If ACCU 1 ≠ ACCU 2, then RLO = "1"
> F		N	Y	N	Y			Compare two fixed–point numbers for greater than: If ACCU 2 > ACCU 1, then RLO = "1"
>= F		N	Y	N	Y			Compare two fixed–point numbers for greater than or equal: If ACCU 2 >= ACCU 1, then RLO = "1"
< F		N	Y	N	Y			Compare two fixed–point numbers for less than: If ACCU 2 < ACCU 1, then RLO = "1"
<= F		N	Y	N	Y			Compare two fixed–point numbers for less than or equal: If ACCU 2 <= ACCU 1, then RLO = "1"

In−struc−tion (STL)	Operand					1 RLO dependent 2 RLO affected 3 FS dependent 4 FS affected				Execution time in µs					Function description
	I	Q	F	T	C	1	2	3	4	I	Q	F	T	C	
Block Call Instructions															
JU	FB					N	N	N	Y						Absolute (unconditional) jump to a function block
JC	FB					Y	N	N	Y						Conditional jump to a function block
C	DB					N	N	N	N	64					Call a data block (the selected DB also stays selected outside all block limits)
Return Instructions															
BE						N	N	N	Y						End block (conclusion of a block)
BEC						Y	N	N	Y						End block conditional
BEU						N	N	N	Y						End block absolute (unconditional)
Zero Operation Instructions															
NOP 0						N	N	N	N	49					Zero Operation
NOP 1						N	N	N	N	51					Zero Operation, breakpoint in test mode
Halt Instructions															
STP						N	N	N	N						Not permitted
Image Construction Instructions															
BLD 255						N	N	N	N						End segment
Call System Functions															
JU/JC OB20															System start by user program
JU/JC OB22															Implement functions as with voltage return
JU/JC OB39															Process system flag in running cycle by system

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Supplementary Operations

In–struc–tion (STL)	Operand					1 RLO dependent 2 RLO affected 3 FS dependent 4 FS affected				Execution time in µs					Function description
	I	Q	F	T	C	1	2	3	4	I	Q	F	T	C	
Logic Operations															
AW						N	N	N	N						AND operation (on word basis) of ACCU 2 with ACCU 1; result is stored in ACCU 1; result can be evaluated using ANZ 1 / ANZ 0
OW						N	N	N	N						OR operation (on word basis) of ACCU 2 with ACCU 1; result is stored in ACCU 1; result can be evaluated using ANZ 1 / ANZ 0
XOW						N	N	N	N						Exclusive OR operation (on word basis) of ACCU 2 with ACCU 1; result is stored in ACCU 1; result can be evaluated using ANZ 1 / ANZ 0
Conversion Instructions															
CFW						N	N	N	N						Form 1's complement of ACCU 1
CSW						N	N	N	N						Form 2's complement of ACCU 1 result can be evaluated using ANZ 1 / ANZ 0
Shift Instructions															
SLW						N	N	N	N						Shift contents of ACCU 1 by 0 to 15 bits to the left. (Empty positions are filled with zeros. Result can be evaluted using ANZ 1/ANZ 0.)
SRW						N	N	N	N						Shift contents of ACCU 1 by 0 to 15 bits to the right. (Empty positions are filled with zeros. Result can be evaluted using ANZ 1/ANZ 0.)
Jump Operations															
JU=	Symbol address max. 4 characters					N	N	N	N						Absolute jump (unconditional) to symbol address
JC=	Symbol address max. 4 characters					Y	N	N	Y						Conditional jump to symbol address (if RLO = "0", the RLO will be set to "1")
JZ=	Symbol address max. 4 characters					N	N	N	N						Jump on result = "0"; will only be carried out if ANZ 1 = 0 and ANZ 0 = 0. RLO is not affected.
JN=	Symbol address max. 4 characters					N	N	N	N						Jump on result +/– "0"; will only be carried out if ANZ 1 = 1 and ANZ 0 = 0. RLO is not affected.
JP=	Symbol address max. 4 characters					N	N	N	N						Jump on result > "0"; will only be carried out if ANZ 1 =1 and ANZ 0 = 0. RLO is not affected.
JM=	Symbol address max. 4 characters					N	N	N	N						Jump on result < "0"; will only be carried out if ANZ 1 = 0 and ANZ 0 = 1. RLO is not affected.
JO=	Symbol address max. 4 characters					N	N	N	N						Jump on "overflow"; will be carried out if display OVER-FLOW is set. RLO will not be affected.
Other Instructions															
D	0 – 255					N	N	N	N						Decrement the low byte (bits 0 to 7) of ACCU 1 by the value of n (n = 0 to 255) (no carry)
I	0 – 255					N	N	N	N						Increment the low byte (bits 0 to 7) of ACCU 1 by the value of n (n = 0 to 255) (no carry)
TAK	–					N	N	N	N						Swap contents of ACCU 1 and ACCU 2
B	DW 0 to 255					N	N	N	N	100 + substituted command					Process data word; the next instruction is carried out using the operand whose value is stored in the DW
B	FW 31 to 254					N	N	N	N	100 + substituted command					Process flag word; the next instruction is carried out using the operand whose value is stored in the FW

8.6 ASCII Table for the Display

Cyrillic	Standard		
00 = А	20 =	40 = @	60 =
01 = Б	21 = !	41 = A	61 = a
02 = В	22 = ”	42 = B	62 = b
03 = Г	23 = #	43 = C	63 = c
04 = Д	24 = $	44 = D	64 = d
05 = Е	25 = %	45 = E	65 = e
06 = Ж	26 = &	46 = F	66 = f
07 = З	27 = ’	47 = G	67 = g
08 = И	28 = (	48 = H	68 = h
09 = Й	29 =)	49 = I	69 = i
0A = К	2A = *	4A = J	6A = j
0B = Л	2B = +	4B = K	6B = k
0C = М	2C = ,	4C = L	6C = l
0D = Н	2D = −	4D = M	6D = m
0E = О	2E = .	4E = N	6E = n
0F = П	2F = /	4F = O	6F = o
10 = Р	30 = 0	50 = P	70 = p
11 = С	31 = 1	51 = Q	71 = q
12 = Т	32 = 2	52 = R	72 = r
13 = У	33 = 3	53 = S	73 = s
14 = Ф	34 = 4	54 = T	74 = t
15 = Х	35 = 5	55 = U	75 = u
16 = Ц	36 = 6	56 = V	76 = v
17 = Ч	37 = 7	57 = W	77 = w
18 = Ш	38 = 8	58 = X	78 = x
19 = Щ	39 = 9	59 = Y	79 = y
1A = Ы	3A = :	5A = Z	7A = z
1B = Ъ	3B = ;	5B = [	7B = {
1C = Э	3C = <	5C = ¥	7C = |
1D = Ю	3D = =	5D =]	7D = }
1E = Я	3E = >	5E = ^	7E = −>
1F =	3F = ?	5F = _	7F =

with bit 7 set Cyrillic	Standard		
80 = А	A0 =	C0 = @	E0 =
81 = Б	A1 = !	C1 = A	E1 = a
82 = В	A2 = ”	C2 = B	E2 = b
83 = Г	A3 = #	C3 = C	E3 = c
84 = Д	A4 = $	C4 = D	E4 = d
85 = Е	A5 = %	C5 = E	E5 = e
86 = Ж	A6 = &	C6 = F	E6 = f
87 = З	A7 = ’	C7 = G	E7 = g
88 = И	A8 = (	C8 = H	E8 = h
89 = Й	A9 =)	C9 = I	E9 = i
8A = К	AA = *	CA = J	EA = j
8B = Л	AB = +	CB = K	EB = k
8C = М	AC = ,	CC = L	EC = l
8D = Н	AD = −	CD = M	ED = m
8E = О	AE = .	CE = N	EE = n
8F = П	AF = /	CF = O	EF = o
90 = Р	B0 = 0	D0 = P	F0 = p
91 = С	B1 = 1	D1 = Q	F1 = q
92 = Т	B2 = 2	D2 = R	F2 = r
93 = У	B3 = 3	D3 = S	F3 = s
94 = Ф	B4 = 4	D4 = T	F4 = t
95 = Х	B5 = 5	D5 = U	F5 = u
96 = Ц	B6 = 6	D6 = V	F6 = v
97 = Ч	B7 = 7	D7 = W	F7 = w
98 = Ш	B8 = 8	D8 = X	F8 = x
99 = Щ	B9 = 9	D9 = Y	F9 = y
9A = Ы	BA = :	DA = Z	FA = z
9B = Ъ	BB = ;	DB = [	FB = {
9C = Э	BC = <	DC = ¥	FC = |
9D = Ю	BD = =	DD =]	FD = }
9E = Я	BE = >	DE = ^	FE = −>
9F =	BF = ?	DF = _	FF =

Changes for fluorescent:

5B,DB =	[	7B,FB =	£
5C,DC =	\	7C,FC =	¥
5D,DD =	]	7D,FD =	1/2
5E,DE =	↑	7E,FE =	
5F,DF =	←	5F,DF =	_

Changes for fluorescent with Cyrillic character set:

5B,DB =	[	7B,FB =	{
5C,DC =	\	7C,FC =	|
5D,DD =	]	7D,FD =	}
5E,DE =	^	7E,FE =	~

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8.7 ASCII Table for the Keyboard

Cyrillic	Standard		Function Keys	
00 = А	20 =	40 = @	60 = function key	E0 = Switch to display mode
01 = Б	21 = !	41 = A	61 = function key	E1 = Switch on LCD illumination for one minute
02 = В	22 = ”	42 = B	62 = function key	E2 = Switch to download mode
03 = Г	23 = #	43 = C	63 = function key	E3 =
04 = Д	24 = $	44 = D	64 = function key	E4 =
05 = Е	25 = %	45 = E	65 = function key	E5 =
06 = Ж	26 = &	46 = F	66 = function key	E6 =
07 = З	27 = ’	47 = G	67 = function key	E7 =
08 = И	28 = (	48 = H	68 = function key	E8 =
09 = Й	29 =)	49 = I	69 = function key	E9 =
0A = К	2A = *	4A = J	6A = function key	EA =
0B = Л	2B = +	4B = K	6B = function key	EB =
0C = М	2C = ,	4C = L	6C = function key	EC = Cursor to next input field
0D = Н	2D = –	4D = M	6D = function key	ED = Cursor one input character to the right
0E = О	2E = .	4E = N	6E = function key	EE = Cursor one input character to the left
0F = П	2F = /	4F = O	6F = function key	EF = DUE key (terminate input)
10 = Р	30 = 0	50 = P	70 = function key	FF = no key function
11 = С	31 = 1	51 = Q	71 = function key	
12 = Т	32 = 2	52 = R	72 = function key	
13 = У	33 = 3	53 = S	73 = function key	
14 = Ф	34 = 4	54 = T	74 = function key	
15 = Х	35 = 5	55 = U	75 = function key	
16 = Ц	36 = 6	56 = V	76 = function key	
17 = Ч	37 = 7	57 = W	77 = function key	
18 = Ш	38 = 8	58 = X	78 = function key	
19 = Щ	39 = 9	59 = Y	79 = function key	
1A = Ы	3A = :	5A = Z	7A = function key	
1B = Ъ	3B = ;	5B = [	7B = function key	
1C = Э	3C = <	5C = ¥	7C = function key	
1D = Ю	3D = =	5D =]	7D = function key	
1E = Я	3E = >	5E = ^	7E = function key	
1F =	3F = ?	5F = _		

Changes for fluorescent:

5B = [
5C = \
5D =]
5E = ↑
5F = ↓

Changes for fluorescent with Cyrillic character set:

5B = [
5C = \
5D =]
5E = ^
5F = _

8.8 Example of Programming the System FB

FB 1

```
SEGMENT 1         0000
NAME :AUS

0005      :AN  F    1.0                    RETURN OF VOLTAGE?
0006      :JC =ANF
0007      :R   F    1.0                    VOLTAGE PRESENT AND
0008      :R   F    1.1                    MEMORY IS DELETED
                              cf. DB 2
0009      :JU FB   6
000A NAME :COPY
000B QUEL :    KY 2,1                      SOURCE DATA BLOCK, DATA WORD
000C ZIEL :    KY 1,11                     DESTINATION DATA BLOCK = SYSDB
000D ANZ  :    KY 0,60                     START OF DATA DL = 0
000E      :                                            DR = 1
000F      :                                LENGTH OF DATA TO BE COPIED

0010      :C   DB   1
0011      :L   KY 3,1                      LOAD INDICATION
0013      :T   DW   9                      DISPLAY OUTPUT SYSDB
0014      :L   KF  +40                     LENGTH OF DISPLAY OUTPUT
0015      :T   DW  10
0016      :S   F   10.0                    ENABLE KEYBOARD
0017      :S   F   11.0                    ENABLE DISPLAY
0018 ANF  :
                              cf. DB 11
0019      :JC FB   2
001A NAME :ASCII−DU
001B QUEL :    KY 11,1                     SOURCE      DATA BLOCK, DATA WORD
001C ZIEL :    KY 11,25                    DESTINATION DATA BLOCK, DATA WORD
001D ANZ  :    KY 0,5                      START OF THE DATA DL = 0
001E      :                                            DR = 1,
001F      :                                LENGTH OF THE DATA TO BE RECODED
                              cf. DB 12
0020      :
0021      :JC FB   3
0022 NAME :DU−ASCII
0023 QUEL :    KY 12,1                     SOURCE      DATA BLOCK, DATA WORD
0024 ZIEL :    KY 12,25                    DESTINATION DATA BLOCK, DATA WORD
0025 ANZ  :    KY 0,5                      START OF THE DATA DL = 0
0026      :                                            DR = 1
0027      :                                LENGTH OF THE DATA TO BE RECODED

0028      :
0029      :A  F  100.0                     AUXILIARY FLAG
002A      :JC FB   9                       DISPLAY INPUT WITH FB4 AND FB5
002B NAME :EINGABE
002C      :
002D      :
002E      :L   FY  25
002F      :L   KH 0060                     HEX VALUE FOR FUNCTION KEY 1
0031      :><F
0032      :JC =ENDE
0033      :S   F  100.0                    AUXILIARY FLAG
0034      :
0035      :
0036 ENDE :L   KH 0000                     KEYBOARD IMAGE
0038      :T   FY  25                      DELETION − SEE CHAP. 3.3.2.18
0039      :
003A      :
003B      :BE
```

Programming of FB 2, FB 3 and FB 6 by the User

The user must program this FB as a dummy FB in his/her block directory on the PG, and then transfer it to the ES 030-K. The dummy FB only consists of a block header and the BE command.

Example:

```
FB2
NAME      : ASCII−DU
BEZ       : I/Q/D/B/T/C:D  KM/KH/KY/KS/KF/KT/KC/KG:KY
BEZ       ; I/Q/D/B/T/C:D  KM/KH/KY/KS/KF/KT/KC/KG:KY
BEZ       ; I/Q/D/B/T/C:D  KM/KH/KY/KS/KF/KT/KC/KG:KY
BE
```


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FB 9

```
SEGMENT 1         0000
NAME :EINGABE                              TEXT INPUT FB

0005      :AN  F  101.0                    DISPLAY ENABLE
0006      :JC =M001
0007      :JU =M002
0008 M001 :
0009      :L   FY   9
000A      :C   DB   1
000B      :T   DW 200
000C      :L   KY 3,21
000E      :T   DW   9                      LOAD INDICATION
000F      :JU FB   4
0010 NAME :SET7                            DEFINE INPUT FIELDS
0011 QUEL :    KY 3,31                     SOURCE DATA BLOCK, DATA WORD
0012 ANZ  :    KY 0,20                     START OF DATA DL = 0
0013      :                                            DR = 1
0014      :                                NUMBER OF ENABLED FIELDS
0015      :                                IN DISPLAY
0016      :
0017      :S   F   11.0                    DISPLAY ENABLE
0018      :S   F  101.0                    AUXILIARY FLAG
0019 M002 :
001A      :AN  F  101.1
001B      :JC =M003                        KEYBOARD ENABLE
001C      :JU =M004
001D M003 :
001E      :JU FB   6
001F NAME :COPY                            ALPHANUMERIC KEYBOARD
0020 QUEL :    KY 2,31                     SOURCE DATA BLOCK, DATA WORD
0021 ZIEL :    KY 1,11                     DESTINATION DATA BLOCK SYSDB
0022 ANZ  :    KY 0,60                     START OF DATA DL = 0
0023      :                                            DR = 1
0024      :                                LENGTH OF THE DATA TO BE COPIED
0025      :                                IN BYTES
0026      :
0027      :S   F   10.0                    KEYBOARD ENABLE
0028      :S   F  101.1                    AUXILIARY FLAG
0029 M004 :
002A      :L   FY  25
002B      :L   KH 0060                     SCAN DUE
002D      :><F
002E      :JC =ENDE
002F      :
0030      :JU FB   6
0031 NAME :COPY                            LOAD FUNCTION KEYS
0032 QUEL :    KY 2,1                      SOURCE DATA BLOCK, DATA WORD
0033 ZIEL :    KY 1,11                     DESTINATION DATA BLOCK SYSDB
0034 ANZ  :    KY 0,60                     START OF DATA DL = 0
0035      :                                            DR = 1
0036      :                                LENGTH OF THE DATA TO BE COPIED
0037      :                                IN BYTES
0038      :
0039      :JU FB   5                       DELETE INDICATION FIELDS
003A NAME :LOE7                            ACCEPT INDICATION
003B QUEL :    KY 3,31                     SOURCE DATA BLOCK, DATA WORD
003C ANZ  :    KY 0,20                     LENGTH OF THE INPUT FIELDS TO
003D      :                                BE DISABLED
003E      :
003F      :L   KH 0000
0041      :T   FW 100                      DELETE AUXILIARY FLAG
0042      :L   KY 3,1                      DELETE SELECTION
0044      :T   DW   9                      LOAD DISPLAY
0045      :S   F   11.0                    DISPLAY ENABLE
0046 ENDE :
0047      :L   KH 0000                     DELETE
0049      :T   FY  25                      ENTERED KEY
004A      :BE
```

DB2

```
DATA BLOCK FOR  FUNCTION KEYS FOR USER PARAMETERISATION
                FUNCTION KEYS IN DISPLAY MODE
                FUNCTION KEYS FOR ALPHANUMERIC INPUTS

EITHER DL = USER FUNCTION KEYS
OR     DR = SYSTEM FUNCTION KEYS
IS LOADED DEPENDING ON THE KEY-OPERATED SWITCH.

THE ALPHANUMERIC VALUES FOR THE USER ARE TRANSFERRED BY RECOPYING
STARTING AT DATA WORD 31.
EITHER DL = LETTERS
OR     DR = NUMBERS
IS LOADED DEPENDING ON THE KEY-OPERATED SWITCH.
     0:     KH = 0000;                      KEYBOARD DATA BLOCK
     1:     KH = 60E0;                      FUNCTION KEY  1/TEST MODE
     2:     KH = 65E2;                      FUNCTION KEY  6
     3:     KH = 6A00;                      FUNCTION KEY 11
     4:     KH = 6F00;                      FUNCTION KEY 16
     5:     KH = 7400;                      FUNCTION KEY 21
     6:     KH = E000;                      FUNCTION KEY 26/USER TEST
     7:     KH = 6100;                      FUNCTION KEY  2
     8:     KH = 6600;                      FUNCTION KEY  7
     9:     KH = 6B00;                      FUNCTION KEY 12
    10:     KH = 7000;                      FUNCTION KEY 17
    11:     KH = 7500;                      FUNCTION KEY 22
    12:     KH = E200;                      FUNCTION KEY 27/USER DOWNLOAD
    13:     KH = 6200;                      FUNCTION KEY  3
    14:     KH = 6700;                      FUNCTION KEY  8
    15:     KH = 6C00;                      FUNCTION KEY 13
    16:     KH = 7100;                      FUNCTION KEY 18
    17:     KH = 7600;                      FUNCTION KEY 23
    18:     KH = 7B00;                      FUNCTION KEY 28
    19:     KH = 6300;                      FUNCTION KEY  4
    20:     KH = 6800;                      FUNCTION KEY  9
    21:     KH = 6D00;                      FUNCTION KEY 14
    22:     KH = 7200;                      FUNCTION KEY 19
    23:     KH = 7700;                      FUNCTION KEY 24
    24:     KH = 7C00;                      FUNCTION KEY 29
    25:     KH = 6400;                      FUNCTION KEY  5
    26:     KH = 6900;                      FUNCTION KEY 10
    27:     KH = 6E00;                      FUNCTION KEY 15
    28:     KH = 7300;                      FUNCTION KEY 20
    29:     KH = 7800;                      FUNCTION KEY 25
    30:     KH = 7D00;                      FUNCTION KEY 30
    31:     KH = 41E0;                      A/TEST MODE             FK  1
    32:     KH = 46E2;                      F/DOWNLOAD OPERATION    FK  6
    33:     C  ='K7';                       K/7                     FK 11
    34:     KS ='P4';                       P/4                     FK 16
    35:     C  ='U1';                       U/1                     FK 21
    36:     KH = 5A00;                      Z/BLANK                 FK 26
    37:     C  ='B ';                       B/BLANK                 FK  2
    38:     KS ='G ';                       G/BLANK                 FK  7
    39:     C  ='L8';                       L/8                     FK 12
    40:     KS ='Q5';                       Q/5                     FK 17
    41:     C  ='V2';                       V/2                     FK 22
    42:     KS =' 0';                       BLANK/0                 FK 27
    43:     C  ='C ';                       C/BLANK                 FK  3
    44:     KS ='H ';                       H/BLANK                 FK  8
    45:     C  ='M9';                       M/9                     FK 13
    46:     KS ='R6';                       R/6                     FK 18
    47:     C  ='W3';                       W/3                     FK 23
    48:     KH = 0000;                      RETURN TO MAIN MENU KEY FK 28
    49:     C  ='D ';                       D/BLANK                 FK  4
    50:     KS ='I ';                       I/BLANK                 FK  9
    51:     C  ='N ';                       N/BLANK                 FK 14
    52:     KS ='S ';                       S/BLANK                 FK 19
    53:     C  ='X ';                       X/BLANK                 FK 24
    54:     KH = 6060;                      DUE FUNCTION            FK 29
    55:     C  ='E ';                       E/BLANK                 FK  5
    56:     KS ='J ';                       J/BLANK                 FK 10
    57:     C  ='O ';                       O/BLANK                 FK 15
    58:     KH = 54EE;                      T/CURSOR LEFT           FK 20
    59:     KH = 59ED;                      Y/CURSOR RIGHT          FK 25
    60:     KS ='  ';                       BLANK/BLANK             FK 30
    61:
```


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DR 11 = E0 DL 11 = 60 **FK 1**	DR 17 = 00 DL 17 = 61 **FK 2**	DR 23 = 00 DL 23 = 62 **FK 3**	DR 29 = 00 DL 29 = 63 **FK 4**	DR 35 = 00 DL 35 = 64 **FK 5**
DR 12 = E2 DL 12 = 65 **FK 6**	DR 18 = 00 DL 18 = 66 **FK 7**	DR 24 = 00 DL 24 = 67 **FK 8**	DR 30 = 00 DL 30 = 68 **FK 9**	DR 36= 00 DL 36 = 69 **FK 10**
DR 13 = 00 DL 13 = 6A **FK 11**	DR 19 = 00 DL 19 = 6B **FK 12**	DR 25 = 00 DL 25 = 6C **FK 13**	DR 31 = 00 DL 31 = 6D **FK 14**	DR 37= 00 DL 37 = 6E **FK 15**
DR 14 = 00 DL 14 = 6F **FK 16**	DR 20 = 00 DL 20 = 70 **FK 17**	DR 26 = 00 DL 26 = 71 **FK 18**	DR 32 = 00 DL 32 = 72 **FK 19**	DR 38= 00 DL 38 = 73 **FK 20**
DR 15 = 00 DL 15 = 74 **FK 21**	DR 21 = 00 DL 21 = 75 **FK 22**	DR 27 = 00 DL 27 = 76 **FK 23**	DR 33 = 00 DL 33 = 77 **FK 24**	DR 39= 00 DL 39 = 78 **FK 25**
DR 16 = 00 DL 16 = E0 **FK 26**	DR 22 = 00 DL 22 = E2 **FK 27**	DR 28 = 00 DL 28 = 7B **FK 28**	DR 34 = 00 DL 34 = 7C **FK 29**	DR 40= 00 DL 40 = 7D **FK 30**

DR = System function key
DL = User function key
FK = Function key

All values specified in hexadecimal

Keyboard Assignment in Accordance with DB 2

DB3

```
  0:    KH = 0000;                        INDICATION DATA BLOCK
  1:    KS ='TEST PROGRAM OF ALL ';
 11:    C  ='OPTIONS OF ES030-K  ';
 21:    KS ='    TEXT INPUT      ';
 31:    C  ='--------------------';
 41:    KS ='MOBY-M COMD  :1=READ';
 51:    C  ='2=WRT  3=DEL  4=READ';
 61:    KS ='MOBY-I COMD: 1=READ ';
 71:    C  ='2=WRT  3=DEL 4=READ ';
 81:    KS ='MOBY=L COMD: 1=READ ';
 91:    C  ='2=WRT  3=DEL 4=READ ';
101:    KS ='READ----------------';
111:    C  ='--------------------';
121:    KS ='WRITE---------------';
131:    C  ='--------------------';
141:    KS ='DELETE--------------';
151:    C  ='--------------------';
161:    KS ='RESET---------------';
171:    C  ='--------------------';
181:    KS ='-------ERROR--------';
191:    C  ='-------FINISHED-----';
201:    KS ='SERIAL INTERFACE    ';
211:    C  ='--------------------';
221:    KS ='SERIAL EXPAN. IF    ';
231:    C  ='--------------------';
241:
```

DB11

```
  0:    KH = 0000;
  1:    KH = 3132;                        ASCII 1/2
  2:    KH = 3334;                        ASCII 3/4
  3:    KH = 3520;                        ASCII 5/BLANK
  4:    KH = 0000;
  5:    KH = 0000;
  :
  :
  :
 23:    KH = 0000;
 24:    KH = 0000;
 25:    KF = +12345;                      CONVERTED BINARY NUMBER
 26:    KH = 0000;
 27:    KH = 0000;
 28:
```

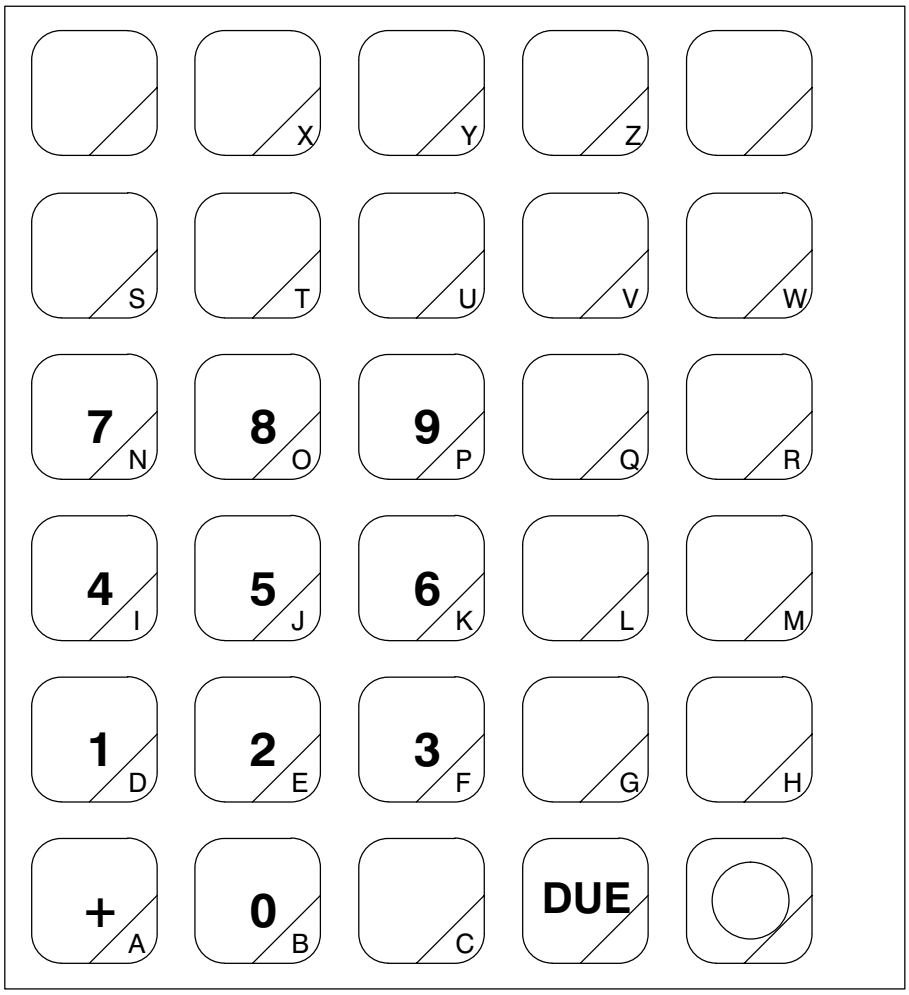
```
DB12
     0:     KH = 0000;
     1:     KF = +12345;                    FIXED PT NUMBER
     2:     KH = 0000;
     3:     KH = 0000;
     4:     KH = 0000;
     5:     KH = 0000;
     :
     :
     :
    23:     KH = 0000;
    24:     KH = 0000;
    25:     KH = 3132;                      CONVERTED ASCII − VALUE
    26:     KH = 3334;
    27:     KH = 3500;
    28:
```

8.9 Example of Keyboard Labels

The following figure (scale 1:1) can be copied to a transparency and:

a) For the sealed keyboard:
Cut out the figure (size: 119 mm x 130 mm), and insert from right to left in the side slit of the keyboard.

b) For the illuminated keys:
Cut out the individual keys, and place each on the desired illuminated key together with the transparent covering included.



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9 ESCOPY

9.1 General

The program ESCOPY, executable under MS–DOS, makes communication with the Acquisition Station ES 030 ("download operation") possible using the computers V.24 interface (COM1/COM2). Using the PCOPY program, the ES 030 user program, which was written under PCP/M in the STEP5 programming language using a programmer (PG), must first be copied from the PCP/M partition to MS–DOS. If the STEP5 program was already written under MS–DOS, the copying onto the MS–DOS partition with the PCOPY program is not required.

9.1.1 Hardware Requirements

- IBM compatible computer (PC, AT, PG 750, PG 730) with a minimum of 640 Kbytes of main memory
- V.24 interface (port 1/2)
- ES 030
- Connection cable between the ES 030 and the computer's V.24 port

Note: A VGA card with an appropriate screen is required for **dialogue operation**. For dialogue operation on the PG 730, the monochrome mode must be switched on using the MS–DOS command "mode mono".

9.1.2 Software Requirements

- Operating system MS–DOS 3.xx and higher

The following files are contained on the shipped diskettes:

ESCOPY.EXE	Program for communication between the ES 030 and the PC
PCOPY.EXE	Used to transfer S5 files from the PCP/M partition to MS–DOS

These programs must be copied from the diskette into a subdirectory that is to be created on the hard disk drive (e.g., C:\ES). In the AUTOEXEC.BAT file, the search path must be appended accordingly with PATH C:\ES.

Caution: The program ESCOPY installs its own serial interface procedure (3964R) with the appropriate parameters. The existing initialisation of the serial interface will not be saved.

The connection cable between the PG/PC and the ES 030, as well as the diskettes containing the corresponding programs, are shipped under the order number 6AW5451–8AU.

9.2 Functions

ESCOPY transfers a STEP5 file (S5 file) to the ES 030 via a serial interface (COM1 or COM2). The transferred user program is stored in the ES 030 user memory (EEPROM).

Further functions of ESCOPY

- parameterize serial interface
- read the complete contents of the ES 030 user memory and store it in an MS–DOS file (memory copy).
- read the ES 030 bookkeeper
- erase the ES 030 user memory
- read a data block from the ES 030 and display it on the screen. (This function is valid only if "download operation" has been selected using the function key. Also see the following "Remember" note).
- Reset ES 030 and start user program.

Remember:

Before communication commences, the ES 030 must be switched to the "download" operational mode:

a) System start:
   1. Set key switch to horizontal position.
   2. Press key "U" *) while switching on the mains voltage. Release key "U".
   3. Press key "DUE" *). The ES 030 is now in the test mode.
   4. The "download" operation is switched on by selecting key "0" *).

b) Function keys
   The ES 030 function keys can also be used to select the "download" operational mode. For these function keys, the value E2H must be stored in DB1 of the keyboard code (DW11 – 40). After pressing the "Download function key", the ES 030 will immediately be in the "download" mode of operation. The "download" ready indication appears on the display.

   *) For the keyboard assignment, see Chapter 6.2.1

9.3 Using ESCOPY

Two modes of operation are available to the ESCOPY user:

- **batch call**
- **dialogue operation**

9.3.1 Batch Call

Table: Batch Call of PCOPY

Using PCOPY, a newly created, modified, or appended STEP5 file must first be copied from the PCP/M partition to MS−DOS (only required if the STEP5 file was written under PCP/M).

Call: PCOPY (n) (LW) : (file name.s5d)

- File name, corresponding to S5 convention
- PCP/M drive (A, B, or C)
- User area under PCP/M

Example: PCOPY 6C: ES@@@@ST.S5D

This PCOPY call transfers the S5 file “ES@@@@ST.S5D” from the PCP/M partition (user = 6 of hard disk drive C) to the current MS−DOS directory.

Table: Batch Call of ESCOPY

	Serial interface 1 = COM1 2 = COM2	Commands	File Name	Comment
ESCOPY	**1** or **2**	**0**	**S5 file name** *)	Transfer of the S5 file located in MS−DOS to the ES 030 using the selected interface
ESCOPY	**1** or **2**	**1**	**MS−DOS file name** *)	Read ES 030 user memory and store in an MS−DOS file
ESCOPY	**1** or **2**	**2**		Request bookkeeper of all blocks in the ES 030
ESCOPY	**1** or **2**	**3**		Erase ES 030 user memory
ESCOPY	**1** or **2**	**4**	**DB number**	Read data block from the ES 030 RAM
ESCOPY	**1** or **2**	**F**		Reset the ES 030 and start the user program

*) The complete path name (including drive) can be specified in the **batch mode**.
When specifying a drive (A: or B:), ensure that drive is ready (insert diskette).

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Detailed Description of the Batch Calls

ESCOPY 1 0 ES@@@@ST.S5D
The ES 030 user memory will be erased completely. ESCOPY transfers the file ES@@@@ST.S5D from the current MS–DOS directory via COM1 to the ES 030.

ESCOPY 1 1 DATEN.DAT
ESCOPY reads the ES 030 user memory via COM1 and stores the contents in the file DATEN.DAT in the current MS–DOS directory. Editing the data using the STEP5 programming package is not possible.

ESCOPY 1 2
ESCOPY reads the bookkeeper of the ES 030 user program via COM1 and displays it on the screen. The screen output has the following format:
ADDRESS BLOCK TYPE NUMBER LENGTH

ESCOPY 1 3
ESCOPY erases the complete ES 030 user memory

ESCOPY 1 4 20
ESCOPY reads the specified data block (DB20 in this case) out of the **ES 030 RAM** and displays it on the screen. Only data blocks DB1 to DB119 can be read and displayed. The screen display will be in KH (hexadecimal), KS (character), and KF (fixed–point number).

Remember: The displayed data block is valid only if "download" operation has been selected using the function key E2H (see also Chapter 9.2).

ESCOPY 1 F
ESCOPY resets the ES 030 and starts the user program.

All ESCOPY batch calls can, of course, be combined into a program in an MS–DOS batch file.

Example of an MS–DOS Batch File TRANSMIT.BAT
Creation of an S5 file MOBY@@ST.S5D in STEP5. This file is to be stored on drive A under User=5.

TRANSMIT.BAT

PCOPY 5A: MOBY@@ST.S5D
(Transferring the S5 block from drive A, User=5 to the current MS–DOS directory)

ESCOPY 1 0 MOBY@@ST.S5D
(Transferring the S5 file via COM1 to the ES 030)

ESCOPY 1 2
(Read ES 030 bookkeeper via COM1)

ESCOPY 1 F
(Resetting the ES 030 via COM1 and starting the user program MOBY@@ST.S5D. The ES 030 performs a system start.)

9.3.2 Dialogue Operation

The input ESCOPY <RET> calls up the dialogue operation. A mask will appear on the PC screen. Using the arrow keys "↑↓", individual functions can be selected.

INTERFACE

Move the selection window to "INTERFACE" and press the <RET> enter key. This function will select the serial interface COM1 or COM2. Via the selected interface, the user must connect the ES 030 with the computer (V.24 cable).

By entering "1" for COM1 or "2" for COM2, the corresponding interface will be selected. If an illegal interface number is entered, an error message will be generated.

The current selection will stay valid for the whole session. The default selection upon switching on the computer is COM1 (if the file ESCOPY.BUP does not exist, also see Chapter 9.4).

Note: The selected interface will be displayed in the lower right corner of the screen.

COPYING TO THE ES 030

Move the selection window to "COPY TO THE ES 030" and enter <RET>.
This function serves to transfer an S5 file stored under MS–DOS to the ES 030. The ES 030 user memory will be completely erased prior to this.
The corresponding S5 file may already be stored under MS–DOS, or it may have to be copied from the PCP/M partition into the MS–DOS working directory.

Computer prompt:

S5 file already under DOS (y/n)?

– After entering "y", the computer will ask for the respective file name. Enter the file name and press <RET>. ESCOPY will automatically add the PCP/M extension "ST.S5D" to the file name and transfer the file via the selected interface to the ES 030. If the specified S5 file does not exist in the current working directory, an error message will be generated.

Note: The S5 file **must** be stored in the MS–DOS working directory. **No drive specifications or path specifications are allowed.**

– By entering "n", ESCOPY will open a window and ask for
  – the user area (0 ... 15) of the respective S5 file under PCP/M
  – the drive number of the S5 file under PCP/M. The user must ensure that a diskette is in the drive that has been selected.
  – the S5 file name. The file name will have, corresponding to STEP5 convention, the PCP/M extension "ST.S5D" added.

With the help of the parameters that the computer has asked for, ESCOPY will now call up PCOPY as Child process, and copy the specified file from the PCP/M partition into the working directory under MS–DOS. A file under MS–DOS which already has the same name, will be re–named and given the extension ".OLD" (backup). An error message will be generated if the specified file does not exist in the working directory under MS–DOS after PCOPY has been executed. The user should again make sure that the parameters entered are correct.
On an error–free execution of the PCOPY call, ESCOPY will transfer the parameterized file via the selected interface to the ES 030.

DATA BLOCKS

Move the selection window to “DATA BLOCKS” and press <RET>. This function serves to read data blocks from the **ES 030 RAM**. ESCOPY must be told which data module is to be read and displayed. The screen display will be in KH (hexadecimal), KC (character), and KF (fixed−point number).

Note: Only data blocks DB1 to DB119 can be read and displayed.

Caution: The displayed data block is valid only if download operation has been selected using the function key E2H (see also Chapter 9.2).

READ BOOKKEEPER

Move the selection window to “READ BOOKKEEPER” and press <RET>.
This function will display all blocks which are currently in the ES 030 user memory. The display on the screen will have the following format:
ADDRESS BLOCK TYPE NUMBER LENGTH

ERASE ES 030

Move the selection window to “ERASE ES 030” and press <RET>. This function will erase the complete contents of the ES 030 user memory.

RESET/CANCEL

Move the selection window to “RESET/CANCEL” and press <RET>.
This function will reset the program counter of the ES 030 and start the user program stored in the ES 030. A system start will be carried out.

Note: After starting the user program with “RESET/CANCEL”, the ES 030 will no longer be in the “download” mode of operation.

9.4 Use

Entering the command (e.g., ESCOPY 1 2) and pressing the RETURN key will start the commands in **batch operation** (see also Chapter 9.3.1).
Selecting the commands in the **dialogue mode of operation** is carried out by moving the selection window to the corresponding function and pressing the RETURN key. The message “Command started −−>” indicates that the command has been started. If the command has been carried out with no errors, the message “Done!” will appear. The user can issue the next command. In case of an error, the message “Error!” will appear. A detailed error message in form of a blinking text will be displayed at the bottom of the screen. The error must be acknowledged with the <F5> function key. After the cause of the error has been determined, the command can be issued again.

The function key <F6> is used to store the status of the current session (interface number, file number, and data block number). The status will be stored in the file ESCOPY.BUP in the current directory.
The values stored in the file ESCOPY.BUP will be used as default when ESCOPY is called up in the **dialogue mode of operation**.

Pressing the function key <F8> will terminate the dialogue mode of operation of ESCOPY.

9.5 Downloading

<table>
<tr><th>ES 030−K with keyboard and display</th><th>ES 030−K without keyboard and display</th></tr>
<tr><td colspan="2">Disconnect the ES 0303-K from the power supply.</td></tr>
<tr><td colspan="2">Disconnect the serial interface from connector 1.</td></tr>
<tr><td colspan="2">Connect download cable with level converter with connector 1.</td></tr>
<tr><td>Key-operated switch horizontal</td><td rowspan="4">Power on</td></tr>
<tr><td>Press “U” key and power on</td></tr>
<tr><td>Press “DUE” key.</td></tr>
<tr><td>Press “O” key.</td></tr>
<tr><td colspan="2">Transfer program with ESCOPY.</td></tr>
<tr><td colspan="2">Perform RESET command with ESCOPY (“F” command).</td></tr>
<tr><td colspan="2">Disconnect ES 030-K from power supply.</td></tr>
<tr><td colspan="2">Important: Be sure to disconnect the download cable.</td></tr>
<tr><td colspan="2">Connect the user cable to the serial interface (connector 1).</td></tr>
<tr><td colspan="2">Turn on power supply.</td></tr>
<tr><td colspan="2">The new user program is operational.</td></tr>
</table>

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9.6 Error Messages

The error messages listed here are those that require a detailed explanation. All other errors are obvious and can easily be corrected.

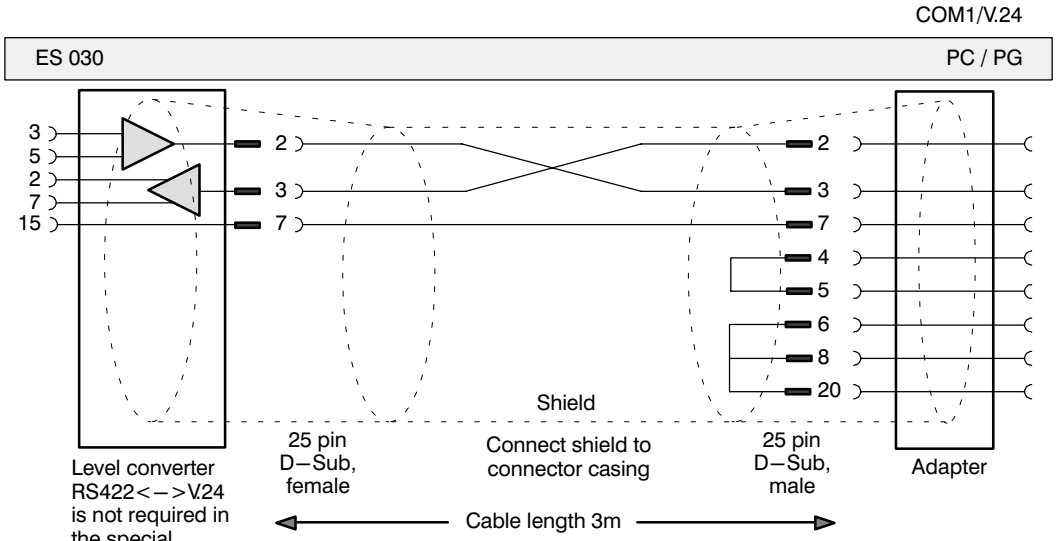
Messages	Cause
The received telegram does not make sense!	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
File cannot be opened for writing. Check path!	The contents of the ES 030 user memory have been read, cannot be written into the indicated file, however. I.e.: – the declared path (subdirectory) does not exist – The drive is not ready (no diskette in drive) – illegal character contained in the file name
The indicated file is not an S5 file!	The file to be transferred is not an S5 file. The S5 file stored under MS–DOS is not an S5 file, has unintentionally been modified, or the program PCOPY does not function properly.
Receiving error on the 3964R driver!	There is interference in the communication between the PG/PC and the ES 030 or the communication cannot be established. Switch off the ES 030 and set to download mode of operation again.
The ES 030 indicates: <Receiving Error!>	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
The ES 030 indicates: <EEPROM programming/erase error>	The S5 file transferred contains too many blocks (not enough ES 030 memory or the user program is too long) or the EEPROM is defective.
The ES 030 indicates: <No S5 block in user memory!>	No S5 blocks exist in the ES 030 (user memory is empty/has been erased).
The ES 030 indicates: <Unknown command!>	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
Error while writing to file!	The contents of the ES 030 user memory have been read, cannot be written into the indicated file, however. I.e.: – the declared path (subdirectory) does not exist – The drive is not ready (no diskette in drive) – illegal character contained in the file name
Error during PCP/M to DOS conversion. Check file name or parameters!	The PCOPY call has been terminated in dialogue operation but the designated file has not been copied from PCP/M to MS–DOS. I.e.: – the declared file name is incorrect – the file does not exist under this user or drive under PCP/M – the file could not be copied because there is no PCP/M diskette in the drive or the diskette is not formatted for PCP/M – no PCP/M partition exists on the hard disk or on the diskette
Error in the initialisation string!	The serial interface of the PG/PC cannot be initialised. It is not an IBM compatible computer or the interface component is defective.
Timeout during transmit. Check partner device!	There is interference in the communication between the PG/PC and the ES 030 or the communication cannot be established. Switch off the ES 030 and set to download mode of operation again.
Driver error. File cannot be found. Not an S5 file!	The file to be transferred is not an S5 file. The S5 file stored under MS–DOS is not an S5 file, has unintentionally been modified, or the program PCOPY does not function properly.

Messages	Cause
Driver error. Error while reading file. Not an S5 file!	The file to be transferred is not an S5 file. The S5 file stored under MS−DOS is not an S5 file, has unintentionally been modified, or the program PCOPY does not function properly.
Driver error. Heap too small. Function terminated! Not an S5 file!	The file to be transferred is not an S5 file. The S5 file stored under MS−DOS is not an S5 file, has unintentionally been modified, or the program PCOPY does not function properly.
Driver error. Stack depth has been exceeded. Not an S5 file!	The file to be transferred is not an S5 file. The S5 file stored under MS−DOS is not an S5 file, has unintentionally been modified, or the program PCOPY does not function properly.
Acknowledge telegram is too long!	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
Unknown command!	The command declared in the batch call does not exist. See table in Chapter 9.3.1
Unknown S5 block has been transferred!	The block transferred was not a program/function/data or organisation block (no PB/FB/DB or OB).
Invalid command in acknowledge during receipt!	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
Invalid acknowledge during receipt!	A serious error has occurred in the telegram traffic. Switch off the ES 030 and set to download mode of operation again.
Illegal character in the file name. **Illegal file name/drive!**	The given filename may not contain drive declarations (character ":" is not allowed in a file name)
Connection has not been established. Check interface or cables!	The communications link between PG/PC and the ES 030 cannot be established. I.e.: – the ES 030 is not/is no longer in the download mode of operation – the wrong interface was parameterized – there is an error in the connecting cable – there is an error in interface block of the PG/PC or the computer is not IBM compatible

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9.7 Cabling

The technical description of the ES 030 and the description of the PG/PC interface must be observed when fabricating the cable.



ES 030 25 pin female pin assignment	**Signal**	**Cable LIYCY 5*0,14**	PG/PC 25 pin male pin assignment
2	TxD	wth	3
3	RxD	brn	2
			jumper 4,5
7	GND	grn	7
			jumper 6,8,20
casing	shield		casing

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10 Warnings

English

Warning

Hazardous voltages are present in this equipment during operation.

To ensure safe operation of the equipment, maintenance shall only be performed by qualified personnel in accordance with the instructions in the MOBY catalog[1] and technical description.

Failure to observe these instructions can result in death, severe personal injury or substantial damage to property.

The following instructions and those on all product labels must be followed when carrying out any maintenance work.

- Always disconnect and earth the equipment before starting any maintenance.
- Use only spare parts authorized by the manufacturer.
- The servicing intervals as well as the instructions for repair and replacement shall be duly observed.
- A lithium battery is contained in mobile data memories with RAM. The following instructions must be observed:

  To avoid the risk of fire, explosion and severe burns, the battery should not be recharged, dismantled, exposed to heat over 100 degrees Celsius, ignited, or brought into contact with water.

The special instructions must be followed when using heat-resistant data storage media.

1 Should you not be in possession of the MOBY catalog, it can be obtained through your local Siemens office.

Deutsch

Warnung

Beim Betrieb elektrischer Geräte stehen zwangsläufig bestimmte Teile dieser Geräte unter gefährlicher Spannung.

Sicherer Betrieb der Geräte setzt voraus, daß diese von qualifiziertem Personal sachgemäß unter Beachtung der im MOBY-Katalog[1] und der technischen Beschreibung enthaltenen Hinweise eingesetzt werden.

Bei Nichtbeachtung können Tod, schwere Körperverletzung oder erheblicher Sachschaden die Folge sein.

Beachten Sie daher auch bei Instandhaltungsmaßnahmen an diesem Gerät alle hier und auf dem Produkt selbst aufgeführten Hinweise.

- Vor Beginn jeglicher Arbeiten ist das Gerät vom Netz zu trennen und zu erden.
- Es dürfen nur vom Hersteller zugelassene Ersatzteile verwendet werden.
- Die vorgeschriebenen Wartungsintervalle sowie die Anweisungen für Reparatur und Austausch sind unbedingt einzuhalten.
- Bei einem mobilen Datenspeicher mit RAM ist eine Lithiumbatterie integriert, hierzu sind folgende Hinweise zu beachten:

  Vermeiden Sie das Risiko von Feuer, Explosionen und schweren Verbrennungen. Die Batterie darf nicht nachgeladen, auseinandergebaut, über 100° Celsius erwärmt, entzündet oder ihr Inhalt mit Wasser in Berührung gebracht werden.

Beim hitzefesten Datenträger sind die besonderen Hinweise zu berücksichtigen.

1 Sollten Sie nicht im Besitz des MOBY-Katalogs sein, so kann er über jede örtliche SIEMENS-Niederlassung bestellt werden.

Français

Attention

Le fonctionnement d'un équipement électrique implique nécessairement la présence de tensions dangereuses sur certaines de ses parties.

L'exploitation sûre de cet équipement implique qu'il soit mis en oeuvre de façon adéquate par des personnes qualifiées, en respectant les consignes de sécurité figurant au catalogue MOBY[1] et aux descriptions techniques.

Le non-respect des consignes de sécurité peut conduire à la mort, à des lésions corporelles graves ou à un dommage matériel important.

Ne procéder à l'entretien que dans le plus grand respect des règles de sécurité énoncées ici ou figurant sur le produit.

- Avant toute intervention, mettre l'appareil hors tension et à la terre.
- N'utiliser que des pièces de rechange autorisées.
- Respecter la périodicité d'entretien et les instructions de réparation et de remplacement.
- Les mémoires embarquées (RAM) sont équipées d'une pile au lithium.

  Ne pas exposer la pile au feu, danger d'explosion et de lésions graves. La pile ne doit pas être rechargée, ouverte exposée à des températures supérieures à 100˚ C ou exposée au feu. Son contenu ne doit pas entrer en contact avec de l'eau.

En ce qui concerne les supports de données résistants à la chaleur, respecter les consignes spécifiques.

1 Si vous ne disposez pas ou du catalogue MOBY, ce peuvent être commandés auprès de votre agence SIEMENS.

Italiano

Pericolo

Durante il funzionamento di apparecchi elettrici, determinate parti di tali apparecchi si trovano inevitabilmente sotto tensione pericolosa.

Per un funzionamento sicuro di questi apparecchi è necessario che essi vengano adoperati, nel modo opportuno, solo da personale qualificato, che osservi le indicazioni contenute nel catalogo[1] per gli apparecchi MOBY e nella descrizione tecnica.

In caso di non osservanza si possono verificare la morte, gravi lesioni alle persone o notevoli vanni alle cose.

Per questo motivo è necessario che le avvertenze riportate qui e sul prodotto stesso vengano rispettate anche nel caso di misure di manutenzione degli apparecchi.

- Prima di iniziare qualsiasi lavoro è necessario staccare l'apparecchio dalla rete ed effettuare una messa a terra.
- Possono essere utilizzati solo pezzi di ricambio prodotti dal costruttore.
- E'assolutamente necessario rispettare i tempi di manutenzione previsti e le indicazioni riguardanti il ricambio e la riparazione.
- In una memoria dati mobile dotata di RAM è integrata una batteria al litio; in questo caso è necessario osservare le seguenti indicazioni:

  evitare il pericolo di incendio, di esplosioni e di gravi ustioni. E'vietato ricaricare, smontare, riscaldare oltre i 100˚ C o incendiare la batteria, oppure mettere il suo contenuto a contatto con acqua.

Nel caso di un supporto dati resistente al calore è necessario osservare le indicazioni speciali al riguardo.

1 Se non doveste essere in possesso del catalogo MOBY, potete ordinarlo presso qualsiasi filiale SIEMENS di zona.

Español

Precaución

Durante el funcionamiento de los equipos eléctricos hay partes de los mismos que se encuentran forzosamente bajo tensión peligrosa.

Un funcionamiento seguro de los equipos presupone que han sido instalados correctamente por personal calificado observando las indicaciones contenidas en el Catálogo[1] de los equipos MOBY y la Descripción técnica.

La no observación de dichas indicaciones puede provocar la muerte, lesiones corporales graves o daños materiales considerables.

Por este motivo es preciso observar también durante las operaciones de mantenimiento y reparación en dicho equipo todas las indicaciones que figuran aquí y en el producto.

- Antes de comenzar cualquier trabajo es preciso seccionar de la red el equipo y ponerlo a tierra.
- Solo deben utilizarse repuestos homologados por el fabricante.
- Es imprescindible observar los intervalos de mantenimiento especificados asi como las instrucciones de reparación y reemplazo.
- Las memorias de datos móviles con RAM tienen integrada una batería de litio; al respecto es preciso observar las indicaciones siguientes:

  Evite riesgos de fuego, explosiones y quemaduras graves. La batería no debe ser recargada, desmontada, calentada a mas de 100 grados centígrados, inflamada: su contenido no deberá ponerse en contacto con agua.

En los soportes de datos con protección térmica es preciso observar las indicaciones particulares respectivas.

1 Si no dispone del catálogo MOBY, estos pueden pedirse a través de cualquier sucursal local de SIEMENS.

Svensk

Varning

Vid drift av elektrisk utrustning ligger det alltid en farlig spänning på vissa delar av utrustningen.

Säker drift av utrustningen förutsätter att den utförs av kvalificerad personal med uppmärksamhet på anvisningarna i MOBY-katalogen[1] samt de anvisningarsom ges i den tekniska beskrivningen.

Om dessa anvisningar ej beaktas kan följden bli dödsfall, svår kroppskada eller avsevärda materielskador.

Uppmärksamma vid underhållsarbete också anvisningar som ges här och på själva produkten.

- Före allt arbete skall utrustningen skiljas fran nätet och jordas.
- Bara reservdelar som godkänts av tillverkaren får användas.
- lakttag alltid föreskrivna underhållsintervall samt de anvisningar som givits rörande reparation och utbyte.
- Det mobila dataminnet med RAM innehåller et litiumbatteri. För detta gäller följande anvisningar:

  Undvik risk för öppen låga, explosioner och förbränning. Batteriet får inte efterladdas, tas isär, värmas upp över 100˚ C eller tändas på., och dess innehåll får ej komma i beröring med vatten.

För värmebeständiga datamedier gäller speciella anvisningar, som måste beaktas.

1 Om Ni inte har ett exemplar av MOBY-katalogen så kan den beställas från närmaste SIEMENS-kontor.

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