

COMMUNICATION MANUAL

MAS 100 Iso NT/MH[®] Microbial Air Sampler



English



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For best performance of your product please read this instruction manual carefully. The manual will provide you with the necessary information for correct and safe use of your new instrument.

If you need additional technical or application information, do not hesitate to contact us at welcome@mbv.ch or find more information on www.mbv.ch.

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Note

Up-to-date product information – such as Service Information Letters (SIL) – are available in the [expert center](#) section of the MBV AG website www.mbv.ch and [MICROBIAL AIR SAMPLER MAS-100 Iso NT®](http://www.mbv.ch/isont/files) (www.mbv.ch/isont/files) / [MICROBIAL AIR SAMPLER MAS-100 Iso MH®](http://www.mbv.ch/isomh/files) (www.mbv.ch/isomh/files)

There, important product after-sales information about changes, issues, instructions and news is provided to customers.

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01	04.02.2015	First edition

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Abbreviations

The microbiological air sampler [MAS-100 Iso MH](#) is designated hereafter as «Instrument».

The [Software MAS-100 Iso NT Air Sampler - C&C](#) (communication and calibration) is designated hereafter as «PC Software».

Applicability

The information in this manual is valid for the following configurations:

Component	Component designation	Revision from
Hardware	Main PCB MAS-100 Iso NT	≥V6
	Main PCB MAS-100 Iso MH	≥V6
Firmware	Firmware MAS-100 Iso NT	≥V2.7
	Firmware MAS-100 Iso MH	≥V1.0
Software	Software MAS-100 Iso NT Air Sampler - C&C	≥V3.0
	Software MAS-100 Iso NT and MH Air Sampler - C&C	≥V3.1.14

	The PC Software works for these instruments: ■ MAS-100 Iso MH ■ MAS-100 Iso NT (Standard and RABS)
	The instrument will communicate its type and firmware version to the PC Software. The PC Software will interact with the instrument accordingly.

Related user manuals

The following user manuals provide additional essential information:

Document designation	Document scope
User Manual MAS-100 Iso MH	Describes hardware related topics
Installation Manual MAS-100 Iso MH	Describes the installation options. Contains technical information and the installation checklist.
Software Manual MAS-100 Iso NT&MH	Describes the PC Software functions
User Manual Anemometer	Describes the adjustment and calibration procedures
Pressure Test Manual MAS-100 Iso NT&MH	Describes how to operate the pressure test kit

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1 General information

This chapter provides information of general interest regarding the instrument.

1.1 Safety information



IT IS IMPORTANT TO READ THESE INSTRUCTIONS BEFORE USING THIS INSTRUMENT.

Please read the safety data sheet and the instrument-specific safety information in this manual carefully before using the instrument and/or any accessory supplied with this product.

1.1.1 Severity levels

	Warning Symbols in red boxes indicate hazardous situations which could result in danger to life and/or serious injury and/or irreparable damage to the instrument.
	Attention Symbols in yellow boxes indicate critical situations which could result in light injuries and/or damage to the equipment and/or unreliable air sampling results.
	Note Symbols in green boxes indicate information which may be of major interest for the user.

1.1.2 Specific safety information for the instrument

	Hazard of damage to the instrument Read the instructions in this user manual carefully before any usage of the instrument and pay attention to all warnings. Keep this manual in a designated place, accessible for all users for future reference. Ensure that all personnel have read and understood the content of this manual.
	Hazard of damage to the instrument The instrument is designed for IP65. Do not spill liquids into the electric/electronic connections or through the sampling heads.
	Hazard of damage to the instrument The piping downstream of the decontamination outlet must be unblocked and free of obstructions. Otherwise an excessive backpressure could build up and release decontamination fluid into the instrument.

	Hazard of damage to the instrument and/or wrong air sampling results The instrument is a precision device for industrial and laboratory use. The instrument shall only be operated by trained, qualified and authorized personnel as stated in chapter 1.2.1.
	Hazard of damage to the equipment and/or wrong air sampling results Any application other than the intended use is not covered by warranty. For additional information, please consult chapter 1.2.2 and chapter 1.3.
	Hazard of wrong air sampling results Using the instrument with the «Easy-Clean» base requires additional considerations during adjustment and calibration: Always perform calibrations and adjustments with the MAS-100 Family Calibration Disk with 85mm diameter or a Petri dish inside the sampling head.
	Hazard of wrong air sampling results An adequate handling of the Petri dish and of the instrument are essential. Always follow good cleanroom practices to make sure that the Petri dish and sampling head do not get contaminated.
	Hazard of wrong air sampling results The manufacturer declines any responsibility for misuse of the PC Software and for entering wrong results. It is the sole responsibility of the user to fill-in the correct values. This system was not developed to meet the technical requirements from 21CFR part 11 and international regulations regarding GxP regulated records. If data generated by this system in a GxP regulated environment is needed, ensure to maintain paper recording in accordance with GxP procedures.
	Hazard of cross contamination The FDA considers the separation of penicillin production from other drug products for human use as a GMP requirement (21CFR211.46(d)), therefore we recommend that you take any precaution for installing and handling your MAS system accordingly.

1.2 General Provisions

1.2.1 Personnel qualification

The instrument is a precision device for industrial and laboratory use. Its use should be restricted to trained, qualified and authorized personnel.

1.2.2 Intended product use

The instrument is intended solely for the collection of air samples at ambient pressure onto a microbiological culture medium to monitor the microbiological air quality in contamination-controlled areas, such as cleanrooms, isolators, operating theatres, flow hoods, etc.

1.2.3 Operating conditions

The instrument must be calibrated and operated in similar environmental conditions. Please consult the operating conditions in [chapter «Technical specifications»](#) of the respective instruments' [User Manual](#).

1.2.4 «Dual-Use» statement

The MAS-100 Iso MH is an instrument designed solely for civilian purposes and is excluded in the scope of the European «Dual-Use» regulation (EU) 2021/821.

1.3 Warranty

1.3.1 General

This chapter informs about the warranty of the instrument and the procedures to follow if the instrument is not working as described in the user manuals.

For products listed in this publication purchased via Merck KGaA the applicable warranty terms may be found at: www.millipore.com/terms (within the «Terms and conditions of sale» applicable to your purchase transaction).

For products listed in this publication purchased directly from MBV AG the applicable warranty may be found at: <https://www.mbv.ch/about-us/gtc>.

1.3.2 Quality statement

The instrument has been designed and manufactured to the highest quality levels as described in our ISO 9001 processes.

The manufacturer guarantees the instrument's performance to specifications for a period of 24 months (starting from shipping date) and for spare and replacement parts for a period of 3 months after repair or service.

1.3.3 Contact

In case of warranty claim please contact your instrument supplier:

MBV AG	Worldwide:	www.mbv.ch/service
Merck KGaA	USA:	Call 1-800-MILLIPORE (1-800-645-5476)
	Rest of the world:	www.millipore.com/techservice

1.3.4 Exclusion clauses

The warranty covers exclusively material and manufacturing defects which occurred during the above described periods of time. The warranty does not cover the natural wear and tear of parts or any damage caused by improper handling, negligence, or non-observance of the user manuals or Service Information Letters. The warranty expires immediately if any of the following conditions are infringed:

- The instrument shall only be serviced or repaired by qualified, trained and authorized technicians.
- The instrument shall only be serviced or repaired as described in the service manual.
- The instrument shall only be serviced or repaired using original MBV AG spare parts.
- The instrument shall only be operated according to the defined intended use.
- The instrument shall only be operated and updated with original firmware from MBV AG.
- The instrument shall not be modified physically in any way.

	Hazard of damage to the instrument There are no user-serviceable parts inside the instrument.
	Risk of warranty loss Every instrument is secured internally with an anti-tamper seal. Disassembling the instrument will break the seal and render the warranty void.

2 Instrument description

This manual is an evolution of the original communication manual of the MAS-100 Iso NT instrument.

It has been enhanced and reworked to the present document to cover additional types of the MAS-100 Iso family.

Instrument	Short name
MAS-100 Iso NT (Standard)	STD
MAS-100 Iso NT (RABS)	RABS
MAS-100 Iso MH (Multihead)	MH
MAS-100 Iso CM (Continuous)	CM

For each explained operation (command, read/write, check), examples are noted for reproduction.

	Note The described examples use the MAS-100 Iso NT as baseline instrument. Functions explained for other instruments than the MAS-100 Iso NT are explained in specific footnotes.
---	---

3 Profibus interface description

The Profibus interface is used to communicate with Profibus Master Software and Tools. All types of supported interfaces use the protocol described in [chapter 8](#).



Note

Please consult the respective [Installation manual](#) for detailed information about the Profibus interface installation.

- The GSD-file [MBV_06c3.gsd](#) contains the information which is necessary to communicate with the instrument.
- The identification code is: [0x06C3](#).
- This is the identification number from the Profibus manufacturer for the Profibus module and may be used for test purpose only.
- For proper use a unique number must be provided by the Profibus administrator.

4 Ethernet interface description

The Ethernet interface is used to communicate with the PC Software and other TCP/IP control software and tools. All types of supported interfaces use the protocol described in [chapter 7](#).



Note

Please consult the respective installation manual for detailed information about the Ethernet interface installation.

5 RS-232 interface description

This chapter contains the necessary information to set up the RS-232 connection. All types of supported interfaces use the protocol described in [chapter 7](#).

5.1 Communication parameters

To establish a connection with the instrument, the «Default» settings for the serial port must be set:

The instruments RS-232 settings can be changed and must be the same for the control device or software.

Port	RS-232
Bits per second (baud rate)	19'200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

5.2 RS-232 to RS-485

Conversion from RS-232 to RS-485 must be done with an appropriate converter.

6 USB interface description

The USB interface is used to communicate with the PC Software. All types of supported interfaces use the protocol described in [chapter 7](#).

A driver for Windows operating systems is installed automatically during the instrument software setup or is available on request.



Note

For more information please consult the [Software Manual MAS-100 Iso NT&MH](#).

7 Common Interface Protocol

7.1 Introduction

This document describes all interface commands to communicate with the listed MAS-100 Iso instruments. These commands are common for all instrument-specific interfaces (USB, RS-232, Profibus and Ethernet). The only exception for communication via Profibus is described in [chapter 8](#).

7.2 Interface Operations Overview

All operations are ordered by sending requests to perform a specified operation. After performing a request, the device replies with the same format.

7.2.1 Command anatomy

Request and reply formats are defined as follows:

`%<Operation>#<id>{$Value1{$Value2{...}}}(CR)`

Where:

Symbol / Input	Description	required / optional
%	Every command needs to start with the character %.	required
<Operation>	Two characters of operation type (see below).	required
#	The hashtag is followed by the <Operation> characters.	required
<id>	Operation identifier, integer value.	required
{\$Value1{\$Value2{...}}}	0, 1 or several values. Each value starts with the character \$.	optional
(CR)	Every command needs to end with the Carriage Return character (#13).	required

7.2.2 Passing parameters

Command accepts at most 20 parameters.

Maximum length of a command parameter is 20 characters.

Integer values are passed as string decimal representations (i.e. 1253 should be encoded as \$1253).

Unicode-string are passed per character, each character code in separate parameter (i.e. string:

“Head 1” should be encoded as \$72\$101\$97\$100\$32\$49).

7.2.3 Operations

Defined operations are presented in the table below.

Operation	Code	Send to MAS-100 Iso NT	Answer of MAS-100 Iso NT
Execute a command	CM	%CM#id{\$Value}(CR)	%CM#id(CR)
Read a setting	RS	%RS#id(CR)	%RS#id\$Value(CR)
Write a setting	WS	%WS#id\$Value(CR)	%WS#id\$Value(CR) (see note below)
Read a measurement value	RM	%RM#id(CR)	%RM#id\$Value(CR)
Read a system information	RI	%RI#id(CR)	%RI#id\$Value(CR)
Read the state	ST	%ST#id(CR)	%ST#id\$State(CR)
Read a probe (sample) log entry	RP	%RP#id\$Value (CR)	%RP#id{\$Value} (CR)
Read an alarm log entry	RA	%RA#id\$Value (CR)	%RA#id{\$Value} (CR)
Write Serial Number	WS	%WS#id\$Value (CR)	%WS#id\$Value
Write Password	WP	%WP#id\$Value (CR)	%WP#id\$Value (CR)
Check Password	CP	%CP#id\$Value (CR)	%CP#id\$0/1 (CR)

Nomenclature:

Id = Operation Identifier

(CR) = Carriage return / Enter

{ \$Value } = 0, 1, or several values can be given (max. 20)

	Note The value sent in the answer of a write operation is the value that has been read from the hardware after executing the write operation. If the value of the write operation and the value of the answer are not identical the write operation failed.
---	---

7.2.4 Error handling

When an invalid string (invalid command ID, invalid parameter ID, not enough arguments ...) is sent or the time between receiving the characters of a command is too long (10 seconds), the instrument answers with a '?'.

Example:

Send Command with invalid command ID to MAS-100 Iso NT:	%CM#12M(CR)
Answer of MAS-100 Iso NT:	?

7.3 Execute command (%CM#Id)

This chapter describes all the commands that can be executed on the instrument.

7.3.1 Start/Stop a measurement / decontamination

ID	Operation	Action
1	Command	Start measurement cycle
2	Command	Start flush decontamination cycle
3	Command	Stop running measurement (measurement AND flush)



Note

A measurement or flush decontamination cycle (command 1 and 2) can only be started, when the instrument state (see [chapter 7.8.9](#)) is idle, otherwise the command is ignored.

Example:

Start measurement cycle:	%CM#1(CR)
Answer of instrument:	%CM#1(CR)

7.3.2 Alarm acknowledgement

ID	Operation	Action
4	Command	Clear all pending alarms/warnings/info, ignored if no alarm/warning/info is active

Example:

Clear pending alarms:	%CM#4(CR)
Answer of instrument:	%CM#4(CR)

7.3.3 Load default values



Note

This function is restricted to factory users only.

7.3.4 Reset memory

ID	Operation	Action
5	Command	Clear probe log
6	Command	Clear alarm log
7	Command	Clear statistics (operating hours, number of valve cycles)
8	Command	Clear all (probe log, alarm log, statistics)
9	Command	Clear statistics for valve VU / VU1.1)
10	Command	Clear statistics for valve AU / VU2
11	Command	Clear statistics for valve Flush / VU3
12 ¹	Command	Clear statistics for blower
13	Command	Clear statistics for pump
14	Command	Clear statistics for flow sensor
15	Command	Clear adjustment data
16 ²	Command	Clear statistics for sampling head
17 ³	Command	Clear statistics for valve VU1.2
18 ⁴ Fehler! Textmarke nicht definiert.	Command	Clear statistics for valve VU1.3
19 ⁵	Command	Clear statistics for valve VU1.4

Example:

Clear Alarm Log:	%CM#6(CR)
Answer of instrument:	%CM#6(CR)

7.3.5 Calibration

	Note This function is restricted to factory users only.
---	---

7.3.6 Service mode

	Note This function is restricted to factory users only.
---	---

¹ Only available for MAS-100 Iso NT/MH

² Only available for MAS-100 Iso CM

³ Only available for MAS-100 Iso MH

⁴ Only available for MAS-100 Iso MH

⁵ Only available for MAS-100 Iso MH

7.3.7 Set valve states



Note
This function is restricted to factory users only.

7.3.8 Set digital output



Note
This function is restricted to factory users only.

7.3.9 Sampling head



Note
This function is restricted to factory users only.

7.4 Check password/write password (%CP/WP#Id)



Note
This function is restricted to factory users only.

7.5 Read/write settings (%RS/WS#Id)

7.5.1 Process settings

ID	Operation	Action
1	R/W	Measurement mode: 0: Standard 1: SQS 2 ⁶ : CNS
2	R/W	Target Volume: 0 ... 2'000 [Liter]
3	R/W	Number of fractions: 2 ... 20
4	R/W	Sample duration: 0 ... 1'440 [min]
34 ⁷	R/W	Sets the CNS Delay: 0 ... 144 [min]



Note

Number of fractions and samples duration is only relevant if SQS mode is selected.

Example:

Read from instrument:	(Mode)	%RS#1(CR)
Answer of instrument:	(Mode: STD)	%RS#1\$(CR)

7.5.2 Delay data

ID	Operation	Action
5	R/W	Delay ON/OFF: 0 = Delay OFF 1 = Delay ON
6	R/W	Delay time: 0 ... 120 [min]

Example:

Write to instrument:	(Delay: 100 min)	%WS#6\$100(CR)
Answer of instrument:		%WS#6\$100(CR)

7.5.3 User selection

ID	Operation	Action
7	R/W	User selection ON/OFF: 0 = User selection OFF, 1 = User selection ON
8	R/W	Current user ID: 1 ... 10
9	R/W	User name: Parameter 1: User ID (1 ... 10) Parameter 2: User name

Example:

Read from instrument:	(User ID)	%RS#8(CR)
Answer of instrument:		%RS#8\$(CR)

⁶ Additionally available for the MAS-100 Iso MH

⁷ Only available for MAS-100 Iso MH

7.5.4 Time/Date

ID	Operation	Action
10	R/W	Time Parameter 1: Hours: 0 ... 23 Parameter 2: Minutes: 0 ... 59 Parameter 3: Seconds: 0 ... 59
11	R/W	Date Parameter 1: Day: 1 ... 31 Parameter 2: Month: 1 ... 12 Parameter 3: Year: 2'005 ... 2'030

Example:

Write to instrument:	(Time: 10:00:00)	%WS#10\$10\$0\$0(CR)
Answer of instrument:		%WS#10\$10\$0\$0(CR)

7.5.5 Head ID

ID	Operation	Action
12 ⁸	R/W	Head ID Parameter: 1 ... 20 Unicode Character

Example:

Read from instrument:	(Head ID)	%RS#12(CR)
Answer of instrument:	(Head 1)	%RS#12\$72\$101\$97\$100\$32\$49(CR)

7.5.6 Location

ID	Operation	Action
13 ⁹	R/W	Location parameter: 1 ... 20 Unicode character

Example:

Write to instrument:	(Location: Room 1)	%WS#13\$82\$111\$111\$109\$32\$49(CR)
Answer of instrument:		%WS#13\$82\$111\$111\$109\$32\$49(CR)

7.5.7 Protected mode

ID	Operation	Action
14	R/W	Protected mode: 0: Protected mode OFF 1: Protected mode ON

Example:

Write to instrument:	(Set to protected mode)	%WS#14\$1(CR)
Answer of instrument:		%WS#14\$1(CR)

⁸ Applied to MAS-100 Iso NT/MH: Sets/gets always the value of head 1

⁹ Applied to MAS-100 Iso NT/MH: Sets/gets always the value of head 1

Online print

ID	Operation	Action
15	R/W	Online print: 0: Online print OFF 1: Online print ON

Example:

Write to instrument:	(Set online print)	%WS#15\$1(CR)
Answer of instrument:		%WS#15\$1(CR)

7.5.8 Calibration validity time

ID	Operation	Action
16	R/W	Calibration validity time in months: 0: Disable calibration validity check and hide calibration date and calibration validity in system info. 1 ... 255 Set calibration validity time

Example:

Write to instrument:	(Calibration validity time)	%WS#16\$12(CR)
Answer of instrument:		%WS#16\$12(CR)

7.5.9 Lock calibration

ID	Operation	Action
17	R/W	If Calibration is locked, no measurement can be started if the calibration validity has expired: 0: Calibration is not locked, 1: Calibration is locked



Hazard of wrong measuring results

If calibration validity time is set to 0 months (=not locked), this setting would be ignored

Example:

Write to instrument:	(Lock the Calibration)	%WS#17\$1(CR)
Answer of instrument:		%WS#17\$1(CR)

7.5.10 Predefined standard volumes

ID	Operation	Value
18	R/W	Sets the predefined volumes: 0: Set predefined volume 1: 0 ... 2'000 liter 1: Set predefined volume 2: 0 ... 2'000 liter 2: Set predefined volume 3: 0 ... 2'000 liter 3: Set predefined volume 4: 0 ... 2'000 liter 4: Set predefined volume 5: 0 ... 2'000 liter

Example:

Read from instrument:	(Standard Volume 1)	%RS#18\$(CR)
Answer of instrument:	(Standard Volume = 500 Liter)	%RS#18\$1\$500(CR)

7.5.11 Time and date format

ID	Operation	Action
19	R/W	Sets the format of time and date: 0: EUR format 1: USA format 2: JAP format

Example:

Write to instrument:	(Time/date format: EUR)	%WS#19\$0(CR)
Answer of instrument:	(EUR)	%WS#19\$0(CR)

7.5.12 Summertime

ID	Operation	Action
20	R/W	Sets the summertime: 0: Summertime 1: Wintertime

Example:

Read from instrument:	(Summertime status)	%RS#20(CR)
Answer of instrument:	(Summertime OFF)	%RS#20\$1(CR)

7.5.13 HMI position (MAS-100 Iso NT only)

ID	Operation	Action
21	R/W	Sets the HMI position (position of instrument in user interface if several instruments are connected: 0 ... 8: position

Example:

Read from instrument:	(HMI position)	%RS#21(CR)
Answer of instrument:	(Position 2)	%RS#21\$2(CR)

7.5.14 Printer selection

ID	Operation	Action
22	R/W	Sets the printer connected to the instrument: 0: None 1: Epson TM-U220 2: Samsung SRP-275

Example:

Read from instrument:	(Printer type)	%RS#22(CR)
Answer of instrument:	(Epson TM-U220)	%RS#22\$1(CR)

7.5.15 Pump power for decontamination

ID	Operation	Action
23	R/W	Sets pump power for decontamination: 40 ... 100: Pump power for decontamination [%]

Example:

Write to instrument:	(Pump power 65 %)	%WS#23\$65(CR)
Answer of instrument:	(Set to 65%)	%WS#23\$65(CR)

7.5.16 Digital flow guard signal for decontamination

ID	Operation	Action
24 ¹⁰	R/W	Use digital flow guard signal for decontamination: 0: Do not use digital signal 1: Use digital signal

Example:

Read from instrument:	(Usage of digital flow guard)	%RS#24(CR)
Answer of instrument:	(Do not use digital signal)	%RS#24\$0(CR)

7.5.17 Threshold for analog flow guard signal for decontamination

ID	Operation	Action
25	R/W	Threshold for analog flow guard signal for decontamination: 0 ≤ Analog signal ≤ Threshold: no flow Threshold ≤ analog signal ≤ 4'095: flow 0 ... 4'095: Threshold [mV]

Example:

Write to instrument:	(Threshold of 2047 mV)	%WS#25\$2047(CR)
Answer of instrument:		%WS#25\$2047(CR)

¹⁰ Only available for MAS-100 Iso NT

7.5.21 Ethernet interface settings

ID	Operation	Action
29	R/W	Parameter 1: Ethernet Interface Enabled/Disabled 0 = Ethernet Disabled 1 = Ethernet Enabled
		Parameter 2: 0 ... 255: IP Address, Byte 1
		Parameter 3: 0 ... 255: IP Address, Byte 2
		Parameter 4: 0 ... 255: IP Address, Byte 3
		Parameter 5: 0 ... 255: IP Address, Byte 4
		Parameter 6: 0 ... 255: Netmask, Byte 1
		Parameter 7: 0 ... 255: Netmask, Byte 2
		Parameter 8: 0 ... 255: Netmask, Byte 3
		Parameter 9: 0 ... 255: Netmask, Byte 4
		Parameter 10: 0 ... 255: Default Gateway, Byte 1
		Parameter 11: 0 ... 255: Default Gateway, Byte 2
		Parameter 12: 0 ... 255: Default Gateway, Byte 3
		Parameter 13: 0 ... 255: Default Gateway, Byte 4
		Parameter 14: Duplex Mode: 0: Half Duplex 1: Full Duplex



Note

Profibus and Ethernet interface cannot be enabled at the same time, enabling Ethernet will automatically disable Profibus.

Example:

Write to instrument: (Ethernet settings: Enabled, address 125)	%WS#29\$1\$125(CR)
Answer of instrument:	%WS#29\$1\$125(CR)

7.5.22 Sampling head



Note

This setting is implemented for future purposes only.

ID	Operation	Action
31 ¹¹	R/W	Sets the sampling head. 42: Sampling head for 4.2 l/min Target Flow

Example:

Write to instrument:	(Sampling head = 4 l/min)	%WS#31\$40(CR)
Answer of instrument:		%WS#31\$40(CR)

11 Only available for MAS-100 Iso CM
The Target Flow will be set automatically according to the selected sampling head.
After modifying the sampling head, the device must be recalibrated before a new measurement can be started.

7.5.23 Head count

ID	Operation	Action
32 ¹²	R/W	Sets the available head count for measurement: Parameter: 1 ... 4 Head count

Example:

Write to instrument:	(Set available head count to 4)	%WS#32\$4(CR)
Answer of instrument:		%WS#32\$4(CR)

7.5.24 Head selection

ID	Operation	Action
33 ¹³	R/W	Selects the head for measurement: Parameter: 1 ... 4 Selected head

Example:

Write to instrument:	(Select head)	%WS#33\$1(CR)
Answer of instrument:		%WS#33\$1(CR)

7.5.25 CNS Delay

ID	Operation	Action
34 ¹⁴	R/W	Sets the CNS Delay: Parameter: 0 ... 144 CNS Delay [min]

Example:

Write to instrument:	(CNS Delay (10 min) time)	%WS#34\$10(CR)
Answer of instrument:		%WS#34\$10(CR)

7.5.26 Head ID of head

ID	Operation	Action
35 ¹⁵	R/W	Read/Write the head ID of the desired head. Parameter 1: 1 ... 4: Desired head Parameter 2 ... 20: Unicode character

Example:

Read from instrument:	(Head ID of head 1)	%RS#35\$1(CR)
Answer of instrument:	(Head 1)	%RS#35\$1\$72\$101\$97\$100\$32\$49(CR)

12 Only available for MAS-100 Iso NT/MH
13 Only available for MAS-100 Iso NT/MH
14 Only available for MAS-100 Iso NT/MH
15 Only available for MAS-100 Iso NT/MH

7.5.27 Location of head

ID	Operation	Action
36 ¹⁶	R/W	Read/Write the location of the desired head. Parameter 1: 1 ... 4 Desired head Parameter 2 ... 20: Unicode Character

Example:

Write to instrument: (Location of head: Head 1 and room 1)	%WS#36\$1\$82\$111\$111\$109\$32\$49(CR)
Answer of instrument:	%WS#36\$1\$82\$111\$111\$109\$32\$49(CR)

7.5.28 Pneumatic connection lengths between manifold and head

ID	Operation	Action
37 ¹⁷	R/W	Read/Write pneumatic connection lengths between the manifold and the desired head. Parameter 1: 1 ... 4: Desired head Parameter 2: 10 ... 300: Pneumatic connection lengths [0.1 m]

Example:

Write to instrument: (Length from instrument to head 1 of 5 m)	%WS#37\$1\$50(CR)
Answer of instrument:	%WS#37\$1\$50(CR)

7.5.29 Pipe diameter

ID	Operation	Action
38 ¹⁸	R/W	Read/Write pipe diameter of the pneumatic connection. Parameter 1: 1 ... 50: Pipe diameter [mm]

Example:

Write to instrument: (Pipe diameter of 22 mm)	%WS#38\$22(CR)
Answer of instrument:	%WS#38\$22(CR)

7.5.30 Pneumatic connection lengths between device and manifold

ID	Operation	Action
39 ¹⁹	R/W	Read/Write pneumatics connection length between device and manifold. Parameter 1: 0 ... 90: Pneum. con. length between device and manifold [0.1 m]

Example:

Write to instrument: (Pneumatic connection lengths between device and manifold of 1.0 m)	%WS#39\$10(CR)
Answer of instrument:	%WS#39\$10(CR)

¹⁶ Only available for MAS-100 Iso NT/MH

¹⁷ Only available for MAS-100 Iso NT/MH

¹⁸ Only available for MAS-100 Iso NT/MH

¹⁹ Only available for MAS-100 Iso NT/MH

7.5.31 Maximum allowable flow deviation from target air flow

This setting is used for a calibration sequence.

ID	Operation	Action
40 ²⁰	R/W	Read/Write maximum allowable flow deviation from target air flow. Parameter 1: 25 ... 250: Allowable deviation [0.1%]

Example:

Write to instrument: (Maximum allowable flow deviation from target air flow of (2.5%))	%WS#40\$25(CR)
Answer of instrument:	%WS#40\$25(CR)

²⁰ Only available for MAS-100 Iso NT/MH

7.6 Read measurement values (%RM#Id)

ID	Operation	Value	Range	Unit	Resolution
1	R	Flow ²¹	0 ... 150	l/min	0.1 l/min
2	R	Flush flow	On/Off	-	-
3	R	Ambient pressure	750 ... 1'150	mbar	1 mbar
4	R	Gas temperature	0 ... 100	°C	0.1°C
5	R	Relative gas humidity	0 ... 100	%	1%
6	R	Sampled volume, only if measurement running	0 ... 2'000	Liter	0.1 Liter
7	R	Time remaining, only if measurement running	0 ... 32'767	s	1 s
8 ²²	R	Sampled volume of head 2, only if measurement running	0 ... 2'000	Liter	0.1 Liter
9 ²²	R	Sampled volume of head 3, only if measurement running	0 ... 2'000	Liter	0.1 L
10 ²²	R	Sampled volume of head 4, only if measurement running	0 ... 2'000	Liter	0.1 L
The following measurement values are only intended for service use					
20	R	ADC-Value of ambient pressure	0 ... 4'095	mV	1 mV
21	R	ADC (Analog to digital conversion)-Value of flow	0 ... 4'095	mV	1 mV
22	R	ADC-Value of flush flow	0 ... 4'095	mV	1 mV
23	R	ADC-Value temperature of mainboard	0 ... 4'095	mV	1 mV
24 ²³	R	ADC-Value of blower current	0 ... 4'095	mV	1 mV
25	R	ADC-Value of 24V supply	0 ... 4'095	mV	1 mV
26	R	ADC-Value of 10V supply	0 ... 4'095	mV	1 mV
27	R	ADC-Value of blower supply	0 ... 4'095	mV	1 mV



Note

For all values above 32'767 means value not defined (sensor not working properly, sensor not calibrated).

Example:

Read from instrument:	(Ambient pressure)	%RM#3(CR)
Answer of instrument:	(Absolute pressure = 973 mbar)	%RM#3\$973(CR)

²¹ Applied to MAS-100 Iso NT/MH: The values of the currently active head are returned

²² Only available for MAS-100 Iso NT/MH

²³ Only available for MAS-100 Iso NT/MH

7.7 Read system information (%RI#Id)

7.7.1 Instrument name

ID	Operation	Action
1	R	Instrument name ²⁴ : «MAS-100 Iso NT»

Example:

Read from instrument:	(Hardware Version)	%RI#1(CR)
Answer of instrument:		%RI#1\$77\$65\$83\$45\$48\$48\$32\$73\$115\$111\$3278\$84(CR)

7.7.2 Hardware version

ID	Operation	Action
2	R	Hardware version

Example:

Read from instrument:	(Hardware version)	%RI#2(CR)
Answer of instrument:	(Hardware version= 2)	%RI#2\$2(CR)

7.7.3 Firmware version

ID	Operation	Action
3	R	Parameter 1: 1 st part version Parameter 2: 2 nd part version Parameter 3: 3 rd part version ²⁵

Example:

Read from instrument:	(Firmware version)	%RI#3(CR)
Answer of instrument:	(Version = 1.2.3)	%RI#3\$1\$2\$3(CR)

7.7.4 Date of last adjustment

ID	Operation	Action
4 ²⁶	R	Parameter 1: Day of month of last adjustment:1 ... 31 Parameter 2: Month of Year of last adjustment:1 ... 12 Parameter 3: Year of last adjustment:2'005 ... 2'030

Example:

Read from instrument:	(Month of year of last adjustment)	%RI#4(CR)
Answer of instrument:	(Date = 01.03.2006)	%RI#4\$1\$3\$2006(CR)

²⁴ MAS-100 Iso NT/MH returns: «MAS-100 Iso NT»

²⁵ 3-part firmware version introduced for MAS-100 NT with FW V2.8.5, for MAS-100 Iso MH with FW V1.2.6

²⁶ Applied to MAS-100 Iso NT/MH: Values of head 1

7.7.5 Calibration validity

ID	Operation	Action
5 ²⁷	R	59

Example:

Read from instrument:	(Calibration validity)	%RI#5(CR)
Answer of instrument:	(1 year)	%RI#5\$365(CR)

7.7.6 Serial number

ID	Operation	Action
6	R	Serial №

Example:

Read from instrument:	(Serial №)	%RI#6(CR)
Answer of instrument:	(Serial № = 45'001)	%RI#6\$45001(CR)

7.7.7 Number of probe log entries

ID	Operation	Action
7	R	№ of currently saved probe log entries: 0 ... 100

Example:

Read from instrument:	(№ of probe log entries)	%RI#7(CR)
Answer of instrument:	(№ of Entries = 54)	%RI#7\$54(CR)

7.7.8 Number of alarm log entries

ID	Operation	Action
8	R	Number of currently saved alarm log entries: 0 ... 100

Example:

Read from instrument:	(№ of alarm log entries)	%RI#8(CR)
Answer of instrument:	(№ of entries = 33)	%RI#8\$33(CR)

²⁷ Applied to MAS-100 Iso NT/MH: Values of head 1

7.7.9 Statistic data

ID	Operation	Action
9	R	Parameter 1: Operating time instrument: 0 ... 32767 [h] Parameter 2 ²⁸ : Operating time blower: 0 ... 32767 [min] Parameter 3: Operating time vacuum pump: 0 ... 32767 [min] Parameter 4 ²⁹ : Number of cycles of valve 1: 0 ... 32767 [N° of cycles] Parameter 5: Number of cycles of valve 2: 0 ... 32767 [N° of cycles] Parameter 6: Number of cycles of valve 3: 0 ... 32767 [N° of cycles] Parameter 7 ³⁰ : Operating time flow sensor: 0 ... 2147483647 [min] Parameter 8 ³¹ : Operating time sampling head: 0 ... 2147483647 [min] Parameter 9 ³² : Number of cycles of valve VU2: 0 ... 2147483647 [N° of cycles] Parameter 10 ³² : Number of cycles of valve VU3: 0 ... 2147483647 [N° of cycles] Parameter 11 ³² : Number of cycles of valve VU4: 0 ... 2147483647 [N° of cycles]

Example: (MAS-100 Iso NT):

Read from instrument:	(N° of cycles of valve 1)	%RI#9\$4(CR)
Answer of instrument:	(N° of cycles = 2457)	%RI#9\$2457(CR)

Example: (MAS-100 Iso CM):

Read statistic data from MAS-100 Iso CM device:	%RI#9(CR)
Answer of instrument:	%RI#9
Operating time device = 2'217 min	\$2217
Operating time blower = 0 min	\$0
Operating time vacuum pump = 25 min	\$25
Number of cycles of valve VU = 75 cycles	\$75
Number of cycles of valve AU = 73 cycles	\$73
Number of cycles of flush valve = 3 cycles	\$3
Operating time flow sensor = 234 min	\$234
Operating time sampling head = 2 min	\$2(CR)

7.7.10 Running fraction

ID	Operation	Action
10	R	Current fraction if measurement with SQS mode is running: 0 ... 20

Example:

Read from instrument:	(N° of running fraction)	%RI#10(CR)
Answer of instrument:	(N° of running fraction = 2)	%RI#10\$2(CR)

28 Returns «0» on MAS-100 Iso CM

29 Applied to MAS-100 Iso NT/MH: Number of cycles of valve VU1

30 Applied to MAS-100 Iso NT: Parameter 7 is the last transmitted parameter.

31 Only available for MAS-100 Iso CM.

- Parameter 8 is the last transmitted parameter.

- Returns «0» on MAS-100 Iso NT/MH

32 Only available for MAS-100 Iso NT/MH

7.7.11 Adjustment/Calibration error

ID	Operation	Action
11	R	Error of last calibration: 0: No error 10: Offset of flow sensor out of tolerance 11 ³³ : Blower could not be started 12: Gain of flow sensor out of tolerance 13: Invalid flow 14: No connection to DA-100 NT 15: Flow measurement of DA-100 NT invalid 16: Pressure measurement of DA-100 NT invalid 17: Desired flow cannot be reached 18 ³⁴ : Desired head is not available for adjustment/calibration (see chapter 7.5.24) 19 ³⁴ : Head error (Valve self-test failed) 20: Gain of ambient pressure sensor out of tolerance

Example:

Read from instrument:	(Error of last calibration)	%RI#11(CR)
Answer of instrument:	(No Error)	%RI#11\$0(CR)

³³ Applied to MAS-100 Iso CM: Pump could not be started.

³⁴ Only possible on MAS-100 Iso NT/MH

7.7.12 ctual (current) flow adjustment data

ID	Operation	Action
12 ³⁵	R	Data of flow calibration: Parameter 1: Calibration validity: 0 calibration not valid, 1 calibration valid Parameter 2: Sensor offset, 0 ... 4'095 [mV] Parameter 3: Calibration flow 1, [1/10 l/min] Parameter 4: ADC value for flow 1, [mV] Parameter 5: Calibration Flow 2, [1/10 l/min] Parameter 6: ADC Value for flow 2, [mV] Parameter 7: Nr of flow calibration points (0, 1, 2) Parameter 8: Flow sensor gain Parameter 9: 0=manual calibration, 1=automatic calibration Parameter 10: Serial number of DA-100 NT if automatic calibration Parameter 11: Flow deviation of DA-100 NT if automatic calibration Parameter 12: Calibration day of month of DA-100 NT if automatic calibration Parameter 13: Calibration month of DA-100 NT if automatic calibration Parameter 14: Calibration year of month of DA-100 NT if automatic calibration Parameter 15: Calibration temperature if automatic calibration [1/10°C] Parameter 16: Calibration pressure if automatic calibration [mbar] Parameter 17: DA-100 flow variation during adjustment Parameter 18: Flow sensor variation during adjustment Parameter 19: Flow sensor sensitivity

Example:

Read from instrument: (Flow calibration data)	%Rl#12(CR)
Answer of instrument: (Calibration valid, offset = 712 mV, flow 1 = 90.2 l/min, ADC for flow 1 = 2306 mV, flow 2 = 109.8 l/min, ADC for flow 2 = 3007 mV, Gain = 120, Automatic Calibration, DA-100 NT Serial-Nr. = 20'000, Date of calibration of DA-100 NT:12. Oct. 2007, Calib. Temp. = 24.5 °C, Calib. Pressure = 956 mbar, DA Flow Var. = 1, Flow Sensor Var. = 2, Flow Sensor Sens. = 15)	%Rl#12\$1\$712\$902\$2306\$1098\$3007 \$120\$1\$20000\$12\$10\$2007\$245\$956\$1\$2\$15 (CR)

7.7.13 Ambient pressure adjustment data

ID	Operation	Action
13	R	Data of ambient pressure adjustment: Parameter 1: Calibration validity: 0 calibration not valid, 1 calibration valid Parameter 2: Sensor gain: 0 ... 1'000 Parameter 3: Ambient pressure during calibration, 750 ... 1'150 [mbar]

³⁵ Applied to MAS-100 Iso NT/MH: Values of head 1

Example:

Read from instrument:	(Ambient pressure calibration data)	%RI#13(CR)
Answer of instrument:	(Calibration valid, sensor gain = 317, ambient pressure during calibration = 962 mbar):	%RI#13\$1\$317\$962 (CR)

7.7.14 Instrument model

ID	Operation	Action
14	R	Instrument Model: 0: Standard, 1: RABS, 2: CM, 3: MH

Example:

Read from instrument:	(Instrument model)	%RI#14(CR)
Answer of instrument:	(Instrument model = RABS)	%RI#14\$1(CR)

7.7.15 Previous (last) flow adjustment data

ID	Operation	Action
15 ³⁶	R	Data of flow calibration: Parameter 1: Calibration validity: 0 = calibration not valid, 1 = calibration valid Parameter 2: Sensor offset, 0 ... 4'095 [mV] Parameter 3: Calibration flow 1, [1/10 l/min] Parameter 4: ADC value for flow 1, [mV] Parameter 5: Calibration flow 2, [1/10 l/min] Parameter 6: ADC value for flow 2, [mV] Parameter 7: № of flow calibration points (0, 1, 2) Parameter 8: Flow sensor gain Parameter 9: Automatic calibration: 0 manual calibration, 1 automatic calibration Parameter 10: Serial number of DA-100 NT if automatic calibration Parameter 11: Flow deviation of DA-100 NT if automatic calibration Parameter 12: Calibration day of month of DA-100 NT if automatic calibration Parameter 13: Calibration month of DA-100 NT if automatic calibration Parameter 14: Calibration year of month of DA-100 NT if automatic calibration Parameter 15: Calibration temperature if automatic calibration [1/10 °C] Parameter 16: Calibration atmospheric pressure if automatic calibration [mbar] Parameter 17: DA-100 flow variation during adjustment Parameter 18: Flow sensor variation during adjustment Parameter 19: Flow sensor sensitivity

Example:

Read from instrument: (Flow calibration data of previous calibration)	%RI#15(CR)
Answer of instrument: (Calibration valid, offset = 712 mV, flow 1 = 90.2 l/min, ADC for flow 1 = 2306 mV, flow 2 = 109.8 l/min, ADC for flow 2 = 3007 mV, Gain = 120, Automatic Calibration, DA-100 NT Serial №. = 20000, Date of calibration of DA-100 NT: 12. Oct. 2007, Calib. Temp. = 24.5°C, Calib. Pressure = 956 mbar, DA Flow Var. = 1, Flow Sensor Var. = 2, Flow Sensor Sens. = 15):	%RI#15\$1\$712\$902\$2306\$1098\$3007\$120\$1\$20000\$12\$10\$2007\$245\$956\$1\$2\$15(CR)

³⁶ Applied to MAS-100 Iso NT/MH: Values of head 1

7.7.16 Date of previous (last) adjustment

ID	Operation	Action
16 ³⁷	R	Parameter 1: Day of month of previous calibration: 1 ... 31 Parameter 2: Month of year of previous calibration: 1 ... 12 Parameter 3: Year of previous calibration: 2'005 ... 2'030

Example:

Read from instrument:	(Day of previous Calibration)	%R#16(CR)
Answer of instrument:	(Date = 01.03.2006)	%R#16\$1\$3\$2006(CR)

7.7.17 Flow calibration test data for test protocol

This command returns the data of a flow calibration test. The data can be used to create a test protocol. Note that this data is only stored temporary and is no more available after power down.

ID	Operation	Action
17	R	Data of flow calibration test for calibration certificate: Parameter 1: Day of month of calibration test Parameter 2: Month of calibration test Parameter 3: Year of month of DA-100 NT of calibration test Parameter 4: Serial number of DA-100 NT if automatic calibration Parameter 5: Flow deviation of DA-100 NT if automatic calibration Parameter 6: Flow sample 1 of DA-100 NT Parameter 7: Flow sample 2 of DA-100 NT Parameter 8: Flow sample 3 of DA-100 NT Parameter 9: Calibration day of month of DA-100 NT if automatic calibration Parameter 10: Calibration month of DA-100 NT if automatic calibration Parameter 11: Calibration year of month of DA-100 NT if automatic calibration Parameter 12: Reference temperature of automatic test [1/10 °C] Parameter 13: Reference atmospheric pressure of automatic test [mbar] Parameter 14: DA-100 flow variation during calibration Parameter 15: Flow sensor variation during calibration Parameter 16: Flow sensor sensitivity

Example: None.

³⁷ Applied to MAS-100 Iso NT/MH: Values of head 1

7.7.18 Flow calibration test data for calibration certificate

This command returns the data of a flow calibration test of the first test after a recalibration. The data can be used to create a calibration certificate and is saved to the non-volatile memory of the instrument.

ID	Operation	Action
17	R	Data of flow calibration test for calibration certificate: Parameter 1: Day of month of calibration test Parameter 2: Month of calibration test Parameter 3: Year of month of DA-100 NT of calibration test Parameter 4: Serial No of DA-100 NT if automatic calibration Parameter 5: Flow deviation of DA-100 NT if automatic calibration Parameter 6: Flow sample 1 of DA-100 NT Parameter 7: Flow sample 2 of DA-100 NT Parameter 8: Flow sample 3 of DA-100 NT Parameter 9: Calibration day of month of DA-100 NT if automatic calibration Parameter 10: Calibration month of DA-100 NT if automatic calibration Parameter 11: Calibration year of month of DA-100 NT if automatic calibration Parameter 12: Reference temperature of automatic test [1/10 °C] Parameter 13: Reference atmospheric pressure of automatic test [mbar] Parameter 14: DA-100 flow variation during calibration Parameter 15: Flow sensor variation during calibration Parameter 16: Flow sensor sensitivity

Example: None.

7.7.19 Saved flow calibration data

This command returns the data of the saved flow calibration. The data can be used to create a calibration certificate and is saved in the non-volatile memory of the instrument.

ID	Operation	Action
18 ³⁸	R	Data of flow calibration test for calibration certificate: Parameter 1: Day of month of calibration test Parameter 2: Month of calibration test Parameter 3: Year of month of DA-100 NT of calibration test Parameter 4: Serial No of DA-100 NT if automatic calibration Parameter 5: Flow deviation of DA-100 NT if automatic calibration Parameter 6: Flow sample 1 of DA-100 NT Parameter 7: Flow sample 2 of DA-100 NT Parameter 8: Flow sample 3 of DA-100 NT Parameter 9: Calibration day of month of DA-100 NT if automatic calibration Parameter 10: Calibration month of DA-100 NT if automatic calibration Parameter 11: Calibration year of month of DA-100 NT if automatic calibration Parameter 12: Reference Temperature of automatic test [1/10 °C] Parameter 13: Reference atmospheric pressure of automatic test [mbar] Parameter 14: DA-100 flow variation during calibration Parameter 15: Flow sensor variation during calibration Parameter 16: Flow sensor sensitivity

Example: None.

7.7.20 Calibration activation date

This command returns the date of the activation of the calibration.

ID	Operation	Action
19 ³⁹	R	Date of activation: Parameter 1: 0 = Calibration not activated 1 = Calibration activated Parameter 2: Day of activation Parameter 3: Month of activation Parameter 3: Year of activation

Example: None.

7.7.21 Flow calibration values



Note

This function is restricted to factory users only.

³⁸ Applied to MAS-100 Iso NT/MH: Values of head 1
³⁹ Applied to MAS-100 Iso NT/MH: Values of head 1

7.7.22 Saved flow calibration values

This command returns the saved flow values measured by the DA-100 NT during flow calibration.

ID	Operation	Action
21 ⁴⁰	R	Date of activation: Parameter: 1 - 9 Measured flow values of DA-100 in 0.1 l/min

Example: None.

7.7.23 Date of last adjustment of head

ID	Operation	Action
22 ⁴¹	R	Parameter 1: 1 ... 4 Desired head Parameter 2: Day of month of last adjustment 1 ... 31 Parameter 3: Month of year of last adjustment 1 ... 12 Parameter 4: Year of last adjustment 2'001 ... 2'030

Example:

Read from instrument:	(Date of last adjustment of head 1)	%RI#22\$1(CR)
Answer of instrument:	(Head=1, date = 01.03.2006)	%RI#22\$1\$1\$3\$2006(CR)

7.7.24 Date of previous adjustment of head

ID	Operation	Action
23 ⁴¹	R	Parameter 1: 1 ... 4 Desired head Parameter 2: Day of month of previous calibration 1 ... 31 Parameter 3: Month of year of previous calibration 1 ... 12 Parameter 4: Year of previous calibration 2'001 ... 2'030

Example:

Read from instrument:	(Date of previous adjustment of head 1)	%RI#23\$1(CR)
Answer of instrument:	(Head=1, date = 01.03.2006)	%RI#23\$1\$1\$3\$2006(CR)

⁴⁰ Applied to MAS-100 Iso NT/MH: Values of head 1
⁴¹ Only available for MAS-100 Iso NT/MH

7.7.25 Flow adjustment data of head

ID	Operation	Action
24 ⁴¹	R	Data of flow adjustment: Parameter 1: 1 ... 4: Desired head [] Parameter 2: Calibration validity: 0: Calibration not valid 1: Calibration valid Parameter 3: Sensor offset, 0 ... 4'095 [mV] Parameter 4: ADC value for flow 1, [mV] Parameter 5: Adjustment flow 1, [1/10 l/min] Parameter 6: Calibration flow 2, [1/10 l/min] Parameter 7: ADC value for flow 2, [mV] Parameter 8: № of flow adjustment points (0, 1, 2) Parameter 9: Flow sensor gain Parameter 10: Automatic adjustment: 0: Manual adjustment 1: Automatic adjustment Parameter 11: Serial № of DA-100 NT if automatic adjustment Parameter 12: Flow deviation of DA-100 NT if automatic adjustment Parameter 13: Calibration day of month of DA-100 NT if automatic adjustment Parameter 14: Calibration month of DA-100 NT if automatic adjustment Parameter 15: Calibration year of month of DA-100 NT if automatic adjustment Parameter 16: Calibration temperature if adjustment calibration [1/10 °C] Parameter 17: Calibration atmospheric pressure if autom. adjustment [mbar] Parameter 18: DA-100 flow variation during adjustment Parameter 19: Flow sensor variation during adjustment Parameter 20: Flow sensor sensitivity

Example:

Read from instrument: (Flow adjustment data of head 1)	%RI#12\$1(CR)
Answer of instrument: (Head=1, calibration valid, offset = 712 mV, flow 1 = 90.2 l/min, ADC for flow 1 = 2306 mV, flow 2 = 109.8 l/min, ADC for flow 2 = 3007 mV, Gain = 120, Automatic calibration, DA-100 NT Serial № = 20'000, Date of calibration of DA-100 NT: 12. Oct. 2007, Calib. temp. = 24.5°C, Calib. pressure = 956 mbar)	%RI#12\$1\$712\$902\$2306\$1098\$3007 \$120\$1\$20000\$12\$10\$2007\$245\$956\$1\$2\$15(CR)

7.7.26 Flow adjustment data of previous adjustment of head

ID	Operation	Action
25 ⁴¹	R	Data of flow adjustment: Parameter 1: 1 ... 4: Desired head Parameter 2: Adjustment validity: 0: Calibration not valid 1: Calibration valid Parameter 3: Sensor offset, 0 ... 4'095 [mV] Parameter 4: ADC value for flow 1, [mV] Parameter 5: Adjustment flow 1, [1/10 ℓ/min] Parameter 6: Adjustment flow 2, [1/10 ℓ/min] Parameter 7: ADC value for flow 2, [mV] Parameter 8: № of flow calibration points (0, 1, 2) Parameter 9: Flow sensor gain Parameter 10: Automatic calibration: 0: Manual adjustment 1: Automatic adjustment Parameter 11: Serial № of DA-100 NT if automatic adjustment Parameter 12: Flow deviation of DA-100 NT if automatic adjustment Parameter 13: Calibration day of month of DA-100 NT if automatic adjustment Parameter 14: Calibration month of DA-100 NT if automatic adjustment Parameter 15: Calibration year of month of DA-100 NT if automatic adjustment Parameter 16: Calibration temperature if automatic adjustment [1/10°C] Parameter 17: Calibration atmospheric pressure if autom. adjustment [mbar] Parameter 18: DA-100 flow variation during adjustment Parameter 19: Flow sensor variation during adjustment Parameter 20: Flow sensor sensitivity

Example:

Read from instrument: (Flow adjustment data of previous adjustment of head 1)	%RI#15\$(CR)
Answer of instrument: (Head=1, calibration valid, offset = 712 mV, flow 1 = 90.2 l/min, ADC for flow 1 = 2306 mV, flow 2 = 109.8 l/min, ADC for flow 2 = 3007 mV, Gain = 120, Automatic Calibration, DA-100 NT Serial № = 20'000, Date of calibration of DA-100 NT: 12. Oct. 2007, Calib. Temp. = 24.5°C, Calib. Pressure = 956 mbar):	%RI#15\$1\$712\$902\$2306\$1098\$3007\$120\$1\$20000\$12\$10\$2007\$245\$956\$1\$2\$15(CR)

7.7.27 Calibration validity of head

ID	Operation	Action
26 ⁴¹	R	Parameter 1: 1 ... 4 Desired head Parameter 2: Positive result: № of days the calibration is valid Negative result: № of days when the calibration is expired

Example:

Read calibration validity of head 1 from a MAS-100 Iso NT/MH device:	%Rl#5\$1(CR)
Answer of instrument: (Head =1, 1 year)	%Rl#5\$1\$365(CR)

7.7.28 Calibration activation date of head

This command returns the date of the activation of the calibration.

ID	Operation	Action
27 ⁴¹	R	Date of activation: Parameter 1: 1 ... 4 Desired head Parameter 2: Calibration activated:0: Calibration not activated 1: Calibration activated Parameter 3: Day of activation Parameter 4: Month of activation Parameter 5: Year of activation

Example: None.

7.7.29 Saved flow calibration data of head

This command returns the data of the saved flow calibration. The data can be used to create a calibration certificate and are saved to the non-volatile memory of the device.

ID	Operation	Action
28 ⁴¹	R	Data of flow calibration for calibration certificate: Parameter 1: 1 ... 4: Desired head Parameter 2: Day of month of calibration test Parameter 3: Month of calibration test Parameter 4: Year of month of DA-100 NT of calibration test Parameter 5: Serial № of DA-100 NT if automatic calibration Parameter 6: Flow deviation of DA-100 NT if automatic calibration Parameter 7: Flow sample 1 of DA-100 NT Parameter 8: Flow sample 2 of DA-100 NT Parameter 9: Flow sample 3 of DA-100 NT Parameter 10: Calibration day of month of DA-100 NT if automatic calibration Parameter 11: Calibration month of DA-100 NT if automatic calibration Parameter 12: Calibration year of month of DA-100 NT if automatic calibr. Parameter 13: Reference Temperature of automatic test [1/10 °C] Parameter 14: Reference atmospheric pressure of automatic test [mbar]

Example: None.

7.7.30 Saved flow calibration flow values of head



Note

This function is restricted to factory users only.

7.7.31 Maximum allowable flow deviation from target air flow for test protocol

This command returns the maximum allowable flow deviation from target airflow of a calibration test. The data can be used to create a test protocol.

ID	Operation	Action
30 ⁴²	R	Maximum allowable flow deviation from target airflow for calibration certificate Parameter 1: 25 ... 250 Allowable deviation [0.1%]

Example: None.



Note

This data is only stored temporarily and are no more available after power down.

7.7.32 Saved maximum allowable flow deviation from target air flow of head

This command returns the maximum allowable flow deviation from target of the saved flow calibration. The data can be used to create a calibration certificate and are saved to the non-volatile memory of the device.

ID	Operation	Action
31 ⁴³	R	Maximum allowable flow deviation from target airflow of the desired for calibration certificate: Parameter 1: 1 ... 4 Desired head Parameter 2: 25 ... 250 Allowable deviation [0.1%]

Example: None.

7.7.33 Firmware beta version

ID	Operation	Action
99 ⁴⁴	R	Returns the Beta Version: Parameter 1: ≥ 0 Beta version < 0 Firmware is no beta version

Example: None.

⁴² Only available for MAS-100 Iso NT/MH
⁴³ Only available for MAS-100 Iso NT/MH
⁴⁴ Only available for MAS-100 Iso NT/MH

7.7.34 Target adjustment flow

ID	Operation	Action
100	R	Target adjustment flow for running adjustment (state must be 15 or 17, see chapter 7.8.6): 40 ... 130 l/min, Resolution: 0.1 SLPM

Example:

Read from instrument:	(Target adjustment flow)	%RI#100(CR)
Answer of instrument:	(Flow = 92.5 SLPM)	%RI#100\$925(CR)

7.7.35 Adjustment flow correction

ID	Operation	Action
101 ⁴⁵	R	Adjustment flow at target flow SLPM: 50 ... 102.5 SLPM, Resolution: 0.1 SLPM

Example:

Read from instrument:	(Adjustment flow)	%RI#101(CR)
Answer of instrument:	(Flow = 102.5 SLPM)	%RI#100\$1025(CR)

7.7.36 Adjustment flow correction of head

ID	Operation	Action
102 ⁴¹	R	Adjustment flow at target flow SLPM Parameter 1: 1 ... 4 Desired head Parameter 2: 250 ... 1128 [0.1 SLPM]

Example:

Read from instrument:	(Adjustment flow of head 1)	%RI#102\$1(CR)
Answer of instrument:	(Head=1, flow = 102.5 SLPM)	%RI#102\$1\$1025(CR)

7.7.37 Software compatibility



Note

This function is restricted to factory users only.

⁴⁵ Applied on MAS-100 Iso NT/MH: Values of head 1. Range for a MAS-100 Iso NT/MH device: 250 ... 1'128 [1/10 SLPM]

7.8 Read states (%ST#Id)

7.8.1 Measurement states

ID	Operation	Action
1	R	Measurement States: 0: Ready: ready to start measurement cycle or flush cycle 1: Failed: failure during measurement cycle or flush cycle Measurement: 5: Waiting: waiting until delay time passed 6: Running: measuring 7: Passed: measurement successful 8: Stopped: measurement stopped Decontamination Flush: 10: Running: flush running 11: Flush stopped: Flush has been stopped (shown very short) 12: Start: start up flush 13: Stop: shut down flush

Example:

Read from instrument:	(Measurement State)	%ST#1(CR)
Answer of instrument:	(Flush running = 10)	%ST#1\$10(CR)

7.8.2 Alarm state

ID	Operation	Action
2	R	Get alarm state with Parameter: Result value 1: Number of currently active alarms: 0 ... 18 Result value 2 ID of oldest alarm: 91 ... 119 Result value 19: ID of currently active alarm: 91 ... 119

Alarm ID	Description
91 ⁴⁶	Blower did not reach minimal rotation / blower does not start
92	Minimal flow for starting measurement not reached
93	Valves cannot close
94	Target flow not reached
95	Flush flow not reached
96	Valves cannot close
97	Instrument temperature too high
98	Last measurement/Decontamination flush was interrupted by power down
99	Sampling duration too low
100	Calibration not valid/activated
101	Calibration required
102	Target volume too low
103	High flow sensor power supply out of tolerance
104	Measurement stopped
105	24 Volt supply too low
106	24 Volt supply too high
107 ⁴⁷	Rotation error: Initial run failed or communication error with sampling head.
108 ⁴⁸	Position not reached: Termination run failed.
109 ⁴⁹	Humidity too high
110 ⁵⁰	Head not available
111 ⁵¹	Head error (VU valve self-test failed)
112 ... 118	Reserve
119	Displayed in the xml report only as 'No Alarm', meaning: 'Measurement finished'



Note

If there is currently no alarm active, result value 1 is 0 and no other result values are sent. The number of effective sent result values corresponds to the number of currently active alarms + 1. Order of alarms: Result value 2 is the oldest alarm, result value 19 is the latest alarm.

Example:

Read from instrument:	(Alarm State)	%ST#2(CR)
Answer of instrument:	(Blower does not start = 91)	%ST#2\$1\$91(CR)

⁴⁶ Applied to MAS-100 Iso CM device: Pump does not start.

⁴⁷ Only possible on MAS-100 Iso CM

⁴⁸ Only possible on MAS-100 Iso CM

⁴⁹ Only possible on MAS-100 Iso MH/CM

⁵⁰ Only possible on MAS-100 Iso MH

⁵¹ Only possible on MAS-100 Iso MH

7.8.3 Warning state

ID	Operation	Action
3	R	Get active Warnings Parameter: Result value 1: Number of currently active warnings: 0 ... 18 Result value 2: ID of oldest warning: 31 ... 59 Result value 11: ID of currently active warning: 31 ... 59

Warning ID	Description
31	Default value loaded
32	Mainboard temperature too high
33	Supply +24V too low
34	Supply +24V too high
35	Offset high flow sensor out of tolerance
36	Recalibration soon required
37	No fieldbus module available
38	All standard volumes are 0
41	Ethernet communication error
42 ... 59	Reserve



Note

If there is currently no alarm active, result value 1 is 0 and no other result values are sent. The number of effective sent result values corresponds to the number of currently active alarms + 1. Order of alarms: Result value 2 is the oldest alarm, result value 19 is the latest alarm.

Example:

Read from instrument:	(Warning State)	%ST#3(CR)
Answer of instrument:	(Supply +24V too high = 34)	%ST#3\$1\$34(CR)

7.8.4 Technical faults

ID	Operation	Action
4	R	Get active technical faults: Parameter: Resultvalue1: Number of currently active technical faults: 0 ... 18 Result value 2: ID of oldest technical fault: 61 ... 89 Result value 11: ID of current technical fault: 61 ... 89

Warning ID	Description
61	Error during writing data to Non-Volatile RAM (NV-RAM)
62	Invalid checksum in NV-RAM
63 ... 89	Reserve



Note

If there is currently no technical fault active, result value 1 is 0 and no other result values are sent. The number of effective sent result values corresponds to the number of currently active technical faults + 1. Order of technical faults: result value 2 is oldest; result value 11 is the latest technical fault.

Example:

Read from instrument:	(Technical failures)	%ST#4(CR)
Answer of instrument:	(Error writing to NV-RAM)	%ST#4\$1\$61(CR)

7.8.5 Valve states

ID	Operation	Action
5	R	Get valve states Result value 1 ⁵² : Valve 1: 0 = closed, 1 = open Result value 2: Valve 2: 0 = closed, 1 = open Result value 3 ⁵³ : Valve 3: 0 = closed, 1 = open Result value 4 ⁵⁴ : Valve VU2: see footnote 52 Result value 5 ⁵⁴ : Valve VU3: see footnote 52 Result value 6 ⁵⁴ : Valve VU4: see footnote 52

Example:

Read from instrument:	(Valve state)	%ST#5(CR)
Answer of instrument:	(VU=0, AU=1, FL=0)	%ST#5\$0\$1\$0(CR)

52 Applied to MAS-100 Iso NT/MH: Valve VU1:

Bit0:	= 0: closed	= 1: open;
Bit1:	= 0: valve available	= 1: not available because of head count setting
Bit2:	= 0: no diagnostics error	= 1: diagnostics error
Bit3:	= 0: diagnostics check was possible	= 1: diagnostics check not possible, at least one VU Valve is open.

53 Applied to MAS-100 Iso NT/CM: This value is the last transmitted value

54 Only available for MAS-100 Iso NT/MH

7.8.6 Adjustment/Calibration state

ID	Operation	Action
6	R	Calibration State: 0 = Idle, 1 = Error during calibration Ambient pressure adjustment: 1: wait until user starts ambient pressure calibration 2: Wait until user sets ambient pressure setting 3: Reading ambient pressure 4: Calculate Sensor parameters 5: Wait until user leaves ambient pressure calibration Flow adjustment: 10: Wait until user starts high flow sensor calibration 11: Read sensor offset 12⁵⁵: Start up blower 13⁵⁶: Check if blower started 14: Open valves 15: Wait until calibration flow 1 is adjusted 16: Read flow 1 17: Wait until mean calibration flow 1 entered 18: Wait until calibration flow 2 is adjusted 19: Read flow 2 20: Wait until mean calibration flow 2 entered 21: Wait until calibration flow 3 is adjusted 22: Read flow 3 23: Wait until mean calibration flow 3 entered 24⁵⁷: Close valves, stop blower 25: Calculate sensor parameters 26: Wait until user leaves high flow calibration Flow calibration test 30: Wait until DA-100 NT connected 31: Start test 32: Wait until flow is stable 33: Check if target flow reached 34: Read flow from DA-100 NT 35: Stop pneumatics 36: Wait until user leaves calibration flow test

Example:

Read from instrument:	(Calibration state)	%ST#6(CR)
Answer of instrument:	(Calibration state =Idle)	%ST#6\$0(CR)

⁵⁵ Applied to MAS-100 Iso CM: Startup pump

⁵⁶ Applied to MAS-100 Iso CM: Check if pump started

⁵⁷ Applied to MAS-100 Iso CM: Close valves, stop pump

7.8.7 Digital inputs

ID	Operation	Action
7	R	Get state of digital inputs (only for service use) Parameter: Result value: State of digital inputs; the returned number interpreted as binary number is a bit set, where each digital input has a corresponding bit (input 1 is significant bit, input 8 is most significant bit); if a bit is set (=1), the corresponding input is high, otherwise low

Example:

Read from instrument:	(Digital inputs)	%ST#7(CR)
Answer of instrument:	(Input 7 is high, all others low)	%ST#7\$64(CR)

7.8.8 Digital outputs

ID	Operation	Action
8	R	Get state of digital outputs (only for service use) Parameter: Result value: State of digital outputs; the returned number interpreted as binary number is a bit set, where each digital output has a corresponding bit (output 1 is significant bit, output 8 is most significant bit); if a bit is set (=1), the corresponding output is high, otherwise low

Example:

Read from instrument:	(Digital outputs)	%ST#8(CR)
Answer of instrument:	(Output 7 is high, all others low)	%ST#8\$128(CR)

7.8.9 All states

This command reads all states defined above within one single call.

ID	Operation	Action
9	R	Get all states Resultvalue 1: Measurement state, see chapter 7.8.1 Resultvalue 2: Calibration state, see chapter 7.8.6 Resultvalue 3: Alarms, see chapter 7.8.2; the returned number interpreted as binary number is a bitset, where each alarm ID has a corresponding bit (alarm ID 91 is least significant bit, alarm ID98 is most significant bit); if a bit is set (=1), the corresponding alarm is active, otherwise inactive Resultvalue 4: Warnings, see chapter 7.8.3; the returned number interpreted as binary number is a bitset, where each warning ID has a corresponding bit (warning ID 31 is least significant bit, alarm ID36 is most significant bit); if a bit is set (=1), the corresponding warning is active, otherwise inactive Resultvalue 5: Technical faults, see chapter 7.8.4; the returned number interpreted as binary number is a bitset, where each technical fault ID has a corresponding bit Resultvalue 6⁵⁸:Valve states: 0: All valves closed 1: Valve VU (1/1.1) open, other valves closed 2: Valve AU (2) open, other valves closed 3: Valves VU and AU open, valve flush closed 4: Valve flush (3) open, other valves closed 5: Valves VU and flush open, valve AU closed 6: Valves AU and flush open, valve VU closed 7: all valves open Result value 7: Digital inputs (see chapter 7.8.7): Result value 8: Digital outputs (see chapter 7.8.8):

Example:

Read from instrument:	(States)	%ST#9(CR)
Answer of instrument: (Measure state = waiting, calibration state = idle, no alarms, no warning, no technical fault, all valves closed, digital inputs all low, digital output 2 high):		%ST#9\$5\$0\$0\$0\$0\$0\$0\$0\$2(CR)

⁵⁸ Applied to MAS-100 Iso NT/MH: Valve states:
 Bit 0 Valve VU1 state: 0 = closed, 1 = open
 Bit 1 Valve AU state: 0 = closed, 1 = open
 Bit 2 Valve Flush state: 0 = closed, 1 = open
 Bit 3 Valve VU2 state: 0 = closed, 1 = open
 Bit 4 Valve VU3 state: 0 = closed, 1 = open
 Bit 5 Valve VU4 state: 0 = closed, 1 = open

7.8.10 Fieldbus state

ID	Operation	Action
10	R	Get state of fieldbus (Profibus, Ethernet) Parameter – Result value: 0: Data exchange running 1: Communication possible, configuration ok 2: Module running, initialization finished 10: Watchdog error of COM module 11: COM module defect 12: Wrong COM module detected 13: No COM module detected 14: Wrong Identification № 15: Wrong Ident №, only basic software 16: Bus not enabled

Example:

Read from instrument:	(Fieldbus state)	%ST#10(CR)
Answer of instrument:	(Data exchange running)	%ST#10\$0(CR)

7.8.11 State flush flow available

ID	Operation	Action
11	R	Get flush flow state Parameter – Result value: 0 = flush flow not available, 1 = flush flow available

Example:

Read from instrument:	(Flush flow state)	%ST#11(CR)
Answer of instrument:	(Flush flow not available)	%ST#11\$0(CR)

7.8.12 Currently active head

ID	Operation	Action
12 ⁵⁹	R	Read the currently active head: Parameter: 1 ... 4 Currently active head

Example:

Read from instrument:	(Currently active head)	%ST#12(CR)
Answer of instrument:	(Currently active head = 2)	%ST#12\$2(CR)

⁵⁹ Only available for MAS-100 Iso MH

7.8.13 Position sensor

ID	Operation	Action
13 ⁶⁰	R	Read the position sensor state: Parameter1: 0: position sensor state: sensor not detected 1: position sensor state: sensor detected -1: position sensor state: not up to date, service mode is not active Parameter2: 0...1'000: position sensor impulse count, since the last reset of the counter -1: position sensor impulse count is not up to date; service mode isn't active.

Example:

Read from instrument:	(Position sensor)	%ST#13(CR)
Answer of instrument:	(Position sensor state = 1, position sensor impulse count = 10)	%ST#13\$1\$10(CR)

7.8.14 Read probe log entry (%RP#Id)

ID	Operation	Action
1	R	Parameter: Index: Index of probe log entries, 0 ... nr of currently saved entries Result values: Result1: %RP#1\$0\$5 Index of current read log entry (0 ... 99) Nr of following packages Package: 1 Index of current read log entry (0 ... 99) Nr of current package User: Username Package: 2 Index of current read log entry (0 ... 99) Nr of current package Log ID Day of start date: 1 ... 31 Month of start date: 1 ... 12 Year of start date: 2005 ... 2030 Hour of start time: 0 ... 23 Minute of start time: 0 ... 59 Package: 3 Index of current read log entry (0 ... 99) Nr of current package Day of end date: 1 ... 31 Month of end date: 1 ... 12 Year of end date: 2005 ... 2030 Hour of end time: 0 ... 23 Minute of end time: 0 ... 59 Package: 4 Index of current read log entry (0 ... 99) Nr of current package Mode: 0 ... 2 (0 = STD, 1 = SQS, 2 = CNS⁶¹) Target volume: 0 ... 2000 [l/min] Nr of fractions: 2 ... 20 (0 if STD Mode) Sampling duration: 0 ... 1440 [min] (0 if STD Mode) Delay On: 0 ... 1 (0 = Off, 1 = On) Delay time⁶²: 0 ... 120 [min] (0 if Delay off)

⁶⁰ Only available for MAS-100 Iso CM

⁶¹ CNS mode is only available for MAS-100 Iso MH

⁶² Applied to MAS-100 Iso NT/CM: This parameter is the last transmitted parameter of this package.

		Head count⁶³: 1 ... 4 [] (0 if STD Mode) Selected head⁶³: 1 ... 4 [] (0 if not STD Mode) CNS Delay⁶³: 0 ... 1440 [min] (0 if not CNS Mode) Package: 5⁶⁴ Index of current read log entry (0 ... 99) № of current package Measured volume: 0 ... 2'000 [l/min] Nr of measured fractions: 2 ... 20 (0 if STD Mode) State: 1: Failed 6: Running 7: Passed 8: Stopped Error ID: 90 ... 119 Package: 6 (Measurement values of head 2)⁶⁵ Index of current read log entry (0 ... 99) № of current package Measured volume: 0 ... 2'000 [l/min] Nr of measured fractions: 2 ... 20 (0 if STD Mode) State: 1: Failed 6: Running 7: Passed 8: Stopped Error ID: 90 ... 119 Package: 7 (Measurement Values of head 3)⁶⁶ Index of current read log entry (0 ... 99) № of current package Measured volume: 0 ... 2'000 [l/min] № of measured fractions: 2 ... 20 (0 if STD Mode) State: 1: Failed 6: Running 7: Passed 8: Stopped Error ID: 90 ... 119 Package: 8 (Measurement Values of head 4)⁶⁷ Index of current read log entry (0 ... 99) № of current package Measured volume: 0 ... 2'000 [l/min] № of measured fractions: 2 ... 20 (0 if STD Mode) State: 1: Failed 6: Running 7: Passed 8: Stopped Error ID: 90 ... 119
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⁶³ Only available modes for MAS-100 Iso NT/MH

⁶⁴ Applied to MAS-100 Iso NT/CM: This Package is the last transmitted package.

Applied to MAS-100 Iso NT/MH: Measurement values of head 1

⁶⁵ Only available modes for MAS-100 Iso MH

⁶⁶ Only available modes for MAS-100 Iso MH

⁶⁷ Only available modes for MAS-100 Iso MH

Example:

Read from instrument:	(Probe log entry)	%RP#1\$0(CR)
Answer of instrument:	(Log entry, № of packages)	%RP#1\$0\$5
Answer of instrument:	(Log entry, package, user name)	%RP#2\$0\$1\$MUD
Answer of instrument:	(Log entry, package, start date/time: 31.12.2005 08:34)	%RP#2\$0\$2\$31\$12\$2005\$8\$34
Answer of instrument:	(Log entry, package, end date/time: 31.12.2005 08:44)	%RP#2\$0\$3\$31\$12\$2005\$8\$44
Answer of instrument:	(Log entry, package, process settings)	%RP#2\$0\$4\$0\$2000\$0\$0\$1\$120
Answer of instrument:	(Measured values)	%RP#2\$0\$5\$2000\$0\$7

7.9 Read alarm log entry (%RA#Id\$Index\$Values)

ID	Operation	Action
1	R	Read Alarm Log Entry Parameter: Index: Index of alarm log entries, 0 ... № of currently saved entries Index Range: 0 ... 99 (Max. 100 entries) Result values: Index of read alarm, 0 ... 99 Unique Log ID Probe ID, -32768 if not measurement running when error was generated Day, 1 ... 31 Month, 1 ... 12 Year, 2005 ... 2030 Hour, 0 ... 23 Minute, 0 ... 59 Second, 0 ... 59 Alarm ID: 91 ... 120 (see chapter 7.8.2)

Example:

Read from instrument:	(Latest Alarm Log Entry)	%RA#1\$0(CR)
Answer of instrument:		%RA#1\$0\$1\$10\$2005\$17\$45\$32\$91

8 Profibus communication

8.1 Profibus communication protocol selection

To change the used Profibus communication protocol, go to the Service Menu of the PC Software and select Interface first, then Profibus:

- STD: Common interface protocol as used for the other interfaces, with some minor changes described in the next chapter
- SPS: cyclic-continuous protocol with fix memory assignment; only a reduced instruction set available

8.2 Standard Profibus protocol

The standard Profibus protocol is the common interface protocol used for all interfaces, but there is a small difference. After every command it is necessary to acknowledge the command.

The following example will explain the communication between Profibus and the MAS-100 Iso NT.

Example Change Time and Date Format to USA:

Write command to MAS-100 Iso NT:	%WS#19\$(CR)
Command response of MAS-100 Iso NT:	%WS#19\$(CR)
Write acknowledge to MAS-100 Iso NT:	%ACK(CR)
Acknowledge response of MAS-100 Iso NT:	%ACK(CR)

Significance of colors:

-  Like RS-232 protocol
-  Additional for Profibus communication

Important:

Whenever the acknowledge command is pending at the input side of the instrument, the instrument puts it's state information (measurement state, calibration state, valve states and active alarms, technical faults and warnings) to the output side and updates it at regular intervals. Data are sent in binary format; see command «All States» in [chapter 7.8.9](#):

Byte	Description
1	Measurement state see chapter 7.8.1
2	Calibration state see chapter 7.8.6
3, 4	Active alarms see chapter 7.8.2
5, 6	Active warnings see chapter 0
7,8	Active technical faults see chapter 7.8.4

8.3 SPS Profibus protocol

The instrument uses a Profibus communication module, which has 32-byte input and 32-byte output data memory. These 32 bytes are assigned fixed, so that all relevant data are permanently available without having to send a request to the instrument.

The SPS protocol is not ASCII based, but pure binary, which means that all numbers are stored as binary values in the input/output memory. The 'Big-Endian' byte ordering is used for values which need more than 1 byte, which means that more significant bytes are saved at lower addresses. Values which can be negative are saved in the 'two's complement' format.

The first 2 bytes of the input memory are reserved for the implemented commands, each bit defines a command. To execute a command, the corresponding bit must be set to 1 and kept, until the command was executed (e.g. measurement started, can be seen with the measurement state).

For restarting a command, the corresponding bit must be set to 0 for some time. Commands which cannot be executed at the same time (e.g. start decontamination while measurement running) are ignored. To start such a command later, the corresponding bit must be set to 0 first.

The input data is read and processed every 200 ms, the output data is also updated every 200 ms.

To be sure that the input data is accepted, the data must be kept stable for at least 200 ms, but preferably longer.

8.3.1 Input data

The 32-byte input data are assigned as follows:

Byte	Description	Format (see chapter 8.3.3)	Value Range	Unit	
0	Reserve	-	-	-	
1	Bit 0: Start measurement Bit 1: Start decontamination Bit 2: Stop measurement / decontamination Bit 3: Alarm acknowledge Bit 4: Set time Bit 5: Set date Bit 6: Set settings Bit 7: Reserve	-	-	-	Commands
2	Volume	Numeric	0 ... 2'000	Liter	Settings
3					
4	Measure duration (SQS mode)	Numeric	0 ... 1'439	min	
5					
6	Modes for MAS-100 Iso NT & MH: 0 = STD 1 = SQS 2 = CNS (for MAS-100 Iso MH only)	[Mode]	-	-	
7	No. of Fractions (SQS mode)	Numeric	2 ... 50	-	
8	Delay	Numeric	0 ... 120	min	
9	User ID	[User ID]	-	-	
10	Date: Day	Numeric	1 ... 31	DD	
11	Date: Month	Numeric	1 ... 12	MM	
12	Date: Year	Numeric	2'007 ... 2'050	YYYY	
13					
14	Time: Seconds	Numeric	0 ... 59	s	
15	Time: Minutes	Numeric	0 ... 59	m	
16	Time: Hours	Numeric	0 ... 24	h	
17	Head selection (STD mode) ⁶⁸	Numeric	1...4		
18	CNS delay (CNS mode) ⁶⁹	Numeric	0 ... 1'440	min	
19					
20-31	Not used (Reserve)	-	-	-	

⁶⁸ Only available for MAS-100 Iso NT/MH

⁶⁹ Only available for MAS-100 Iso NT/MH

8.3.2 Output data

The 32-byte output data are assigned as follows:

Byte	Description	Format (See chapter 8.3.3)	Value Range	Unit					
0	Measure state	[MeasureState]	-	-	Actual States				
1	Active alarms	[Alarms]	0 ... 2 ²⁴ - 1	-					
2									
3									
4	Active warnings	[Warnings]	0 ... 2 ¹⁶ - 1	-					
5									
6	Active technical faults	[TechFaults]	0 ... 2 ⁸ - 1	-					
7	Valve states: On a MAS-100 Iso NT/MH device: Bit0 is set if at least one VU valve is open.	[Valves]	0 ... 2 ⁸ - 1	-	System information				
8	Serial number ($< 100'000 \rightarrow$ Iso NT, $> 100'000$ – Iso MH)	Numeric	0 ... 2 ³² - 1	-					
9									
10									
11	FW Version Bit 0 ... 3: Minor version Bit 4 ... 7: Major version	[FW Version]	Minor Version: 0 ...9 Major Version: 0 ...16	-					
12									
13						Time: Minutes	Numeric	0 ... 59	-
14						Time: Hours	Numeric	0 ... 23	-
15	Running fraction (SQS mode) (Kept until new measurement started)	Numeric	0 ... 50	-		Measure Values			
16	Actual flow	Numeric	0 ... 200.0	0.1 l/min					
17									
18	Cumulated volume (Kept until new measurement started)	Numeric	0 ... 2'000	0.1 Lit.					
19									
20	Time remaining (Kept until new measurement started)	Numeric	0 ...86'400	s					
21									
22									
23	Desired volume	Numeric	0 ... 2'000	Liter	Settings				
24									
25									
26	Measurement duration (SQS mode)	Numeric	0 ... 1'439	min					
27									
28	Mode (SQS/STD) Modes for a MAS-100 Iso MH: 0 = STD 1 = SQS 2 = CNS	[Mode]	-	-					
29	№ of fractions (SQS mode)	Numeric	2 ... 50	-					
30	Delay	Numeric	1 ... 120	min					
31	User ID	[UserID]	-	-					

8.3.3 Used formats

8.3.3.1 ON / OFF

On / Off	Description
0	OFF
1	ON

8.3.3.2 Numeric

Raw value, position of decimal separator is deducible from the unit.

8.3.3.3 Measurement state

Measurement state	Description
0 ... 13	See chapter 7.8.1

8.3.3.4 Alarms

The returned number interpreted as binary number is a Bitset, where each alarm ID has a corresponding bit (alarm ID 91 is least significant bit, alarm ID 98 is most significant bit); if a bit is set (=1), the corresponding alarm is active, otherwise inactive. For more Information, please consult [chapter 7.8.9](#).

Bit 7 is the Most Significant Bit (MSB), Bit 0 the Least Significant Bit (LSB)

Bit	7	6	5	4	3	2	1	0
Alarm IDs in Byte 1	114	113	112	111	110	109	108	107
Alarm IDs in Byte 2	106	105	104	103	102	101	100	99
Alarm IDs in Byte 3	98	97	96	95	94	93	92	91

8.3.3.5 Warnings

Bit set, where each warning ID has a corresponding bit (warning ID31 is least significant bit, warning ID38 is most significant bit); if a bit is set (=1), the corresponding warning is active, otherwise inactive.

Warning bit	Description
0 ... 15	See chapter 7.8.9
16 ... 23	See chapter 7.8.9

8.3.3.6 Technical faults

Bit set, where each technical fault ID has a corresponding bit:

Technical fault bits	Description
0	Error during writing data to Non-Volatile RAM (NV-RAM)
1	Invalid checksum in NV-RAM
2 ... 7	Reserve

8.3.3.7 Valves

Valves bits	Description
0	Valve 1
1	Valve 2
2	Valve 3
3 ... 7	Reserve

8.3.3.8 Model

Instrument model	Description
0	Standard
1	RABS

8.3.3.9 Firmware version

3-part firmware version introduced for MAS-100 NT with FW V2.8.5, for MAS-100 Iso MH with FW V1.2.6, but can only be displayed as 2-part firmware version in the SPS protocol.

Bit 0 ... 3	Minor version, 0 ... 9
Bit 4 ... 7	Major version, 0 ... 16

8.3.3.10 Printer selection

Printer	Description
0	None
1	Epson TM-U220
2	Samsung SRP-275

8.3.3.11 UserID

UserID	Description
0	User selection OFF
1 ... 10	User selection ON, ID of selected user



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