EM - 100/N

Industrial Modem EM-100/N

Operating and Installation Instructions

Issued 11/1998
from Software Version 2.3
from Hardware Revision 5

Ident. No. 73015082
Edition 01

All the figures and descriptions in this operating and installation manual have been compiled only after careful checking. Despite this however, the possibility of errors cannot be completely eliminated. Therefore, no guarantee can be given for completeness or for the content. Also, the manual cannot be taken as giving assurance with regard to product characteristics. Furthermore, characteristics are also described in it which are only available as options.

The right is reserved to make changes in the course of technical development. We would be very grateful for suggestions for improvement and notification of any errors, etc.

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Mainz-Kastel, June 1997

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1 General remarks

The ELSTER EM-100 Industrial Modem is used for the transmission of serial digital data on telephone lines and in particular for the system volume correctors (EK-86/ -87/-88) and the DS-100 Data Collecting Device. The EM-100 can however also be used by other devices with a serial interface (RS 232/V24). The high level of integration with microprocessor technology enables a compact design and high performance features to be achieved for acceptable cost. The modem is designed for connection to the lines of the public telephone network and private branch exchanges (PBXs). The connection is formed by automatic dialling for outgoing calls and by automatic or manual connection for incoming calls.

1.1 Performance features

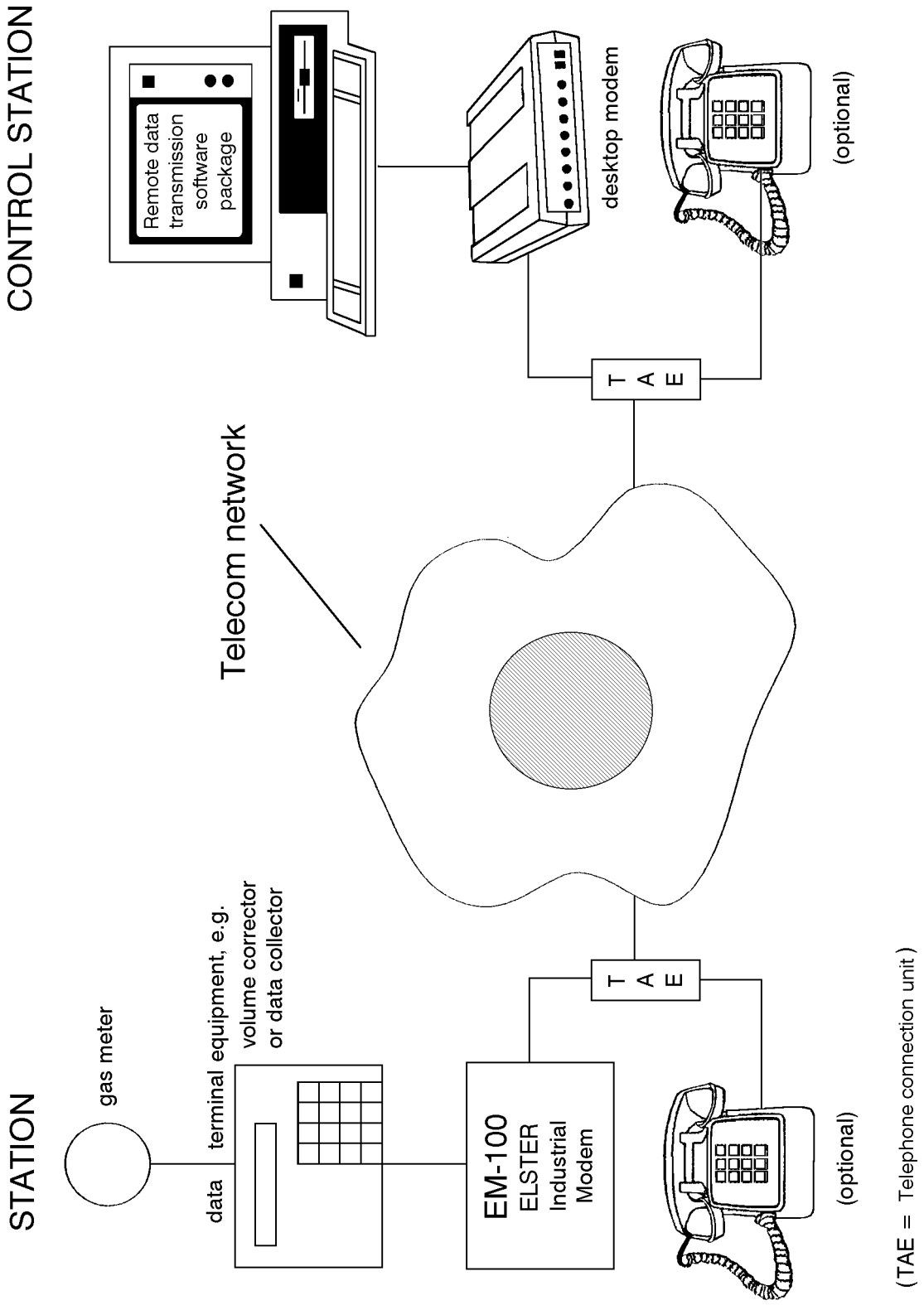
- Operation on telecom lines.
- Asynchronous duplex transmission with 1200 bits/s and 2400 bits/s conforming to V.22bis.
- Asynchronous duplex transmission with 300 bits/s conforming to V.21.
- Supplementary data link protocol according to MNP4 can be activated.
- Asynchronous automatic dialling according to V.25bis.
- Automatic call acceptance according to V.25.
- V.24 interface for data terminal equipment (DTE).
- Transmission rate for DTE adjustable dependent on line speed (300, 2400, 4800 bits/s).
- RTS/CTS and XON/XOFF handshake selectable on the DTE interface.
- Power supply output (static) for the volume corrector (EK-88) for Ex Zone 2 and non-hazardous ambients.
- Power supply output (static) selectable for
  - EK-88 Volume Corrector for Ex Zone 2 or area not subject to Ex conditions or
  - Mobile AS-100 Readout Device
    (from hardware version 2.0 onwards, can be recognised by memory location “130 channels”)
- Power supply output (switched) for battery-powered DS-100 Data Collecting Device and the EK-88 Volume Corrector.

Note:
For the communicating station there are software packages available such as the Telecoms Start-up Package or the Control Station Software Package (LSM-100).

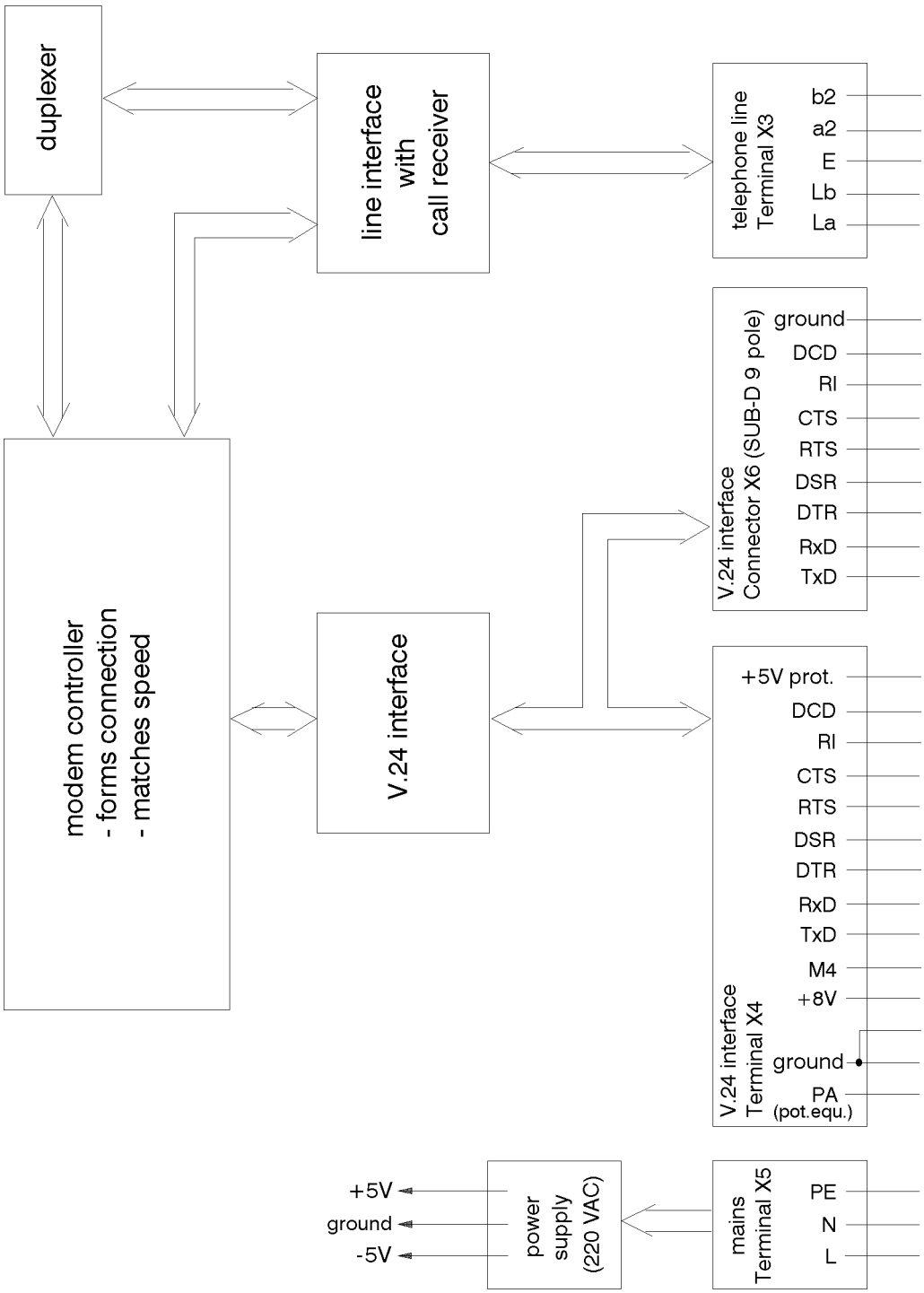
1.2 Mechanical description

The electronic system including the power supply is accommodated in a housing providing protection to IP54. The cable entries for the mains lead, telephone lead and V.24 lead fitted with PG compression glands in the inside of the housing. On the board there are connection terminals for the voltage supply, telephone line, serial interface and for the power supply outputs (static, switched).

1.3 Data transmission with the EM-100



1.4 Block diagram of the EM-100/N Industrial Modem



2 Installing the EM-100

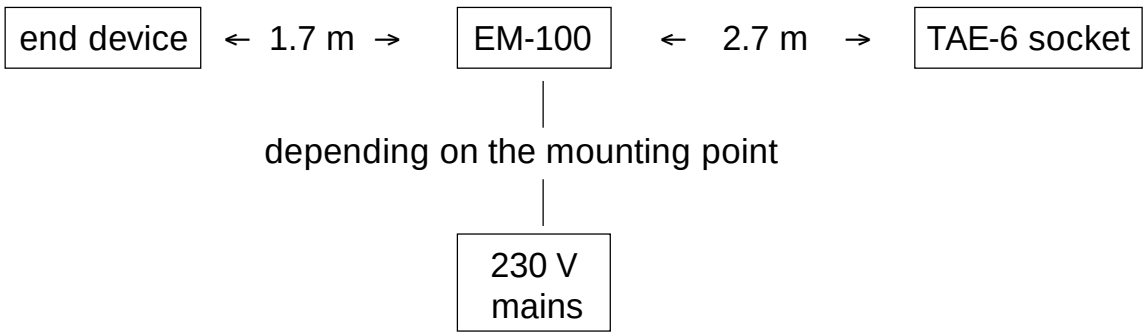
2.1 Installation requirements

To operate a modem on a public or private telecom network the standard fitting of a TAE-6 telephone connection unit is necessary at the telephone connection point. Here, suitable versions are the TAE-6-NF or the TAE-6-NFN (F = Fernsprecher (telephone set), N = Nebengerät (secondary device) such as a modem or fax machine).

Where the public network is involved, the installation of this connection unit must only by undertaken by the appropriate authority or approved company. The continual availability of a telephone set is not necessary if the telephone connection is to a modem.

For the power supply a 230 V supply is needed and its routing through to the EM-100 mounting point must be provided.

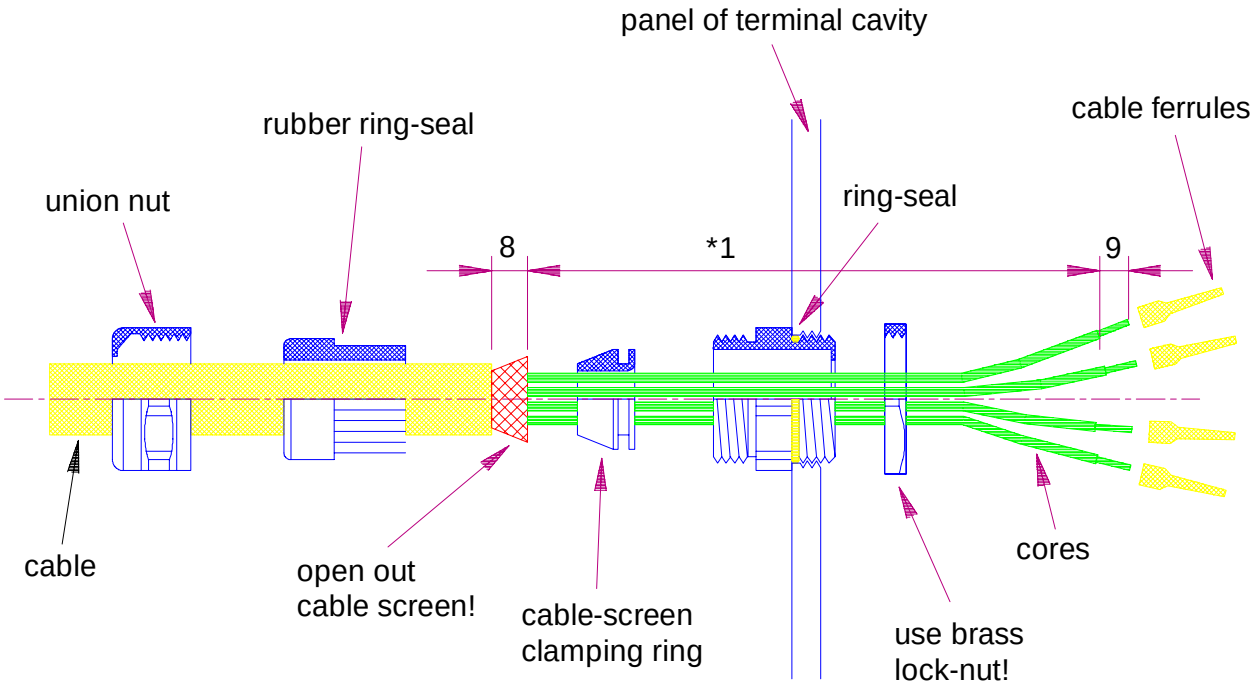
The modem is supplied with ready-mounted leads to the end device (DS-100, EK-86/-87/-88) and to the telephone socket; please note the following lead lengths:



If the lengths of the supplied standard leads are not sufficient, the following maximum lengths should be observed due to technical reasons:

V.24 lead (from end device to the EM-100): 15 m
TAE-6 telephone lead (from EM-100 to the TAE-6 socket): 10 m

When connecting the cable screen on a DS-100 read-out cable (Ident. No. 73013328) or on an AS-100 read-out cable (Ident. No. 73014540) to a PG/EMC cable union gland (e.g. when replacing a works-mounted cable for one with a special length), the following drawing and mounting instructions should be followed:



*1: Length of individual cores different depending on connection!

Procedure for connecting the cable screen to the cable gland

1. Push the nut and ring-seal over the cable.
2. Remove cable sheath to suit the distance between the housing panel and terminal (e.g. approx. 10 cm).
3. Strip the screen back until it protrudes approx. 8-10 cm from the sheath.
4. Open out the screen slightly.
5. Push the screen clamping ring under the screen.
6. Strip the cores as necessary and fit core ferrules.
7. Insert the cable into the gland until the screen clamping ring is pushed lightly against the union nut. Do not use force to pull the cable into the housing!
8. Push the ring-seal into the gland (over the screen and clamping ring) and tighten the nut. The cable should then be clamped firmly to the gland.
9. Connect the cores to the terminals.

EMC warning notice:
The device contains electronic circuits which may be damaged by electrostatic discharges. The installation personnel should therefore discharge themselves before starting the installation work.

2.2 Initial operation

1. Connect the serial lead from the EM-100 to the end device (DS-100 Data Collector or EK-86/-87/-88 Volume Corrector) using the round connector.
2. Connect the modem to the telephone connection unit by inserting the TAE-6 plug into the socket labelled “N”. The coded plug only fits this socket, it is self-locking and can be withdrawn by pressing the plastic protrusion with a screwdriver or similar tool.
3. The terminal space below the front panel of the modem becomes accessible with the opening of the cover to the terminal space. The supply voltage should be connected, as labelled, to the left terminals.
4. Once the voltage supply is switched on, the LED “Mains” lights up on the EM-100 and the modem executes an initialisation mode with self-test.
5. The modem is ready for use when the LEDs “Mains” and “DTE ready/S1” illuminate.

2.3 Setting the operating modes

The ELSTER EM-100 Industrial Modem is supplied ready for connection to the end devices DS-100 and EK-86/-87/-88. The settings of the DIL switches K2 and K3 have also been configured for these end devices.
However, if a change is required, the following settings are possible using the two 8-pole DIL switches K2 and K3:

DIL switch K2

	1	No. of rings before automatic answering
	on off	1 x ring 5 x rings
2	3	Baud rate for DTE / operating mode
on off on off	on on off off	4800 baud / V.25bis mode 4800 baud / DS-100 mode 2400 baud / V.25bis mode 300 baud / V.25bis mode
	4	Supplementary data link protocol
	on off	MP 4 on MP 4 off
5	6	Transmission method
on off on off	on on off off	V.21 V.22bis without guard tone V.22bis with 550 Hz guard tone V.22bis with 1800 Hz guard tone
7	8	Handshake with DTE
on off on off	on on off off	No handshake RTS/CTS hardware handshake XON/XOFF software handshake No permitted

Note:
If the MNP4 data link protocol is switched on, MNP4 must be also be switched on at the control station modem. Conversely, if MNP4 is switched off, then MNP4 must also be switched off at the control station modem, otherwise the connected terminal device may under some circumstances be placed in an undefined state!

Note:

The modem stores 300 bytes in a buffer in the transmit direction and 16 bytes in the receive direction in order to match the speed, irrespective of the set handshake procedure on the V.24 interface.

DIL switch K3

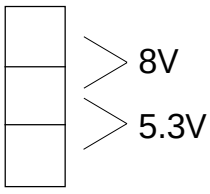
1	2	3	Character format
on	on	on	7 data bits + 1 stop bit
off	on	on	7 data bits + 2 stop bits
on	off	on	7 data bits + parity + 1 stop bit
off	off	on	7 data bits + parity + 2 stop bits
on	on	off	8 data bits + 1 stop bit
off	on	off	8 data bits + 2 stop bits
on	off	off	8 data bits + parity + 1 stop bit
off	off	off	8 data bits + parity + 2 stop bits
		4	parity
		on	even parity
		off	odd parity
		5	carrier removal before break in conn.
		on	200 ms
		off	10 s

Jumpers K4/K5

K4	K5	Trans. level
off	on	-13 dBm
on	off	-9 dBm
off	off	-6 dBm

Jumper K1 = on
Jumper K90 = off

Jumper X11



Standard setting is jumper on 8 V for external voltage supply of an EK-88 Volume Corrector.

Set the jumper to 5.3 V for the voltage supply of an AS-100 Readout Device.

The use of this voltage supply is only possible with special cables, see accessories.

3 V.24 interface

The interface to the computer (DTE) conforms electrically to CCITT V.24. A 14-pole terminal strip is used for the connection.

V.24 interface lines

RS 232	CCITT	DIN	Designation	From DCE	To DCE
TxD	103	D1	Transmitted data		x
RxD	104	D2	Received data	x	
RTS	105	S2	DTE ready to receive		x
CTS	106	M2	DCE ready to receive	x	
DSR	107	M1	DCE ready	x	
DTR	108.2	S1.2	DTE ready		x
DCD	109	M5	Received signal level	x	
RI	125	M3	Incoming call	x	
	112	M4	High transmission speed selected	x	
DRS	111	S4	Accept high transmission speed		x
TI	142	PM1	Test loop active	x	

4 Automatic dialling and call acceptance according to V.25bis / V.25

4.1 Function of the V.24 interface lines

Line: DTE ready DTR/108.2/S1.2

The DCE switches the DTR line to the ON state:

- so that a connection can be formed automatically
- to indicate to the DCE that the DTE is ready for accepting an incoming call.

The DTE switches the DTR line to the OFF state:

- to cause the DCE to break the connection during the data phase
- to cause the DCE to cancel the formation of the connection
- to indicate to the DCE that the DTE is not ready to accept an incoming call.

Line: DCE ready DSR/107/M1

The DCE switches the DSR line to the ON state:

- to indicate to the DTE at the end of the automatic formation of the connection that the connection has been formed and the DCE is ready for transmission.

The DCE switches the DSR line to the OFF state:

- as response to a request to release the DTR line.

Line: DCE ready to receive CTS/106/M2 and received signal level DCD/109/M5

The DCE switches the lines CTS and DCD to the ON state:

- after the DTR line has been switched ON by the DTE.

The DCE switches the lines CTS and DCD to the OFF state:

- after switch-on and detection of the answer tone
- after the DTR line has been switched OFF by the DTE
- after the answer tone has expired for an incoming automatic connection.

Line: Incoming call - RI/125/M3

An incoming call is signalled to the DTE via the RI line. The incoming call cancels any request for the formation of the connection before the line is seized.

4.2 Format of instructions and messages

The formation of the connection takes place with the aid of the CTS, DSR, DTR and DCD interface lines and the information interchange between the DTE and DCE on the TxD and RxD lines. This information consists of instructions or messages and is accompanied by parameters as required.

Commands can either be terminated with the character sequence C_rL_f (C_r = Carriage Return (0x0D), L_f = Line Feed (0x0A)) or just with the character L_f. The DCE interprets the L_f character as the end of the command.

Summary of the supported instructions

CRNxx..x (Call Request with Number) Dialling instruction
This instruction causes the DCE to initiate the formation of the connection. The parameter contains the telephone number to be called. The number can, if required, include special control characters (see also table of dialling parameters in this chapter).

DNLx (Download) Configuration instruction
The parameter x defines the number of ringing pulses that the modem allows to pass before seizing the line.

CIC (Connect Incoming Call) Call acceptance instruction
This instruction causes the DCE to immediately accept the incoming call signalled (INC) from the DCE to the DTE.

DIC (Disregard Incoming Call) Call ignore instruction
This instruction causes the DCE not to answer the incoming call signalled (INC) from the DCE to the DTE, providing the telephone is not yet seized.

Summary of messages sent by the DCE

VAL (Valid) Validity message.
This message is used to acknowledge an instruction from the DTE, i.e. to inform the DTE of the acceptance of the instruction.

INV (Invalid) Invalidity message.
This message is output by the DCE on reception of an invalid or non-executable instruction.

INC (Incoming Call) Signals an incoming call.
This message is output by the DCE to inform the DTE of a call on the telephone line.

CFIxx (Call Failure Indication) Signals unsuccessful formation of connection.
With an unsuccessful formation of a connection this message is output by the DCE with parameters stating the reason as response to a dialling instruction from the DTE. A summary of the possible parameters is given in the following table:

Response parameters for an unsuccessful formation of the connection

CB Own connection busy.

ET Subscriber busy.

NT Reply tone not detected.

AB Release tone

FC Dialling inhibited, because 12 consecutive requests to form a connection were unsuccessful. This state can only be reset by a hardware reset.

DD The dialled number can only be dialled after a time monitoring period of 5 resp. 60 seconds has expired (see Chapter 5 “Monitoring dialling”).

Table of dialling parameters

0	Figure 0
1	Figure 1
2	Figure 2
3	Figure 3
4	Figure 4
5	Figure 5
6	Figure 6
7	Figure 7
8	Figure 8
9	Figure 9
T	Multi-frequency dialling
P	Pulse dialling
:	Dialling tone detection
<	Dialling interval 1 s
=	Dialling interval 3 s
>	Operate ground key
_	Grouping character (_ = 0x20)
.	Grouping character (. = 0x2E)

Note:
The use of the grouping characters within the subscriber number is generally permitted. The control character ":" for the detection of the dialling tone may only occur once within the subscriber number. At positions after the second figure of a subscriber number the use of the control character ":" is not permitted.

4.3 Interchanging instructions and messages

With each instruction at least one message follows or, with a successful attempt at calling, the ON state on the DSR line follows.

If the DCE finds an error in an instruction, it gives a negative acknowledgement of the instruction with an invalidity message (INV).

4.4 Procedure at the interface

The procedure between the DTE and the DCE for automatic dialling and the answering of calls conforms to the CCITT Recommendations.

4.4.1 Sequence at the interface for an outgoing call

- Before beginning the dialogue with the DCE, the DTE signals its readiness with the ON state on the DTR line. Consequently, the interface changes from the state “DTE not ready” to the state “DTE ready”.
- The DCE then signals its readiness for dialogue with the DTE by switching the lines CTS and DCD to the ON state. The interface is then in the state “DTE-DCE dialogue”. The DTE can output instructions and the DCE messages in this state.
- The DTE requests the formation of a connection with a dialling instruction CRNxx...x and then changes to the state “Formation of connection”.
- The DCE acknowledges the (correct) instruction with VAL and starts the formation of the connection.
- After making the connection and detecting the answer tone the interface enters the state “Answer tone detected” and the lines CTS and DCD are switched to the OFF state.
- The DTE is informed of an unsuccessful attempt at forming a connection by the message CFIxx from the DCE. The DTE then enters the state “DTE-DCE dialogue”.
- After termination of the procedure for forming the connection the DSR line is switched to the ON state and the interface enters the state “Ready for transmission”. From this state the DTE can enter the “Data transmission phase” in the normal manner.
- The DTE can cancel a connection or an attempt at a connection at any time by switching off the DTR line (state “Released by the DTE”). The interface then enters the state “DTE not ready” or the state “Incoming call”, depending on whether the RI line is in the OFF or ON state.

Note:

An incoming call cancels a request for the formation of a connection before line seizure, i.e. if the interface is in the state “Forming a connection” when an incoming call occurs, the DTE is informed of the incoming call by the RI line and the INC message and the interface changes to the state “Incoming call ready for acceptance”.

4.4.2 Sequence at the interface for an incoming call

- Before beginning the dialogue with the DCE, the DTE signals its readiness with the ON sate on the DTR line. Consequently, the interface changes from the state “DTE not ready” to the state “DTE ready”.
- The DCE then signals its readiness for dialogue with the DTE by switching the lines CTS and DCD to the ON state. The interface then enters the state “DTE-DCE dialogue”. In this state the DTE can output instructions and the DCE messages.
- An incoming call is indicated to the DTE via the RI line and through the “Signalling of an incoming call” INC. In this manner the interface enters the state “Incoming call ready for acceptance”.
- If a call occurs when the interface is in the state “DTE not ready”, the DCE changes to the state “Incoming call”. The DTE can switch on the DTR line to answer the call or take up the dialogue with the DCE. The interface then enters the state “Incoming call”. The DCE responds by switching the lines CTS and DCD to the ON state. The interface then enters the state “Incoming call ready for acceptance”.
- In the state “Incoming call ready for acceptance” the DTE can reject the call within 1 s (T4) by switching OFF the DTR line or by outputting the call-ignore instruction DIC. In the latter case the interface remains in the state “Incoming call ready for acceptance” until the RI line enters the OFF state. Thereafter, the interface re-enters the state “DTE-DCE dialogue”.
- If the incoming call is not rejected in the state “Incoming call ready for acceptance” by the DTE within 1 s or if the DTE requests the immediate acceptance of the call with a CIC call acceptance instruction, then the DCE switches the state “Line seized” on the line via the state “Incoming call accepted” and it transmits the answer tone.
- After the termination of the line procedures the DSR line is switched to the ON state and the interface enters the state “Ready for transmission”. In this state the DTE can enter the state “Data transmission phase” in the normal manner.

5 Monitoring dialling

The modem is equipped for monitoring of dialling which ensures that a certain period must expire before a new attempt at dialling is made after an unsuccessful attempt at dialling.

The following conditions apply here:

a) After an unsuccessful attempt at dialling, the period before the next attempt at dialling must be at least 5 seconds.

b) After three consecutive, unsuccessful attempts at dialling the same number, the period before the next attempt at dialling this number must be at least 60 seconds.

c) After 12 consecutive, unsuccessful attempts at dialling any numbers the modem enters the standby state, i.e. it does not accept any more dialling instructions.

In cases a) and b) the modem outputs the message CFIDD in response to dialling instructions as an indication that the waiting period before a new attempt at dialling has not yet expired.

In case c) the modem outputs the message CFIFC in response to dialling instructions to indicate that generally no more dialling instructions will be accepted. In this case the modem must be restarted by switching it off and then on in order to be able to dial again.

6 DS-100 mode

The DS-100 mode can be activated with the switches K2.2 and K2.3. This mode has been implemented to enable devices which do not support the V.25bis protocol to communicate with the EM-100 Industrial Modem.

This mode is particularly interesting with regard to call acceptance. There are the following differences compared to the V.25bis protocol:

- No INC is transmitted to the DTE for an incoming call.
- M5 is not active during the instruction phase.

7 Technical data

7.1 Line interface

Transmission lines	Public/private telecom network
Transmission modes	V.21 (300 bits/s duplex, asynchronous), V.22bis (1200/2400 bits/s duplex, asynchronous)
Guard tone	1800 Hz or 550 Hz (with V.22bis) selectable
Equaliser	Adaptive
Impedance	According to 1TR2
Transmission level	-6 dBm, -9 dBm and -13 dBm selectable
Minimum receiving level	-43 dBm
Lead connection	TAE-6 lead on screw terminals in modem
Telecom network connection	TAE-6 socket (plug coding “N”)

7.2 DTE interface

Interface 1a	9-pole SUB-D connector to RS-232C/V.24 (can also be used for other equipment)
Alternatively:	
Interface 1b	Screw terminals for the serial interface, can be used for ELSTER end devices and also other equipment
Additional signals	- Switched power supply for battery-powered end devices - Voltage supply for the EK-88 System Volume Corrector or for the AS-100 Measurement and Data Acquisition Unit from hardware version 2.0 onwards for application in Ex Zone 2 or in an Ex-free environment.

The following parameters for the interfaces (1a and 1b) for the DTE can be selected via switch K2:

Baud rate	300, 2400, 4800 baud
Data bits	7 or 8
Stop bits	1 or 2
Parity	even, odd or none

Control	without, with XON/XOFF, with RTS/CTS selectable
Carrier monitoring	selectable (0.2 or 10 s)
Call acceptance	selectable to 1 or 5 rings
Data integrity protocol	MNP4 (on or off)

7.3 Automatic dialling device

Protocol	according to V.25bis
Data format	asynchronous start/stop
Connection	according to CCITT 108.2
Dialling mode	pulsed or multi-frequency dialling
Pulse dialling	62 ms / 38 ms
Dial tone detection	300 Hz - 700 Hz
Exchange line acquisition	possible by ground key or flash

7.4 Other features

Formation of connection	integrated automatic dialling unit for data connections to CCITT V.25bis
Call detection	manual or automatic call acceptance according to V.25
Test functions	Test loops 2 and 3 conform to CCITT
BZT approval	No. A 014686C (BZT = Bundesamt für Zulassungen der Telekommunikation / Federal Office for Telecoms Approvals)

7.5 Power supply

Connection via screw terminals

Wire thickness	0.5 to 2.5 mm^2
Power supply	Integrated mains power supply, 220 V ± 15%, 3 VA max.
Power consumption	Approx. 3 VA

7.6 Ambient conditions

Operating temperature	-10°C - +45°C
Storage temperature	-25°C - +70°C
Rel. humidity	Without condensation
Class of protection	IP 54

7.7 Mechanical data

Wall-mounted housing with PG compression glands.

Housing dimensions H x B x D (incl. mounting frame)	225 x 215 x 72 mm
Drilling template for fixing housing for wall mounting (B x H)	200 x 120 mm
Hole for fixing housing (diameter)	5.5 mm
Weight	approx. 1.3 kg (without lead)
Lead to TAE-6 socket (with plug TAE-6-N coding)	approx. 2.7 m
Lead to end device (with connector for DS-100/EK-86/-87/-88)	approx. 1.7 m

8 Important information

If, during data transmission using the modem, the handset is raised from a telephone set further down the line, this does not affect the data transmission. If the modem however releases the connection, then under some circumstances a chargeable connection may still exist if the handset is not replaced.

A Appendix

A1 Connector pin assignment

Mains connection - Terminal X5

Pin	Description
1	PE (earth)
2	L
3	N
4	PE (earth)
5	PA - potential equalisation

Telephone line - Terminal X3

Pin	Description	Colours for standard connecting leads
1	La	white
2	E	yellow
3	not used	green
4	Lb	brown
5	b2	grey
6	a2	pink

V.24 interface - Terminal X4

Pin	Description	Jumpers and colours for standard connecting leads
1	Supply for additional device	white
2	TxD (D1)	yellow
3	RxD (D2)	green
4	RTS (S2)	
5	DCD (M5)	
6	Ground	pink
7	DTR (S1)	
8	DSR (M1)	grey
9	RI (M3)	
10	CTS (M2)	
11	8V/5.3V supply voltage	
12	Ground	
13	M4	
14	PA - potential equalisation	
		brown: not connected

V.24 interface - Connector X6 (SUB-D 9-pole)

Pin	Description	I/O
1	DCD (M5)	out
2	RxD (D2)	out
3	TxD (D1)	in
4	DTR (S1)	in
5	Ground	-
6	DSR (M1)	out
7	RTS (S2)	in
8	CTS (M2)	out
9	RI (M3)	out

A2 List of accessories

- Modified cable lengths for the telephone lead and the data backup cable on request.
- Cable for supplying power to the EK-88 via the EM-100 (length 2.0 m, order number 73015124).
- Cable for power supply and serial data interface between AS-100 data acquisition device and EM-100 Modem (length 2.0 m, order number 73015540).
- Connecting lead between EM-100 modem and terminal device with 90 degree angular plug (length 5 m, order number 73015469).
- Connecting lead from EM-100 Modem to terminal device with 90 degree angled plug (length 2 m, order no. 73016253)
- Connecting lead from EM-100 Modem to terminal device with straight cable outlet (length 2 m, order no. 73013328) (standard cable)
- Connecting lead from EM-100 Modem to terminal device with straight cable outlet (length 10 m, order no. 73016278)
- Adapter cable from EM-100 Modem to the AS-100 (length 2 m, order no. 73015525). In contrast to the cable 73015540 list above, this is not permanently terminated to the EM-100. It can be used rather as an adapter between an AS-100 and one of the 'EM-100 to terminal device' connecting leads listed above.

A3 Position of the switches and jumpers

Ex-works EM-100 configuration

Jumpers K4/K5

	K4	K5	Transmission level
	off	on	-13 dBm
X	on	off	-9 dBm
	off	off	-6 dBm

Jumper K1 = on
Jumper K90 = off
Jumper X11 to 8 V

_____
X = default setting

DIL switch K2

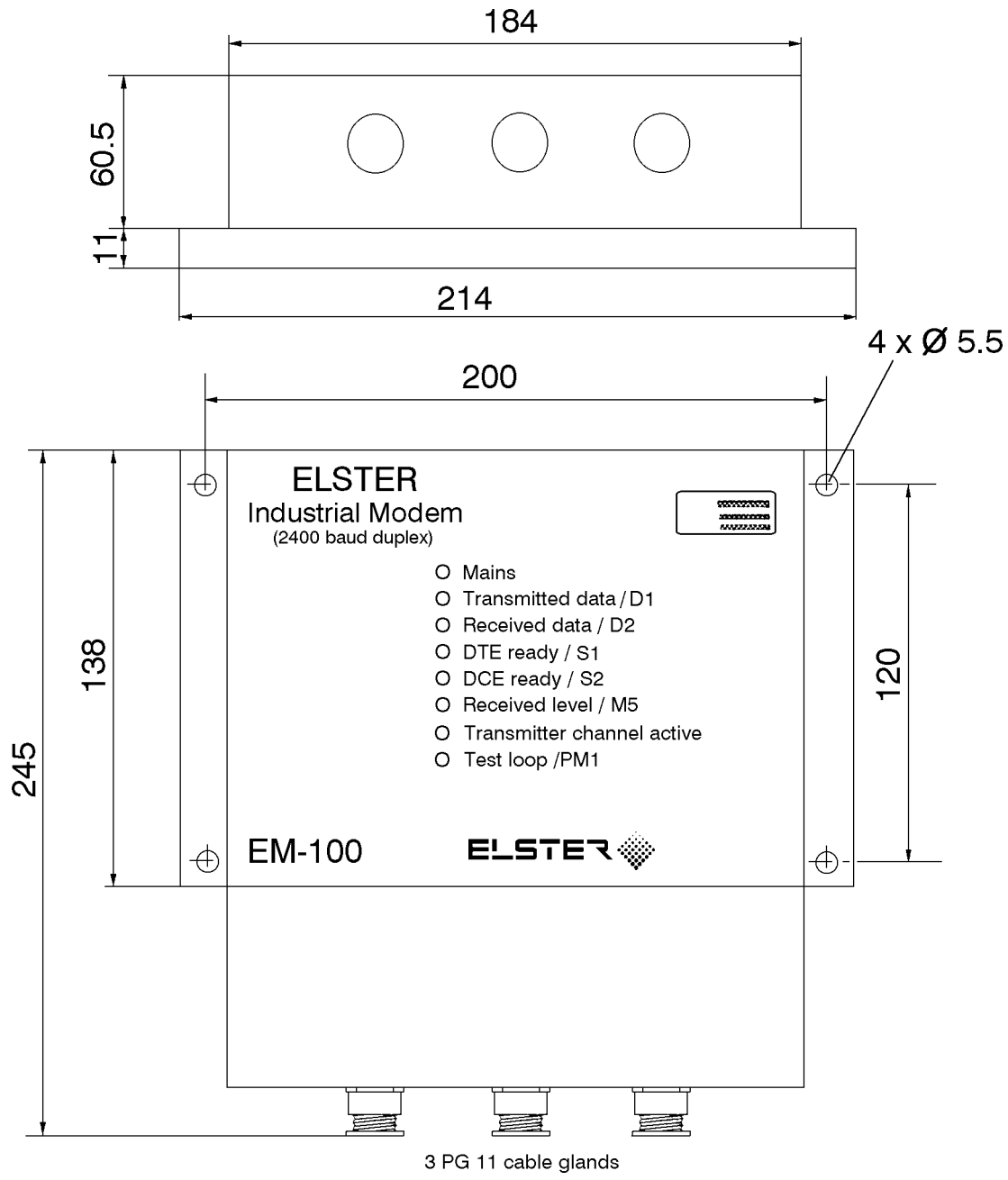
		1	No. of rings before automatic answering
		on	1 x ring
X		off	5 x rings
	2	3	Baud rate for DTE / operating mode
	on	on	4800 baud / V.25bis mode
X	off	on	4800 baud / DS-100 mode
	on	off	2400 baud / V.25bis mode
	off	off	300 baud / V.25bis mode
		4	Supplementary data link protocol
		on	MP 4 on
X		off	MP 4 off
	5	6	Transmission method
	on	on	V.21
X	off	on	V.22bis without guard tone
	on	off	V.22bis with 550 Hz guard tone
	off	off	V.22bis with 1800 Hz guard tone
	7	8	Host handshake
X	on	on	No handshake
	off	on	RTS/CTS hardware handshake
	on	off	XON/XOFF software handshake
	off	off	No permitted

DIL switch K3

	1	2	3	Character format
	on	on	on	7 data bits + 1 stop bit
	off	on	on	7 data bits + 2 stop bits
	on	off	on	7 data bits + parity + 1 stop bit
	off	off	on	7 data bits + parity + 2 stop bits
X	on	on	off	8 data bits + 1 stop bit
	off	on	off	8 data bits + 2 stop bits
	on	off	off	8 data bits + parity + 1 stop bit
	off	off	off	8 data bits + parity + 2 stop bits
			4	parity
X			on	even parity
			off	odd parity
			5	carrier removal before break in conn.
X			on	200 ms
			off	10 s

X = default setting

A4 Drawing showing the housing / housing dimensions



A5 Approval certificate

BUNDESAMT FÜR ZULASSUNGEN IN DER TELEKOMMUNIKATION

ZULASSUNGSURKUNDE

Zulassungsnummer: A014686C

Objektbezeichnung: EM-100

Zulassungsinhaber: ELSTER Produktion GmbH
Steinernstraße 19
D-6503 Mainz-Kastel

Zulassungsart: Allgemeinzulassung

Objektmerkmal: Modem als eigenständige Einrichtung

Objektart: Endeinrichtung zur Anschaltung an Anschlüsse mit analogen Anschaltepunkten mit der in der Anlage beschriebenen und geprüften Konfiguration

Saarbrücken, den 21.05.92

Im Auftrag

Krämer

1 Anlage

Approval certificate (Translation of German original)

FEDERAL OFFICE FOR APPROVALS IN TELECOMMUNICATIONS

APPROVAL CERTIFICATE

Approval number:	A01486C
Object designation:	EM-100
Approval registrant:	ELSTER Produktion GmbH Steinernstraße 19 D-6503 Mainz-Kastel
Type of approval:	General approval
Object features:	Modem as independent device
Type of object:	Terminal device for connection to analogue terminals with a tested configuration as described in the appendix.

Saarbrücken, 21st May 1992

1 Appendix

A6 EC Declaration of Conformance

EG-Konformitätserklärung

gemäß „Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)"
bzw. EMV-Richtlinie 89/336/EWG des Rates vom 3. Mai 1989 (EMV-Richtlinie)
sowie der Artikel 5 und 14 der Richtlinie 93/68/EWG des Rates vom 22. Juli 1993
zur Änderung der Richtlinie 89/336/EWG

Das Industriemodem

Typ EM-100/N

erfüllt die EMV-Anforderungen gemäß

DIN EN 50082 Teil 1
sowie
DIN VDE 0878 Teil 3 bzw. EN 55022

i.V. Pfaff

i.A. Döß

Mainz-Kastel, den 21. Dezember 1995

ELSTER

Elster Produktion GmbH, Steinernstraße 19, 55252 Mainz-Kastel
Telefon: 06134/605-0, Telefax: 06134/605-390, Telex: 6 134 915

EC Declaration of Conformance (Translation of German original)

EC Declaration of Conformance

according to the “Law on the electromagnetic compatibility of equipment (EMCL)” and the EMC Guideline 89/336/EWG of the Council of 3rd May 1989 (EMC Guideline) as well as Articles 5 and 14 of the Guideline 93/68/EWG of the Council of 22nd July 1993 about the modification of Guideline 89/336/EWG.

The Industrial Modem

Type EM-100/N

fulfils the EMC requirements according to

DIN EN 50082 Part 1
and
DIN VDE 0878 Part 3 or EN 55022

Mainz-Kastel, 21st December 1995

ELSTER

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A7 Manufacturer's Declaration for use in Zone 2

Herstellererklärung

gemäß DIN VDE 0165 von 2.91, Abschnitt 6.3.10

Das Elster Industriemodem

EM-100

ist entsprechend DIN VDE 0165

zum Einsatz in Zone 2 für Gase der Temperaturklasse T1

(Zündtemperatur > 450 °C, z.B. Erdgas) geeignet.
(Anlage ist zu beachten!)

Elektronik-Systeme
Segmentleitung
O. Pfaff

Elektronik-Systeme
T.Döß

Mainz-Kastel, den 17. November 1998

Zugrundeliegende Verordnungen, Richtlinien und Normen:

- Verordnung über elektrische Anlagen in explosionsgefährdeten Räumen (ElexV) vom 27.2.1980 (BGBl. I S. 214)
- Explosionsschutz-Richtlinien (EX-RL) mit Beispielsammlung, Ausgabe 9.90
- DIN VDE 0165, Ausgabe 2.91

ELSTER

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Anlage zur Herstellererklärung für
Industriemodem EM-100
Seite 1 von 2

1. Allgemeines

In Normen, Verordnungen und Richtlinien ist festgelegt, welche Maßnahmen zur Vermeidung der Gefahren durch explosionsfähige Atmosphäre notwendig sind.

Über Maßnahmen, die das Entstehen und die Entzündung gefährlicher explosionsfähiger Atmosphäre verhindern, geben die “Explosionsschutz-Richtlinien (EX-RL)”, Ausgabe 9.90 der Berufsgenossenschaft der chemischen Industrie erschöpfend Auskunft. In enger Bindung an VDE 0165 wurden als Grundlage für die Beurteilung des Umfanges der Schutzmaßnahmen Zoneneinteilungen für die explosionsgefährdeten Bereiche vorgenommen.

In einer umfangreichen Beispielsammlung zu den Explosionsschutz-Richtlinien sind auch für den Bereich der Gas-Meßanlagen und Gasdruckregelanlagen Hinweise gegeben, welche Maßnahmen ausreichend sind, um entsprechende Gefahren zu vermeiden.

Unter Lfd-Nr. 1.3.4 Gasdruckregelanlagen

Lfd-Nr. 1.3.5 Gas-Meßanlagen

wird eindeutig auf die DVGW-Arbeitsblätter G490, G491, G492/I (in Vorbereitung), G492/II und G495 verwiesen.

Bei Beachtung dieser Regeln sind Explosionsschutz-Maßnahmen bei

1. Gasdruckregelanlagen in Räumen mit über 4 bar Betriebsdruck (Eingangsdruck) im ganzen Raum nach Zone 2

   und

2. Gas-Meßanlagen in Räumen mit über 4 bar Betriebsdruck im ganzen Raum nach Zone 2

erforderlich!

Zone 2 umfaßt Bereiche, in denen damit zu rechnen ist, daß gefährliche explosionsfähige Atmosphäre durch Gase, Dämpfe oder Nebel nur selten und dann auch nur kurzzeitig auftritt.

Anlage zur Herstellererklärung für
Industriemodem EM-100
Seite 2 von 2

2. Einsatz des EM-100 in der Zone 2

Vom Betreiber ist sicherzustellen, daß nach der erfolgten Installation für das Industriemodem EM-100 die Schutzart IP 54 nach DIN 40 050 erfüllt wird. Dazu müssen alle Kabeldurchführungen dicht, alle nicht genutzten Durchführungen verschlossen und die Schutzkappe für die Datenschnittstelle aufgesteckt bzw. ein Verbindungsstecker angeschlossen und verschraubt sein.

Beim Anschluß von Einrichtungen an die Ein-/Ausgänge des EM-100 müssen folgende Punkte beachtet werden:

- Eine Veränderung der Installation darf nur in spannungslosem Zustand erfolgen. Vor der Installation ist sicherzustellen, daß keine explosionsfähige Atmosphäre vorhanden ist.
- Es ist sicherzustellen, daß die in der Betriebsanleitung der EM-100 genannten Grenzwerte und Vorgaben eingehalten werden.

3. Überspannungsschutz-Maßnahmen

Das Industriemodem EM-100 erfüllt die EMV-Anforderungen gemäß DIN EN 50082 Teil 1 sowie DIN VDE 0878 Teil 3 bzw. EN 55022.

Entsprechend DIN VDE 0165 Abs. 6.3.1.3 entstehen im EM-100 **betriebsmäßig** keine Funken, Lichtbögen oder unzulässig hohe Temperaturen. Durch hochenergetische Störungen in **nicht-betriebsmäßigen** Situationen (z.B. bei einem Blitzeinschlag) kann im Gerät trotzdem Funken- oder Flammenbildung auftreten. Um dies zu vermeiden, sollten in der Gasstation Überspannungsschutz-Maßnahmen ergriffen werden. Diese sind im einzelnen:

- geeigneter Blitzableiter
- überspannungsgeschützte TAE-Dosen
- überspannungsgeschützte Spannungsversorgung

Elster Produktion GmbH, Mainz-Kastel, den 17. November 1998

A7 Manufacturer's Declaration for use in Zone 2

(translation from German)

Manufacturer's Declaration

according to DIN VDE 0165 of Feb.91, Section 6.3.10

The Elster Industrial Modem

EM-100

is suitable according to DIN VDE 0165

for use in Zone 2 for gases in Temperature Class T1

(Ignition temperature > 450 °C, e.g. natural gas).
(take note of appendix!)

Electronic Systems
Section Manager
O. Pfaff

Electronic Systems
T. Döß

Mainz-Kastel, 17. November 1998

Relevant directives, guidelines and standards:

- Directive on electrical systems in areas subject to explosion hazard (ElexV) of 27th Feb. 1980 (BGBl. 1 S. 214)
- Explosion protection guidelines (EX-RL) with set of examples, issued Sept. '90
- DIN VDE 0165, issued Feb. '91

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Appendix to Manufacturer's Declaration for
Industrial Modem EM-100
Page 1 of 2

1. General remarks

The measures that are necessary to avoid hazards due to areas that are subject to the risk of explosion are defined in standards, directives and guidelines.

The “Explosionschutz-Richtlinien (EX-RL)” [Explosion Protection Guidelines], issued Sept. ’90 by the Berufsgenossenschaft der chemischen Industrie give comprehensive information regarding the measures which will prevent the creation and ignition of dangerous explosive atmospheres. Zone subdivisions for the areas subject to explosion hazards have been made in close association with VDE 0165, forming a basis for the assessment of the scope of protective measures.

Information is also given for the sector of gas measurement systems and gas pressure regulation systems in a comprehensive set of examples about the explosion protection guidelines. This information shows which measures are sufficient to prevent the relevant risks.

Under Item No. 1.3.4 Gas pressure regulation systems

Item No. 1.3.5 Gas measurement systems

clear reference is made to the DVGW Worksheets G490, G491, G492/I (in preparation), G492/II and G495.

When observing these rules, explosion protective measures are required with

1. Gas pressure regulation systems in areas with over 4 bar operating pressure (input pressure) in the complete area to Zone 2

   and

2. Gas measurement systems in areas with over 4 bar operating pressure in the complete area to Zone 2

Zone 2 includes areas in which it can be expected that hazardous explosive atmospheres due to gases, vapours or mists only occasionally and then only briefly occur.

Appendix to Manufacturer's Declaration for
Industrial Modem EM-100
Page 1 of 2

2. Use of the EM-100 in Zone 2

The operator must ensure that protection to IP 54 is fulfilled after completion of installation of the EM-100 Industrial Modem. To achieve this, all cable entries must be sealed, all unused apertures closed off and the protective cap for the data interface must be in place or a connector plug must be connected and screwed secure.

When connecting devices to the inputs and outputs of the EM-100, the following points must be followed:

- Any modification to the installation must only take place without any voltage on the device. Before installation, it must be ensured that no atmosphere is present which is capable of causing an explosion.
- It must be ensured that the limits and specified figures quoted in the EM-100 operating instructions are observed.

3. Measures for overvoltage protection

The EM-100 Industrial Modem fulfils the EMC requirements according to DIN EN 50082 Part 1 as well as DIN VDE 0878 Part 3 and EN 55022.

In conformance with DIN VDE 0165 Section 6.3.1.3 no sparks, arcing or impermissibly high temperatures occur in the EM-100 **in normal operation**. Due to high energy faults in **abnormal operating** circumstances (e.g. during a lightning strike), sparks or flame formation may however occur in the device. To prevent this overvoltage protection measures should be provided in the gas station. In more detail these are:

- suitable lightning conductor
- telephone sockets protected against overvoltage
- voltage supply protected against overvoltage.

Elster Produktion GmbH, Mainz-Kastel, 17. November 1998