

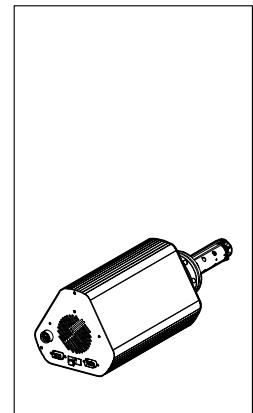
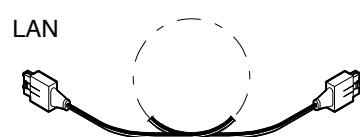
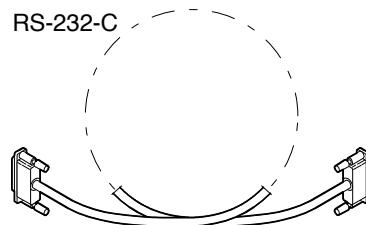
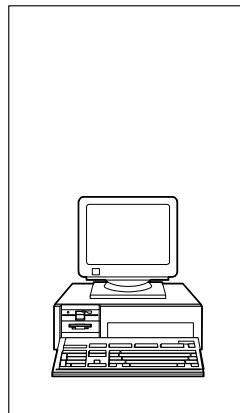


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QMS 200

Quadrupole mass spectrometer

Prisma™



RS-232-C ASCII
RS-232-C binary
LAN

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1 Important information

1.1 Explanation of symbols


DANGER:

Information on preventing any kind of personal injury or extensive equipment damage.


CAUTION:

Special information on damage prevention.


NOTE:

Special information on cost-effective use.

- < > Exact lettering on the control / element (key, potentiometer, measurement socket etc.)
- « » Display, reaction (text on screen, display, illuminated LED, etc.)
- » « Operating mode, effect (»run«, etc.)
- [.....] Literature reference

1.2 Validity

This document is based on firmware versions:

QMS firmware number **BG 509 726 -I**
 DSP firmware number **BG 509 725 -I**

To determinate the version contained in your unit, proceed as follows:

ASCII interface	according to section 5.3.2.7 <config> TEST function
Binary interface	according to section 6.4.2.7 <config> TEST frame
LAN interface	according to section 7.2 Data transmission

If the last letter in the number is farther into the alphabet than the letter in the above numbers, the module may contain additional features, but this document stills applies.

1.3 Literature

- [1] Operating manual
Prisma™
 Quadrupole mass spectrometer QMS 200
 BG 805 201 BE
 Pfeiffer Vacuum, D-35614 Asslar
- [2] Operating manual
 Network controller board
 OPA 200
 SH-ARC BAL
 SoHard GmbH, Gesellschaft für Soft- und Hardware-Entwicklung mbH, D-90766 Fürth, Deutschland

2 Description

2.1 RS-232-C interface

- Standard serial interface according to the RS-232-C standard. Allows various data transmission rates.

2.1.1 RS-232-C ASCII format

- Serial communication interface with ASCII-coded data format and simple communication protocol.

This interface format is very easy to use and is thus often used in combination with BASIC programs.

2.1.2 RS-232-C binary format

- Serial communication interface with binary-coded data format and communication protocol according to SECS-1 with higher transmission reliability.

This interface format is used for communication between the Prisma and the Balzers Quadstar 422™ software. However, it can also be used for other purposes.

2.2 LAN interface

- Network-compatible serial interface for high transmission rates and long distances.

This is a fiber optics interface for an 'ARCNET® Local Area Network'. The optical transmission technology used for this interface keeps interference to a minimum.

3 Installation

→ [1]

4 Technical data

→ [1]

Notes

5 RS-232-C interface (ASCII format)

5.1 Data transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

5.1.1 Definitions

The following definitions are used:

Abbreviations and symbols

Symbol	Meaning	Decimal	Hex.
Computer	Computer or terminal		
Prisma	Quadrupole mass spectrometer QMS 200		
[...]	Optional elements		
ASCII	American Standard Code for Information Interchange		
<ETX>	END OF TEXT Reset the interface	3	03
<CR>	CARRIAGE RETURN Go to the beginning of the line	13	0D
<LF>	LINE FEED Advance by one line	10	0A
<SP>	SPACE Leave a space	32	20
<NUL>	NULL Pertains to a negligible value or a lack of information	0	00
<ENQ>	INQUIRY Request for data transmission	5	05
<ACK>	ACKNOWLEDGMENT Positive report signal	6	06
<NAK>	NEGATIVE ACKNOWLEDGMENT Negative report signal	21	15

Terms

- "Transmit": Data transfer from the computer to the Prisma
- "Receive": Data transfer from the Prisma to the computer

Types of data

- "Programming data"
e.g. data commands transmitted from a computer to a Prisma (parameters)
- "Measured data"
e.g. signals resulting from measurements transmitted to the computer for processing
- "Status data"
information on the momentary operational status of the Prisma output as the result of a specific inquiry

Data formats

Mnemonics

An abbreviation consisting of three letters or two letters and a numeral. Capital or lower case letters (alpha characters) can be used.

Numeric

The whole number contains the numeric information. There are three ways to express the decimal part of the number:

Presentation with whole numbers

Corresponds to a style in which the decimal point at the end of a number is accepted, but not transmitted (1, 2, 3, ... 10, ... 20 etc.).

Floating point decimal

Its position depends on its place value in any particular instance. The decimal point should always be preceded by a numeral, even when this is a zero (0.1, ... 1.345, ... 1.0 etc.).

Exponential presentation

with fixed point part and fixed decimal point, the letter E and a two place exponent with sign digit (1.234E-12, etc.).

High order zeros

do not need to be entered. Reports never include them.

Sign digit

The '+' is not written for positive numbers.

Separator

The smallest unit is the character string. It is separated from the next block of data by a comma.

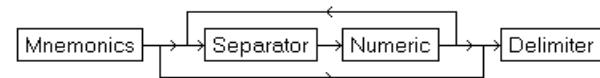
Delimiter

The coding for a legal final character is the ISO 7-bit code <CR> (carriage return). When a final character comes through, the Prisma (the transmitter) goes from an active transmission state to an idle state.

5.1.2 Syntax

Arrows located between fields that point to the right indicate the sequence in which the transmission must be made. Arrows pointing to the left are feedback loops indicating the possibility of one or more repetitions of the field. Arrows pointing to the right that surround fields indicate that this field can be included as an option.

Record (data block)



5.1.3 Communication protocol (data link)

Data transmission

1 start bit, 8 data bits, 1 stop bit, no parity, no hw handshake

Transmission format

The data transmission procedure is character-oriented, meaning that the message is transmitted to the Prisma as programming data in ASCII strings. Each message is terminated with <CR> (end of message). <LF> may be transmitted, but it is ignored by the Prisma. Spaces are ignored, too. All other incoming characters are filed in an input buffer. The string is not evaluated until the 'end of message' signal comes through. After each transmission of a string, the computer must wait for the feedback message (<ACK><CR> or <NAK><CR>).

Transmission protocol

Computer	Prisma	Explanation
Programming data →		Receives message with end character
<CR> [<LF>] →		

←	<ACK> <CR> <LF>	Positive confirmation of message receipt
---	-----------------	--

Receive format

The output of measured data, status data or parameters must first be initialized with the appropriate programming data (mnemonics). Afterwards, i.e. after the <ACK><CR><LF> message is received, the measured data, status data or the parameters can be called with <ENQ>. A repeated transmission of <ENQ> calls further ASCII strings. <CR> can be entered after <ENQ>, but it is not necessary. <ENQ> always affects the last initialization. The transmission of data does not need to be confirmed by the computer. The computer's input buffer must have a minimum capacity of 256 characters.

Receive protocol

Computer	Prisma	Explanation
<ENQ> [<CR> [<LF>]] →		Request for data transmission
← measured data, status data or parameters		Data transmitted
← <CR> <LF>		with end character
⋮		
<ENQ> [<CR> [<LF>]] →		Request for data transmission
← measured data, status data or parameters		Data transmitted
← <CR> <LF>		with end character
⋮		

Error control

All strings are checked. If an error is detected, all the characters up to the next <CR> are ignored, and the negative confirmation <NAK> is output. The appropriate flag is set in the error word. Errors can be decoded when the error word is read.

Error recognition protocol

Computer	Prisma	Explanation
Programming data →		Receives message with end character
<CR> [<LF>] →		
***** Transmission or ***** ***** programming error *****		
← <NAK> <CR> <LF>		Negative confirmation of a message
Programming data →		Receives string with end character
<CR> [<LF>] →		
← <ACK> <CR> <LF>		Positive confirmation of a message

5.1.4 Influencing the measurement by changing a parameter



CAUTION:

If, as it is entered, a parameter change affects an active measurement cycle, the measured data ring buffer is cleared and the cycle is repeated.

In the same way changes to an <operation> parameter cause the measurement to be repeated.



In the appendix there are two program examples for measurements over the RS-232-C interface in ASCII format.

5.2 Mnemonics

5.2.1 <channels> group

Function	Parameter	Mnemonics	Page	Meaning
<select>	Measure-Ch Parameter-Ch	SMC SPC	9 9	Selected measurement channel Selected parameter channel
<detect>	TYPE SEM AI-CH TPR / PKR-CTRL	DTY DSE DAI DPC	9 9 9 9	Signal source selection SEM high voltage for a channel Analog input Enable / disable the measurement circuit TPR / PKR
<mass>	MODE FIRST / MASS WIDTH SPEED / DWELL RESOL THRESH Steps	MMO MFM MWI MSD MRE MTH MST	9 9 9 10 10 10 10	Spectrum scan operating mode First mass for a scan / mass number Width of a scan Measurement speed / measurement time Resolution Peak processor threshold
<amplif>	MODE RANGE RANGE-L OFFSET OFFSET CORR. MASS-CAL P-CAL P-Time	AMO ARA ARL AOF ACL ACA APC APT	10 10 10 10 11 11 11 11	Measurement range switching mode Electrometer range Narrowest measurement range for Auto Down Offset correction for the electrometer Offset correction Factor for mass scale calibration: SLOPE + OFFSET “Break” factor for changing the measurement channel in multichannel operation “Break” time for measurement channel switchover
<aux>	STATE COPY TO CH	AST ACO	11 11	Enable measurement channel Copy the parameter set to channel xx
<output>	AO-CH AO-MODE MONITOR	OAC OMO OAM	11 11 11	Analog output channel number Analog output mode Analog output monitor ON / OFF
<trip>	TYPE LEVEL-A LEVEL-B DO-A DO-B	TTY TLA TLB TDA TDB	12 12 12 12 12	Type of switching function Switching function A / lower threshold for switching function Switching function B / upper threshold for switching function Digital output bit number for switching function A Digital output bit number for switching function B

5.2.2 <general> group

Function	Parameter	Mnemonics	Page	Meaning
<di/do>	DIG-IN DIG-OUT	DIS DOC	13 13	Digital input status Digital output control
<config> SYSTEM	MASS-R DETECT IS-TYP	SMR SDT SIT	13 13 13	Type of mass range Type of ion detector Type of ion source
<config> QMS-HW	QMS-HW	QHW	13	Pc boards QMS 200
<config> INIT	RESET	IRE	14	Parameter set (standard / user)
<config> CTRL	MODE BAUD NODE SEM+FIL Prot SEM+FIL Prot-Lev	CMO CBR CNA CSF ISP	14 14 14 14 14	Select type of input Transmission speed for the RS-232-C interface Node address for the LAN interface SEM and filament protection Protection thresholds
<config> SIMUL	SIMUL	TSI	14	Simulated test spectrum
<config> TEST	QMS DSP	TQM TDS	14 15	RAM test, EEPROM test, program number RAM test, EEPROM test, program number
<error>	ERROR State-QMS	ERR ESQ	15 15	Error message from QMS 200 Control unit status (interface only)

5.2.3 <ion source> group

Function	Parameter	Mnemonics	Page	Meaning
<emiss>	EMISS FIL-MAX	EMI EPR	16 16	Emission current Max. filament current
<v1...v6>	V1 IONREF V2 CATH V3 FOCUS V4 F-AXIS V5 EXTRACT RF-Polarity	VO1 VO2 VO3 VO4 VO5 SOP	16 16 16 16 16 16	Ion source voltage 1 Ion source voltage 2 Ion source voltage 3 Ion source voltage 4 Ion source voltage 5 DC polarity

5.2.4 <operation> group

Function	Parameter	Mnemonics	Page	Meaning
<sem hv>	SEM-VOLTAGE	SHV	17	Common SEM high voltage
<sem>	Control	SEM	17	Enable / disable the SEM high voltage + output of SEM voltage (actual value)
<ion src>	FILAM D-TIME D-EMIS D-PROT CTRL	IFI IDT IDE IDP ISC	17 17 17 17 17	Filament selection Duration of degas process Emission current for degas Maximum filament current for degas Enable / disable degas
<cycle>	FUNCT MODE CYCLES BEGIN END TRIG Run-Time ADJ-TYP	CFU CYM CYS CBE CEN CTR CWA CCF	17 17 18 18 18 18 18 18	Measurement cycle operation Measurement cycle sequence Number of measurement cycles First channel in cycle Last channel in cycle Measurement cycle control Scan time Measurement cycle coarse / fine peak adjustment
<run / halt>	RUN / HALT	CRU	19	Start / stop the measurement cycle
<filam>	Fila-Emi	FIE	19	Enable / disable the emission

5.2.5 Group of measured data not defined by a channel

Function	Parameter	Mnemonics	Page	Meaning
TOTAL	TPR / PKR	TPE	20	Total pressure cold cathode
ANALOG	A-Input A-Output	AIN AOU	20 20	Analog input status Analog output status
<trip> STATUS	T-State	TST	20	Switching function status
EMIS	EMI-CUR	ECU	20	Emission current + filament current display

5.2.6 Group of measured data defined by a channel

Function	Parameter	Mnemonics	Page	Meaning
MESSDATA	B-Counter M-Counter M-State M-Data Type B-Header B-Data	MBC MBH MDB	21 21 21-22	Contents counter for measured data buffer Number of measured values for this type of data Measurement is running / has finished Type of data Measured data buffer header Measured data buffer

5.3 Description

5.3.1 <channels> group

5.3.1.1 <select> function

Measure-Ch

Transmit: **SMC** [,xx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Measurement channel selected	0 ... 63	

Parameter-Ch

Transmit: **SPC** [,xx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Channel selected for parameter	0 ... 63	

5.3.1.2 <detect> function

TYPE

Transmit: **DTY** [,x]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Selects the signal source	0 = FARAD 1 = SEM 5 = TPR / PKR 6 = A-INPUT	

SEM

Transmit: **DSE** [,xxxx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xxxx <CR><LF>

Meaning	Value x	Comments
SEM high voltage defined by the channel	0 (SEM-HV) 1 ... 3000 V	<sem hv> applies for SEM-HV

AI-CH

Transmit: **DAI** [,xx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
AI channel number	x = 0 ... 1	

TPR / PKR-CTRL

Transmit: **DPC** [,x]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
The TPR / PKR measurement circuit is enabled / disabled	0 = OFF 1 = ON	

5.3.1.3 <mass> function

MODE

Transmit: **MMO** [,x]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Scan mode	0 = SCAN-N 1 = SCAN-F 2 = STAIR 3 = SAMPLE 4 = PEAK-L 5 = PEAK-F	Standard scan Scan with FIR filter Scan of whole number masses Standard measurement of a single mass Peak processor level criterion Peak processor FIR filter criterion

FIRST / MASS

Transmit: **MFM** [,xxxx.xx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xxxx.xx <CR><LF>

Meaning	Value x	Comments
First mass for a scan / mass number	0.00 ... 300.00	Minimal steps = 0.03 ($\frac{1}{32}$)

WIDTH

Transmit: **MWI** [,xxxxx]<CR><LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR><LF>]]
 Receive: xxxx <CR><LF>

Meaning	Value x	Comments
Width of scan	-300 ... +300 u	Except for «SAMPLE»; limited by the measurement range; backwards if negative

SPEED / DWELL

Transmit: **MSD [,xx]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
SPEED: Measurement speed per amu for «SCAN» (min. SPEED=200 ms)	4 = 10 ms 5 = 20 ms 6 = 50 ms 7 = 0.1 s 8 = 0.2 s 9 = 0.5 s 10 = 1 s 11 = 2 s 12 = 5 s 13 = 10 s 14 = 20 s 15 = 60 s	SCAN from 200 ms
DWELL: Measurement time for «SAMPLE»		

RESOL

Transmit: **MRE [,xxx]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxx <CR><LF>

Meaning	Value x	Comments
Resolution	0 ... 255	0 = off (integral spectrum) 1 = narrowest peak width 255 = largest peak width

THRESH

Transmit: **MTH [,x]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Threshold for peak processor	0 ... 7	Fix-Range Auto-Range 0 = 0.01; 1×10^{-15} A 1 = 0.03; 1×10^{-14} A 2 = 0.1; 1×10^{-13} A 3 = 0.3; 1×10^{-12} A 4 = 1; 1×10^{-11} A 5 = 3; 1×10^{-10} A 6 = 10; 1×10^{-9} A 7 = 30; 1×10^{-8} A % F.S. referenced to RANGE

Steps

Transmit: **MST [,x]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Measurement channel resolution	$1 = \frac{1}{32} u$	

5.3.1.4 <amplif> function**MODE**

Transmit: **AMO [,x]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Measurement range switchover mode	0 = FIX 1 = AUTO-D 2 = AUTO	

RANGE

Transmit: **ARA [,sxx]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sxx <CR><LF>

Meaning	Value x	Comments
Electrometer range	E-12 ... E-5	

RANGE-L

Transmit: **ARL [,sxx]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sxx <CR><LF>

Meaning	Value x	Comments
Lowest electrometer range for Auto-D	E-12 ... E-5	

OFFSET

Transmit: **AOF <CR>[<LF>]**
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sxxxx,...,sxxxx, <CR><LF>

Meaning	Value x	Comments
Offset correction for the electrometer (read only)	x = -32768 +32767	Referenced to «RANGE» and sxxxxx (7 x for Fast, 8 x for Normal, 8 x for Slow)

OFFSET CORRECTION

Transmit: **ACL** [,x]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Offset correction	0, 1	0 = Offset correction inactive 1 = Offset correction active

MASS-CAL

Transmit: **ACA** [,sxxx,yyyy]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sxxx,yyyy <CR><LF>

Meaning	Value x,y	Comments
Calibration factor for measured scale	x = -767 ... +767 y = -394 ... +394	x = CAL_LOW (Offset) y = CAL_HIGH (Slope)

P-CAL

Transmit: **APC** [,x,x]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.x <CR><LF>

Meaning	Value x	Comments
Measurement pause for changing the channel in multichannel operation	0.0 ... 9.9	

P-Time (Channel change)

Transmit: **APT**<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxxx <CR><LF>

Meaning	Value x	Comments
Pause time for measurement channel change (read only)	0 ... 65,535	Resolution = 1 ms

5.3.1.5 <aux> function
STATE

Transmit: **AST** [,x]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Enables measurement channel	0 = ENABLE 1 = SKIP	The channel is enabled The channel is skipped

COPY TO CH

Transmit: **ACO** [,x,xx[,yy]]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: 0,0,0 <CR><LF>

Meaning	Value x,y	Comments
Copies the parameter set to channel yy	x = 0 ... 2 0 = to all 1 = to one 2 = swap xx = 0 ... 63 yy = 0 ... 63	Copy from channel xx to all channels Copy from channel xx to channel yy Swap channel xx with yy

5.3.1.6 <output> function
AO-CH

Transmit: **OAC** [,xx]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Analog output channel number	0 ... 4	0 = no channel

AO-MODE

Transmit: **OMO** [,x]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Analog output mode for <AO> and MONITOR	0 = linear 1 = logarithmic 8 DEC 2 = logarithmic 3 DEC	

MONITOR

Transmit: **OAM** [,x]<CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Analog output mode for <mon>	0 = Off 1 = On	Monitor On / Off

5.3.1.7 <trip> function

TYPE

Transmit: **TTY** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Type of switching function	0 = OFF 1 = ABS	Switching function disabled Switching function without hysteresis
	2 = HYST	Switching function with hysteresis

LEVEL-A

Transmit: **TLA** [,x.xxEsxx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.xxEsxx <CR><LF>

Meaning	Value x	Comments
Switching function A / lower threshold for the switching function	1.00 E-24 9.99 E+24	

LEVEL-B

Transmit: **TLB** [,x.xxEsxx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.xxEsxx <CR><LF>

Meaning	Value x	Comments
Switching function B / upper threshold for the switching function	1.00 E-24 9.99 E+24	

DO-A (relay allocation)

Transmit: **TDA** [,xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Digital output bit number for switching function A	0 ... 1 99	No allocation

DO-B (relay allocation)

Transmit: **TDB** [,xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Digital output bit number for switching function B	0 ... 1 99	No allocation

5.3.2 <general> group

5.3.2.1 <di/do> function

DIG-IN

Transmit: **DIS** [,xx] <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx,x <CR><LF>

Meaning	Value x	Comments
Digital input statuses	xx = 0 ... 1 x = 0 ... 1 0 = Low 1 = High	DI number. 0 = Ext. Prot 1 = Ext. Start Read bit status

DIG-OUT (Relays)

Transmit: **DOC** [,xx[,x]] <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx,x <CR><LF>

Meaning	Value x	Comments
Digital output control	xx = 0 ... 1 99 x = 0 ... 1 0 = Clear 1 = Set	Relay number All relays together Relay manipulation

5.3.2.2 <config> SYSTEM function

MASS-R

Transmit: **SMR** [,x] <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Defines the mass range	0 = 100 1 = 200 7 = 300	

DETECT

Transmit: **SDT** [,x] <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Defines the type of ion detection	0 = FARAD 4 = CH-TRON	Faraday Channeltron

IS-TYP

Transmit: **SIT** [,x] <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Defines the type of RF ion source	1 = HS thor. iridium 2 = HS tungsten 3 = SPM tungsten	HS ion source " Sputter Process Monitor

5.3.2.3 Function <config> QMS-HW

QMS-HW

Transmit: **QHW** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,x,x,x,x,x,x,x <CR><LF>

Meaning	Value x	Comments
Configuration of Prisma	0 = No; 1 = HV 200	
	0 = No; 1 ... 3	1 = RF 201 2 = RF 202 3 = RF 203
	0 = No;	
	0 = No;	
	0 = No;	
	0 = No; 1 = DO	
	0 = No;	
	0 = No; 1 = TPR 250	
	0 = No; 1 = PKR 250	

5.3.2.4 <config> INIT function

RESET

Transmit: **IRE** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: 0 <CR><LF>

Meaning	Value x	Comments
Set of parameters for the ion source and the measurement channels	0 = NO 1 = FACTORY	No action Default parameters

5.3.2.5 <config> CTRL function

MODE

Transmit: **CMO** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Type of input	1 = ASCII 2 = BIN 3 = MODEM 4 = LAN	RS-232-C with ASCII format RS-232-C with binary format RS-232-C with binary format Field bus interface

BAUD

Transmit: **CBR** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Transmission speed for the serial interface	0 = 300 bit/s 1 = 1200 bit/s 2 = 2400 bit/s 3 = 4800 bit/s 4 = 9600 bit/s 5 = 19200 bit/s	

NODE

Transmit: **CNA** [,xxx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxx <CR><LF>

Meaning	Value x	Comments
Node address for the field bus interface	1 ... 255	

SEM + FIL PROTECTION

Transmit: **CSF** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
SEM + FIL protection	0 = INTERN 1 = EXTERN 2 = EXT-PROT	

SEM + FIL PROTECTION LEVEL

Transmit: **ISP** [,sx.xxxxEsxx,sy.yyyyEsyy]
 <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sx.xxxxEsxx,sy.yyyyEsyy <CR><LF>=EXT. PROT

Meaning	Value x,y	Comments
Protection threshold (total pressure) ⇒ only for SEM + FIL = EXT. PROT	1.1700E-38 3.4000E+38	x = Level A (Enable threshold) y = Level B (Disable threshold)

5.3.2.6 <config> SIMUL function

SIMUL

Transmit: **TSI** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Spectrum simulation for testing purposes	0 = OFF 1 = INTERN 2 = EXTERN	No simulation Internal simulation External simulation

5.3.2.7 <config> TEST function



NOTE:

Depending on the test, two to three seconds can elapse between transmission and receipt.

QMS (Systemcontroller)

Transmit: **TQM** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x[.yyyyyyyyy] <CR><LF>

Meaning	Value x,y	Comments
Control unit test routine	x = 0 ... 3 0 = RAM-T 1 = EPROM-T 2 = PRG-NO. 3 = No test yyyyyyyyy	Check sum for test 1 or Program number for test 2

DSP (Signalcontroller)

Transmit: **TDS [,x]** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x[.yyyyyyyyyy] <CR><LF>

Meaning	Value x,y	Comments
Digital signal processor test	x = 0 ... 3 0 = RAM-T 1 = EPROM-T 2 = PRG-NO. 3 = No test yyyyyyyyyy	Check sum for test 1 or Program number for test 2

5.3.2.8 <error> function

ERROR

Transmit: **ERR** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx,xx,xx,...,xx <CR><LF>

Meaning	Value x	Comments
Error messages (are cleared when a response to a query is transmitted)	xx = 0, 17...47 0 = no error	No. 17 No. 33 No. 18 No. 34 No. 19 No. 35 No. 20 No. 36 No. 21 No. 37 No. 22 No. 38 No. 23 No. 39 No. 24 No. 40 No. 25 No. 41 No. 26 No. 42 No. 27 No. 43 No. 28 No. 44 No. 29 No. 45 No. 30 No. 46 No. 31 No. 47 No. 32

State QMS

Transmit: **ESQ** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx,xx,xx,...,xx <CR><LF>

Meaning	Value x	Comments
Control unit status	xx = 1...16 0 = all statuses 0	Bit Function Status 0 Status 1 1: Cycle Halt Run 2: Cycle Mono Multi 3: Emis off on 4: SEM-Sply off on 5: Ext. Start O.K. wait for Trigger 9: Degas off on 10: Adjust off on 11: Adjust halt run 15: Ring buffer not empty empty 16: Ring buffer O.K. overflow



NOTE:

The status »Ring buffer overflow« (Bit 16) is not canceled until the next cycle is started (»Run«).

5.3.3 <ion source> group

5.3.3.1 <emiss> function

EMISS

Transmit: **EMI** [.x.xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.xx <CR><LF>

Meaning	Value x	Comments
Emission current	0.00 ... 2.00 mA	

FIL-MAX

Transmit: **EPR** [.x.xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.xx <CR><LF>

Meaning	Value x	Comments
Maximum filament current	0.00 ... 3.50 A	

5.3.3.2 <v1...v6> and <v7...> function

V1

Transmit: **VO1** [.xxx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxx <CR><LF>

Meaning	Value x	Comments
Voltage 1: IONREF	105 ... 150 V	Step = 1 V

V2

Transmit: **VO2** [xxx.x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxx.x <CR><LF>

Meaning	Value x	Comments
Voltage 2: CATH	0.0 ... 100.0 V	Step = 0.5 V

V3

Transmit: **VO3** [,sxx.xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sxx.xx <CR><LF>

Meaning	Value x	Comments
Voltage 3: FOCUS	0.00 30.00 V	Step = 0125 V

V4

Transmit: **VO4** [.xx.xx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx.xx <CR><LF>

Meaning	Value x	Comments
Voltage 4: F-AXIS	0.00 ... 15.00 V	Step = 0.125 V

V5

Transmit: **VO5** [,xxx] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxx <CR><LF>

Meaning	Value x	Comments
Voltage 5: EXTRACT	0 ... 150 V	Step = 1 V

RF-POLARITY

Transmit: **SOP** [.x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
DC polarity	x = 0, 1	0 = normal 1 = inverse

5.3.4 <operation> group

5.3.4.1 <sem hv> and <sem> function

SEM-VOLTAGE

Transmit: **SHV [,xxxx]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxxx <CR><LF>

Meaning	Value x	Comments
Defined common SEM high voltage	0 ... 3000 V	SEM high voltage not defined in a measurement channel

Control

Transmit: **SEM [x,y]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,y <CR><LF>

Meaning	Value x,y	Comments
Define SEM high voltage status on / off	x = 0; 1 y = 0 ... 3000	with «FARAD» = automatically Off 0 = OFF 1 = ON SEM-Voltage (actual value)

5.3.4.2 <ion src> function

FILAM

Transmit: **IFI [x]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Filament selection	x = 0 ... 2	0 = Filament 0 1 = Filament 1 2 = Filament 1 + 2

D-TIME

Transmit: **IDT [,xx]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx <CR><LF>

Meaning	Value x	Comments
Duration of Degas	0 = MANUAL 1 ... 99 min	Continue Degas until stop command is entered manually

D-EMIS

Transmit: **IDE [,xx.x]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx.x <CR><LF>

Meaning	Value x	Comments
Emission current for Degas	00.0 ... 10.0 mA	

D-PROT

Transmit: **IDP [x.xx]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x.xx <CR><LF>

Meaning	Value x	Comments
Filament current for Degas	0.00 ... 3.50 A	

CTRL

Transmit: **ISC [x]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Turn Degas on / off	0 = STOP 1 = START / RUN	

5.3.4.3 <cycle> function

FUNCY

Transmit: **CFU [x]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Defines the type of measurement cycle	0 = CYCLE 1 = ADJUST 4 = Offset Measure 5 = Synchron-Scan 6 = RF-Tune	Measurement operation Mass number adjustment Offset measurement Test scan RF tune

MODE

Transmit: **CYM [x]** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Measurement cycle sequence	0 = MONO 1 = MULTI	Single channel cycle Multichannel cycle

CYCLES

Transmit: **CYS** [,xxxx] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: xxxx <CR><LF>

Meaning	Value x	Comments
Number of measurement cycles	0 = REPEAT 1 ... 10,000	Continuous cycle repeat

BEGIN

Transmit: **CBE** [,xx] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: xx <CR><LF>

Meaning	Value x	Comments
First channel in the cycle	0 ... 63	Only for »multi«, otherwise the first channel is always the selected channel

END

Transmit: **CEN** [,xx] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: xx <CR><LF>

Meaning	Value x	Comments
Last channel in the cycle	0 ... 63	Only for »multi«, otherwise the first channel is always the selected channel

TRIG (→ 46)

Transmit: **CTR** [,x] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: x <CR><LF>

Meaning	Value x	Comments
Measurement cycle control	0 = INTERN 1 = EXT-AUTO 2 = EXT-NORM 3 = EXT-SINGLE	

Run-Time (stop watch)

Transmit: **CWA** [,x] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: x,xxx,yy,xx,yyy <CR><LF>

Meaning	Value x,y	Comments
Measurement cycle time	x = 0 ... 1 xxx = 0 ... 119 h yy = 0 ... 59 min xx = 0 ... 59 s yyy = 0 ... 999 ms	0 = LAP off; 1 = LAP on Automatic Run Time transmission

ADJ-TYP

Transmit: **CCF** [,x] <CR>[<LF>
<ACK><CR><LF>
Receive: <ENQ>[<CR>[<LF>]]
Transmit: x <CR><LF>

Meaning	Value x	Comments
Coarse / fine peak adjustment search	0 = COARSE 1 = FINE	Coarse; only in «SAMPLE» Fine; only in «SAMPLE»

5.3.4.4 <run/halt> function

RUN / HALT

Transmit: **CRU** [.x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Start / stop of the measurement cycle	0 = STOPP 1 = START 2 = JOB-RUN	

5.3.4.5 <filam> function

Fila-Emi

Transmit: **FIE** [.x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x <CR><LF>

Meaning	Value x	Comments
Emission enabled / disabled	0 = OFF 1 = ON	

5.3.5 Group of measured data not defined in measurement channels

5.3.5.1 Total pressure

TPR / PKR

Transmit: **TPE** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,y.yEsyy <CR><LF>

Meaning	Value x,y	Comments
Total pressure	x = 0 ... 4 0 = O.K. 1 = Underrange 2 = Overrange 3 = Error 4 = Off 1.0 E+3 ... 5.0 E-10	Circuit status Measured data O.K. Measurement underrange Measurement overrange Error at the measuring unit Measurement unit disabled Measurement value TPR / PKR in [mbar] (pressure)

5.3.5.2 Analog

A-Input

Transmit: **AIN** [,x] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,sxxxxx <CR><LF>

Meaning	Value x	Comments
Analog input statuses	x = 0, 1 +5120 ... -5120	AI channel Read out AI voltage in [mV]

A-Output

Transmit: **AOU** [,x[,sxxxxx]] <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,sxxxxx <CR><LF>

Meaning	Value x	Comments
Analog output statuses	x = 0 ... 3 ≥ 4 +5120 ... -5120	AO channel All AO channels together AO voltage in [mV]

5.3.5.3 <trip> STATUS

T-State

Transmit: **TST** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,y <CR><LF>

Meaning	Value x,y	Comments
Switching function statuses for the selected parameter channel	x = 0 ... 1 0 = passive 1 = active	Switching function status A
	y = 0 ... 1 0 = passive 1 = active	Switching function status B

5.3.5.4 Emission

EMI-CUR

Transmit: **ECU** <CR>[<LF>]
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx.xx,y.yy <CR><LF>

Meaning	Value x,y	Comments
Emission current Filament current	x = 0.00 ... 20.48 mA y = 0.00 ... 5.12 A	

5.3.6 Group of measured data defined in measurement channels

B-Counter

Transmit: **MBC** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxxxxx <CR><LF>

Meaning	Value x	Comments
Measured data buffer Intensity counter	0 ... 131,071	0 to 128k

B-Header

Transmit: **MBH** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,xx,yy,xxxxxx,xxx <CR><LF>

Meaning	Value x,y	Comments
Measured data buffer header	x = 0 ... 1 0 = running 1 = ended	Measurement status
	xx = 0 ... 63	Measurement channel number
	yy = 0 ... 16	0 = no block available Data type for electrometer oper 7 = SCAN 8 = PEAK 9 = SAMPLE 10 = ADJUST 14 = TPR / PKR 15 = A-INPUT 16 = Run-Time
	xxxxxx = 0 ... 131,071	Number of values for the type of data 0 to 128k
	xxx = 0 ... 120	Counter

5.3.6.1 Measured data

Measured data in SCAN and STAIR operation

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sx.xxxxEsxx <CR><LF>

Meaning	Value x	Comments
Peak intensity	1.0000 E0 9.9999 E16	E+6 without «CALIB» [cps]

Measured data in PEAK processing mode

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxxx.xx,sy.yyyyEsyy <CR><LF>

Meaning	Value x,y	Comments
Mass number	0.00 ... 2047.99	Internally in steps of 1/64 (1/32); as a function of the measurement range and «SPEED»
Peak intensity	1.0000 E0 9.9999 E16	E+6 without «CALIB» [cps]

Measured data in SAMPLE mode

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: sx.xxxxEsxx <CR><LF>

Meaning	Value x	Comments
Peak intensity	1.00000 E0 9.99999 E16	24-bit mantissa; E+6 with- out «CALIB»; [cps]

ADJUST data

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xx,xx,xxxx.xx,sy.yyyyyEsyy
 <CR><LF>

Meaning	Value x,y	Comments
Status message	xx = 0 ... 31	0 = good Bit 0 = 1: «MASS» too low Bit 1 = 1: «MASS» too high Bit 2 = 1: Intensity hasn't dropped to 66% Bit 3 = 1: Intens. > F.S. Bit 4 = 1: Intens. < «THRESH»
Measurement channel number	xx = 0 ... 63	
Mass number	0.00 ... 2047.99	
Peak intensity	1.00000 E0 9.99999 E16	[cps]

5.3.6.2 Total pressure

Measured data from Cold cathode measurement

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,y.yEsyy <CR><LF>

Meaning	Value x,y	Comments
Total pressure cold cathode	x = 0 ... 4 0 = O.K. 1 = Underrange 2 = Overrange 3 = Error 4 = Off 1.0 E-3 ... 5.0 E-10	Cold cathode circuit status Measured data O.K. Measurement underrange Measurement overrange Error at the measuring unit Measurement circuit disabled Measurement value TPR / PKR in [mbar] (pressure)

5.3.6.3 Analog

Measured data form Analog input

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: x,sxxxxx <CR><LF>

Meaning	Value x	Comments
Analog input statuses	x = 0, 1 +5120 ... -5120	AI channel Read out AI voltage in [mV]

5.3.6.4 Run-Time

Run-Time measured data

Transmit: **MDB** <CR>[<LF>
 Receive: <ACK><CR><LF>
 Transmit: <ENQ>[<CR>[<LF>]]
 Receive: xxxx <CR><LF>

Meaning	Value x	Comments
Measurement cycle time	0 ... 2^{32} -1 ms	

6 RS-232-C interface (binary format)

6.1 Data transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

6.1.1 Definitions

The following definitions are used:

Abbreviations and symbols

Symbol	Meaning	Decimal	Hex.
Computer	Computer or terminal		
Prisma	Quadrupole mass spectrometer QMS 200		
<ENQ>	INQUIRY Request for data transmission	5	05
<EOT>	END OF TEXT End of transmission	4	04
<ACK>	ACKNOWLEDGMENT Positive report signal	6	06
<NAK>	NEGATIVE ACKNOWLEDGMENT Negative report signal	21	15

Terms

"Transmit": Data transfer from the computer to the Prisma

"Receive": Data transfer from the Prisma to the computer

Floating point data format according to IEEE 754, Single Precision

Sign digit	8-bit exponent	23-bit mantissa
S	E ₇ ... E ₀	M ₂₂ ... M ₀

Range of values:

$$(-1)^S \cdot 1.M \cdot 2^{(E-127)} \rightarrow 1.17 \cdot 10^{-38} \dots 3.4 \cdot 10^{38}$$

Exponent:

8-bit US (unsigned) with an offset of -127 for base 2 number.

Example: 2³ → 8-bit Exponent = 127 + 3 = 130

Mantissa:

Sign digit +23-bit fixed point part for base 2 number with place value without the leading 1.

Number value 0:

Mantissa and exponent are set to 0. The sign digit retains its validity (+0 and -0 are thus possible).

Number value ∞ :

Mantissa = 0 and exponent = 255. The sign digit distinguishes between $+\infty$ and $-\infty$.

Non-numbers (NAN):

Mantissa > 0 and exponent = 255.

6.1.2 Communication protocol (Data link)

The data transmission takes place according to the SECS-1 standard (semi equipment communication standard 1) with the following two deviations:

- minimum Header size = 1
- LSB comes before MSB

6.1.2.1 Standard data traffic according to SECS-1

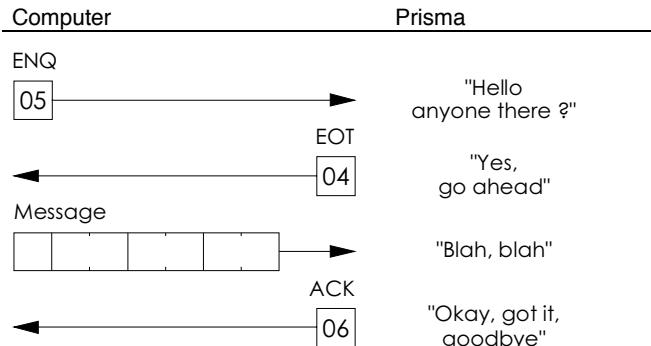
Data transmission

1 start bit, 8 data bits, 1 stop bit, no parity, no hw handshake

Format

The data transmission request <ENQ> must be confirmed by the transmitter with <EOT> before data are transmitted. Once the data have been transmitted, the check sum is transmitted and the transmitter waits for the <ACK> confirmation. When <ACK> is received, the transmission is ended.

Protocol

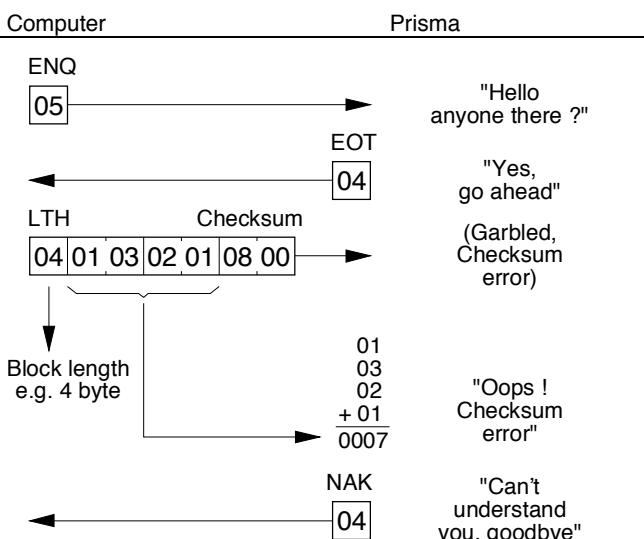


6.1.2.2 Error control according to SECS-1

Check sum error

When the checksum turns up an error, <NAK> is output as a transmission confirmation. When <NAK> is received, the previous transmission will be repeated up to six times.

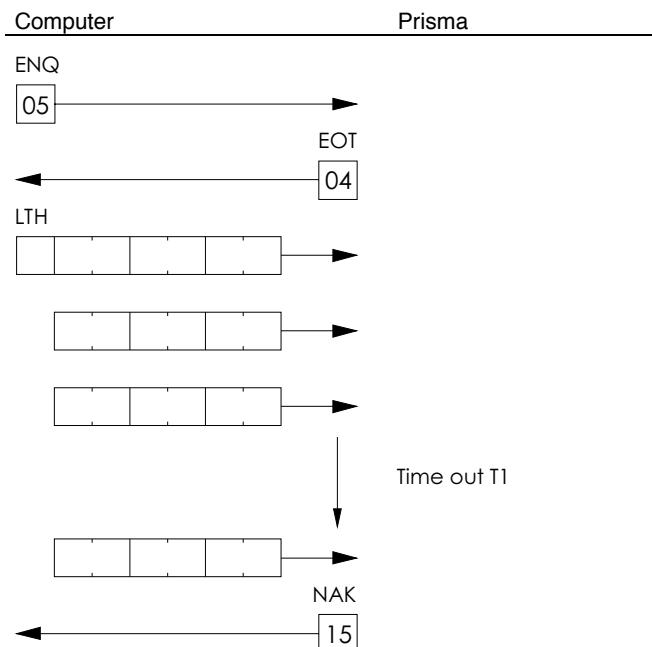
Protocol for check sum error



Timeout T1

The receiver only waits for a character for a certain amount of time during a transmission. If this time expires, the transmission is aborted.

Protocol for timeout T1



NOTE:

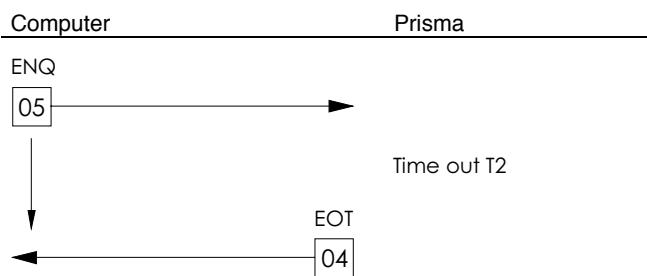
The time between two characters may not be longer than 0.5 s.

Timeout T2

If no response is received to the data transmission within a certain time, the transmission is aborted after seven attempts.

This is the case when the <ENQ> request is not confirmed with <EOT> or when no message is transmitted after <EOT> or when the transmission is not acknowledged with <ACK> or <NAK>.

Protocol for timeout T2



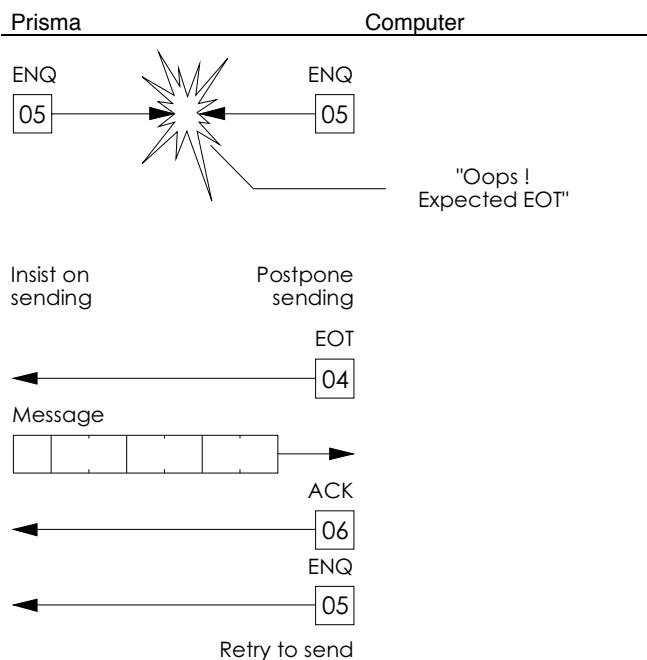
NOTE:

The minimum delay time for the reception of the response is 1 s.

Request collision

If two requests for data transmission are made at the same time, the computer temporarily postpones its request and confirms the request from the Prisma with <EOT>.

Protocol for collision



6.1.3 Influencing the measurement by changing a parameter

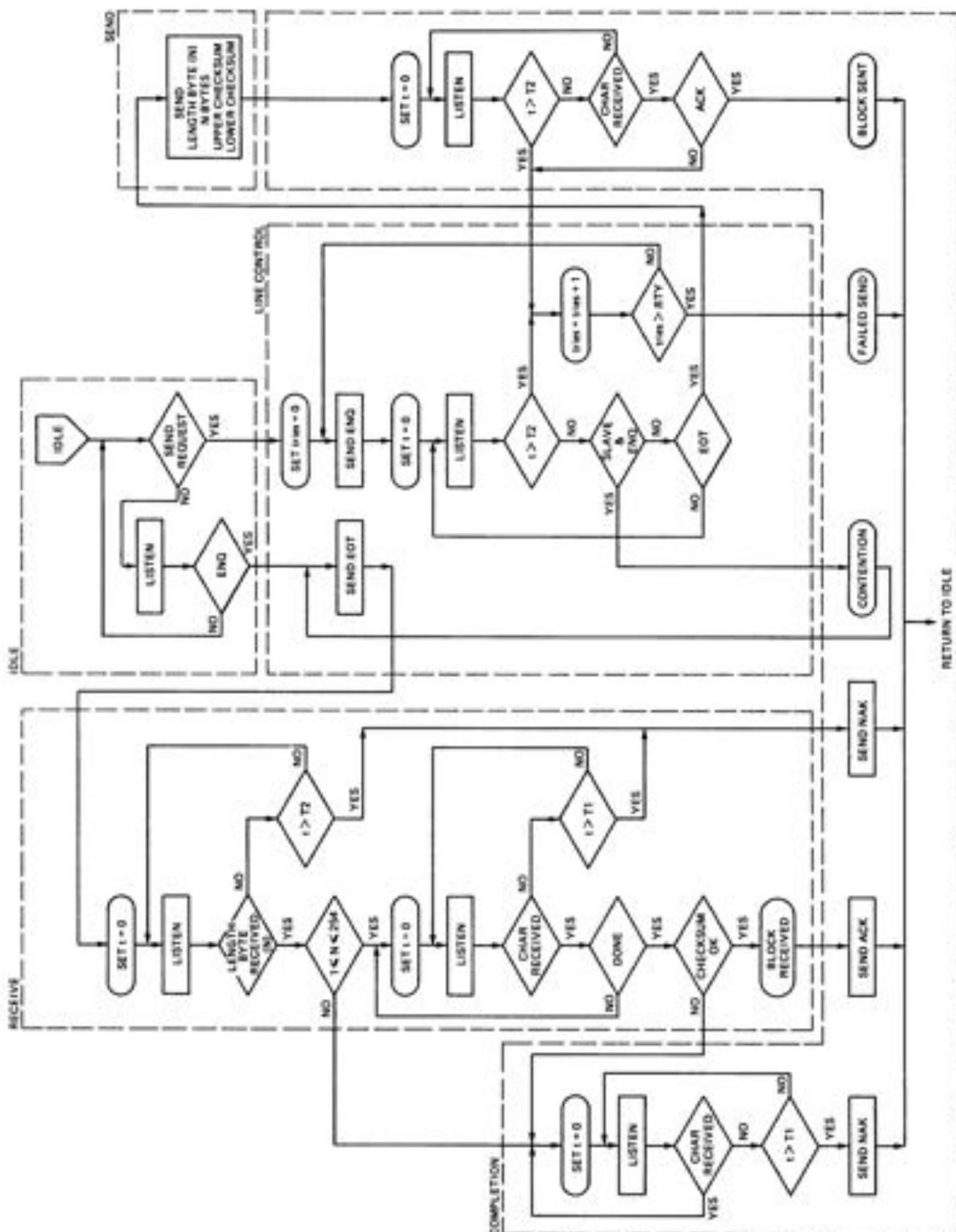


CAUTION:

If, as it is entered, a parameter change affects an active measurement cycle, the measured data ring buffer is cleared and the cycle is repeated.

In the same way, changes to an <operation> parameter cause the measurement to be repeated.

6.2 Block transfer diagram



6.3 Block identification

6.3.1 <channels> group

Frame	Parameter	Block identification	Page	Meaning
<select>	Measure-Ch	01 / 02	31	Selected measurement channel
	Parameter-Ch	03 / 04		Selected parameter channel
<detect>	TYPE	05 / 06	31	Signal source selection
	SEM			SEM high voltage for a channel
	AI-CH			Analog input
<mass>	TPR/PKR-CTRL	103 / 104	32, 49	Enable / disable the measurement circuit
	MODE	07 / 08		Spectrum scan operation
<amplif>	FIRST / MASS		33	First mass for a scan / mass number
	WIDTH			Width of a scan
	SPEED / DWELL			Measurement speed / measurement time
	RESOL			Resolution
	THRESH			Peak processor threshold
	Steps			Measurement channel resolution (points per mass)
	MODE	11 / 12	34	Measurement range switching mode
<aux>	RANGE			Electrometer range
	RANGE-L			Narrowest measurement range for Auto Down
	OFFSET			Offset correction for the electrometer
	P-CAL			"Break" factor for changing the measurement channel in multichannel operation
<output>	P-Time	69 / 70		"Break" time for measurement channel switchover
	STATE	13 / 14	35	Enable measurement channel
<trip>	COPY TO CH	16		Copy the parameter set to channel xx
	AO-CH	17 / 18	35	Analog output channel number
<trip>	AO-MODE			Analog output mode
	MONITOR			Analog output monitor
	TYPE	19 / 20	36	Type of switching function
<trip>	LEVEL-A			Switching function A / lower threshold for switching function
	LEVEL-B			Switching function B / upper threshold for switching function
	DO-A			Relay for switching function A
	DO-B			Relay for switching function B

6.3.2 <general> group

Frame	Parameter	Block identification	Page	Meaning
<di/do>	DIG-IN	23 / 24	37	Digital input statuses (block operation)
		25 / 26	37	" (single bit operation)
		29 / 30	38	Digital output status (single bit operation)
<config> SYSTEM	QMA MASS-R DETECT IS-TYP	31 / 32	38	Type of analyzer Type of mass range Type of ion detector Type of ion source
<config> QMS-HW	QMS-HW	33 / 34	39	Pc boards in the QMS 200
<config> INIT	RESET	36	39	Parameter set (standard / user)
<config> CTRL	MODE	37 / 38	40	Select type of input
	BAUD			Transmission speed for the RS-232-C interface
	NODE			Node address for the LAN interface
	SEM + FIL			SEM and filament supply
<config> SIMUL	SIMUL	71 / 72	40	Simulated test spectrum
<config> TEST	QMS	39 / 40	41	RAM test, EPROM test, program number
	DSP			RAM test, EPROM test, program number
<error> STATUS	ERROR	41 / 42	42	Error message from QMS 200
	State-QMS			QMS status (only communication interface)
<Mass-Cal>	CAL_LOW	75 / 76	43	Low-Mass: Offset
	CAL_HIGH			High-Mass: Slope
<Trip Total>	LEVEL-A	77 / 78	43	Switching function A
	LEVEL-B			Switching function B

6.3.3 <ion source> group

Function	Parameter	Block identification	Page	Meaning
<IS-Parameter>	V1 V2 V3 V4 V5 EMISS FIL-MAX D-TIME D-EMIS D-PROT RF-POL	73 / 74	44	

6.3.4 <operation> group

Frame	Parameter	Block identification	Page	Meaning
<sem hv>	SEM-VOLTAGE	49 / 50	45	Common SEM high voltage
<sem>	Control			Enable / disable the SEM high voltage
<ion src>	MODE	51 / 52	45	Type of ion source operation
	FILAM			Filament selection
	CTRL	57 / 58	46	Enable / disable degas
<cycle>	FUNCT	59 / 60	46	Measurement cycle operation
	MODE			Measurement cycle sequence
	CYCLES			Number of measurement cycles
	BEGIN			First channel in cycle
	END			Last channel in cycle
	TRIG			Measurement cycle control
	Run-Time	61 / 62	47	Scan time
	ADJ-TYP	63 / 64	47	Measurement cycle coarse / fine peak adjustement
<run / halt>	RUN / HALT	65 / 66	47	Start / Stop the measurement cycle
<filam>	Fila-Emi	67 / 68	48	Enable / disable the emission

6.3.5 Group of measured data not defined by a channel

Frame	Parameter	Block identification	Page	Meaning
TOTAL	Penning	103 / 104	49, 32	Total pressure TPR / PKR
ANALOG	A-Input	105 / 106	49	Analog input statuses
	A-Output	107 / 108	50	Analog output statuses
<trip> STATUS	T-State	109 / 110	51	Switching function statuses (block operation)
		111 / 112	52	" (single bit operation)
<TUNE 200>	EMI_CUR	117 / 118	52	Tune = measured value RM 2000
	FIL_CUR			
	TUNE_V			
	SEM_V			
	TEMP_V			
<OFFSET-VALUES>	OSET-F1	119 / 120	53	Offset Fast
	OSET-F2			
	OSET-F3			
	OSET-F4			
	OSET-F5			
	OSET-F6			
	OSET-F7			
	OSET-N1			Offset Normal
	OSET-N2			
	OSET-N3			
	OSET-N4			
	OSET-N5			
	OSET-N6			
	OSET-N7			
	OSET-N8			
	OSET-S1			Offset Slow
	OSET-S2			
	OSET-S3			
	OSET-S4			
	OSET-S5			
	OSET-S6			
	OSET-S7			
	OSET-S8			

6.3.6 Group of measured data defined by a channel

Frame	Parameter	Block identification	Page	Meaning
MESSDATA	B-Counter	131 / 132	55	Contents counter for measured data buffer
	M-Counter			Number of measured value for this type of data
	M-State	133 / 134	55-61	Measurement is running / has finished
	M-Data Type			Type of data
	B-Header			Measured data buffer header
	B-Data			Measured data buffer

6.4 Description

6.4.1 <channels> group

6.4.1.1 <select> frame

Measurement channel

Read parameters		Transmit parameters					
Byte	Block 01		Byte	Block 02		Comments	
	1			2		Block length	
	1	01		1	02	Block identification	
	2			2	0 ... 63	Selected measurement channel	
						Check sum	
						LSB	
						MSB	

Parameter channel (load channel)

Read parameters		Transmit parameters					
Byte	Block 03		Byte	Block 04		Comments	
	1			2		Block length	
	1	03		1	04	Block identification	
	2			2	0 ... 63	Selected parameter channel	
						Check sum	
						LSB	
						MSB	

6.4.1.2 <detect> frame

Read parameters		Transmit parameters						
Byte	Block 05		Byte	Block 06		Comments		
	2			9			Block length	
	1	05		1	06		Block identification	
	2	0 ... 63		2	0 ... 63		Selected parameter channel	
				3	0 ... 6		TYPE 0 = FARAD; 1 = SEM 5 = TPR / PKR 6 = A-Input	
				4	0 ... LSB		SEM 0 = Common high voltage 1 ... 3000 V	
				5	... 3000 MSB		"	
				6			8-bit US	
				7	0 ... 1		AI-CH = 0 ... 1	
				8			GAP (empty byte)	
				9			GAP (empty byte)	

TOTAL-CTRL

Read parameters		Transmit parameters					
Transmit: Block 103 Receive: Block 104		Transmit: Block 104					
Byte	Block 103	Byte	Block 104	Parameter	Variable type	Mne	Comments
	1		7		8-bit US		Block length
1	103	1	104	TPR/PKR-CTRL	8-bit US	DPC	Block identification
		2	0 ... 1		8-bit US		0 = Turn off measurement circuit 1 = Turn on measurement circuit
		3	0		8-bit US		GAP (empty byte)
		4	0		FLOAT		GAP (empty byte)
		5					GAP (empty byte)
		6					GAP (empty byte)
		7					GAP (empty byte)
Check sum		Check sum		16-bit US		Check sum	
LSB		LSB					
MSB		MSB					



NOTE:

Bytes 3 ... 7 have no significance for data transmission. The frame content corresponds to that given in section 6.4.5.1 for data reception.

6.4.1.3 <mass> frame

Read parameters		Transmit parameters		
		Transmit: Block 08		
Block 07		Block 08		
Byte	Byte	Parameter	Variable type	Mne
	2		8-bit US	
1	07	channel	8-bit US	SPC
2	0 ... 63	MODE	8-bit US	MMO
	08	FIRST / MASS	32-bit US	MFM
1	0 ... 63	"	"	
2	0 ... 5	"	"	
3	0 ... LSB	WIDTH	16-Bit S	MWI
4	"			-300 ... +300 u ¹⁾
5	"			
6	"			
7	... 30'000 MSB	SPEED / DWELL	8-bit US	MSD
8	-300 ... LSB			4 = 10 ms/u; 5 = 20 ms/u
9	... +300 MSB			6 = 50 ms/u; 7 = 0,1 s/u
10	4 ... 15			8 = 0,2 s/u; ²⁾ 9 = 0,5 s/u
11	0 ... 255	RESOL	8-bit US	10 = 1 s/u; 11 = 2 s/u
12	0 ... 7	THRESH	8-bit US	12 = 5 s/u; 13 = 10 s/u
13				14 = 20 s/u; 15 = 60 s/u
14	1			
Check sum	LSB		8-bit US	Fix-Range
	MSB		8-bit US	0 = 0,01; 1 = 1 x 10 ⁻¹⁵ A
Check sum	LSB		8-bit US	1 = 0,03; 1 = 1 x 10 ⁻¹⁴ A
	MSB		8-bit US	2 = 0,1; 1 = 1 x 10 ⁻¹³ A
			8-bit US	3 = 0,3; 1 = 1 x 10 ⁻¹² A
			8-bit US	4 = 1; 1 = 1 x 10 ⁻¹¹ A
			8-bit US	5 = 3; 1 = 1 x 10 ⁻¹⁰ A
			8-bit US	6 = 10; 1 = 1 x 10 ⁻⁹ A
			8-bit US	7 = 30; 1 = 1 x 10 ⁻⁸ A
				% F.S. referenced to RANGE
				GAP (empty byte)
		Steps	8-bit US	1/32 u
			8-bit US	
			16-bit US	Check sum

¹⁾ The maximum mass depends on the selected mass range (\rightarrow section 6.4.5.2).

2) minimum SCAN-SPEED

6.4.1.4 <amplif> frame

Read parameters Transmit: Block 11 Receive: Block 12		Transmit parameters Transmit: Block 12																																																																																																																				
<table border="1"> <thead> <tr> <th>Byte</th><th>Block 11</th></tr> </thead> <tbody> <tr><td>1</td><td>2</td></tr> <tr><td>2</td><td>11</td></tr> <tr><td>2 ... 63</td><td></td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Byte</th><th>Block 12</th></tr> </thead> <tbody> <tr><td>1</td><td>16</td></tr> <tr><td>2</td><td>12</td></tr> <tr><td>2 ... 63</td><td>0 ... 63</td></tr> <tr><td>3</td><td>0 ... 2</td></tr> <tr><td>4</td><td>-12 ... -5</td></tr> <tr><td>5</td><td>-12 ... -5</td></tr> <tr><td>6</td><td></td></tr> <tr><td>7</td><td></td></tr> <tr><td>8</td><td>0 ... 1 LSB</td></tr> <tr><td>9</td><td>MSB</td></tr> <tr><td>10</td><td></td></tr> <tr><td>11</td><td></td></tr> <tr><td>12</td><td></td></tr> <tr><td>13</td><td></td></tr> <tr><td>14</td><td>0 ... 99</td></tr> <tr><td>15</td><td></td></tr> <tr><td>16</td><td></td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Check sum</th><th>LSB</th></tr> </thead> <tbody> <tr><td></td><td>MSB</td></tr> </tbody> </table>	Byte	Block 11	1	2	2	11	2 ... 63		Byte	Block 12	1	16	2	12	2 ... 63	0 ... 63	3	0 ... 2	4	-12 ... -5	5	-12 ... -5	6		7		8	0 ... 1 LSB	9	MSB	10		11		12		13		14	0 ... 99	15		16		Check sum	LSB		MSB		<table border="1"> <thead> <tr> <th>Parameter</th><th>Variable type</th><th>Mne</th><th>Comments</th></tr> </thead> <tbody> <tr><td></td><td>8-bit US</td><td></td><td>Block length</td></tr> <tr><td>channel</td><td>8-bit US</td><td></td><td>Block identification</td></tr> <tr><td>MODE</td><td>8-bit US</td><td>SPC</td><td>Selected parameter channel</td></tr> <tr><td></td><td>8-bit US</td><td>AMO</td><td>0 = Fix 1 = Auto-D 2 = Auto</td></tr> <tr><td>RANGE</td><td>8-Bit S</td><td>ARA</td><td>Exponent (not calibrated) -12 ... -5</td></tr> <tr><td>RANGE-L</td><td>8-Bit S</td><td>ARL</td><td>Exponent (not calibrated, only for Auto-D) -12 ... -5</td></tr> <tr><td></td><td>8-bit US</td><td></td><td>GAP (empty byte)</td></tr> <tr><td></td><td>8-bit US</td><td></td><td>GAP (empty byte)</td></tr> <tr><td>OFFSET</td><td>16-Bit S</td><td>AOF</td><td>Offset-Subtraction 0 = Off; 1 = On</td></tr> <tr><td></td><td>FLOAT</td><td></td><td>GAP (empty byte)</td></tr> <tr><td></td><td></td><td></td><td>GAP (empty byte)</td></tr> <tr><td></td><td></td><td></td><td>GAP (empty byte)</td></tr> <tr><td>P-CAL</td><td>8-bit US</td><td>APC</td><td>0,0 ... 9,9 GAP (empty byte)</td></tr> <tr><td></td><td>8-bit US</td><td></td><td>GAP (empty byte)</td></tr> <tr><td></td><td>8-bit US</td><td></td><td></td></tr> <tr><td></td><td>16-bit US</td><td></td><td>Check sum</td></tr> </tbody> </table>	Parameter	Variable type	Mne	Comments		8-bit US		Block length	channel	8-bit US		Block identification	MODE	8-bit US	SPC	Selected parameter channel		8-bit US	AMO	0 = Fix 1 = Auto-D 2 = Auto	RANGE	8-Bit S	ARA	Exponent (not calibrated) -12 ... -5	RANGE-L	8-Bit S	ARL	Exponent (not calibrated, only for Auto-D) -12 ... -5		8-bit US		GAP (empty byte)		8-bit US		GAP (empty byte)	OFFSET	16-Bit S	AOF	Offset-Subtraction 0 = Off; 1 = On		FLOAT		GAP (empty byte)				GAP (empty byte)				GAP (empty byte)	P-CAL	8-bit US	APC	0,0 ... 9,9 GAP (empty byte)		8-bit US		GAP (empty byte)		8-bit US				16-bit US		Check sum
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	16-bit US		Check sum																																																																																																																			

Pause time parameters

Read parameters Transmit: Block 69 Receive: Block 70		Transmit parameters Transmit: Block 70																																																												
<table border="1"> <thead> <tr> <th>Byte</th><th>Block 69</th></tr> </thead> <tbody> <tr><td>1</td><td>2</td></tr> <tr><td>2</td><td>69</td></tr> <tr><td>2 ... 63</td><td>0 ... 63</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Byte</th><th>Block 70</th></tr> </thead> <tbody> <tr><td>1</td><td>6</td></tr> <tr><td>2</td><td>70</td></tr> <tr><td>2 ... 63</td><td>0 ... 63</td></tr> <tr><td>3</td><td>0</td></tr> <tr><td>4</td><td>0 ... LSB</td></tr> <tr><td>5</td><td>... 65'535 MSB</td></tr> <tr><td>6</td><td>0</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Check sum</th><th>LSB</th></tr> </thead> <tbody> <tr><td></td><td>MSB</td></tr> </tbody> </table>	Byte	Block 69	1	2	2	69	2 ... 63	0 ... 63	Byte	Block 70	1	6	2	70	2 ... 63	0 ... 63	3	0	4	0 ... LSB	5	... 65'535 MSB	6	0	Check sum	LSB		MSB		<table border="1"> <thead> <tr> <th>Parameter</th><th>Variable type</th><th>Mne</th><th>Comments</th></tr> </thead> <tbody> <tr><td></td><td>8-bit US</td><td></td><td>Block length</td></tr> <tr><td>channel</td><td>8-bit US</td><td>SPC</td><td>Block identification</td></tr> <tr><td></td><td>8-bit US</td><td></td><td>Selected parameter channel</td></tr> <tr><td></td><td>8-bit US</td><td></td><td>GAP (empty byte)</td></tr> <tr><td>P-Time</td><td>16-bit US</td><td>APT</td><td>Pause time for channel changeover Resolution = 1 ms</td></tr> <tr><td>"</td><td>8-bit US</td><td></td><td>GAP (empty byte)</td></tr> <tr><td></td><td>16-bit US</td><td></td><td>Check sum</td></tr> </tbody> </table>	Parameter	Variable type	Mne	Comments		8-bit US		Block length	channel	8-bit US	SPC	Block identification		8-bit US		Selected parameter channel		8-bit US		GAP (empty byte)	P-Time	16-bit US	APT	Pause time for channel changeover Resolution = 1 ms	"	8-bit US		GAP (empty byte)		16-bit US		Check sum
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"	8-bit US		GAP (empty byte)																																																											
	16-bit US		Check sum																																																											

6.4.1.5 <aux> frame

Channel status

Read parameters Transmit: Block 13 Receive: Block 14		Transmit parameters Transmit: Block 14					
Byte	Block 13	Byte	Block 14	Parameter	Variable type	Mne	Comments
	2		3		8-bit US		Block length
1	13	1	14		8-bit US		Block identification
2	0 ... 63	2	0 ... 63	channel	8-bit US	SPC	Selected parameter channel
		3	0 ... 1	STATE	8-bit US	AST	0 = enable; 1 = skip
	Check sum LSB		Check sum LSB		16-bit US		Check sum
	MSB		MSB				

Copy parameter

		Transmit parameters Transmit: Block 16				
Byte	Block 16	Parameter	Variable type	Mne	Comments	
	4		8-bit US		Block length	
1	16		8-bit US		Block identification	
2	0 ... 63	Copy ch	8-bit US	ACO	Source channel for parameters	
3	0 ... 63	Copy to	8-bit US	ACO	Target channel for parameters	
4	0 ... 2	Copy art	8-bit US	ACO	0 = to all channels 1 = to one channel 2 = swap	
	Check sum LSB		16-bit US		Check sum	
	MSB					

6.4.1.6 <output> frame

Read parameters Transmit: Block 17 Receive: Block 18		Transmit parameters Transmit: Block 18					
Byte	Block 17	Byte	Block 18	Parameter	Variable type	Mne	Comments
	2		7		8-bit US		Block length
1	17	1	18		8-bit US		Block identification
2	0 ... 63	2	0 ... 63	channel	8-bit US	SPC	Selected parameter channel
		3	0 ... 4	AO-CH	8-bit US	OAC	0 = no channel 1 ... 4 = Channel 1...4
		4	0 ... 2	AO-MODE	8-bit US	OMO	0 = Lin; 1 = Log 8; 2 = Log 3
		5	0 ... 1	MONITOR	8-bit US	OAM	0 = Off; 1 = On
		6			8-bit US		GAP (empty byte)
		7			8-bit US		GAP (empty byte)
	Check sum LSB		Check sum LSB		16-bit US		Check sum
	MSB		MSB				

6.4.1.7 <trip> frame

Read parameters		Transmit parameters		
Byte	Block 19	Byte	Block 20	
			2	
1	19	1	13	
2	0 ... 63	2	20	8-bit US
		3	0 ... 63	channel 8-bit US
		4	0 ... 2	TYPE 8-bit US
		5	according to IEEE 754	LEVEL-A TTY
		6		FLOAT TLA
		7		"
		8		"
		9	according to IEEE 754	"
		10		"
		11		"
		12	0 ... 1 (99)	DO-A 8-bit US
		13	0 ... 1 (99)	DO-B 8-bit US
				16-bit US
	Check sum	Check sum	LSB	
	MSB		MSB	
				Comments
				Block length
				Block identification
				Selected parameter channel
				0 = off; 1 = absolute
				2 = hysteresis
				Switching function A / lower threshold value for the switching function 1.00 E-24 ... 9.99 E+24
				Switching function B / upper threshold value for the switching function 1.00 E-24 ... 9.99 E+24
				Relay for switching function A (99 = off)
				Relay for switching function B (99 = off)
				Check sum

6.4.2 <general> group

6.4.2.1 <di/do> frame

DI statuses (block operation)

Read parameters					
Transmit: Block 23					
Receive: Block 24					
Byte	Block 23	Byte	Block 24	Parameter	Comments
	1		9		Block length
	1		24		Block identification
	1		0 ... 1		Bit 0...1: 0 = low; 1 = high
	2				GAP (empty byte)
	3				GAP (empty byte)
	4				GAP (empty byte)
	5				GAP (empty byte)
	6				GAP (empty byte)
	7				GAP (empty byte)
	8				GAP (empty byte)
	9				GAP (empty byte)
Check sum		Check sum		16-bit US	Check sum
LSB		LSB			
MSB		MSB			

DI statuses (single bit operation)

Read parameters					
Transmit: Block 25					
Receive: Block 26					
Byte	Block 25	Byte	Block 26	Parameter	Comments
	2		3		Block length
	1		26		Block identification
	2		0 ... 1		Selected DI bit
	2		0 ... 1		0 = low; 1 = high
	Check sum		Check sum		Check sum
	LSB		LSB		
	MSB		MSB		



NOTE:

DI 0 = "Ext. Prot"
DI 1 = "Ext. Start"

DO statuses (Relays) (single bit operation)

Read parameters Transmit: Block 29 Receive: Block 30		Transmit parameters Transmit: Block 30					
Byte	Block 29	Byte	Block 30	Parameter	Variable type	Mne	Comments
	2		3		8-bit US		Block length
1	29	1	30		8-bit US		Block identification
2	0 ... 1	2	0 ... 1		8-bit US		Selected DO bit (0 = Relais of switching function A 1 = Relais of switching function B)
		3	0 ... 1	DIG-OUT	8-bit US	DOC	0 = clear; 1 = set
					16-bit US		Check sum
	Check sum LSB		Check sum LSB				
	MSB		MSB				

6.4.2.2 <config> SYSTEM frame

Read parameters Transmit: Block 31 Receive: Block 32		Transmit parameters Transmit: Block 32					
Byte	Block 31	Byte	Block 32	Parameter	Variable type	Mne	Comments
	1		6		8-bit US		Block length
1	31	1	32		8-bit US		Block identification
		2	4		8-bit US		GAP (empty byte)
		3	0 ... 7	MASS-R ³⁾	8-bit US	SMR	0 = 100 1 = 200 7 = 300
		4	0 ... 4	DETECT	8-bit US	SDT	0 = Farad; 4 = Channeltron
		5	1 ... 3	IS-TYP	8-bit US	SIT	1 = HS thoriated iridium; 2 = HS tungsten 3 = SPM tungsten
		6			8-bit US		GAP (empty byte)
	Check sum LSB		Check sum LSB		16-bit US		Check sum
	MSB		MSB				

³⁾ read only

6.4.2.3 <config> QMS-HW frame

Read parameters							
Transmit: Block 33							
Byte	Block 33	Byte	Block 34	Parameter	Variable type	Mne	Comments
1	1		11	QMS-HW	8-bit US		Block length
1	33	1	34		8-bit US		Block identification
		2	0 ... 1		8-bit US	QHW	0 = none; 1 = HV 200
		3	0 ... 3		8-bit US		0 = none; 1 = RF 201
		4			8-bit US		2 = RF 202 3 = RF 203
		5			8-bit US		GAP (empty byte)
		6			8-bit US		GAP (empty byte)
		7			8-bit US		GAP (empty byte)
		8	1		8-bit US		GAP (empty byte)
		9			8-bit US		1 = DO (Relay)
		10	0 ... 1		8-bit US		GAP (empty byte)
		11	0 ... 1		8-bit US		0 = none; 1 = TPR 250
							0 = none; 1 = PKR 250
Check sum		Check sum		16-bit US		Check sum	
LSB	MSB	LSB	MSB				

6.4.2.4 <config> INIT frame

Transmit parameters					
Transmit: Block 36					
Byte	Block 36	Parameter	Variable type	Mne	Comments
1	2	RESET	8-bit US		Block length
1	36		8-bit US		Block identification
2	0 ... 1		8-bit US	IRE	0 = no action 1 = default parameters (Factory)
					Check sum
Check sum		16-bit US		Check sum	
LSB	MSB				

6.4.2.5 <config> CTRL frame

Read parameters		Transmit parameters					
Transmit: Block 37 Receive: Block 38		Transmit: Block 38					
Byte	Block 37	Byte	Block 38	Parameter	Variable type	Mne	Comments
	1		6		8-bit US		Block length
1	37	1	38	MODE	8-bit US		Block identification
		2	1 ... 4		8-bit US	CMO	1 = RS-232 ASCII 2 = RS-232 binary 3 = MODEM 4 = LAN
		3	0 ... 5	BAUD	8-bit US	CBR	0 = 300; 1 = 1200 Bit/s 2 = 2400; 3 = 4800 Bit/s 4 = 9600; 5 = 19200 Bit/s
		4	0 ... 255	NODE	8-bit US	CNA	Node address
		5	0 ... 2	SEM+FIL	8-bit US	CSF	0 = internal; 1 = external 2 = Ext prot
		6	0		8-bit US		GAP (empty byte)
					16-bit US		Check sum
	Check sum	LSB					
		MSB					
	Check sum	LSB					
		MSB					

6.4.2.6 <config> SIMUL frame

Read parameters		Transmit parameters					
Transmit: Block 71 Receive: Block 72		Transmit: Block 72					
Byte	Block 71	Byte	Block 72	Parameter	Variable type	Mne	Comments
	1		2		8-bit US		Block length
1	71	1	72	SIMUL	8-bit US		Block identification
		2	0 ... 2		8-bit US	TSI	0 = no simulation 1 = internal simulation 2 = external simulation
					16-bit US		Check sum
	Check sum	LSB					
		MSB					
	Check sum	LSB					
		MSB					

6.4.2.7 <config> TEST frame

Read parameters					
Transmit: Block 39					
Receive: Block 40					
Block 39		Block 40			
Byte		Byte		Parameter	Variable type
	2		15		8-bit US
1	39	1	40		8-bit US
2	0 ... 3; 8 ... 10	2	0 ... 3; 8 ... 10		8-bit US
		3	0		8-bit US
		4	65 ... 90		8-Bit ASCII
		5	65 ... 90		8-Bit ASCII
		6	48 ... 57		8-Bit ASCII
		:	:		
		11	48 ... 57		8-Bit ASCII
		12	45, 65 ... 90		8-Bit ASCII
		13	45, 65 ... 90		8-Bit ASCII
		14	0 ... LSB		16-bit US
		15	... 65'535 MSB		TCH
Check sum	LSB	Check sum	LSB		16-bit US
	MSB		MSB		
				Comments	
				Block length	
				Block identification	
				0 = No test	
				1 = Ram test	
				2 = Eprom test	
				3 = Program number	
				8 = Ram test	
				9 = Eprom test	
				10 = Program number	
				GAP (empty byte)	
				Program number (66=B)	
				Program number (71=G)	
				Program number (0...9)	
				:	
				Program number (0...9)	
				Program index (45= -)	
				Program index (45= -)	
				Check sum for EPROM test	
				Check sum	



NOTE:

Depending on the test, there may be a 2 to 3 second delay between transmission (Block 39) and reception (Block 40).

6.4.2.8 <error> / STATUS frame

Read parameters							
Transmit: Block 41 Receive: Block 42							
Byte	Block 41	Byte	Block 42	Parameter	Variable type	Mne	Comments
1	1	11			8-bit US		Block length
1	41	1	42	ERROR	8-bit US		Block identification
		2	0 ... LSB		32-bit US	ERR	
		3		"			
		4		"			
		5	$\dots 2^{32}-1$ MSB	"			
		6			16-bit US		GAP (empty byte)
		7	$\dots 2^{16}-1$ MSB	State-QMS	16-bit US	ESQ	Bit Status 0 / 1
		8	0 ... LSB				0: Cycle Halt / Run
		9	$\dots 2^{16}-1$ MSB	"			1: Mono / Multi
		10	0				2: Emission off / on
		11	0				3: SEM-Supply off / on
	Check sum	LSB					4: Wait for external trigger
		MSB					7: -
	Check sum	LSB					8: Degas off / on
		MSB					9: Adjust off / on
							10: Adjust run
							14: Ring buffer empty
							15: Ring buffer overflow
					8-bit US		GAP (empty byte)
					8-bit US		GAP (empty byte)
					16-bit US		Check sum

**NOTE:**

When reading parameters, the ERROR and Warning messages are automatically erased.

When transmitting parameters, the ERROR and Warning messages are automatically erased.

**NOTE:**

The »Ring buffer overflow« status (bit 15) is not cleared until the next measurement cycle is started (»run«).

6.4.2.9 <Mass-Cal 200> frame

Read parameters Transmit: Block 75 Receive: Block 76		Transmit parameters Transmit: Block 76					
Byte	Block 75	Byte	Block 76	Parameter	Variable type	Mne	Comments
	1		6		8-bit US		Block length
1	75	1	76	CAL_LOW	16-Bit S	ACA	Block identification
		2	-767 ...				Low-Mass: Offset
		3	... +767				
		4	-394...				
		5	... +394				
		6					GAP (empty byte)
					16-bit US		
							Check sum
							Check sum
	Check sum LSB MSB		Check sum LSB MSB				

6.4.2.10 <Trip Total> frame

Switching point for SEM + FIL-Protection with (external) total pressure measurement via TPR / PKR

Read parameters Transmit: Block 77 Receive: Block 78		Transmit parameters Transmit: Block 78					
Byte	Block 77	Byte	Block 78	Parameter	Variable type	Mne	Comments
	1		9		8-bit US		Block length
1	77	1	78	LEVEL-A	FLOAT	ISP	Block identification
		2	according to IEEE 754				Switching function A / lower threshold (Enable threshold) 1.00E-11 ... 1.00E+3 mbar
		3					
		4					
		5					
		6	according to IEEE 754	LEVEL-B	FLOAT	ISP	Switching function B / upper threshold (Disable threshold) 1.00E-11 ... 1.00E+3 mbar
		7					
		8					
		9					
					16-bit US		
	Check sum LSB MSB		Check sum LSB MSB				Check sum

6.4.3 <ion source> group

6.4.3.1 <IS-Parameter> frame

Read parameters		Transmit parameters					
Transmit: Block 73		Transmit: Block 74					
Byte	Block 73	Byte	Block 74	Parameter	Variable type	Mne	Comments
							Block length
1	1	1	30				
1	73	1	74				Block identification
		2	105 ... 150	V1	8-bit US	VO1	Filament 1 105 ... 150 V in steps of 1 V
		3	0 ... 200	V2	8-bit US	VO2	0 ... 100 V in steps of 0.5V
		4	0 ... 240	V3	8-bit US	VO3	0 ... 30 V in steps of 0.125 V
		5	0 ... 120	V4	8-bit US	VO4	0 ... 15,0 V in steps of 0.125 V
		6	0 ... 150	V5	8-bit US	VO5	0 ... 150 V in steps of 1 V
		7	0 ... 200	EMISS	8-bit US	EMI	0 = off; 0.01 ... 2.00 mA
		8	0 ... LSB	FIL-MAX	16-bit US	EPR	0.00 ... 3.50 A
		9 350 MSB	"			
		10	105 ... 150	V1	8-bit US	VO1	Filament 2 105 ... 150 V in steps of 1 V
		11	0 ... 200	V2	8-bit US	VO2	0 ... 100 V in steps of 0.5V
		12	0 ... 240	V3	8-bit US	VO3	0 ... 30 V in steps of 0.125 V
		13	0 ... 120	V4	8-bit US	VO4	0 ... 15,0 V in steps of 0.125 V
		14	0 ... 150	V5	8-bit US	VO5	0 ... 150 V in steps of 1 V
		15	0 ... 200	EMISS	8-bit US	EMI	0 = off; 0.01 ... 2.00 mA
		16	0 ... LSB	FIL-MAX	16-bit US	EPR	0.00 ... 3.50 A
		17 350 MSB	"			
		18	105 ... 150	V1	8-bit US	VO1	Filament 1 + 2 105 ... 150 V in steps of 1 V
		19	0 ... 200	V2	8-bit US	VO2	0 ... 100 V in steps of 0.5V
		20	0 ... 240	V3	8-bit US	VO3	0 ... 30 V in steps of 0.125 V
		21	0 ... 120	V4	8-bit US	VO4	0 ... 15,0 V in steps of 0.125 V
		22	0 ... 150	V5	8-bit US	VO5	0 ... 150 V in steps of 1 V
		23	0 ... 200	EMISS	8-bit US	EMI	0 = off; 0.01 ... 2.00 mA
		24	0 ... LSB	FIL-MAX	16-bit US	EPR	0.00 ... 3.50 A
		25 350 MSB	"			
		26	0 ... 99	D-TIME	8-bit US	IDT	Degas 0 = manual; 1 ... 99 Min.
		27	0 ... 100	D-EMIS	8-bit US	IDE	0.0 ... 10.0 mA
		28	0 ... LSB	D-PROT	16-bit US	IDP	0.00 ... 3.50 A
		29 350 MSB	"			
		30	0 ... 1	RF-POL	8-bit US	SOP	RF polarity: 0 = normal; 1 = inverse
					16-bit US		Check sum
	Check sum	LSB					
		MSB					
			Check sum	LSB			
				MSB			

6.4.4 <operation> group

6.4.4.1 <sem hv> / <sem> frame

Read parameters		Transmit parameters				
Byte		Byte				
Block 49		Block 50		Para-meter	Variable type	Mne
1	49	1	50		8-bit US	
		2	0 ... LSB	SEM-VOLTAGE	8-bit US	SHV
		3	... 3000 MSB	"	16-bit US	0 ... 3000 V
		4	0 ... 1	Control	8-bit US	SEM
Check sum		Check sum			16-bit US	0 = off; 1 = on
LSB		LSB				Check sum
MSB		MSB				

6.4.4.2 ION SRC frame

Ion source parameters

Read parameters		Transmit parameters				
Byte		Byte		Para-meter	Variable type	Mne
Block 51		Block 52				
1	51	1	52		8-bit US	
		2	0 ... 1	MODE	8-bit US	ISM
		3			8-bit US	0 = normal; 1 = Degas
		4	0 ... 2	FILAM	8-bit US	GAP (empty byte)
		5			8-bit US	0 = Filament 1
		6			8-bit US	1 = Filament 2
		7			8-bit US	2 = Filament 1 + 2
Check sum		Check sum			16-bit US	GAP (empty byte)
LSB		LSB				GAP (empty byte)
MSB		MSB				Check sum



NOTE:

The emission current is output from a separate frame (→ section 6.4.3.1).

Degas control parameter

Read parameters		Transmit parameters					
Transmit: Block 57 Receive: Block 58		Transmit: Block 58					
Byte	Block 57	Byte	Block 58	Parameter	Variable type	Mne	Comments
	1		2	CTRL	8-bit US		Block length
1	57	1	58		8-bit US		Block identification
		2	0 ... 1		8-bit US	ISC	0 = Stop; 1 = Start
	Check sum LSB MSB		Check sum LSB MSB		16-bit US		Check sum

6.4.4.3 <cycle> frame

Read parameters		Transmit parameters					
Transmit: Block 59 Receive: Block 60		Transmit: Block 60					
Byte	Block 59	Byte	Block 60	Parameter	Variable type	Mne	Comments
	1		8	FUNCT	8-bit US		Block length
1	59	1	60		8-bit US		Block identification
		2	0 ... 6		8-bit US	CFU	0 = Cycle 1 = Adjust 4 = Offset Measure 5 = Synchron-Scan ⁴⁾ 6 = RF-Tune
	3	3	0 ... 1	CYCLES	8-bit US	CYM	0 = Mono; 1 = Multi
	4	4	0 ... LSB		16-bit US	CYS	0 = Repeat 1 ... 10,000 cycles
	5	5	... 10'000 MSB		"		
	6	6	0 ... 63	BEGIN	8-bit US	CBE	
	7	7	0 ... 63	END	8-bit US	CEN	
	8	8	0 ... 3	TRIG	8-bit US	CTR	0 = internal; 1 = Ext. Auto 2 = Ext. norm.; 3 = Ext. single
	Check sum LSB MSB		Check sum LSB MSB		16-bit US		Check sum

Explanations concerning TRIG

Defines the type of measurement cycle start.

Parameter set	Explanations
INTERN	The measurement cycle is started and stopped via RUN/HALT (Frame 65/66)
EXT-AUTO	The measurement cycle is started by the positive flank of the 'RUN-IN' signal coming via the <ctrl> connector. The measurement cycle runs until it is stopped when the <halt> signal is issued or until a predefined number of cycles has been completed. It starts again with the positive trigger flank.
EXT-NORM	The measurement cycle is started by the positive trigger flank of the 'RUN-IN' signal coming via the <ctrl> connector. It runs either as long as the trigger level is high, or until the <halt> signal is entered, or until a predefined number of cycles has been completed.
EXT-SNGL	The measurement cycle is started by the positive flank of the 'RUN-IN' signal coming via the <ctrl> connector. However, the operator must have prepared the system for this by pressing the <run> key on the console beforehand. The measurement cycle runs until it is stopped when the <halt> signal is issued or until a predefined number of cycles has been completed.

⁴⁾ only for test

Run Time (watch)

Read parameters Transmit: Block 61 Receive: Block 62																						
Block 61 Byte <table border="1"><tr><td>1</td></tr></table> 1 <table border="1"><tr><td>61</td></tr></table>	1	61	Block 62 Byte <table border="1"><tr><td>6</td></tr></table> 1 <table border="1"><tr><td>62</td></tr></table> 2 <table border="1"><tr><td>0 ... LSB</td></tr></table> 3 <table border="1"><tr><td>"</td></tr></table> 4 <table border="1"><tr><td>"</td></tr></table> 5 <table border="1"><tr><td>... 2^{32} -1 MSB</td></tr></table> 6 <table border="1"><tr><td>0 ... 1</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table>	6	62	0 ... LSB	"	"	... 2^{32} -1 MSB	0 ... 1	Check sum	LSB		MSB	Check sum	LSB		MSB	Para-meter Watch	Variable type 8-bit US 8-bit US " " " " 8-bit US 16-bit US	Mne CWA	Comments Block length Block identification Cycle run time in [ms] 0 = LAP off; 1 = LAP on Automatic Run Time transmission Check sum
1																						
61																						
6																						
62																						
0 ... LSB																						
"																						
"																						
... 2^{32} -1 MSB																						
0 ... 1																						
Check sum	LSB																					
	MSB																					
Check sum	LSB																					
	MSB																					

Adjust parameters

Read parameters Transmit: Block 63 Receive: Block 64	Transmit parameters Transmit: Block 64																	
Block 63 Byte <table border="1"><tr><td>1</td></tr></table> 1 <table border="1"><tr><td>63</td></tr></table>	1	63	Block 64 Byte <table border="1"><tr><td>2</td></tr></table> 1 <table border="1"><tr><td>64</td></tr></table> 2 <table border="1"><tr><td>0 ... 1</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table>	2	64	0 ... 1	Check sum	LSB		MSB	Check sum	LSB		MSB	Para-meter ADJ-TYP	Variable type 8-bit US 8-bit US 8-bit US 16-bit US	Mne CCF	Comments Block length Block identification 0 = coarse adjustement 1 = fine adjustement Check sum
1																		
63																		
2																		
64																		
0 ... 1																		
Check sum	LSB																	
	MSB																	
Check sum	LSB																	
	MSB																	

Cycle control parameters (operation state)

Read parameters Transmit: Block 65 Receive: Block 66	Transmit parameters Transmit: Block 66																	
Block 65 Byte <table border="1"><tr><td>1</td></tr></table> 1 <table border="1"><tr><td>65</td></tr></table>	1	65	Block 66 Byte <table border="1"><tr><td>2</td></tr></table> 1 <table border="1"><tr><td>66</td></tr></table> 2 <table border="1"><tr><td>0 ... 2</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table> <table border="1"><tr><td>Check sum</td><td>LSB</td></tr><tr><td></td><td>MSB</td></tr></table>	2	66	0 ... 2	Check sum	LSB		MSB	Check sum	LSB		MSB	Para-meter RUN / HALT	Variable type 8-bit US 8-bit US 8-bit US 16-bit US	Mne CRU	Comments Block length Block identification 0 = Stop; 1 = Start 2 = job start (autostatus) Check sum
1																		
65																		
2																		
66																		
0 ... 2																		
Check sum	LSB																	
	MSB																	
Check sum	LSB																	
	MSB																	

Job-Start: The measurement cycle is started. When the job is completed, the Prisma replies to the interface with <error> / STATUS frame (→ section 6.4.2.8).

6.4.4.4 <filam> frame

Filament control parameter

Read parameters		Transmit parameters					
Transmit: Block 67 Receive: Block 68		Transmit: Block 68					
Byte	Block 67	Byte	Block 68	Parameter	Variable type	Mne	Comments
	1		2		8-bit US		Block length
1	67	1	68		8-bit US		Block identification
		2	0 ... 1	Fila-Emi	8-bit US	FIE	0 = off; 1 = on
Check sum	LSB	Check sum	LSB		16-bit US		Check sum
	MSB		MSB				

6.4.5 Group of measured data not defined by a channel

6.4.5.1 TOTAL frame

Measured data not defined by a channel (total pressure) (TPR/PKR)

Read parameters							
Transmit Block 103 Receive: Block 104							
Byte	Block 103	Byte	Block 104	Parameter	Variable type	Mne	Comments
			1		8-bit US		Block length
1	103	1	7		8-bit US		Block identification
		2	104	TPR/PKR	8-bit US	TPE	0 = Circuit disabled 1 = Circuit enabled
		2	0 ... 1		"		Status circuit: 0 = Measured data ok 1 = outrange situation (too high) 2 = outrange situation (too low) 3 = sensor failure 4 = sensor off
		3	0 ... 4		FLOAT		Measured value in [mbar] (total pressure)
		4	according to IEEE 754		"		
		5			"		
		6			"		
		7			"		
					16-bit US		Check sum
			Check sum	LSB			
				MSB			

6.4.5.2 ANALOG frame

Analog input measured data not defined by a channel (single channel)

Read parameters							
Transmit: Block 105 Receive: Block 106							
Byte	Block 105	Byte	Block 106	Parameter	Variable type	Mne	Comments
			2		8-bit US		Block length
1	105	1	6		8-bit US		Block identification
2	0 ... 1	2	106	A-Input	8-bit US	AIN	AI channel number
		2	0 ... 1		8-bit US		GAP (empty byte)
		3	0		"		Voltage: 0 ... ±5.12 V
		4	-32768 ... LSB		16-Bit S		Resolution = 156.25 µV/LSB
		5	... +32767 MSB		"		
		6	0		8-bit US		GAP (empty byte)
					16-bit US		Check sum
			Check sum	LSB			
				MSB			

Analog output data (single channel)

Read parameters		Transmit parameters			
Transmit: Block 107 Receive: Block 108		Transmit: Block 108			
Block 107		Block 108			
Byte		Byte		Para-meter	Variable type
	2		6		8-bit US
1	107	1	108	A-Output	8-bit US
2	1 ... 12	2	1 ... 4		8-bit US
		3	0		8-bit US
		4	-32768 ... LSB	"	16-Bit S
		5	... +32767 MSB	"	8-bit US
		6	0		16-bit US
Check sum		Check sum			
LSB		LSB			
MSB		MSB			

6.4.5.3 <trip> STATUS frame

Switch function statuses (block operation)

Read parameters					
Transmit: Block 109					
Receive: Block 110					
Byte	Block 109	Byte	Block 110	Parameter	Variable type
	1		17		8-bit US
1	109	1	110	T-State	8-bit US
		2	0 ... 255		8-bit US
		3	0 ... 255		8-bit US
		4	0 ... 255		8-bit US
		5	0 ... 255		8-bit US
		6	0 ... 255		8-bit US
		7	0 ... 255		8-bit US
		8	0 ... 255		8-bit US
		9	0 ... 255		8-bit US
		10	0 ... 255		8-bit US
		11	0 ... 255		8-bit US
		12	0 ... 255		8-bit US
		13	0 ... 255		8-bit US
		14	0 ... 255		8-bit US
		15	0 ... 255		8-bit US
		16	0 ... 255		8-bit US
		17	0 ... 255		8-bit US
Check sum		Check sum		16-bit US	
LSB		LSB		Check sum	
MSB		MSB			

Switching function statuses (single bit operation)

Read parameters							
Transmit: Block 111 Receive: Block 112							
Byte	Block 111	Byte	Block 112	Parameter	Variable type	Mne	Comments
	2		4	channel T-State	8-bit US		Block length
1	111	1	112		8-bit US		Block identification
2	0 ... 63	2	0 ... 63		8-bit US	SPC	Selected parameter channel
		3	0 ... 1		8-bit US	TST	Switching function A: 0 = passive 1 = active
		4	0 ... 1		"		Switching function B: 0 = passive 1 = active
					8-bit US		Check sum
					16-bit US		
							Check sum

6.4.5.4 <Tune 200> frame

Read parameters							
Transmit: Block 117 Receive: Block 118							
Byte	Block 117	Byte	Block 118	Parameter	Variable type	Mne	Comments
	1		10	EMI_CUR	8-bit US		Block length
1	117	1	118		16-bit US	ECU	Block identification
		2	0 ... LSB				Emission current display 0.000 ... 10.,240 mA Resolution: 1 μA/LSB
		3	... 10'240 MSB				
		4	0 ... LSB				
		5	... 4000 MSB				
		6	0 ... LSB				
		7	... 5000 MSB				
		8	0 ... LSB				
		9	... 3000 MSB				
		10	0 ... 150				
					16-bit US		Check sum

6.4.5.5 Offset-Value frame

Read parameters							
Transmit: Block 119 Receive: Block 120							
Byte	Block 119	Byte	Block 120	Parameter	Variable type	Mne	Comments
	1		47		8-bit US		Block length
1	119	1	120	OSET-F1	16-Bit S	AOF	Block identification
		2	-32768... LSB	"			Offset Fast No. 1
		3	... 32767 MSB				-5.12 V ... +5.12 V
		4	-32768... LSB	OSET-F2	16-Bit S	AOF	Resolution: 156.25µV/LSB
		5	... 32767 MSB	"			Offset Fast No. 2
		6	-32768... LSB	OSET-F3	16-Bit S	AOF	-5.12 V ... +5.12 V
		7	... 32767 MSB	"			Resolution: 156.25µV/LSB
		8	-32768 ... LSB	OSET-F4	16-Bit S	AOF	Offset Fast No. 3
		9	... 32767 MSB	"			-5.12 V ... +5.12 V
		10	-32768 ... LSB	OSET-F5	16-Bit S	AOF	Resolution: 156.25µV/LSB
		11	... 32767 MSB	"			Offset Fast No. 4
		12	-32768 .. LSB	OSET-F6	16-Bit S	AOF	-5.12 V ... +5.12 V
		13	... 32767 MSB	"			Resolution: 156.25µV/LSB
		14	-32768 ... LSB	OSET-F7	16-Bit S	AOF	Offset Fast No. 5
		15	... 32767 MSB	"			-5.12 V ... +5.12 V
		16	-32768 ... LSB	OSET-N1	16-Bit S	AOF	Resolution: 156.25µV/LSB
		17	... 32767 MSB	"			Offset Normal No. 1
		18	-32768 ... LSB	OSET-N2	16-Bit S	AOF	-5.12 V ... +5.12 V
		19	... 32767 MSB	"			Resolution: 156.25µV/LSB
		20	-32768 ... LSB	OSET-N3	16-Bit S	AOF	Offset Normal No. 2
		21	... 32767 MSB	"			-5.12 V ... +5.12 V
		22	-32768 ... LSB	OSET-N4	16-Bit S	AOF	Resolution: 156.25µV/LSB
		23	... 32767 MSB	"			Offset Normal No. 3
		24	-32768 ... LSB	OSET-N5	16-Bit S	AOF	-5.12 V ... +5.12 V
		25	... 32767 MSB	"			Resolution: 156.25µV/LSB
		26	-32768 ... LSB	OSET-N6	16-Bit S	AOF	Offset Normal No. 4
		27	... 32767 MSB	"			-5.12 V ... +5.12 V
		28	-32768 ... LSB	OSET-N7	16-Bit S	AOF	Resolution: 156.25µV/LSB
		29	... 3276 MSB	"			Offset Normal No. 5
		30	-32768 ... LSB	OSET-N8	16-Bit S	AOF	-5.12 V ... +5.12 V
		31	... 32767 MSB	"			Resolution: 156.25µV/LSB

to be continued on the next page

Continuation Offset-Value Frame

Byte	Block 119		Para-meter	Variable type	Mne	Comments
	Byte	Block 120				
32	-32768 ...	LSB	OSET-S1	16-Bit S	AOF	Offset Slow No. 1 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
33	... 32767	MSB	"			
34	-32768 ...	LSB	OSET-S2	16-Bit S	AOF	Offset Slow No. 2 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
35	... 32767	MSB	"			
36	-32768 ...	LSB	OSET-S3	16-Bit S	AOF	Offset Slow No. 3 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
37	... 32767	MSB	"			
38	-32768 ... LSB		OSET-S4	16-Bit S	AOF	Offset Slow No. 4 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
39	... 32767 MSB		"			
40	-32768 ...	LSB	OSET-S5	16-Bit S	AOF	Offset Slow No. 5 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
41	... 32767	MSB	"			
42	-32768 ...	LSB	OSET-S6	16-Bit S	AOF	Offset Slow No. 6 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
43	... 32767	MSB	"			
44	-32768 ...	LSB	OSET-S7	16-Bit S	AOF	Offset Slow No. 7 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
45	... 32767	MSB	"			
46	-32768 ...	LSB	OSET-S8	16-Bit S	AOF	Offset Slow No. 8 -5.12 V ... +5.12 V Resolution: 156.25µV/LSB
47	... 32767	MSB	"			
Check sum		LSB	16-bit US		Check sum	
		MSB				
		Check sum				
		MSB				

6.4.6 Group of measured data defined by a channel (Cycle-measured data)

No measured data are output when the cycle is not running (»halt«).

6.4.6.1 MEASURED DATA frame

Measured data buffer contents counter

Measured data when no block is available

Read parameters							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
	1		6		8-bit US		Block length
1	133	1	134	Header	8-bit US		Block identification
		2	0 LSB	"	16-bit US	MDB	Block counter
		3	MSB	"			
		4	0 ... 63	"	8-bit US		Measurement channel number
		5	0	"	8-bit US		No block available
		6	0	"	8-bit US		GAP (empty byte)
Check sum		Check sum	LSB		16-bit US		Check sum
			MSB				

6.4.6.2 Measured data

Measured data for SCAN, STAIR

Read parameters							
Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
			1		8-bit US		Block length
1	133		9 ... max. 245		8-bit US		Block identification
		1	134	Header	16-bit US	MDB	Block counter
		2	0 ... LSB	"	8-bit US		Measurement channel number
		3	... 1023 MSB	"	8-bit US		Data type SCAN, STAIR
		4	0 ... 63	Data	FLOAT		Intensity
		5	7	"			
		6	according to IEEE 754	"			
		7		"			
		8		"			
		9		"			
		10	according to IEEE 754	"	FLOAT		Intensity
		11		"			
		12		"			
		13		"			
		:	:	"			:
		max	according to IEEE 754	"	FLOAT		Intensity
		242		"			
		243		"			
		244		"			
		245		"			
	Check sum	LSB					
		MSB					
	Check sum	LSB					
		MSB					
					16-bit US		Check sum

Measured data for PEAK

Read parameters							
Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
	1		11 ... max. 245		8-bit US		Block length
1	133	1	134		8-bit US		Block identification
		2	0 ... LSB	Header	16-bit US	MDB	Block counter
		3	... 1023 MSB	"	"		
		4	0 ... 63	"	8-bit US		Measurement channel number
		5	8	"	8-bit US		Data type PEAK
		6	0 ... LSB	Data	16-bit US		Mass number: 0 ... 300
		7	... 65'535 MSB	"	"		Resolution = $1/32$ u/bit
		8	according to IEEE 754	"	FLOAT		Intensity
		9		"	"		
		10		"	"		
		11		"	"		
		12	0 ... LSB	"	16-bit US		Mass number: 0 ... 300
		13	... 65'535 MSB	"	"		Resolution = $1/32$ u/bit
		14	according to IEEE 754	"	FLOAT		Intensity
		15		"	"		
		16		"	"		
		17		"	"		
		:	:	"	16-bit US		:
		max	0 ... LSB	"	"		Mass number: 0 ... 300
		240	... 65'535 MSB	"	"		Resolution = $1/32$ u/bit
		241	according to IEEE 754	"	FLOAT		Intensity
		242		"	"		
		243		"	"		
		244		"	"		
		245		"	"		
	Check sum	LSB			16-bit US		Check sum
		MSB					
	Check sum	LSB					
		MSB					

Measured data for SAMPLE

Read parameters							
Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Para-meter	Variable type	Mne	Comments
	1		9 ... max. 245		8-bit US		Block length
1	133	1	134		8-bit US		Block identification
		2	0 ... LSB	Header	16-bit US	MDB	Block counter
		3	... 1023 MSB	"			
		4	0 ... 63	"	8-bit US		Start channel number (begin)
		5	9	"	8-bit US		Data type SAMPLE
		6	according to IEEE 754	Data	FLOAT		Intensity
		7		"			
		8		"			
		9		"			
		10	according to IEEE 754	"	FLOAT		Intensity
		11		"			
		12		"			
		13		"			
		:	:	"			:
		max	according to IEEE 754	"	FLOAT		Intensity
		242		"			
		243		"			
		244		"			
		245		"			
Check sum		Check sum	LSB		16-bit US		Check sum
			MSB				

Measured data for ADJUST

Read parameters							
Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
	1		13 ... max. 245		8-bit US		Block length
1	133	1	134		8-bit US		Block identification
		2	0 ... LSB	Header	16-bit US	MDB	Block counter
		3	... 1023 MSB	"			
		4	0 ... 63	"	8-bit US		Start channel number (begin)
		5	10	"	8-bit US		Data type ADJUST
		6	0 ... 31	Data	16-bit US		Status report
							Bit 0: 0 = good 1 = mass too low (coarse adjust) 1 = no peak found (fine adjust)
							Bit 1: 0 = good 1 = mass too high
							Bit 2: 0 = good 1 = Intensity didn't drop to 66%
							Bit 3: 0 = good 1 = Intensity out-range
							Bit 4: 0 = good 1 = Intensity lower than threshold
		7			"		
		8	0 ... LSB		16-bit US		Mass number: 0 ... 300 Resolution = $1/32$ u/bit
		9	... 65'535 MSB		"		
		10	according to IEEE 754		FLOAT		Intensity
		11			"		
		12			"		
		13			"		
		14	0 ... 31	Data	16-bit US		Status report
		15			"		
		16	0 ... LSB		16-bit US		Mass number: 0 ... 300 Resolution = $1/32$ u/bit
		17	... 65'535 MSB		"		
		18	according to IEEE 754		FLOAT		Intensity
		19			"		
		20			"		
		21			"		
		:	:				:
		max	0 ... 31	Data	16-bit US		Status report
		238			"		
		239			"		
		240	0 ... LSB		16-bit US		Mass number: 0 ... 300 Resolution = $1/32$ u/bit
		241	... 65'535 MSB		"		
		242	according to IEEE 754		FLOAT		Intensity
		243			"		
		244			"		
		245			"		
	Check sum	LSB			16-bit US		Check sum
		MSB					

Measured data defined in channels (total pressure) (TPR / PKR)

→ also section 6.4.5.1

Read parameters Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
			11		8-bit US		Block length
1	133	1	134	Header	8-bit US		Block identification
		2	0 ... LSB	"	8-bit US	MDB	Block counter
		3	... 1023 MSB	"	8-bit US		Measurement channel number
		4	0 ... 63	"	8-bit US		Data type TPR / PKR
		5	14	Data	16-bit US		Status: 0 = measured data O.K. 1 = outrange situation (too high) 2 = outrange situation (too low) 3 = sensor failure 4 = sensor finished
		6	0 ... 4				
		7		"			
		8	according to IEEE 754	"	FLOAT		Measured value in [mbar] (total pressure)
		9		"			
		10		"			
		11		"			
	Check sum	LSB			16-bit US		Check sum
		MSB					

Measured data defined in channel from Analog input

→ also section 6.4.5.2

Read parameters Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
			9		8-bit US		Block length
1	133	1	134	Header	8-bit US		Block identification
		2	0 ... LSB	"	8-bit US	MDB	Block counter
		3	... 1023 MSB	"	8-bit US		Measurement channel number
		4	0 ... 1	"	8-bit US		Data type A-INPUT
		5	15	Data	16-bit US		AI channel number
		6	0 ... 1	"	16-Bit S		Voltage: 0 ... ±5.12 V Resolution = 156.25 µV/LSB
		7		"			
		8	-32768 ... LSB				
		9	... +32767 MSB				
	Check sum	LSB			16-bit US		Check sum
		MSB					

Measured data for Run-Time

Read parameters							
Transmit: Block 133 Receive: Block 134							
Byte	Block 133	Byte	Block 134	Parameter	Variable type	Mne	Comments
			9		8-bit US		Block length
1	133	1	134	Header	8-bit US	MDB	Block identification
		2	0 ... LSB	"	8-bit US		Block counter
		3	... 1023 MSB	"	8-bit US		
		4	0 ... 63	"	8-bit US		Measurement channel number
		5	16	"	8-bit US		Data type Run-Time
		6	0 ... LSB	Data	32-bit US		Measurement cycle time in ms
		7	"	"			
		8	"	"			
		9	... 2^{32} -1 MSB	"			
	Check sum LSB		Check sum LSB		16-bit US		Check sum
	MSB		MSB				

Notes

7 LAN interface

7.1 ARCNET® network

ARCNET® is a 'Local area network' with 'Token passing protocol' (Token-Bus).

Star topology with fiber optics connections (LWL) is used in the Prisma. This topology allows for simple point-to-point connections. If an optical hub is used (e.g. OH 421 optical hub), it is additionally possible to set up networks with up to a maximum of 255 stations (nodes).

Each station has its own identification address (ID) which can be allocated in the network without hierarchical assignment or arrangement. A node address may only be used once.

7.1.1 Token Passing Protocol

Network access is controlled by a "Token" which is passed from one station to another. The station with the "Token" can dispatch a data packet to any other station. After dispatching the data packet, the station must pass on the "Token" to the station with the next highest ID (\Rightarrow Logical ring organization).

7.1.2 Reconfiguring the network

The ARCNET is reconfigured automatically every time the network is started or when a station is added or removed during operation.

7.2 Data transmission

Format of data packet

When the Prisma is used, data are passed only in 'Short packet' format (255 bytes). The same data frames as for the RS-232-C binary interface are used as data packets (\rightarrow section 6). The entire data packet is incorporated in the ARCNET data packet with exception of the check sum which is annexed to the frame.

ARCNET data packet

Address	Short packet	
0	SID	Source identification address
1	DID	Destination identification address
2	COUNT = 256 - N	Size of data packet
	not used	
	not used	
	not used	
COUNT	Block length (Byte 0)	
	Block identification (Byte 1)	
	DATA (Byte 2)	
	:	
	:	
	:	
	:	
	DATA (Byte N)	Same data frame as for the RS-232-C binary interface
255	not used	
	not used	
	not used	
511	not used	Check sum not applicable

7.3 PC interface

Pfeiffer Vacuum offers the SH-ARC 8 LWL ARCNET® Network Controller Board for the AT/ISA bus (\rightarrow [2]).

If requested, a software driver packet in 'C' for operation of the ARCNET® SH-ARC 8 LWL on your PC can also be supplied.

Notes

Appendix

Program examples

SCAN measurement with the RS-232-C interface (ASCII format)

```

10 REM ****
20 REM AVMQ2E.BAS      Measured value query Prisma      19.12.1994 soro
30 REM
40 REM Creation Date : 2.November 1992
50 REM Author        : R. Sonderegger Abt. KEE
60 REM Version       : V00.01
70 REM Modification :
80 REM Contents      :
90 REM ****
100 CLS : ACK$ = CHR$(6): ENQ$ = CHR$(5): LF$ = CHR$(10): ETX$ = CHR$(3)
110 REM ***<general>**<config>**<CTRL>*****
120 OPEN "COM1:19200,N,8,,CS,DS,CD" FOR RANDOM AS #1
130 REM opens COM1: with 19200 bps, no parity and eight data bits.
140 REM CTS, DSR and CD are not checked.
150 COM(1) ON: REM
160 ON COM(1) GOSUB 400
170 CBR% = 5: CMOACK% = 0: GOTO 230
180 OPEN "COM1:9600,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 230
190 OPEN "COM1:4800,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 230
200 OPEN "COM1:2400,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 230
210 OPEN "COM1:1200,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 230
220 OPEN "COM1:300,N,8,,CS,DS,CD" FOR RANDOM AS #1
230 PRINT #1, ETX$; : REM clearing the input buffer of the Prisma
240 PRINT #1, "CMO,1": REM send measurement data or parameters in ASCII strings
250 FOR J = 1 TO 4000: NEXT J' delay four seconds
260 IF CMOACK% = 128 THEN GOTO 370
270 CLOSE
280 IF CBR% = 0 THEN CBR% = 6
290 CBR% = CBR% - 1
300 IF CBR% = 4 THEN PRINT "check 9600 BAUD": GOTO 180
310 IF CBR% = 3 THEN PRINT "check 4800 BAUD": GOTO 190
320 IF CBR% = 2 THEN PRINT "check 2400 BAUD": GOTO 200
330 IF CBR% = 1 THEN PRINT "check 1200 BAUD": GOTO 210
340 IF CBR% = 0 THEN PRINT "check 300 BAUD": GOTO 220
350 CBR% = 5: PRINT "check 19200 BAUD"
360 GOTO 120
370 IF CBR% = 5 THEN GOTO 410
380 PRINT #1, "CBR,5": PRINT "send baud rates 19200 BAUD"
390 CLOSE : GOTO 120
400 CMOACK% = 128: RETURN
410 COM(1) OFF
420 C$ = INPUT$(LOC(1), #1): REM clearing the input buffer of the PC
430 PRINT "19200 BAUD"
440 REM ***<general>**<config>**<SYSTEM>*****
450 INPUT "defines the system configuration ? (Y/N)": IN$
460 IF IN$ = "n" OR IN$ = "N" THEN GOTO 670
470 IF IN$ = "y" OR IN$ = "Y" THEN GOTO 620
480 GOTO 450
620 INPUT "type of ion detection SEM (Y/N)": IN$
630 SDT$ = "0": REM ion detection FARADAY
640 IF IN$ = "y" OR IN$ = "Y" THEN SDT$ = "1"
650 PRINT #1, "SDT," + SDT$: PRINT "SDT,": SDT$: "    ion detection SEM or FARADAY"
660 GOSUB 1380: IF RETRY% > 0 THEN GOTO 650' communications protocol
670 INPUT "vacuum <=10^4 mbar (Y/N)": IN$
680 IF IN$ = "n" OR IN$ = "N" THEN GOTO 790
690 IF IN$ = "y" OR IN$ = "Y" THEN GOTO 710
700 GOTO 670

```

```

710 PRINT #1, "SEM,1": PRINT "SEM,1    enable the SEM high voltage"
720 GOSUB 1380: IF RETRY% > 0 THEN GOTO 710' communications protocol
730 PRINT #1, "FIE,1": PRINT "FIE,1    enable the emission"
740 GOSUB 1380: IF RETRY% > 0 THEN GOTO 730' communications protocol
750 PRINT #1, "TSI,0": PRINT "TSI,0    simulated test spectrum OFF"
760 GOSUB 1380: IF RETRY% > 0 THEN GOTO 750' communications protocol
770 TIMERTEXT$ = " SCAN-FIR mass spectrum mass 0-45           "
780 GOTO 820
790 PRINT #1, "TSI,1": PRINT "TSI,1    simulated test spectrum INTERN"
800 GOSUB 1380: IF RETRY% > 0 THEN GOTO 790' communications protocol
810 TIMERTEXT$ = " SCAN !! simulated test spectrum INTERN !! "
820 REM ***<operation>***<cycle>*****  

830 PRINT #1, "CFU,0": PRINT "CFU,0    measurement operation CYCLE"
840 GOSUB 1380: IF RETRY% > 0 THEN GOTO 830' communications protocol
850 PRINT #1, "CYM,0": PRINT "CYM,0    single channel cycle MONO"
860 GOSUB 1380: IF RETRY% > 0 THEN GOTO 850' communications protocol
870 PRINT #1, "CYS,1": PRINT "CYS,1    number of measurement cycles"
880 GOSUB 1380: IF RETRY% > 0 THEN GOTO 870' communications protocol
882 PRINT #1, "CBE,6": PRINT "CBE,6    selected channel 6"
884 GOSUB 1380: IF RETRY% > 0 THEN GOTO 882' communications protocol
890 REM ***<channels>*****  

900 PRINT #1, "SPC,6": PRINT "SPC,6    selected parameter channel"
910 GOSUB 1380: IF RETRY% > 0 THEN GOTO 900' communications protocol
920 PRINT #1, "SDT": REM ion detection SEM or FARADAY
930 GOSUB 1380: IF RETRY% > 0 THEN GOTO 920' communications protocol
940 PRINT #1, ENQ$; : INPUT #1, SDT$: request for data transmission
950 PRINT #1, "DTY,"; SDT$: PRINT "DTY,"; SDT$: " ion detection SEM or FARADAY"
960 GOSUB 1380: IF RETRY% > 0 THEN GOTO 950' communications protocol
970 PRINT #1, "MMO,1": PRINT "MMO,1    scan with FIR filter"
980 GOSUB 1380: IF RETRY% > 0 THEN GOTO 970' communications protocol
990 PRINT #1, "MSD,10": PRINT "MSD,10    measurement speed per amu 1sec"
1000 GOSUB 1380: IF RETRY% > 0 THEN GOTO 990' communications protocol
1010 PRINT #1, "AMO,2": PRINT "AMO,2    electrometer auto range"
1020 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1010' communications protocol
1050 PRINT #1, "MFM,0": PRINT "MFM,0    first mass"
1060 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1050' communications protocol
1070 PRINT #1, "MWI,45": PRINT "MWI,45    width of a scan"
1080 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1070' communications protocol
1090 REM *** START SCAN *****  

1100 PRINT #1, "CRU,2": PRINT "CRU,2 JOB-RUN the measurement cycle is started!"
1110 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1100' communications protocol
1120 GOSUB 1600: IF LOC(1) = 0 THEN GOTO 1120: REM time display
1130 LINE INPUT #1, ESQ$: REM waiting for measurement job completed
1140 PRINT #1, "MBH": REM query for measured data header
1150 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1140' communications protocol
1160 PRINT #1, ENQ$; : REM request for data transmission
1170 INPUT #1, S%, C%, B%, M%, Z%: REM reading the measured data header
1180 PRINT #1, "MDB": REM query for measured data in scan operation
1190 GOSUB 1380: IF RETRY% > 0 THEN GOTO 1180' communications protocol
1200 REM *** reading the Prisma measured values *****  

1210 FOR I% = 1 TO M%' number of peak intensity
1220 GOSUB 1500: REM measured values transmission
1222 IF (I% MOD 2) = 0 THEN GOTO 1360
1230 SCANDATA = VAL(mdata$): REM peak intensity
1240 REM *** display of measured values *****  

1250 PRINT USING " MASS:###.## ##.#####^^^"; I% / 32; SCANDATA;
1260 LENBAR% = FIX(10 * ((LOG(SCANDATA) * .43429) + 10))
1262 IF SGN(LENBAR%) > -1 THEN GOTO 1268
1264 LENBAR% = 0
1268 PRINT STRING$(LENBAR%, 219)
1270 GOSUB 1600: REM time display
1280 FOR J = 0 TO 100: NEXT J' display delay 1/10 second

```

```

1290 REM *** press any key to stop the screen from scrolling ****
1300 T$ = INKEY$: IF T$ = "" THEN GOTO 1360
1310 TEMPTEXT$ = TIMERTEXT$
1320 TIMERTEXT$ = " hit the space bar to continue ! "
1330 GOSUB 1600: REM time display
1340 T$ = INKEY$: IF T$ = "" THEN GOTO 1330
1350 TIMERTEXT$ = TEMPTEXT$
1360 NEXT I%
1370 GOTO 1090: REM START SCAN
1380 REM *** communications protocol ****
1390 FOR J = 1 TO 2000: REM waiting for acknowledge
1400 IF LOC(1) >= 3 THEN GOTO 1420
1410 NEXT J
1420 A$ = INPUT$(LOC(1), #1)
1430 IF INSTR(A$, ACK$) THEN GOTO 1480
1440 RETRY% = RETRY% + 1: REM if acknowledge is negative
1450 IF RETRY% <= 8 THEN GOTO 1490
1460 PRINT J; A$; " communications ERROR "; TIME$
1470 GOTO 1690: REM END
1480 RETRY% = 0: REM if acknowledge is positive
1490 RETURN
1500 REM *** measured values transmission ****
1510 mdata$ = "": C$ = INPUT$(LOC(1), #1)'clearing the input buffer of the PC
1520 PRINT #1, ENQ$; : REM request for data transmission
1530 FOR J = 1 TO 2000: REM waiting for data
1540 IF LOC(1) = 0 THEN GOTO 1570
1550 dtemp$ = INPUT$(LOC(1), #1): REM reading the characters
1560 mdata$ = mdata$ + dtemp$
1570 IF INSTR(mdata$, LF$) THEN GOTO 1590: REM message received
1580 NEXT J
1590 RETURN
1600 REM *** time display ****
1610 Y = CSRLIN: REM saves cursor position
1620 X = POS(0)
1630 LOCATE 25, 1: REM moves cursor to line 25, column 1
1640 PRINT TIMERTEXT$;
1650 LOCATE 25, 47: REM moves cursor to line 25, column 47
1660 PRINT "BALZERS Prisma "; TIME$; " soro";
1670 LOCATE Y, X: REM restores the old cursor position
1680 RETURN
1690 END

```

MID measurement with the RS-232-C interface (ASCII format)

```

10 REM ****
20 REM MIDQ2E.BAS      Multiple Ion Detection PRISMA      20.12.1994 soro
30 REM
40 REM Creation Date : 2.November 1992
50 REM Author        : R. Sonderegger Abt. KEE
60 REM Version       : V00.01
70 REM Modification :
80 REM Contents      :
90 REM ****
100 CLS : ACK$ = CHR$(6): ENQ$ = CHR$(5): LF$ = CHR$(10): ETX$ = CHR$(3)
110 DATA mddata(7),mass$(7)
120 MASS$(0) = "H2": MASS$(1) = "He": MASS$(2) = "CH4": MASS$(3) = "H2O":
130 MASS$(4) = "N2+CO": MASS$(5) = "O2": MASS$(6) = "Ar": MASS$(7) = "CO2":
140 REM ***<general>***<config>***<CTRL>*****
150 OPEN "COM1:19200,N,8,,CS,DS,CD" FOR RANDOM AS #1
160 REM opens COM1: with 19200 bps, no parity and eight data bits.
170 REM CTS, DSR and CD are not checked.
180 COM(1) ON: REM Aktiviert Ereignisverfolgung
190 ON COM(1) GOSUB 430
200 CBR% = 5: CMOACK% = 0: GOTO 260
210 OPEN "COM1:9600,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 260
220 OPEN "COM1:4800,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 260
230 OPEN "COM1:2400,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 260
240 OPEN "COM1:1200,N,8,,CS,DS,CD" FOR RANDOM AS #1: GOTO 260
250 OPEN "COM1:300,N,8,,CS,DS,CD" FOR RANDOM AS #1
260 PRINT #1, ETX$; : REM clearing the input buffer of the Prisma
270 PRINT #1, "CMO,1": REM send measurement data or parameters in ASCII strings
280 FOR J = 1 TO 4000: NEXT J' delay four seconds
290 IF CMOACK% = 128 THEN GOTO 400
300 CLOSE
310 IF CBR% = 0 THEN CBR% = 6
320 CBR% = CBR% - 1
330 IF CBR% = 4 THEN PRINT "check 9600 BAUD": GOTO 210
340 IF CBR% = 3 THEN PRINT "check 4800 BAUD": GOTO 220
350 IF CBR% = 2 THEN PRINT "check 2400 BAUD": GOTO 230
360 IF CBR% = 1 THEN PRINT "check 1200 BAUD": GOTO 240
370 IF CBR% = 0 THEN PRINT "check 300 BAUD": GOTO 250
380 CBR% = 5: PRINT "check 19200 BAUD"
390 GOTO 150
400 IF CBR% = 5 THEN GOTO 440
410 PRINT #1, "CBR,5": PRINT "send baud rates 19200 BAUD"
420 CLOSE : GOTO 150
430 CMOACK% = 128: RETURN
440 COM(1) OFF
450 C$ = INPUT$(LOC(1), #1): REM clearing the input buffer of the PC
460 PRINT "19200 BAUD"
470 REM ***<general>***<config>***<SYSTEM>*****
480 INPUT "defines the system configuration ? (Y/N)": IN$
490 IF IN$ = "n" OR IN$ = "N" THEN GOTO 700
500 IF IN$ = "y" OR IN$ = "Y" THEN GOTO 650
510 GOTO 480
520 INPUT "type of ion detection SEM (Y/N)": IN$
530 SDT$ = "0": REM ion detection FARADAY
540 IF IN$ = "y" OR IN$ = "Y" THEN SDT$ = "1"
550 PRINT #1, "SDT," + SDT$: PRINT "SDT,": SDT$; " ion detection SEM or FARADAY"
560 GOSUB 1550: IF RETRY% > 0 THEN GOTO 680' communications protocol
570 INPUT "vacuum <=10^4 mbar (Y/N)": IN$
580 IF IN$ = "n" OR IN$ = "N" THEN GOTO 820
590 IF IN$ = "y" OR IN$ = "Y" THEN GOTO 740
600 GOTO 700

```

```

740 PRINT #1, "SEM,1": PRINT "SEM,1    enable the SEM high voltage"
750 GOSUB 1550: IF RETRY% > 0 THEN GOTO 740' communications protocol
760 PRINT #1, "FIE,1": PRINT "FIE,1    enable the emission"
770 GOSUB 1550: IF RETRY% > 0 THEN GOTO 760' communications protocol
780 PRINT #1, "TSI,0": PRINT "TSI,0    simulated test spectrum OFF"
790 GOSUB 1550: IF RETRY% > 0 THEN GOTO 780' communications protocol
800 TIMERTEXT$ = " SAMPLE display measurement data as bargraph"
810 GOTO 850
820 PRINT #1, "TSI,1": PRINT "TSI,1    simulated test spectrum INTERN"
830 GOSUB 1550: IF RETRY% > 0 THEN GOTO 820' communications protocol
840 TIMERTEXT$ = " SAMPLE !! simulated MID bargraph INTERN !! "
850 REM ***<operation>**<cycle>***** ****
860 PRINT #1, "CFU,0": PRINT "CFU,0    measurement operation CYCLE"
870 GOSUB 1550: IF RETRY% > 0 THEN GOTO 860' communications protocol
880 PRINT #1, "CYM,1": PRINT "CYM,1    cycle MULTI"
890 GOSUB 1550: IF RETRY% > 0 THEN GOTO 880' communications protocol
900 PRINT #1, "CYS,1": PRINT "CYS,1    number of measurement cycles"
910 GOSUB 1550: IF RETRY% > 0 THEN GOTO 900' communications protocol
920 PRINT #1, "CBE,0": PRINT "CBE,0    BEGIN"
930 GOSUB 1550: IF RETRY% > 0 THEN GOTO 930' communications protocol
940 PRINT #1, "CEN,7": PRINT "CEN,7    END"
950 GOSUB 1550: IF RETRY% > 0 THEN GOTO 940' communications protocol
960 REM ***<channels>***** ****
970 PRINT #1, "SDT": REM ion detection SEM or FARADAY
980 GOSUB 1550: IF RETRY% > 0 THEN GOTO 970' communications protocol
990 PRINT #1, ENQ$: : INPUT #1, SDT$' request for data transmission
1000 DATA 2,4,16,18,28,32,40,44
1010 RESTORE 1000: REM mass 2 ... 28 .... 44
1020 FOR I% = 0 TO 7
1030 PRINT #1, "SPC,"; I%: PRINT "SPC,"; I%; " selected parameter channel"
1040 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1030' communications protocol
1050 PRINT #1, "DTY,"; SDT$: PRINT "DTY,"; SDT$; " ion detection SEM or FARADAY"
1060 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1050' communications protocol
1070 PRINT #1, "MMO,3": PRINT "MMO,3    SAMPLE"
1080 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1070' communications protocol
1090 PRINT #1, "MSD,7": PRINT "MSD,7    measurement speed per amu 100 ms"
1100 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1090' communications protocol
1110 PRINT #1, "ARA,-5": PRINT "ARA,-5    electrometer range"
1120 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1110' communications protocol
1130 PRINT #1, "AMO,2": PRINT "AMO,2    AUTO electrometer range"
1140 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1130' communications protocol
1150 READ M%
1160 PRINT #1, "MFM,"; M%: PRINT "MFM,"; M%; "mass"
1170 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1160' communications protocol
1180 NEXT I%
1190 CLS : C% = 0
1200 REM *** START MID ***** ****
1210 PRINT #1, "CRU,2": LOCATE 1, 1: REM moves cursor to line 1, column 1
1220 C% = C% + 1
1230 PRINT USING "CRU,2 JOB-RUN ##### measurement cycles"; C%: PRINT
1240 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1210' communications protocol
1250 GOSUB 1780: IF LOC(1) = 0 THEN GOTO 1250: REM time display
1260 LINE INPUT #1, ESQ$: REM waiting for measurement job completed
1270 PRINT #1, "MDB": REM query for measured data in scan operation
1280 GOSUB 1550: IF RETRY% > 0 THEN GOTO 1270' communications protocol
1290 REM *** reading the Prisma measured values ****
1300 RESTORE 1000: REM mass 14 16 .... 44
1310 FOR I% = 0 TO 7' number of peak intensity
1320 GOSUB 1670: REM measured values transmission
1330 IF VAL(MDATA$) >= 1! OR VAL(MDATA$) = 0 THEN GOTO 1350
1340 MIDDATA(I%) = VAL(MDATA$): REM peak intensity

```

```

1350 REM *** display of measured values ****
1360 MIDSUM = 0
1370 FOR J% = 0 TO 7: MIDSUM = MIDSUM + MIDDATA(J%): NEXT J%
1380 INTPR = (MIDDATA(I%) * 100) / MIDSUM
1390 B$ = SPACE$(45)
1400 LSET B$ = STRING$((CINT(ABS(INTPR) / 2)), 219)
1410 READ M%
1420 PRINT USING "\      \:### ##.####^##"; MASS$(I%); M%; MIDDATA(I%);
1430 PRINT B$; : PRINT USING "###.## %"; INTPR: PRINT
1440 GOSUB 1780: REM time display
1450 REM FOR J = 0 TO 100 NEXT J display delay 1/10 second
1460 REM *** press any key to stop the screen from scrolling ****
1470 T$ = INKEY$: IF T$ = "" THEN GOTO 1530
1480 TEMPTEXT$ = TIMERTEXT$
1490 TIMERTEXT$ = " hit the space bar to continue ! "
1500 GOSUB 1780: REM time display
1510 T$ = INKEY$: IF T$ = "" THEN GOTO 1500
1520 TIMERTEXT$ = TEMPTEXT$
1530 NEXT I%
1540 GOTO 1200: REM START SCAN
1550 REM *** communications protocol ****
1560 FOR J = 1 TO 1000: REM waiting for acknowledge
1570 IF LOC(1) >= 3 THEN GOTO 1590
1580 NEXT J
1590 A$ = INPUT$(LOC(1), #1)
1600 IF INSTR(A$, ACK$) THEN GOTO 1650
1610 RETRY% = RETRY% + 1: REM if acknowledge is negative
1620 IF RETRY% <= 8 THEN GOTO 1660
1630 PRINT J; A$; " communications ERROR "; TIME$
1640 GOTO 1870: REM END
1650 RETRY% = 0: REM if acknowledge is positive
1660 RETURN
1670 REM *** measured values transmission ****
1680 GOSUB 1780: REM time display (wait "LF")
1690 MDATA$ = "": C$ = INPUT$(LOC(1), #1)'clearing the input buffer of the PC
1700 PRINT #1, ENQ$; : REM request for data transmission
1710 FOR J = 1 TO 2000: REM waiting for data
1720 IF LOC(1) = 0 THEN GOTO 1750
1730 DTEMP$ = INPUT$(LOC(1), #1): REM reading the characters
1740 MDATA$ = MDATA$ + DTEMP$
1750 IF INSTR(MDATA$, LF$) THEN GOTO 1770: REM message received
1760 NEXT J
1770 RETURN
1780 REM *** time display ****
1790 Y = CSRLIN: REM saves cursor position
1800 X = POS(0)
1810 LOCATE 25, 1: REM moves cursor to line 25, column 1
1820 PRINT TIMERTEXT$;
1830 LOCATE 25, 47: REM moves cursor to line 25, column 47
1840 PRINT "BALZERS PRISMA      TIME$; "; soro; ";"
1850 LOCATE Y, X: REM restores the old cursor position
1860 RETURN
1870 END

```

Notes

