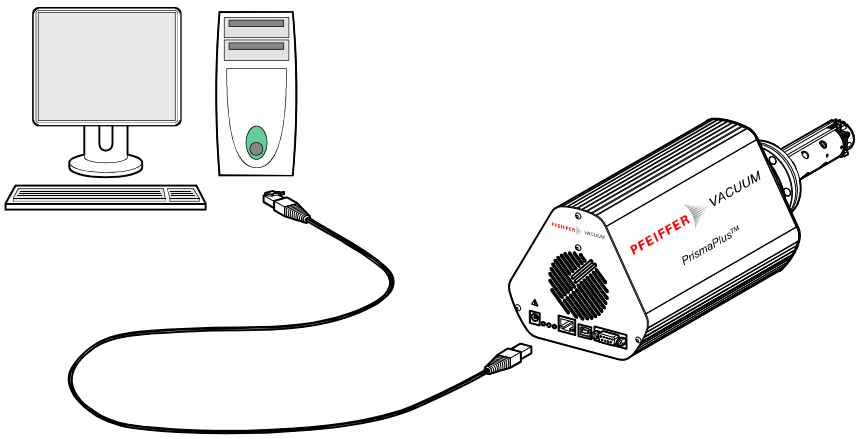
PrismaPlus™

Compact Mass Spectrometer System

QMG 220



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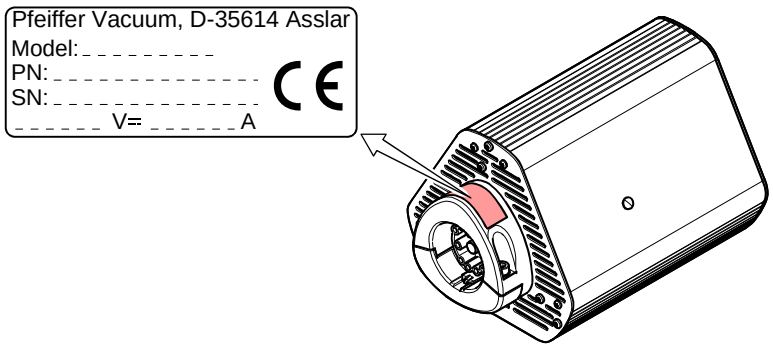
About this Document

This document describes the functionality and programming of the OPC interface of the PrismaPlus™ Compact Mass Spectrometer System.

For safety information on and further technical data of the device, please refer to the respective operating manual (→ 🕮 [1]).

Product Identification

In all communications with Pfeiffer Vacuum, please specify the information on the product nameplate. For convenient reference copy all system information into the spaces provided below.



Validity

This document applies to devices with the following firmware versions:

QMS firmware	3.04.00.00
DSP firmware	3.04.00.00

Use the "QMG Service Tool" to determine the version of your device.

Trademarks

PrismaPlus™	Pfeiffer Vacuum GmbH
QUADERA®	INFICON AG

Content

1 Important Information

1.1 Symbols Used

Notice:
Special information on effective use.

[…] Literature reference

→ 🗎 XY Cross-references within this document.

→ 🕮 [Z] Cross-references to further information sources.

1.2 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories and options not listed in the corresponding product documentation.

The end-user assumes the responsibility in conjunction with the process media used.

1.3 Training

Training

Pfeiffer Vacuum offers application, operating and maintenance courses for the best use of this product. Please contact your local Pfeiffer Vacuum representative.

1.4 Literature

🕮 [1] Operating Instructions PrismaPlus™
Compact Mass Spectrometer System
QMG220
BG 5214 BD (German)
BG 5214 BE (English)
Pfeiffer Vacuum GmbH, D-35614 Asslar

🕮 [2] Technological information
Partial pressure measurement in vacuum technology
BG 800 169 PD (German)
BG 800 169 PE (English)

2 Technical Data

→ 🕮 [Operating Instructions PrismaPlus™]

3 Installation

→ 🕮 [Operating Instructions PrismaPlus™]

4 Introduction to OPC

4.1 What is OPC?

OPC stands for Openness, Productivity, Collaboration (formerly: OLE for Process Control). OPC is a standard software interface which enables data communication between applications of different manufacturers. Today, OPC is the worldwide standard for information exchange between different hardware and software components.

Advantages for the user

Without OPC, two devices can only communicate with each other if each device knows the partner's interface in detail. As a result, extending a control system or replacing devices is laborious. Using OPC, it is sufficient to write an OPC compliant driver once as specified in the standards of the OPC foundation.

4.2 OPC Client/Server Architecture

In order to obtain maximum independence between process linking and the actual application, process linking is implemented as an independent application called "OPC server". An application which accesses the data of an OPC server is called an "OPC client". The relationship between the two applications is a typical client/server architecture in which server provides its services to a client. In this case, the server provides access to process data. A client/server architecture has the advantage that one OPC server can provide its service to several clients simultaneously, and that one client can use the service of several servers simultaneously.

Further references

Further information on OPC can be found on the website of the OPC Foundation:

→ http://www.opcfoundation.org

OPC Programmers' Connection with useful tips:

→ http://www.opcconnect.com/

Matrikon OPC:

→ http://www.matrikonopc.com/

Softing AG:

→ http://www.softing.com/OPC/

CERN:

→ http://itcofe.web.cern.ch/itcofe/Services/OPC/RecommendedTools/welcome.html

The OPC QMG220 Server is based on the OPC Data Access Specification Version 3.00 which is also available on the website of the OPC Foundation.

4.3 LAN Interface

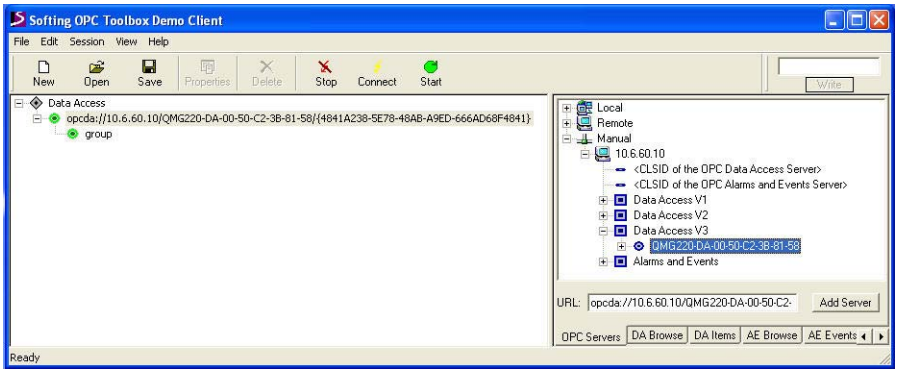
Ethernet is a common and manufacturer independent technology for data communication in a Local Area Network (LAN) at a speed of 10 or 100 million bits per second (Mbps). See BG 5214 BD 3.3.3 "Connecting the PC".

4.4 Testing the QMG Server

For testing the QMG Server you may for example use the Demo OPC Client made by Softing AG. (http://www.softing.com/home/en/industrial-automation/downloads/drivers-demos.php).

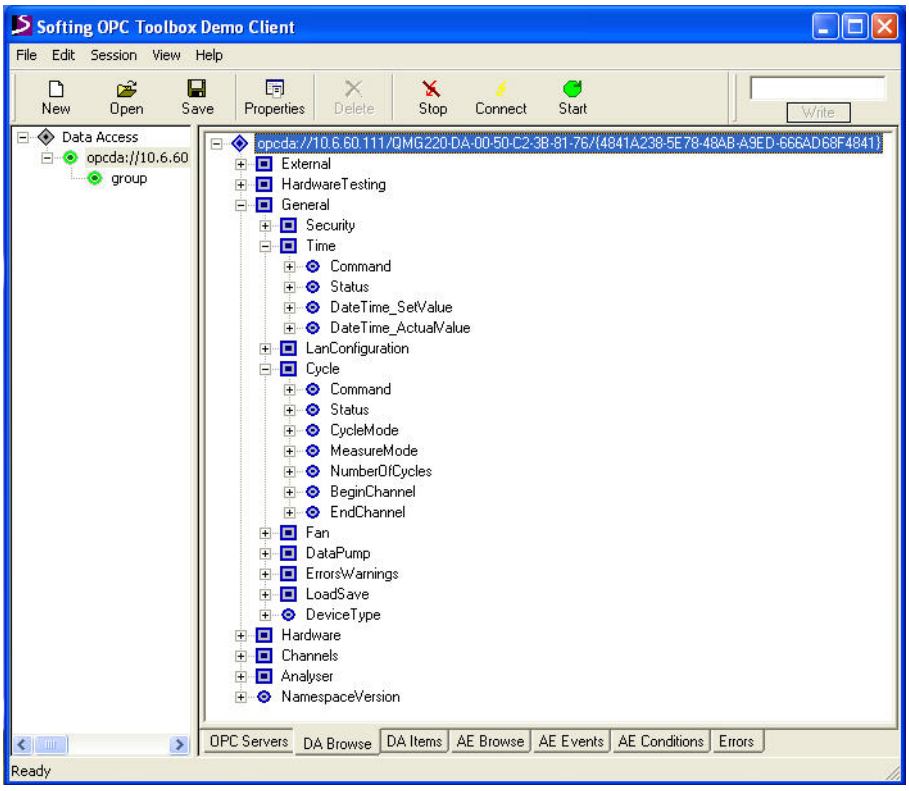
Starting OPC client

Start the Softing OPC Demo Client. In the [OPC Servers] tab, select “Manual”, the IP address, “Data Access V3”, and then the QMG220-DA OPC server.



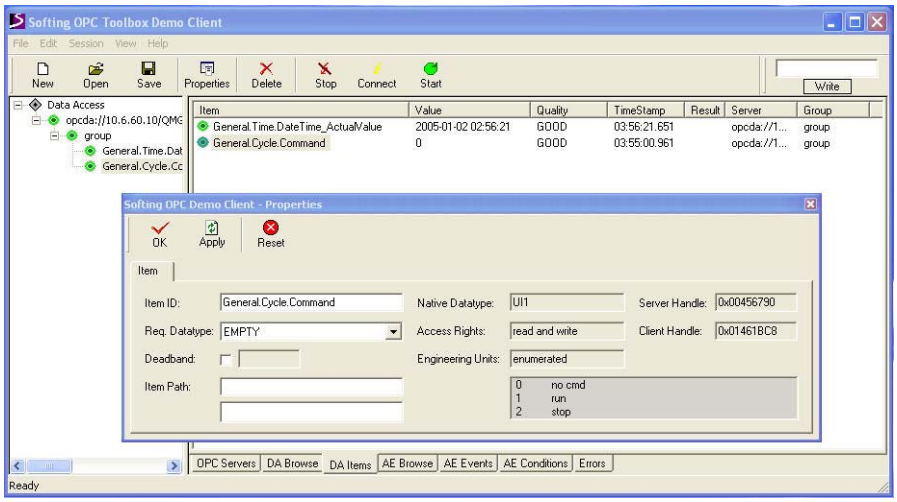
Selecting DA [Browse]

Select the [DA Browse] tab to display the name space.



OPC item properties

Select the [DA Items] tab to display the properties of selected OPC items, for example the item ID, value, data type, time stamp etc.



4.5 Technical Basis

4.5.1 START / STOP

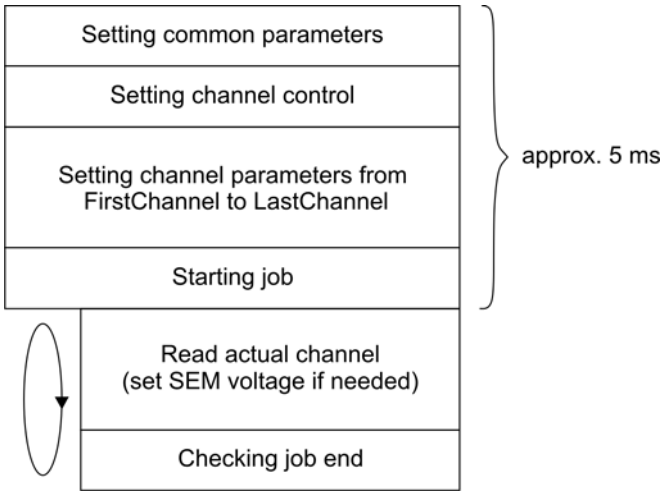
Run

In multichannel mode (item General.Cycle.CycleMode = MULTI), the channel run is indicated (breaks possible in fast runs).

START / STOP start and stop the measurement that is defined in General.Cycle.MeasureMode.

Starting the measurement when a measurement job is already active will result in the job restart.

The following diagram schematically shows the sequence when a measurement is started.



Stop

Set the General.Cycle.Command = 2 to stop the current measurement job.

4.5.2 Login/Logout (Security – Items)

Login

The General.Security.LoggedInUser item prevents that two or more clients are configuring the measuring device at the same time. In fact, login is not required to change parameters, however, the client should inhibit this. For example, at first the login screen should appear. Changing values should only be possible after successful login.

Proceed as follows to login:

1. Set the required values for the following items:
   - General.Security.Name
   - General.Security.Phone
   - General.Security.Password
2. Set General.Security.Command = 1 to start login.
3. Use the General.Security.Status item to check that the login has been performed (0 = "logged off", 1 = "logged on", 2 = "logon failed").

The General.Security.LoggedInUser item indicates the currently logged in user name, and the phone number: "Name(Phone)".

Logout

Logout works in the same way like login but does not require the items "Name", "Phone", and "Password". Set General.Security.Command = 2 to logout. Thus, you can force a logout at any time which may be needed if another user is already logged in and not found for logging out.

The "Status" item indicates the status.

4.6 Data Types

The following data types are used for the various types of OPC variables:

Data Type	OPC Vartype
BYTE	UI1
INTEGER	I2
DOUBLE INTEGER	I4
DOUBLE WORD	UI4
REAL	R4
TIMESTAMP *)	VT_ARRAY|UI1
REALARRAY **)	VT_ARRAY|R4

*) TIMESTAMP:
Special data type. An array that contains 8 Bytes is created for this leaf.
64 bit Integer, number of 100 ns intervals since 1 January 1601

**) REALARRAY:
Special data type. An array is created for this leaf.

5 OPC Items - Overview and Allowed Range

5.1 Overview

OPC name	See page	Meaning
🗁 General		
DeviceType	24	Device type of the mass spectrometer
🗁 Security		
Command	26	User logon/logoff
Status	26	Status of the current user
Name	26	User name input
Phone	26	Phone number input
Password	26	Password input
LoggedInUser	26	Currently logged in user
🗁 Time		
Command	26	Define the device time
Status	26	Device date and time status
DateTime_SetValue	26	Set value for device date and time
DateTime_ActualValue	26	Current device date and time
🗁 Fan		
HighestSystemTemperature	25	Highest measured system temperature
🗁 LanConfiguration		
DeviceName	25	Name of the device in the network
PhysicalAddress	25	MAC address of the device in the LAN
IPAddress	25	IP address of the device in the LAN
DHCP	25	DHCP configuration of the LAN
SubnetMask	25	Subnet mask of the device in the LAN
🗁 LoadSave		
Command	25	Load and save the device settings
Status	26	Status of the loading or saving process
ParameterSet	26	Parameter set for the device settings
🗁 Cycle		
Command	23	Run / Stop
Status	24	Measurement cycle status
CycleMode	23	Measurement cycle sequence
MeasureMode	23	Defines the type of measurement cycle
NumberOfCycles	23	Number of measurement cycles
BeginChannel	23	First channel in the cycle
EndChannel	23	Last channel in the cycle

OPC name	See page	Meaning
🗁 DataPump		
Command	24	Clear the measured data ring buffer
Mode	24	Define the type of ringbuffer access
Status	24	Ringbuffer status
BufferLevel	24	Ringbuffer usage in %
Data	24	Supplies the measurement results in data packets
🗁 ErrorsWarnings		
🗁 Actual		
Warning	24	Actual warning messages from the QMG220
Error	24	Actual error messages from the QMG220
🗁 Static		
Command	25	Clear error and warning messages (interface only)
Status	25	Status of the displayed error and warning messages (interface only)
Warning	25	List of warning messages for the QMG220
Error	25	List of error messages for the QMG220
🗁 Analyzer		
Protection	18	Protection of filament and SEM
🗁 Detector		
Command	17	Define SEM high voltage status on / off
Status	17	SEM voltage status
Type	17	Type of ion detector
🗁 ActualParameters		
CommonSEMVoltage_ActualValue	17	Output of common SEM voltage (actual value)
CommonSEMVoltage_SetValue	17	Defined common SEM voltage (set value)
🗁 Filament		
Command	17	Filament On/Off.
EmissionStatus	18	Filament emission status
ActiveFilament	17	Filament selection
🗁 Degas		
Command	17	Degassing Start/Stop.
Status	18	Filament degas status
EmissionCurrent_SetValue	17	Emission current for degas (set value)
ProtectionCurrent_SetValue	17	Maximum filament current for degas (set value)
Time	18	Duration of filament degas

OPC name	See page	Meaning
🗁 IonSource		
Type	18	Selection of the installed ion source type
ActiveParameterSet	18	Ion source voltages parameter set
🗁 Copy		
Command	18	Copy the current ion source parameters
ToParameterSet	18	Destination for the copy command
🗁 Channels		
🗁 Parameters		
🗁 General		
State	20	Enables measurement channel
🗁 Amplifier		
AutoRangeMode	19	Measuring range change-over mode of the electrometer amplifier
DetectorRange	19	Electrometer range
DownRange	19	Lowest electrometer range for AUTO-DOWN
PauseCalibrate	19	"Break" factor for changing the measurement channel in multichannel operation
🗁 Detector		
DetectorType	20	Signal source selection
SEMVoltage	20	SEM high voltage for a channel
AnalogInputChannel	20	Analog input channel number
🗁 Mass		
MassMode	20	Spectrum scan operating mode
Threshold	21	Peak processor threshold
FirstMass	20	First mass for a scan / mass number
Width	21	Width of a scan
DwellSpeed	20	Measurement speed / measurement time
DigitalFIRWeightFunction	20	Selection of FIR weighting function
Resolution	20	Resolution
🗁 Output		
AnalogOutputChannel	21	Analog output channel number
AnalogOutputMode	21	Analog output mode
AnalogOutputRange	21	Measurement range for analog output
🗁 Trip		
Type	22	Type of trip function
DigitalOutputA	21	Digital output bit number for trip function A
DigitalOutputB	21	Digital output bit number for trip function B
LevelA	22	Trip function A / upper threshold for trip function
LevelB	22	Trip function B / lower threshold for trip function

OPC name	See page	Meaning
🗁 Actuality		
🗁 ActualChannel		
Channel	18	Number of actual measurement channel
MassMode	18	Operation mode of measurement in actual channel
MassValue	18	Current mass value in actual channel
MeasureValue	19	Current measuring value in actual channel
MassValue	19	Array of mass numbers for the 128 channels
MeasureValue	19	Array of measured values for the 128 channels
Status	19	Array of statuses for the 128 channels
TimeStamp	19	Array of time stamps for the 128 channels
🗁 Hardware		
QMA	30	Device type of the QMA
QMH	30	Device type of the QMH
🗁 RF		
Command	30	Define RF parameter set
Status	31	Status of RF parameter set
ParameterSet	31	Selection of parameter set for RF stage
Polarity	31	DC polarity
TuneVoltage_ActualValue	32	Tuning voltage of the RF generator (actual value)
Temperature	32	Temperature of the RF stage
🗁 HardwareSettings		
SerialNumber	31	Serial number of the RF stage
Description	31	Description of the RF stage settings
CAL_HIGH_MASS	31	Factor for mass scale calibration
CAL_LOW_MASS	31	Offset for mass scale calibration
RF_LOW_AMPLITUDE	31	Factory Setting only
RESOL_COARSE	31	Factor for resolution
RESOL_LOW	31	Offset for resolution
RESOL_MAX	31	Factor for resolution at low mass range
LINEAR_H	31	(currently not used)
MassRange	27	Available mass range
🗁 Modules		
🗁 Analyser		
🗁 CI220		
OSVersion	27	CI 220 operating system version
FirmwareVersion	27	CI 220 firmware version

OPC name	See page	Meaning
🗁 SI220		
FirmwareVersion	29	SI 220 firmware version
SimulationMode	30	Spectrum simulation for testing purposes
🗁 EPOffsetValues		
Command	28	Define offset correction for the electrometer
Status	29	Status of the offset correction for the electrometer
Mass	29	Mass for the offset measurement
🗁 EP1		
RangeE-05	28	Offset value for the electrometer
RangeE-06	28	Offset value for the electrometer
RangeE-07	28	Offset value for the electrometer
RangeE-08	28	Offset value for the electrometer
RangeE-09	28	Offset value for the electrometer
RangeE-10	29	Offset value for the electrometer
RangeE-11	29	Offset value for the electrometer
RangeE-12	29	Offset value for the electrometer
🗁 MassScaleCalibration		
Offset	29	Parameter for coarse tuning of the mass scale
Slope	29	Parameter for coarse tuning of the mass scale
🗁 ScanStairTable		
Command	29	Define data points for mass scale fine tuning
Status	30	Status of the data points for mass scale fine tuning
Count	29	Number of data points for mass scale fine tuning
ReferenceValues	30	Nominal mass number for mass scale fine tuning
ActualValues	29	Measured mass number for mass scale fine tuning

OPC name	See page	Meaning
🗁 IS220-1		
Status	27	Status of the ion source supply
Filament_Command	27	Define filament emission status on / off
EmissionCurrent_ActualValue	27	Output of the emission current (actual value)
EmissionCurrent_SetValue	27	Set value for the emission current (nominal value)
FilamentCurrent_ActualValue	27	Output of the filament current (actual value)
ProtectionCurrent_SetValue	27	Maximum filament current (set value)
V01_SetValue	28	Ion source voltage 1 (set value)
V02_SetValue	28	Ion source voltage 2 (set value)
V03_SetValue	28	Ion source voltage 3 (set value)
V04_SetValue	28	Ion source voltage 4 (set value)
V05_SetValue	28	Ion source voltage 5 (set value)
🗁 HV220-1		
Status	27	Status of the high voltage supply
HighVoltage_ActualValue	27	Output of the high voltage supply (actual value)
HighVoltage_SetValue	27	Set value for the high voltage supply (nominal value)
🗁 External		
🗁 IO220-1		
Detection	30	Detection of input/output-module IO220
FirmwareVersion	30	IO220 firmware version
Status	30	Status of the input/output-module IO220
🗁 External		
🗁 AnalogInput		
AI_001_ActualValue	22	Analog input status of AI channel 1
AI_002_ActualValue	22	Analog input status of AI channel 2
AI_003_ActualValue	22	Analog input status of AI channel 3
AI_004_ActualValue	22	Analog input status of AI channel 4
AI_005_ActualValue	22	Analog input status of AI channel 5
🗁 AnalogOutput		
AO_001_SetValue	22	Analog output status at AO channel 1
AO_002_SetValue	22	Analog output status at AO channel 2
AO_003_SetValue	22	Analog output status at AO channel 3
AO_004_SetValue	22	Analog output status at AO channel 4
🗁 DigitalInput		
ActualValues_001	22	Digital input status
🗁 DigitalOutput		
SetValues_001	22	Digital output control

OPC name	See page	Meaning
🗁 TotalPressure		
🗁 TP_001		
Command	22	Total pressure gauge on/off
Status	23	Total pressure gauge status
Type	23	Type of the installed analog/digital pressure gauge
LevelOn	23	Pressure threshold to switch filament and SEM automatically on
LevelOff	22	Pressure threshold to switch filament and SEM automatically off
ActualValue	22	Measured total pressure
RS485Address	23	Address of the installed digital pressure gauge
Degas_Command	22	Define total pressure gauge degas status on / off
🗁 Hardware Testing		
🗁 QC220		
Mode	32	Define hardware test mode
DigIn	32	Parameter for QC220 hardware test
AiTuneV	32	Parameter for QC220 hardware test
AiEmiCur	32	Parameter for QC220 hardware test
AiFilCur	32	Parameter for QC220 hardware test
AiSemV	32	Parameter for QC220 hardware test
AiTempV	32	Parameter for QC220 hardware test
AiRes1	32	Parameter for QC220 hardware test
AiRes2	32	Parameter for QC220 hardware test
AiRes3	32	Parameter for QC220 hardware test
AiMeas	32	Parameter for QC220 hardware test
Status	32	Status of the QC220 hardware test
DigOut	32	Parameter for QC220 hardware test
DigRes	32	Parameter for QC220 hardware test
AoIonRef	32	Parameter for QC220 hardware test
AoCath	32	Parameter for QC220 hardware test
AoFocus	32	Parameter for QC220 hardware test
AoFAxis	32	Parameter for QC220 hardware test
AoExtr	32	Parameter for QC220 hardware test
AoFilProt	32	Parameter for QC220 hardware test
AoEmiss	32	Parameter for QC220 hardware test
AoResol	32	Parameter for QC220 hardware test
AoRes1	32	Parameter for QC220 hardware test
AoSem	32	Parameter for QC220 hardware test
AoMass	32	Parameter for QC220 hardware test
NamespaceVersion	32	Version of the OPC namespace

5.2 Allowed Range

Changing a parameter can affect the measurement.
When a parameter that is relevant for the current measurement cycle is changed, the measurement cycle will be restarted.

The following table lists the allowed range for the OPC items, sorted by the OPC name in alphabetical order.

OPC Name	Type	Allowed Values	Dimension / Data Type	Default Value	Comments
Analyser.Detector.ActualParameters.CommonSEMVoltage_ActualValue: Output of common SEM voltage (actual value)					
	output	0.00…4095	[V] R4	-	Operating voltage of the SEM not defined in a measurement channel.
Analyser.Detector.ActualParameters.CommonSEMVoltage_SetValue: Defined common SEM voltage (set value)					
	input	0…3500	[V] R4	1000	SEM voltage not defined in a measurement channel.
Analyser.Detector.Command: Define SEM high voltage status on / off					
	input	0 = no command 1 = sem on 2 = sem off	UI1	0	Enable / disable the SEM high voltage + output of SEM voltage (actual value)
Analyser.Detector.Status: SEM voltage status					
	output	0 = sem off 1 = sem on	UI1	-	SEM high voltage + output of SEM voltage (actual value) disabled / enabled.
Analyser.Detector.Type: Type of ion detector					
	select	0 = FARAD 1 = SEM	UI1	0	Defines the type of ion detection.
Analyser.Filament.ActiveFilament: Filament selection					
	select	1 = filament 1 2 = filament 2	UI1	1	Filament selection for ion sources containing two filaments.
Analyser.Filament.Command: Filament emission On/Off					
	input	0 = no command 1 = filament on 2 = filament off	UI1	0	Define filament emission status on / off.
Analyser.Filament.Degas.Command: Degassing Start/Stop					
	select	0 = no command 1 = degas start 2 = degas stop	UI1	0	Define filament degas status on / off.
Analyser.Filament.Degas.EmissionCurrent_SetValue: Emission current for degas (set value)					
	input	0.0…10.0	[mA] R4	10	
Analyser.Filament.Degas.ProtectionCurrent_SetValue: Maximum filament current for degas (set value)					
	input	0.00…3.50	[A] R4	3.00	Maximum filament current, used to protect the filament.

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Analyser.Filament.Degas.Status: Filament degas status					
	output	1 = degas 1 active 2 = degas 2 active	UI1	-	Indicates degassing of filament 1 or 2.
Analyser.Filament.Degas.Time: Duration of filament degas					
	input	0…99	[min] UI1	10	0 = Continue degas until stop command is entered manually.
Analyser.Filament.EmissionStatus: Filament emission status					
	output	0 = filament off 1 = filament on	UI1	-	Filament emission disabled / enabled.
Analyser.IonSource.ActiveParameterSet: Ion source voltages parameter set					
	select	0 = Set 1 1 = Set 2 2 = Set 3 3 = Set 4	UI1	0	Ion source voltages parameter set, which contains each one data set for the various filament configura-tions.
Analyser.IonSource.Copy.Command: Copy the current ion source parameters					
	input	0 = no command 1 = copy to all 2 = copy to param set	UI1	0	Copies the parameters to the destination.
Analyser.IonSource.Copy.ToParameterSet: Destination parameter set for the copy command					
	select	0 = Set 1 1 = Set 2 2 = Set 3 3 = Set 4	UI1	0	Destination parameter set.
Analyser.IonSource.Type: Ion source type					
	select	1 = CB 2 = Grid 3 = SPM 4 = HighSensitivity	UI1	1	Selection of the installed ion source type.
Analyser.Protection: Protection of filament and SEM					
	select	0 = INTERN-OFF 1 = EXTERN-ONOFF 2 = EXTERN-OFF	UI1	0	Filament and SEM are monitored to protect them.
Channels.Actuality.ActualChannel.Channel: Number of actual measurement channel					
	output	0…127	UI1	-	-
Channels.Actuality.ActualChannel.MassMode: Operation mode of measurement in actual channel					
	output	0 = SAMPLE 1 = SCAN-N 2 = SCAN-F 3 = STAIR-T 4 = PEAK-L 5 = PEAK-F	UI1	-	Standard measurement of a single mass Standard scan Scan with FIR filter Scan of whole number masses Peak processor level criterion Peak processor FIR filter criterion
Channels.Actuality.ActualChannel.MassValue: Current mass value in actual channel					
	output	0.00…300.00	R4	-	

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Channels.Actuality.ActualChannel.MeasureValue: Current measuring value in actual channel					
	output	1,0000000 E-27 …9,9999999 E+5	R4	-	IEEE 754-format floating point value
Channels.Actuality.MassValue: Array of mass numbers for the 128 channels					
	output	0.00…9,600.00	UI2 array	-	Mass in 1/32 integer format.
Channels.Actuality.MeasureValue: Array of measuring values for the 128 channels					
	output	1,0000000 E-27 …9,9999999 E+5	R4 array	-	IEEE 754-format floating point value
Channels.Actuality.Status: Array of statuses for the 128 channels					
	output	Bit0…1: Out of Range Bit2…3: Unit Bit4…5: Mass resolu-tion Bit6…7: not used Bit8…15: Adjust mode status	UI2 array	-	Channel information for saving the measuring data.
Channels.Actuality.TimeStamp: Array of time stamps for the 128 channels					
	output	0…4’294’967’295	100ns UI1 array	-	Time stamp of the measuring values. 64-Bit file time format (100 ns TICs)
Channels.Parameters.Amplifier.AutoRangeMode: Measuring range change-over mode					
	select	0 = FIX 1 = AUTO 2 = AUTO-DOWN	UI1 array	0 = FIX	Operating mode of the electrome-ter amplifier
Channels.Parameters.Amplifier.DetectorRange: Electrometer range					
	select	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	[A] UI1 array	0 = 1E-5	Measuring range for the ion cur-rent
Channels.Parameters.Amplifier.DownRange: Lowest electrometer range for AUTO-DOWN					
	select	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	[A] UI1 array	0 = 1E-5	Most sensitive measuring range for the ion current
Channels.Parameters.Amplifier.PauseCalibrate: "Break” factor for changing the measurement channel in multichannel operation					
	input	0.00…9.99	R4 array	1	Pause time calibration factor.

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Channels.Parameters.Detector.AnalogInputChannel: Analog input channel number					
	select	1…8	UI1 array	1	
Channels.Parameters.Detector.DetectorType: Signal source selection					
	select	0 = FARAD 4 = C-SEM 5 = ANALOG-IN 6 = TOTAL-PRESSURE	UI1 array	0 = FARAD	Used detector type
Channels.Parameters.Detector.SEMVoltage: SEM high voltage for a channel					
	input	0 1…3,000	[V] R4 array	0	Input 0: Common SEM voltage applies.
Channels.Parameters.General.State: Enables measurement channel					
	select	0 = ENABLE 1 = SKIP	UI1 array	0 = ENABLE	The channel is enabled. The channel is skipped.
Channels.Parameters.Mass.DigitalFIRWeightFunction: Selection of FIR weighting function					
	select	0 = Kaise/Sinc 1 = Gauss	UI1 array	1 = Gauss	Shape of the weighting function
Channels.Parameters.Mass.DwellSpeed: Measurement speed / measurement time					
	select	0 = 0.002 s/amu 1 = 0.005 s/amu 2 = 0.01 s/amu 3 = 0.02 s/amu 4 = 0.05 s/amu 5 = 0.1 s/amu 6 = 0.2 s/amu 7 = 0.5 s/amu 8 = 1 s/amu 9 = 2 s/amu 10 = 5 s/amu 11 = 10 s/amu 12 = 20 s/amu 13 = 60 s/amu	UI1 array	6 = 0.2 s/amu	Dwell: Measurement time for sample measurements Speed: Measuring time per mass for scan measurements (mass scan, min. Speed = 20 ms)
Channels.Parameters.Mass.FirstMass: First mass for a scan / mass number					
	input	0.00…300.00	R4 array	14.00	Minimal steps = 0.01
Channels.Parameters.Mass.MassMode: Spectrum scan operating mode					
	select	0 = SAMPLE 1 = SCAN-N 2 = SCAN-F 3 = SCAN-S 4 = PEAK-L 5 = PEAK-F	UI1 array	0 = SAMPLE	Standard measurement of a single mass Standard scan Scan with FIR filter Scan of whole number masses (Scan Stair) Peak processor level criterion Peak processor FIR filter criterion
Channels.Parameters.Mass.Resolution: Resolution					
	input	0…255	UI1 array	50	0 = off (integral spectrum) 1 = narrowest peak width 255 = largest peak width

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments	
Channels.Parameters.Mass.Threshold: Peak processor threshold						
	select	0…7	UI1 array	0	Fix-Range: 7 = 0.01; 6 = 0.03; 5 = 0.1; 4 = 0.3; 3 = 1; 2 = 3; 1 = 10; 0 = 30; in % F.S. referenced to RANGE	Auto-Range: 1×10^{-15} A 1×10^{-14} A 1×10^{-13} A 1×10^{-12} A 1×10^{-11} A 1×10^{-10} A 1×10^{-9} A 1×10^{-8} A
Channels.Parameters.Mass.Width: Width of a scan						
	input	-300.00…300.00	R4 array	16	Mass range to be scanned (starting with the start mass). Not for sample measurements. Limited by the measurement range; reverse scans, i.e. from right to left, are performed for negative values.	
Channels.Parameters.Output.AnalogOutputChannel: Analog output channel number						
	select	0 = none 1 = 1 2 = 2 3 = 3 4 = 4	UI1 array	0 = none	Measured values are output to this AO, 0 = no channel	
Channels.Parameters.Output.AnalogOutputMode: Analog output mode						
	select	0 = LIN 1 = LOG1D 2 = LOG2D 3 = LOG3D 4 = LOG4D 5 = LOG5D 6 = LOG6D 7 = LOG7D 8 = LOG8D 9 = LOG9D 10 = LOG10D	UI1 array	0 = LIN	Scales the measurement signal output (0…10 V). Parameter valid only for specified AO Channel. 0 = linear scaling 1…10 =logarithmic scaling over the indicated number of decades	
Channels.Parameters.Output.AnalogOutputRange: Measurement range for analog output						
	select	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	[A] UI1 array	0 = 1E-5	Adjusts the measurement range to the maximum measured signal output. Parameter valid only for specified AO Channel.	
Channels.Parameters.Trip.DigitalOutputA,B,: Digital output bit number for trip function A, B						
	input	0…96	UI1 array	96	96 =none (no allocation)	

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Channels.Parameters.Trip.LevelA: Trip function A / upper threshold for trip function					
	input	1.00E-24…9.99E+24	R4 array	0.00	Threshold value A (available only for trip types ABS and HYST).
Channels.Parameters.Trip.LevelB: Trip function B / lower threshold for trip function					
	input	1.00E-24…9.99E+24	R4 array	0.00	Threshold value B (available only for trip types ABS and HYST).
Channels.Parameters.Trip.Type: Type of trip function					
	select	0 = OFF 1 = ABS 2 = HYST	UI1 array	0 = OFF	The trip function is switched off. Trip function without hysteresis. Trip function with hysteresis.
External.AnalogInput.AI_001_ActualValue…External.AnalogInput.AI_005_ActualValue: Analog input statuses					
	output	-10.00…10.00	[V] R4	-	Numerical value of the AI voltage in [V] of the corresponding AI channel.
External.AnalogOutput.AO_001_SetValue…External.AnalogOutput.AO_004_SetValue: Analog output statuses					
	input	0.00…10.00	[V] R4	0	Numerical value of the AO voltage in [V] at the corresponding AO channel.
External.DigitalInput.ActualValues_001: Digital input status					
	const input	Bit 2^0…2^3 (0…2^4-1) 0 = Low 1 = High	UI4	-	Read bit status of DI channel
External.DigitalOutput.SetValues_001: Digital output control					
	input	Bit 2^0…2^{15} (0…2^{16}-1) 0 = Clear 1 = Set	UI4	0	Value of the DO channel (On/Off).
External.TotalPressure.TP_001.ActualValue: Total pressure					
	output	0.0 = LOW …1000.00 = HIGH	[mbar] R4	0	Measured value of total pressure gauge.
External.TotalPressure.TP_001.Command: Define total pressure gauge status on / off					
	select	0 = none 1 = TP_ON 2 = TP_OFF	UI1	0	Enable / disable the total pressure measurement.
External.TotalPressure.TP_001.Degas_Command: Define total pressure gauge degas status on / off					
	select	0 = none 1 = DEGAS_ON 2 = DEGAS_OFF 3 = gauge supply voltage on 4 = gauge supply voltage off	UI1	0	Enable / disable the total pressure gauge degassing.
External.TotalPressure.TP_001.LevelOff: Pressure threshold to switch filament and SEM automatically off					
	input	0.0…1000.0	[mbar] R4	0	Monitoring the QMG via total pres-sure measurement.

OPC Name	Type	Allowed Values	Dimension / Data Type	Default Value	Comments
External.TotalPressure.TP_001.LevelOn: Pressure threshold to switch filament and SEM automatically on					
	input	0.0…1000.0	[mbar] R4	0	Monitoring the QMG via total pressure measurement.
External.TotalPressure.TP_001.RS485Address: Address of the installed digital pressure gauge					
	input	0 = no gauge 1…15	UI1	0	RS485 node number
External.TotalPressure.TP_001.Status: Total pressure gauge status					
	output	Bit 2^0…2^1 0 = no defect 1 = sensor defect 2 = under range 3 = over range Bit 2^8 : Degas on/off Bit 2^9 : V-gauge on/off	UI2	-	Gauge supply voltage
External.TotalPressure.TP_001.Type: Type of the installed analog/digital pressure gauge					
	output	0 = none 1 = PKR251 2 = PBR260 3 = TPR280 4 = HPT100 5 = PPT100 6 = RPT100	UI1	0 = none	No gauge installed Pirani/cold cathode transmitter Pirani/Bayard-Alpert transmitter Pirani transmitter Digital Pirani/Bayard-Alpert transmitter Digital Pirani transmitter Digital Piezo/Pirani transmitter
General.Cycle.BeginChannel: First channel in the cycle					
	input	0…127	UI1	0	Only for cycle mode "MULTI", otherwise the first channel is always the selected channel.
General.Cycle.Command: Run/Stop					
	input	0 = no command 1 = run 2 = stop	UI1	0	Enable / disable cycle measurement
General.Cycle.CycleMode: Measurement cycle sequence					
	select	0 = MONO 1 = MULTI	UI1	1	Single channel cycle Multichannel cycle
General.Cycle.EndChannel: Last channel in the cycle					
	input	0…127	UI1	0	Only for cycle mode "MULTI", otherwise the first channel is always the selected channel.
General.Cycle.MeasureMode: Defines the type of measurement cycle					
	select	0 = CYCLE 1 = ADJ_FINE 2 = ADJ_COARSE 3 = RF-TUNE 4 = OFFSET	UI1	0 = CYCLE	Measurement operation Mass number fine adjustment Mass number coarse adjustment RF tune Offset measurement
General.Cycle.NumberOfCycles: Number of measurement cycles					
	input	0…10,000	UI1	0	0 = Continuous cycle repeat

OPC Name	Type	Allowed Values	Dimension / Data Type	Default Value	Comments
General.Cycle.Status: Measurement cycle status					
	output	1 = halt 3 = run mono 5 = run multi	UI1	-	Indicates the status of the current measurement job. Halted, no measurement job active Measurement job with a single channel is active Measurement job with multiple channels is active
General.DataPump.BufferLevel: Ringbuffer usage in %					
	output	0…100	% UI1		100 % = ringbuffer full
General.DataPump.Command: Clear the measured data in the ringbuffer					
	input	0 = no command 1 = clear buffer	UI1	0	Reset the ringbuffer to the initial condition. Note: Existing data will be deleted.
General.DataPump.Data: Supplies the measurement results in data packets					
	output	complex data structure	UI1 array		See → 57 and following for details on data recording and ringbuffer.
General.DataPump.Mode: Define the type of ringbuffer access					
	select	0 = DATA-LOOSE 1 = HOLD 2 = HOLD-EMPTY	UI1	1	Ringbuffer behaviour at full usage Data loose Hold data until enough free space Hold data until buffer empty
General.DataPump.Status: Ringbuffer status					
	output	0 = undefined 1 = ok, writing enabled 2 = waiting to write new data 3 = ignore new data	UI1	-	Indicates the ringbuffer status for writing new data.
General.DeviceType: Device type of the mass spectrometer					
	output	0 = not defined 1 = QMG700 2 = QMG220	UI1	-	The type is automatically detected.
General.ErrorsWarnings.Actual.Error: Actual error messages from the QMG220					
	error	Bit 0…Bit 95	UI1 array	-	The bit number (=high) corresponds to the error number. The error message is displayed as long as it is pending.
General.ErrorsWarnings.Actual.Warning: Actual warning messages from the QMG220					
	warning	Bit 0…Bit 31	UI4	-	The bit number (=high) corresponds to the warning number. The warning message is displayed as long as it is pending.

OPC Name	Type	Allowed Values	Dimension / Data Type	Default Value	Comments
General.ErrorsWarnings.Static.Command: Clear error and warning messages					
	input	0 = no command 1 = clear errors and warnings	UI1	0	Delete all error and warning messages.
General.ErrorsWarnings.Static.Error: List of error messages for the QMG220					
	error	Bit 0…Bit 95	UI1 array	-	The bit number (=high) corresponds to the error number. The error message is displayed until it is deleted via the General.ErrorsWarnings.Static.Command item.
General.ErrorsWarnings.Static.Status: Status of the displayed error and warning messages (interface only)					
	output	0 = no command 1 = errors and warnings cleared	UI1	-	Indicates when the display of the interface is cleared from error and warning messages.
General.ErrorsWarnings.Static.Warning: List of warning messages for the QMG220					
	warning	Bit 0…Bit 31	UI4	-	The bit number (=high) corresponds to the warning number. The warning message is displayed until it is deleted via the General.ErrorsWarnings.Static.Command item.
General.Fan.HighestSystemTemperature: Highest measured system temperature					
	output	0…150	[°C] UI1	-	Monitors the system temperature to indicate insufficient cooling.
General.LanConfiguration.DeviceName: Name of the device in the LAN					
	output	ASCII string	BSTR	-	Determined device name.
General.LanConfiguration.DHCP: DHCP configuration of the network					
	output	0 = DHCP off 1 = DHCP on	UI1	-	Enable or disable DHCP.
General.LanConfiguration.IPAddress: IP address of the device in the LAN					
	output	xxx.xxx.xxx.xxx	BSTR	-	Determined IP address of the device.
General.LanConfiguration.PhysicalAddress: Physical address of the device in the LAN					
	output	xx-xx-xx-xx-xx-xx	BSTR	-	Determined physical address of the device (MAC address).
General.LanConfiguration.SubnetMask: Subnet mask of the device in the LAN					
	output	255.255.xxx.xxx	BSTR	-	Determined subnet mask of the device.
General.LoadSave.Command: Load and save the device settings					
	input	0 = no command 1 = load settings 2 = save settings	UI1	0	Load or save parameter sets for the device settings.

OPC Name	Type	Allowed Values	Dimension / Data Type	Default Value	Comments
General.LoadSave.ParameterSet: Specify the parameter set for the device settings					
	input	0 = user 1 = factory	UI1	0	Specify the name of the parameter set for the device settings to be loaded or saved with the General.LoadSave.Command.
General.LoadSave.Status: Status of the loading or saving process for device settings					
	output	0 = none 1 = loaded 2 = saved 3 = no access rights	UI1	-	Indicates the loading/saving status
General.Security.Command: User logon/logoff					
	input	0 = no command 1 = logon 2 = logoff	UI1	0	User logon or logoff.
General.Security.LoggedInUser: Currently logged in user					
	output	Name(phone)	BSTR	-	Current user name
General.Security.Name: User name input					
	input	ASCII string	BSTR	-	Type in user name.
General.Security.Password: Password input					
	input	ASCII string	BSTR	-	Type in valid password.
General.Security.Phone: Phone number input					
	input	ASCII string	BSTR	-	Type in phone number.
General.Security.Status: Status of the current user					
	output	0 = no command 1 = logon 2 = logoff	UI1	0	Indicates the status of the current user.
General.Time.Command: Define the device time					
	input	0 = no command 1 = set	UI1	-	Set the device time.
General.Time.DateTime_ActualValue: Current device date and time					
	output	YYYY-MM-DD hh:mm:ss	BSTR	-	Current device date and time (actual value).
General.Time.DateTime_SetValue: Set value for device date and time					
	input	YYYY-MM-DD hh:mm:ss	BSTR	-	Device date and time to be set (set value).
General.Time.Status: Status of the device date and time					
	output	0 = no command 1 = set 2 = error	UI1	0	Indicates the status of the device date and time.

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.MassRange: Available type of mass range					
	output	100, 200, 300	I2	-	Automatically detected. Depends on the installed hardware (RF).
Hardware.Modules.Analyser.CI220.FirmwareVersion: CI 220 firmware version					
	output	0…2^{32} -1	UI4	-	Automatically detected.
Hardware.Modules.Analyser.CI220.OSVersion: CI 220 operating system version					
	output	0…2^{32} - 1	UI4	-	Automatically detected.
Hardware.Modules.Analyser.HV220-1.HighVoltage_ActualValue: Output of the high voltage supply (actual value)					
	output	0.0…4,095.00	[V] R4	-	High voltage supply HV 220-1 for the SEM
Hardware.Modules.Analyser.HV220-1.HighVoltage_SetValue: Set value for the high voltage supply (nominal value)					
	input	0.0…3,500.0	[V] R4	0	High voltage supply HV 220-1 for the SEM
Hardware.Modules.Analyser.HV220-1.Status: Hardware status of the high voltage supply HV 220-1					
	output	0…2^{8} - 1	UI1	0	Only for factory use (service and test purposes).
Hardware.Modules.Analyser.IS220-1.EmissionCurrent_ActualValue: Output of the emission current (actual value)					
	output	0.00…25.60	[mA] R4	-	Ion source supply IS 220-1 for filament emission current
Hardware.Modules.Analyser.IS220-1.EmissionCurrent_SetValue: Set value for the emission current (nominal value)					
	input	0.00…2.00	[mA] R4	1.00	Ion source supply IS 220-1 for filament emission current
Hardware.Modules.Analyser.IS220-1.Filament_Command: Define filament status on / off					
	input	0…2^{8} - 1	UI1	0	Only for factory use (service and test purposes).
Hardware.Modules.Analyser.IS220-1.FilamentCurrent_ActualValue: Output of the filament current (actual value)					
	output	0.00…5.12	[A] R4	-	Ion source supply IS 220-1 for filament current
Hardware.Modules.Analyser.IS220-1.ProtectionCurrent_SetValue: Maximum filament current (set value)					
	input	0.01…4.50	[A] R4	4.00	Maximum filament current of the ion source supply IS 220-1, used to protect the filament.
Hardware.Modules.Analyser.IS220-1.Status: Status of the ion source supply IS 220-1					
	output	0…2^{16} - 1	UI2	-	Only for factory use (service and test purposes).

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.Modules.Analyser.IS220-1.V01_SetValue: Ion source voltage 1 (set value)					
	input	105.00…150.00	[V] R4	150	Potential "Ion Reference". Change in steps of 0.01 V.
Hardware.Modules.Analyser.IS220-1.V02_SetValue: Ion source voltage 2 (set value)					
	input	-100.00…0.00	[V] R4	-70	Potential "Cathode". Change in steps of 0.01 V.
Hardware.Modules.Analyser.IS220-1.V03_SetValue: Ion source voltage 3 (set value)					
	input	-30.00…0.00	[V] R4	-5	Potential "Focus". Change in steps of 0.01 V.
Hardware.Modules.Analyser.IS220-1.V04_SetValue: Ion source voltage 4 (set value)					
	input	-15.00…0.00	[V] R4	-10	Potential "Field Axis". Change in steps of 0.01 V.
Hardware.Modules.Analyser.IS220-1.V05_SetValue: Ion source voltage 5 (set value)					
	input	-150.00…0.00	[V] R4	-50	Potential "Extract". Change in steps of 0.01 V.
Hardware.Modules.Analyser.SI220.EPOffsetValues.Command: Define offset correction for the electrometer					
	input	0 = no command 1 = clear offsets 2 = save offsets 3 = restore offsets 4 = read offsets	UI1	0	Define offset correction for the electrometer preamplifier of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-05: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-5} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-06: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-6} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-07: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-7} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-08: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-8} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-09: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-9} A of the detector.

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-10: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-10} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-11: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-11} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-12: Offset value for the electrometer					
	output	32-Bit IEEE floating-point value	[A] R4	-	Offset value for the measuring range 10^{-12} A of the detector.
Hardware.Modules.Analyser.SI220.EPOffsetValues.Mass: Mass for the offset measurement					
	input	0…300	R4	50.5	Maximum value depends on the type of mass range (Hardware.MassRange).
Hardware.Modules.Analyser.SI220.EPOffsetValues.Status: Status of the offset correction for the electrometer					
	output	0 = no command 1 = offsets cleared 2 = offsets saved 3 = offsets restored 4 = offsets read	UI1	-	Current offset correction for the electrometer preamplifier of the detector.
Hardware.Modules.Analyser.SI220.FirmwareVersion: SI 220 firmware version					
	output	0…2^{32} - 1	UI4	-	Automatically detected.
Hardware.Modules.Analyser.SI220.MassScaleCalibration.Offset: Parameter for coarse tuning of the mass scale					
	input	-0.075…0.075	R4	0.0	Shift the mass scale to the left and right for negative and positive values, respectively.
Hardware.Modules.Analyser.SI220.MassScaleCalibration.Slope: Parameter for mass scale coarse tuning					
	input	0.9850…1.0150	R4	1.0	Shrink and stretch the mass scale for values < 1 and > 1, respective-ly.
Hardware.Modules.Analyser.SI220.ScanStairTable.ActualValues: Measured mass number for mass scale fine tuning					
	input	0.5…299.5	R4 array	0	+/- 0.5 amu around the nominal mass number (reference values)
Hardware.Modules.Analyser.SI220.ScanStairTable.Command: Define data points for mass scale fine tuning					
	input	0 = no command 1 = save table 2 = restore table 3 = set default values 4 = set values 5 = get values	UI1	-	Define data points for mass scale fine tuning in a table.

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.Modules.Analyser.SI220.ScanStairTable.Count: Number of data points for mass scale fine tuning					
	input	0 1…48	UI1	0	0 = no fine tuning is performed. Each data point consists of no-minal and actual mass number. Max. 48 data points (table rows) are allowed.
Hardware.Modules.Analyser.SI220.ScanStairTable.ReferenceValues: Nominal mass number for mass scale fine tuning					
	input	0 1…299	R4 array	0	Reference value for the mass number
Hardware.Modules.Analyser.SI220.ScanStairTable.Status: Status of the data points for mass scale fine tuning					
	output	0 = no error 1 = stairtable saved 2 = stairtable restored 3 = stairtable set to default 4 = stairtable set 5 = stairtable gotten 253 = error stairtable not correct 254 = error stairtable not loaded 255 = internal error	UI1	-	Indicates the status of the stair table for mass scale fine tuning.
Hardware.Modules.Analyser.SI220.SimulationMode: Spectrum simulation for testing purposes					
	select	0 = OFF 1 = INTERN 2 = EXTERN	UI1	0 = OFF	Simulation off Internal simulation External simulation
Hardware.Modules.External.IO220-1.Detection: Detection of input/output-module IO220					
	output	0 = not found 1 = found, ok 2 = found, error	UI1	-	No IO-module detected IO-module detected and ok IO-module detected but not ok
Hardware.Modules.External.IO220-1.FirmwareVersion: IO220 firmware version					
	output	$0…2^{32} - 1$	UI4	-	Automatically detected.
Hardware.Modules.External.IO220-1.Status: Status of the input/output-module IO220					
	output	$0…2^{8} - 1$	UI1	-	Only for factory use (service and test purposes).
Hardware.QMA: Device type of the QMA					
	output	0 = 200	UI1	-	The type is automatically detected.
Hardware.QMH: Device type of the QMH					
	output	0 = none 1 = 221 2 = 222 3 = 223	UI1	-	The type is automatically detected.
Hardware.RF.Command: Define RF parameter set					
	input	0 = no command 1 = load 2 = save 3 = restore	UI1	-	Only for factory use (service and test purposes).

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.RF.HardwareSettings.CAL_HIGH_MASS: Factor for mass scale calibration					
	input	0…65535	UI2	0	Slope
Hardware.RF.HardwareSettings.CAL_LOW_MASS: Offset for mass scale calibration					
	input	0…1023	UI2	0	Offset
Hardware.RF.HardwareSettings.Description: Description of the RF stage settings					
	input	ASCII string	BSTR	-	Comment on the RF hardware settings
Hardware.RF.HardwareSettings.LINEAR_H: (currently not used)					
	input	0…1023	UI2	0	
Hardware.RF.HardwareSettings.RESOL_COARSE: Factor for resolution					
	input	0…65535	UI2	0	Affects all peaks: increasing the value reduces the peak width.
Hardware.RF.HardwareSettings.RESOL_LOW: Offset for resolution					
	input	0…65535	UI2	0	Affects peaks with mass numbers 0…4.
Hardware.RF.HardwareSettings.RESOL_MAX: Factor for resolution at low mass range					
	input	0…1023	UI2	0	Value of minor influence.
Hardware.RF.HardwareSettings.RF_LOW_AMPLITUDE: Factory setting only					
	input	0…1023	UI2	0	Only for factory use (service and test purposes).
Hardware.RF.HardwareSettings.SerialNumber: Serial number of the RF stage					
	input	ASCII string	BSTR	-	Factory setting
Hardware.RF.ParameterSet: Selection of parameter set for RF stage					
	select	0 = user 1 = system 2 = board	UI1	-	User defined parameter set System specific parameter set Board specific parameter set
Hardware.RF.Polarity: DC polarity					
	select	0 = pos 1 = neg	UI1	-	0 = normal (positive) 1 = inverse (negative)
Hardware.RF.Status: Status of RF parameter set					
	output	0 = no error 1 = set loaded 2 = saving sets 3 = sets saved 4 = set restored 254 = set for board not allowed 255 = error loading from eeprom	UI1	-	

OPC Name	Type	Allowed Values	Dimen-sion / Data Type	Default Value	Comments
Hardware.RF.Temperature: Temperature of the RF stage					
	output	0.0…100.0	[°C] R4	-	Temperature monitoring for the RF stage
Hardware.RF.TuneVoltage_ActualValue: Tuning voltage of the RF generator (actual value)					
	output	0.0…5.0	[V] R4	-	Tuning the RF generator requires to turn the tuning screw.
HardwareTesting.QC220.~ : Parameters for QC220 hardware test					
	-	-	-	-	The OPC items "HardwareTesting.QC220.~" are intended only for factory use (service and test purposes).
NamespaceVersion: Version of the OPC namespace					
	output	0…65535	UI2	-	Indicates the used OPC namespace version

6 OPC Items - Details

Changing a parameter can affect the measurement.
When a parameter that is relevant for the current measurement cycle is changed, the measurement cycle will be restarted.

The following table gives detailed information on the OPC items, sorted by the OPC name in alphabetical order.

OPC name	Value	Details
Analyser.Detector.ActualParameters.CommonSEMVoltage_ActualValue		
	0.00…4095 V	Output of global SEM high voltage. It is applied to all measurement channels for which no individual setting has been defined with Channels.Parameters.Detector.SEMVoltage.
Analyser.Detector.ActualParameters.CommonSEMVoltage_SetValue		
		with Analyser.Detector.Type = SEM
	0…3500 V	Defined global SEM high voltage. It is valid for all measurement channels for which no individual setting has been defined with Channels.Parameters.Detector.SEMVoltage.
Analyser.Detector.Command		
		Enable / disable the SEM high voltage + output of SEM voltage (actual value). with Analyser.Protection = INTERN-OFF, EXTERN-OFF
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = sem on	Enable the SEM high voltage.
	2 = sem off	Disable the SEM high voltage.
Analyser.Detector.Status		
		Status of the SEM high voltage.
	0 = sem off	SEM voltage off.
	1 = sem on	SEM voltage on.
Analyser.Detector.Type		
		Specification of the existing signal source (ion collector).
	0 = FARAD	Faraday collector.
	1 = SEM	C-SEM.
Analyser.Filament.ActiveFilament		
		Filament selection for ion sources containing two filaments.
	1 = filament	Filament 1 is used for measurements.
	2 = filament	Filament 2 is used for measurements.

OPC name	Value	Details
Analyser.Filament.Command		
		Switch the active filament on and off. with Analyser.Protection = INTERN-OFF, EXTERN-OFF
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = filament on	Enable filament emission.
	2 = filament off	Disable filament emission.
Analyser.Filament.Degas.Command		
		Switch the active filament degassing on and off.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = degas start	Enable filament degassing.
	2 = degas stop	Disable filament degassing.
Analyser.Filament.Degas.EmissionCurrent_SetValue		
	0.0…10.0 mA	Emission current for degas (set value).
Analyser.Filament.Degas.ProtectionCurrent_SetValue		
	0.00…3.50 A	Maximum filament current for degas, used to protect the filament.
Analyser.Filament.Degas.Status		
		Filament degas status.
	1 = degas 1 active	Filament 1 is degassed.
	2 = degas 2 active	Filament 2 is degassed.
Analyser.Filament.Degas.Time		
		Duration of filament degas.
	0	Degas runs until stop command is given.
	1…99 min	Degas duration.
Analyser.Filament.EmissionStatus		
		Status of the filament emission.
	0 = filament off	Filament emission off.
	1 = filament on	Filament emission on.
Analyser.IonSource.ActiveParameterSet		
		The QMG220 provides 4 parameter sets per ion source type, containing ion source voltages ("Active Set").
	0 = Set 1	Set 1 is the active set.
	1 = Set 2	Set 2 is the active set.
	2 = Set 3	Set 3 is the active set.
	3 = Set 4	Set 4 is the active set.

OPC name	Value	Details
Analyser.IonSource.Copy.Command		
		Copies the current ion source parameters to the selected destination.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = copy to all	Copies the current ion source set to all sets.
	2 = copy to param set	Copies the current parameters to the set defined in Analyser.IonSource.Copy.ToParameterSet.
Analyser.IonSource.Copy.ToParameterSet		
		Select parameter set when copying the current ion source parameters.
	0 = Set 1	Set 1 is the destination for copying.
	1 = Set 2	Set 2 is the destination for copying.
	2 = Set 3	Set 3 is the destination for copying.
	3 = Set 4	Set 4 is the destination for copying.
Analyser.IonSource.Type		
		Selection of the ion source type. The electrode names are replaced and the relevant potentials are made accessible. Select only components that are actually installed in your device.
	1 = CB	Cross-Beam ion source.
	2 = Grid	Grid ion source.
	3 = SPM	Sputter Process Monitor.
	4 = HighSensitivity	High sensitivity.
Analyser.Protection		
		Control of filament and SEM supply. Refer also to 🕮 [1]: "EXTERNAL_PROTECTION". NOTE: With "EXTERNAL-ON-OFF" or "EXTERNAL-OFF", as with "INTERN-OFF", the filament and SEM supply are switched off when the protection current is exceeded (Hardware.Modules.Analyser.IS220-1.ProtectionCurrent_SetValue).
	0 = INTERN-OFF	Use the interface to switch filament and SEM manually on and off. Filament, SEM, and RF supply are switched off when the protection current of the filament is exceeded. The event is saved in the error recorder.
	1 = EXTERN-ON-OFF	An external system, i.e. floating contact or total pressure gauge, controls filament, SEM, and RF. Filament and SEM cannot be switched on and off. • Total pressure gauge detected: control exclusively by the gauge. The floating contact will be ignored. • No total pressure gauge detected: control exclusively by the floating contact. The event is saved in the error recorder.
	2 = EXTERN-OFF	An external system, i.e. floating contact or total pressure gauge, switches filament, SEM, and RF off. • Total pressure gauge detected: switching off exclusively by the gauge. The floating contact will be ignored. • No total pressure gauge detected: switching off exclusively by the floating contact. The event is saved in the error recorder.

OPC name	Value	Details
Channels.Actuality.ActualChannel.Channel		
	0…127	Number of actual measurement channel. See → 🖹 56 and following for details on data recording.
Channels.Actuality.ActualChannel.MassMode		
		Operation mode of current measurement. See item "Channels.Parameters.Mass.MassMode" for details on operation mode and → 🖹 56 and following for details on data recording.
	0 = SAMP	Standard measurement of a single mass.
	1 = SCAN-N	Standard scan.
	2 = SCAN-F	Scan with FIR filter.
	3 = STAIR-T	Scan of whole number masses.
	4 = PEAK-L	Peak processor level criterion.
	5 = PEAK-F	Peak processor FIR filter criterion.
Channels.Actuality.ActualChannel.MassValue		
	0.00…300.00	Current mass value in actual channel. See → 🖹 56 and following for details on data recording. The maximum value depends on the mass range.
Channels.Actuality.ActualChannel.MeasureValue		
	1,0000000 E-27 …9,9999999 E+5	Current measuring value in actual channel. See → 🖹 56 and following for details on data recording.
Channels.Actuality.MassValue		
	0.00…9600.00	Array of mass numbers for the 128 channels. Contains the mass values (1/32) where last measuring has been done in sample mode. See → 🖹 56 and following for details on data recording.
Channels.Actuality.MeasureValue		
	1,0000000 E-27 …9,9999999 E+5	Array of measuring values for the 128 channels. Contains the values that have been last measured in sample mode. See → 🖹 56 and following for details on data recording.
Channels.Actuality.Status		
		Array of statuses for the 128 channels. Indicates information on and validity of the measuring values.
	Bit0…1: Out of Range Bit2…3: Unit Bit4…5: Mass resolution Bit6…7: not used Bit8…15: Adjust mode status	Status 1 [1 Byte]: Bit 0…1: Out of Range (0=okay, 1=Overflow, 2= Underflow) Bit 2…3: Unit (0 = Ampere, 1 = cps, 2 = Volt, 3 = mbar) Bit 4…5: Mass-Resolution (0 = 1/64, 1 = 1/32, 2 = 1/16, 3 = 1/8) Bit 6…7: not used Status 2 [1 Byte]: Bit8…15: Adjust mode status See → 🖹 56 and following for details on data recording. Note: The PrismaPlus™ always reports the Mass Resolution (Bit 4…5) as 1 = 1/32 even when only 1/8 or 1/16 are measured (20ms/amu or 50ms/amu scans).
Channels.Actuality.TimeStamp		
	0…4'294'967'295	Time stamp of the 128 measuring values. File time format (100 ns TICs). 64-Bit integer, number of 100 ns intervals since 1 January 1601. See → 🖹 56 and following for details on data recording.

OPC name	Value	Details
Channels.Parameters.Amplifier.AutoRangeMode		
		Operating mode of the electrometer amplifier.
	0 = FIX	Manual range selection via Channels.Parameters.Amplifier.DetectorRange. Use FIX mode for fastest measurements with limited dynamics. FIX is recommended to obtain very exact measurements, such as isotope ratios, because the interdependent range tolerances are avoided or can be calibrated. Advantages of FIX range: • Avoids relative errors in measured values that are caused by measuring range change-over (change-over of measuring resistors with a characteristic measure of tolerance and individual temperature coefficients). • Very fast measurements.
	1 = AUTO	Automatic range selection across all measurement ranges, very universal. Use AUTO mode whenever adequate. It provides enormous dynamics over more than 10 decades, i.e 200 dB, results in full resolution of the measuring values, and avoids overdriving of the amplifier. Advantages of AUTO range: • Enormous dynamics of measurement range (10 decades, i.e 200 dB). The whole dynamics of a mass spectrum is covered. • In MID mode (sample), AUTO range (above 2 ms) is nearly as fast as FIX range. AUTO is started with the range that has been used for the last measurement (last range). Thus, normally no measuring range change-over is required. In contrast, when the measuring signal has changed the AUTO range provides full resolution of the measuring values.
	2 = AUTO-DOWN	Automatic range selection between the largest (least sensitive) range and the lower range limit. Use AUTO-DOWN mode to confine the lower range. This can be useful for poor signal-to-noise ratios and result in faster measurements. The available dynamics is defined by Channels.Parameters.Amplifier.DownRange.
Channels.Parameters.Amplifier.DetectorRange		
		Manually selected electrometer measuring range for the ion current.
	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	With Channels.Parameters.Amplifier.AutoRangeMode = FIX, and Channels.Parameters.Detector.DetectorType = FARAD or SEM
Channels.Parameters.Amplifier.DownRange		
		Most sensitive measuring range for the ion current.
	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	With Channels.Parameters.Amplifier.AutoRangeMode = AUTO-DOWN, and Channels.Parameters.Detector.DetectorType = FARAD or SEM

OPC name	Value	Details
Channels.Parameters.Amplifier.PauseCalibrate		
	0.00…9.99	A factor used to multiply the pause time determined in the device. In order to wait for transient effects, no measurements are performed during the pause time between two measurement tasks.
Channels.Parameters.Detector.AnalogInputChannel		
		with Channels.Parameters.Detector.DetectorType = ANALOG-IN
	1…8	Number of the analog input for measuring data.
Channels.Parameters.Detector.DetectorType		
	0 = FARAD 4 = C-SEM 5 = ANALOG-IN 6 = TOTAL-PRESSURE	Selection of signal source, depends on the configuration.
Channels.Parameters.Detector.SEMVoltage		
		With Channels.Parameters.Detector.DetectorType = C-SEM
	0	The global value entered with Analyser.Detector.ActualParameters.CommonSEMVoltage_SetValue is applicable.
	1…3,000	Individual SEM high voltage for the selected measurement channel. The individual SEM high voltage leads to long settling times and makes sense only in special cases.
Channels.Parameters.General.State		
		Enable or skip a channel in multichannel mode.
	0 = ENABLE	Measure channel and preserve the parameters.
	1 = SKIP	Skip channel, but the parameters are preserved.
Channels.Parameters.Mass.DigitalFIRWeightFunction		
	0 = Kaise/Sinc 1 = Gauss	FIR filter weighting functions.
Channels.Parameters.Mass.DwellSpeed		
		with Channels.Parameters.Detector.DetectorType = FARAD, SEM, ANALOG-IN
	0 = 0.002 s/amu 1 = 0.005 s/amu 2 = 0.01 s/amu 3 = 0.02 s/amu 4 = 0.05 s/amu 5 = 0.1 s/amu 6 = 0.2 s/amu 7 = 0.5 s/amu 8 = 1 s/amu 9 = 2 s/amu 10 = 5 s/amu 11 = 10 s/amu 12 = 20 s/amu 13 = 60 s/amu	The measured value is determined by averaging across the dwell time. **Operation mode** — **Scan-Speed [µs/u, ms/u, s/u] Dwell-Time [µs, ms, s]** Sample: 2 ms … 60 s Scan-Normal: 20 ms/u … 60 s/u Scan-FIR: 20 ms/u … 60 s/u Scan-Stair: 2 ms/u … 60 s/u Peak-Level: 20 ms/u … 60 s/u Peak-FIR: 20 ms/u … 60 s/u Adjust-Coarse: 20 ms/u … 60 s/u Adjust-Fine: 20 ms/(u/15) … 60 s/(u/15)

OPC name	Value	Details
Channels.Parameters.Mass.FirstMass		
		Starting mass number of the mass scan or mass number by sample.
	0.00…300.00	The mass number is displayed as a decimal value. The minimum step width is 0.01.
Channels.Parameters.Mass.MassMode		
		Mass scan mode. Not with Channels.Parameters.Detector.DetectorType = ANALOG-IN or TOTAL-PRESSURE See → 63 and following. for further details.
	0 = SAMPLE	Measurement on mass value with averaging across dwell time (Channels.Parameters.Mass.DwellSpeed).
	1 = SCAN-N	Normal spectrum from the start mass (Channels.Parameters.Mass.FirstMass) across the scan width (Channels.Parameters.Mass.Width) at the set speed (Channels.Parameters.Mass.DwellSpeed).
	2 = SCAN-F	Same as SCAN-N, with FIR filter.
	3 = SCAN-S	Spectrum with integer mass jumps.
	4 = PEAK-L	Peak search (level criterion) from the start mass via the scan width with the set speed. Significant data reduction because only the intensities and mass number of detected peaks are output.
	5 = PEAK-F	Same as PEAK-L, with FIR filter.
Channels.Parameters.Mass.Resolution		
		Setting of the mass peak separation (resolution). With Channels.Parameters.Detector.DetectorType = FARAD, SEM
	0	Integral mass spectrum (DC OFF). See → 66 for further details.
	1…255	Mass peak separation. The peak width is approximately proportional to the set number (small number = clear separation of peaks). Typical values are approx. 50 for the QMG220.
Channels.Parameters.Mass.Threshold		
		Minimum intensity at which a peak is detected by the peak processor and adjust algorithm. With Channels.Parameters.Detector.DetectorType = FARAD, SEM
	0…7	**Fix-Range:** 7 = 0.01 6 = 0.03 5 = 0.1 4 = 0.3 3 = 1 2 = 3 1 = 10 0 = 30 Fixrange in % of the full scale deflection **Auto-Range:** 7 = 1×10^{-15} A 6 = 1×10^{-14} A 5 = 1×10^{-13} A 4 = 1×10^{-12} A 3 = 1×10^{-11} A 2 = 1×10^{-10} A 1 = 1×10^{-9} A 0 = 1×10^{-8} A

OPC name	Value	Details
Channels.Parameters.Mass.Width		
		Mass scan width of the measurement channel. Not with Channels.Parameters.Mass.MassMode = SAMPLE, or Channels.Parameters.Detector.DetectorType = ANALOG-IN,TOTAL-PRESSURE
	-300.00…300.00	The maximum value depends on the mass range. Negative width results in a backward scan. In this way small peaks that are one mass above a very large peak can be measured more effectively.
Channels.Parameters.Output.AnalogOutputChannel		
		Not with Channels.Parameters.Detector.DetectorType = ANALOG-IN,TOTAL-PRESSURE
	0 (none)	No analog output assigned.
	1…4	Output channel for the measured value of the selected channel. In halt condition the outputs are set to 0 V, except when they are seized by computer outputs.
Channels.Parameters.Output.AnalogOutputMode		
		Format selection for analog output (0…10 V) to AO channel. Not with Channels.Parameters.Output.AnalogOutputChannel = none
	0 = LIN	Linear output within the selected measurement range (Channels.Parameters.Amplifier.AutoRangeMode).
	1 = LOG1D 2 = LOG2D 3 = LOG3D 4 = LOG4D 5 = LOG5D 6 = LOG6D 7 = LOG7D 8 = LOG8D 9 = LOG9D 10 = LOG10D	Logarithmic output within the selected measurement range. 1 decade (LOG1D): 10 V / dec. … 10 decade (LOG10D): 1 V / dec.
Channels.Parameters.Output.AnalogOutputRange		
	0 = 1E-5 1 = 1E-6 2 = 1E-7 3 = 1E-8 4 = 1E-9 5 = 1E-10 6 = 1E-11 7 = 1E-12	Adjusts the measurement range to the maximum measured signal output. Parameter valid only for specified AO Channel. Not with Channels.Parameters.Output.AnalogOutputChannel = none
Channels.Parameters.Trip.DigitalOutputA,B		
		Assignment of a trip function A or B to any bit of a DO. If several switching functions are assigned to the same bit they are combined in an AND function. The DO outputs can also be operated manually or via interfaces. with Channels.Parameters.Detector.DetectorType = AI, EXTERN, and Channels.Parameters.Trip.Type = ABS, HYST
	0…95	Assignment of the trip functions to the DO bit.
	96 = None	No assignment, output remains high impedance.

OPC name	Value	Details
Channels.Parameters.Trip.LevelA, B		
		Threshold values of the trip functions A and B. with (Channels.Parameters.Mass.MassMode = SAMPLE or Channels.Parameters.Detector.DetectorType = ANALOG-IN) and Channels.Parameters.Trip.Type = ABS, HYST
	1.00×10^{-24} …$9.99 \times 10^{+24}$	TripType = ABS: Threshold value of the trip function A or B. TripType = HYST: Upper (A) and lower (B) threshold value. If with TripType = HYST : LevelA < 1.1 × Level B this minimum hysteresis is automatically set.
Channels.Parameters.Trip.Type		
		Mode of trip functions. See → 🗎 69 and following for details on trip functions and watch logic.
	0 = OFF	Trip function not active. The DO bit is available for other applications.
	1 = ABS	A and B are independent trip functions with one threshold value each. Used for vacuum monitoring, differential pressure monitoring, and as comparator.
	2 = HYST	A and B form a trip function with hysteresis. The status changes when the upper or lower threshold value is exceeded. Used to prevent permanent switching for fluttering signals.
External.AnalogInput.AI_001_ActualValue…External.AnalogInput.AI_005_ActualValue		
	-10.00…+10.00 V	Numerical value of the voltage in [V] at the corresponding AI channel. nominal ±10 V, max. ±14 V to GND Resolution: 14 Bit
External.AnalogOutput.AO_001_SetValue…External.AnalogOutput.AO_004_SetValue		
	0.00…10.00 V	Change the voltage at the analog output (AO): Numerical value of the voltage in [V] at the corresponding AO channel. Resolution: 12 Bit
External.DigitalInput.ActualValues_001		
	Bit 2^0…2^3 (0…2^4-1) 0 = Low 1 = High	Read bit status of DI channel. Input voltage: < +5 V (low), nominal +24 V (high), max. +28 V
External.DigitalOutput.SetValues_001		
	Bit 2^0…2^{15} (0…2^{16}-1) 0 = Clear 1 = Set	Switch on and off the DO channels manually: Value of the DO channels (On/Off).
External.TotalPressure.TP_001.ActualValue		
	0.0…1000.0	Measured value of the total pressure gauge. The pressure gauge is not permanently switched on because the plasma in the gauge influences the gas composition in the recipient. Exception: monitoring the QMG. Note that igniting the pressure gauge and displaying the correct pressure will take some time (refer to the operating instructions for the pressure gauge).

OPC name	Value	Details
External.TotalPressure.TP_001.Command		
		Turn On/Off the total pressure gauge. Only valid when a total pressure gauge is installed.
	0 = none	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = TP_ON	Turn the total pressure gauge on.
	2 = TP_OFF	Turn the total pressure gauge off.
External.TotalPressure.TP_001.Degas_Command		
		Start/Stop of the total pressure gauge degassing. Only valid when a total pressure gauge is installed.
	0 = none	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = DEGAS_ON	Enable gauge degassing.
	2 = DEGAS_OFF	Disable gauge degassing.
External.TotalPressure.TP_001.LevelOff		
	0.0…1000.0	Monitoring the QMG via total pressure measurement: pressure threshold when filament and SEM switch automatically off (pressure rise). The items "External.TotalPressure.TP_001.LevelOff" and "External.TotalPressure.TP_001.LevelOn" should form a hysteresis to avoid repeated switching when minor pressure fluctuations occur.
External.TotalPressure.TP_001.LevelOn		
	0.0…1000.0	Monitoring the QMG via total pressure measurement: pressure threshold when filament and SEM switch automatically on (decrease of pressure). The items "External.TotalPressure.TP_001.LevelOff" and "External.TotalPressure.TP_001.LevelOn" should form a hysteresis to avoid repeated switching when minor pressure fluctuations occur.
External.TotalPressure.TP_001.RS485Address		
	0 = no gauge 1…15	Total pressure measurement: address of the installed digital pressure gauge. Only valid when a total pressure gauge is installed. Note that the pressure gauge is only recognized when the device is turned on (no "hot-plug").
External.TotalPressure.TP_001.Status		
		Status of the total pressure gauge.
	Bit 2^0…2^1 0 = no defect 1 = sensor defect 2 = under range 3 = over range	Status 1 "0" gauge indicates "no defect" "1" gauge indicates "sensor defect" "2" gauge indicates "under range" "3" gauge indicates "over range"
	Bit 2^8 : Degas on/off	Status 2 Bit 2^8 = 0 Degas off = 1 Degas on
	Bit 2^9 : V-gauge on/off	Bit 2^9 = 0 gauge supply voltage off = 1 gauge supply voltage on

OPC name	Value	Details
External.TotalPressure.TP_001.Type		
		Automatic detection of the installed pressure gauge type. Note that it is only recognized when the device is turned on (no "hot-plug").
	0 = none	No pressure gauge installed.
	1 = PKR251	Analog gauge PKR251 or PKR261 (Pirani/cold cathode).
	2 = PBR260	Analog gauge PBR260 (Pirani/Bayard-Alpert).
	3 = TPR280	Analog gauge TPR280 or TPR281 (Pirani).
	4 = HPT100	Digital gauge HPT100 (Pirani/Bayard-Alpert).
	5 = PPT100	Digital gauge PPT100 (Pirani).
	6 = RPT100	Digital gauge RPT100 (Piezo/Pirani).
General.Cycle.BeginChannel		
		with General.Cycle.MeasureMode = CYCLE, and General.Cycle.CycleMode = MULTI
	0…127	Start channel of the measurement cycle.
General.Cycle.Command		
		Start/Stop of the measurement defined under General.Cycle.CycleMode.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = run	Start of the measurement.
	2 = stop	Stop of the measurement.
General.Cycle.CycleMode		
		Measurement cycle mode. The cycle is started/stopped with the General.Cycle.Command.
	0 = MONO	Single channel measurement in the selected channel.
	1 = MULTI	Measurement of the channels between General.Cycle.BeginChannel and General.Cycle.EndChannel. Channels with Channels.Parameters.General.State = SKIP will be skipped.
General.Cycle.EndChannel		
		with General.Cycle.MeasureMode = CYCLE, and General.Cycle.CycleMode = MULTI
	0…127	Ending channel of the measurement cycle.

OPC name	Value	Details
General.Cycle.MeasureMode		
		Measurement cycle mode, can only be changed in General.Cycle.Status = halt.
	0 = CYCLE	Normal measurement operation.
	1 = ADJ_FINE	Fine adjustment of the mass scale to peak top with Channels.Parameters.Mass.MassMode = SAMP. Used to compensate nonlinearity of the mass scale. See → 🗎 68 for further details.
	2 = ADJ_COARSE	Coarse adjustment of the mass scale to peak top with Channels.Parameters.Mass.MassMode = SAMP. Used to shift and to shrink or stretch the mass scale. See → 🗎 66 for further details.
	3 = RF-TUNE	Tuning the RF generator (tuning voltage).
	4 = OFFSET	Offset correction: Determine the offset for the electrometer preamplifier and detector. See → 🗎 72 for further details.
General.Cycle.NumberOfCycles		
		with General.Cycle.MeasureMode = CYCLE
	0	The measurement cycle is repeated endlessly.
	1…10,000	Number of measurement cycles to be executed.
General.Cycle.Status		
		Status of the measurement cycle mode.
	1 = halt	The measurement is halted.
	3 = run mono	The measurement runs with General.Cycle.CycleMode = MONO and is controlled internally by the device.
	5 = run multi	The measurement runs with General.Cycle.CycleMode = MULTI and is controlled internally by the device.
General.DataPump.BufferLevel		
	0…100 %	Ringbuffer usage in %; 100 % = ringbuffer full.
General.DataPump.Command		
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = clear buffer	Reset the ringbuffer to the initial condition. Existing data will be deleted.
General.DataPump.Data		
	complex data structure	Supplies the measurement results in data packets. See → 🗎 57 and following for details on data recording and ringbuffer.
General.DataPump.Mode		
		See also to → 🗎 56.
	0 = DATA-LOOSE	Further measuring data will no longer be copied into the ringbuffer when it is full (100 % usage). Data will be lost. The measurement keeps on running.
	1 = HOLD	The ringbuffer is checked for free space to hold the data before a channel run is started. The measurement is stopped in case of too high ringbuffer usage, and will be continued when the ringbuffer usage is sufficient.
	2 = HOLD-EMPTY	The ringbuffer retrieves data only when the ringbuffer is empty and all OPC items have been sent.

<table>
<tr><th>OPC name</th><th>Value</th><th colspan="2">Details</th></tr>
<tr><td colspan="4">General.DataPump.Status</td></tr>
<tr><td></td><td></td><td colspan="2">See also → 🗎 56.</td></tr>
<tr><td></td><td>0 = undefined</td><td colspan="2">The ringbuffer status is undefined.</td></tr>
<tr><td></td><td>1 = ok, writing enabled</td><td colspan="2">Writing data into the ringbuffer is enabled.</td></tr>
<tr><td></td><td>2 = waiting to write new data</td><td colspan="2">The ringbuffer is waiting to write new data.</td></tr>
<tr><td></td><td>3 = ignore new data</td><td colspan="2">The ringbuffer ignores new data.</td></tr>
<tr><td colspan="4">General.DeviceType</td></tr>
<tr><td></td><td></td><td colspan="2">Device type of the mass spectrometer. The unit detects its modules automatically, as far as possible, and displays them.</td></tr>
<tr><td></td><td>0 = not defined</td><td colspan="2">Unknown device type.</td></tr>
<tr><td></td><td>1 = QMG700</td><td colspan="2">Device QMG700.</td></tr>
<tr><td></td><td>2 = QMG220</td><td colspan="2">Device QMG220.</td></tr>
<tr><td colspan="4">General.ErrorsWarnings.Actual.Error:</td></tr>
<tr><td></td><td></td><td colspan="2">Normally, meaningful operation of the device is not possible. A user action is required.</td></tr>
<tr><td></td><td>Bit 0…Bit 95</td><td colspan="2">The bit number (=high) corresponds to the error number. The relevant bit is deleted when an error disappears.
List of error messages:</td></tr>
<tr><td></td><td></td><td>Bit No.</td><td>Description</td></tr>
<tr><td></td><td></td><td>1</td><td>Error: External protection triggered</td></tr>
<tr><td></td><td></td><td>2</td><td>Error: Emission error</td></tr>
<tr><td></td><td></td><td>3</td><td>Error: Filament 1 defect</td></tr>
<tr><td></td><td></td><td>4</td><td>Error: Filament 2 defect</td></tr>
<tr><td></td><td></td><td>5</td><td>Error: RF temperature protection</td></tr>
<tr><td></td><td></td><td>9</td><td>Error: IS error</td></tr>
<tr><td></td><td></td><td>10</td><td>Error: CAN, Bus error</td></tr>
<tr><td></td><td></td><td>11</td><td>Error: CAN, module error</td></tr>
<tr><td></td><td></td><td>17</td><td>Error: RF220, temperature high</td></tr>
<tr><td></td><td></td><td>39</td><td>Error: SEM Error
The actual SEM voltage deviates more than 10 % and more than 30 V from the specified value. The message appears when the error is pending longer than 2.5 seconds.</td></tr>
<tr><td></td><td></td><td>51</td><td>Error: QMsignal init. error
An error occurred when QMsignal was initialized.</td></tr>
<tr><td></td><td></td><td>52</td><td>Error: QMsignal job error</td></tr>
<tr><td></td><td></td><td>Other</td><td>Error: not defined</td></tr>
</table>

<table>
<tr><th>OPC name</th><th>Value</th><th colspan="2">Details</th></tr>
<tr><td colspan="4">General.ErrorsWarnings.Actual.Warning</td></tr>
<tr><td></td><td></td><td colspan="2">Normally, further operation of the device is possible. However, measuring data can be corrupt.</td></tr>
<tr><td></td><td>Bit 0…Bit 31</td><td colspan="2">The bit number (=high) corresponds to the warning number. The relevant bit is deleted when a warning disappears.
List of warning messages:</td></tr>
<tr><td></td><td></td><td>Bit No.</td><td>Description</td></tr>
<tr><td></td><td></td><td>1</td><td>Warning: Emission current out of range</td></tr>
<tr><td></td><td></td><td>2</td><td>Warning: Emission current wide out of range</td></tr>
<tr><td></td><td></td><td>3</td><td>Warning: RF temperature high</td></tr>
<tr><td></td><td></td><td>5</td><td>Warning: Data, ringbuffer full</td></tr>
<tr><td></td><td></td><td>10</td><td>Warning: CAN, driver errorcount</td></tr>
<tr><td></td><td></td><td>11</td><td>Warning: IS220, degas on and emission off</td></tr>
<tr><td></td><td></td><td>Other</td><td>Warning: not defined</td></tr>
<tr><td colspan="4">General.ErrorsWarnings.Static.Command</td></tr>
<tr><td></td><td>0 = no command</td><td colspan="2">A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.</td></tr>
<tr><td></td><td>1 = clear errors and warnings</td><td colspan="2">Delete all errors and warnings.</td></tr>
<tr><td colspan="4">General.ErrorsWarnings.Static.Error</td></tr>
<tr><td></td><td></td><td colspan="2">96 Bits are provided for the error status. One Bit per error is set. The Bits will only be deleted via the General.ErrorsWarnings.Static.Command item.</td></tr>
<tr><td></td><td>Bit 0…Bit 95</td><td colspan="2">List of error messages:</td></tr>
<tr><td></td><td></td><td>Bit No.</td><td>Description</td></tr>
<tr><td></td><td></td><td>1</td><td>Error: External protection triggered</td></tr>
<tr><td></td><td></td><td>2</td><td>Error: Emission error</td></tr>
<tr><td></td><td></td><td>3</td><td>Error: Filament 1 defect</td></tr>
<tr><td></td><td></td><td>4</td><td>Error: Filament 2 defect</td></tr>
<tr><td></td><td></td><td>5</td><td>Error: RF temperature protection</td></tr>
<tr><td></td><td></td><td>9</td><td>Error: IS error</td></tr>
<tr><td></td><td></td><td>10</td><td>Error: CAN, Bus error</td></tr>
<tr><td></td><td></td><td>11</td><td>Error: CAN, module error</td></tr>
<tr><td></td><td></td><td>17</td><td>Error: RF220, temperature high</td></tr>
<tr><td></td><td></td><td>39</td><td>Error: SEM Error
The actual SEM voltage deviates more than 10 % and more than 30 V from the specified value. The message appears when the error is pending longer than 2.5 seconds.</td></tr>
<tr><td></td><td></td><td>51</td><td>Error: QMsignal init. error
An error occurred when QMsignal was initialized.</td></tr>
<tr><td></td><td></td><td>52</td><td>Error: QMsignal job error</td></tr>
<tr><td></td><td></td><td>Other</td><td>Error: not defined</td></tr>
<tr><td colspan="4">General.ErrorsWarnings.Static.Status</td></tr>
<tr><td></td><td>0 = no command</td><td colspan="2"></td></tr>
<tr><td></td><td>1 = errors and warnings cleared</td><td colspan="2">All errors and warnings have been deleted.</td></tr>
</table>

OPC name	Value	Details
General.ErrorsWarnings.Static.Warning		
		32 Bits are provided for the warning status. One Bit per warning is set. The Bits will only be deleted via the General.ErrorsWarnings.Static.Command item.
	Bit 0…Bit 31	List of warning messages:

Bit No.	Description
1	Warning: Emission current out of range
2	Warning: Emission current wide out of range
3	Warning: RF temperature high
5	Warning: Data, ringbuffer full
10	Warning: CAN, driver errorcount
11	Warning: IS220, degas on and emission off
Other	Warning: not defined

General.Fan.HighestSystemTemperature		
	0…150°C	Monitors the system temperature to indicate insufficient cooling.
General.LanConfiguration.DeviceName		
	ASCI String	Actual device name.
General.LanConfiguration.DHCP		
		DHCP stands for Dynamic Host Configuration Protocol, and is used to centrally allocate and manage TCP/IP configurations of client nodes.
	0 = DHCP off	Disable DHCP.
	1 = DHCP on	Enable DHCP.
General.LanConfiguration.IPAddress		
	xxx.xxx.xxx.xxx	IP address of the device.
General.LanConfiguration.PhysicalAddress		
	xx-xx-xx-xx-xx-xx	Every network interface has a MAC address (Media Access Controller) also known as the physical address. This is the actual hardware address that the lowest level of the network uses to communicate. The MAC address is used to assign the TCP/IP address by means of DHCP.
General.LanConfiguration.SubnetMask		
	255.255.xxx.xxx	Looking at a network address and a subnet mask, it can be determined which part of the address is the network address and which part is the host address.
General.LoadSave.Command		
		Load or save parameter sets for the device settings.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = load settings	Load the device settings.
	2 = save settings	Save the device settings.
General.LoadSave.ParameterSet		
		Specify the name of the parameter set for the device settings to be loaded or saved with the General.LoadSave.Command.
	0 = user	User defined parameter set.
	1 = factory	Factory settings. The parameter set for the default device settings has been performed in the factory.

OPC name	Value	Details
General.LoadSave.Status		
		Status of the loading or saving process for device settings
	0 = none	Currently, nothing is being performed.
	1 = loaded	Loading is being performed.
	2 = saved	Saving is being performed.
	3 = no access rights	The access rights of the currently logged in user are not adequate to perform the required action.
General.Security.Command		
		Perform logon or logoff of a user. See → 🗎 9 and following for details.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = logon	Logging on.
	2 = logoff	Logging off.
General.Security.LoggedInUser		
	Name(Phone)	User name of the currently logged in user.
General.Security.Name		
	ASCII string	User name input. Required to logon the user.
General.Security.Password		
	ASCII string	Password input. Required to logon the user.
General.Security.Phone		
	ASCII string	Phone number input.
General.Security.Status		
		Status of the current user. See → 🗎 9 and following for details.
	0 = logged off	The user is logged off.
	1 = logged on	The user is logged on.
	2 = logon failed	Logon of the user has failed. Possible reasons: Typing error for user name or password, inadequate access rights.
General.Time.Command		
		For example, the device time is required for time dependent measurements, i.e. to assign measured data to the time flow of the measurement.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = set	Set the device date and time.
General.Time.DateTime_ActualValue		
	YYYY-MM-DD hh:mm:ss	Actual value of the date and time that is used by the device.
General.Time.DateTime_SetValue		
	YYYY-MM-DD hh:mm:ss	Set value for the date and time that is to be used by the device.

OPC name	Value	Details
General.Time.Status		
		Status of the device date and time.
	0 = no command	Date and time have not yet been set.
	1 = set	Date and time have been set.
	2 = error	An error occurred when setting date and time.
Hardware.MassRange		
		Specificies the existing measurement range (HF generator). Depends on your hardware configuration.
	1…100 amu 1…200 amu 1…300 amu	Refer to 🕮 [1].
Hardware.Modules.Analyser.CI220.FirmwareVersion		
	0…2^{32} -1	Firmware version of the installed CI 220. Automatically detected. The Communication Interface CI 220 is located on the Quadrupole Controller QC220 (Win CE-Processor-Print).
Hardware.Modules.Analyser.CI220.OSVersion		
	0…2^{32} -1	Operating system version of the installed CI 220. Automatically detected.
Hardware.Modules.Analyser.HV220-1.HighVoltage_ActualValue		
	0.0…4,095.00	Output of the high voltage supply HV 220-1 for the SEM. Refer to 🕮 [1].
Hardware.Modules.Analyser.HV220-1.HighVoltage_SetValue		
	0.0…3,500.0 V	Set value of the high voltage supply HV 220-1 for the SEM.
Hardware.Modules.Analyser.HV220-1.Status		
	0…2^{8} - 1	Status of the high voltage supply HV 220-1 for the SEM. Only for factory use (service and test purposes).
Hardware.Modules.Analyser.IS220-1.EmissionCurrent_ActualValue		
	0.00…25.60	Output of the ion source supply IS 220-1 for the filament emission current. Refer to 🕮 [1].
Hardware.Modules.Analyser.IS220-1.EmissionCurrent_SetValue		
	0.01…2.00 mA	Set value of the ion source supply IS 220-1 for the filament emission current.
Hardware.Modules.Analyser.IS220-1.Filament_Command		
	0…2^{8} - 1	Switch the filament emission current of the ion source supply IS 220-1 on and off. Only for factory use (service and test purposes).
Hardware.Modules.Analyser.IS220-1.FilamentCurrent_ActualValue		
	0.00…5.12	Output of the ion source supply IS 220-1 for the filament current. It is automatically adjusted to reach the set emission current.
Hardware.Modules.Analyser.IS220-1.ProtectionCurrent_SetValue		
	0.01…3.50 A	Maximum filament current of the ion source supply IS 220-1, used to protect the filament.
Hardware.Modules.Analyser.IS220-1.Status		
	0…2^{16} - 1	Status of the ion source supply.

OPC name	Value	Details
Hardware.Modules.Analyser.IS220-1.V01_SetValue Hardware.Modules.Analyser.IS220-1.V02_SetValue Hardware.Modules.Analyser.IS220-1.V03_SetValue Hardware.Modules.Analyser.IS220-1.V04_SetValue Hardware.Modules.Analyser.IS220-1.V05_SetValue		
		These parameters are applied to the filament and the ion source type that is selected under Analyser.Filament.ActiveFilament and Analyser.IonSource.Type, respectively. The available parameters depend on the used ion source. For detailed information, please refer to 🕮 [1] and the operating instructions of the used ion source.
	105.00…150.00	V01: Potential "Ion Reference". Change in steps of 0.01 V.
	-100.00…0.00	V02: Potential "Cathode". Change in steps of 0.01 V.
	-30.00…0.00	V03: Potential "Focus". Change in steps of 0.01 V.
	-15.00…0.00	V04: Potential "Field Axis". Change in steps of 0.01 V.
	-150.00…0.00	V05: Potential "Extract". Change in steps of 0.01 V.
Hardware.Modules.Analyser.SI220.EPOffsetValues.Command		
		The offset is caused by a drift of the measuring amplifier and can be compensated by a correction value. The offset of the electronic circuit of the measuring amplifier is determined automatically for each measuring range at a defined mass number. The values are stored in the device and will remain after the power has been cut.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = clear offsets	Delete the offset values.
	2 = save offset	Save the offset values.
	3 = restore offsets	Restore the offset values.
	4 = read offsets	Read the currently saved offset values.
Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-05 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-06 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-07 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-08 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-09 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-10 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-11 Hardware.Modules.Analyser.SI220.EPOffsetValues.EP1.RangeE-12		
	32-Bit IEEE floating-point value	Offset values for the corresponding measuring range of the detector. The device automatically determines the values
Hardware.Modules.Analyser.SI220.EPOffsetValues.Mass		
		The offset values are determined at a defined mass number.
	0…300	Maximum value depends on the hardware configuration. Refer to 🕮 [1].
Hardware.Modules.Analyser.SI220.EPOffsetValues.Status		
		Status of the offset correction for the electrometer preamplifier of the detector.
	0 = no command	No command has been executed.
	1 = offsets cleared	The offset values have been deleted.
	2 = offsets saved	The offset values have been saved.
	3 = offsets restored	The offset values have been restored.
	4 = offsets read	The offset values have been read.

OPC name	Value	Details
Hardware.Modules.Analyser.SI220.FirmwareVersion		
	0…2^{32} - 1	Firmware version of the installed SI 220. Automatically detected. The Signal Interface SI 220 is located on the Quadrupole Controller QC220 (Win CE-Processor-Print).
Hardware.Modules.Analyser.SI220.MassScaleCalibration.Offset		
		Two parameters are used for coarse tuning, to shift and to shrink or stretch the mass scale. This way you can match the actual peaks with the nominal mass numbers.
	-0.075…0.075	Shift the mass scale to the left and right for negative and positive values, respectively.
Hardware.Modules.Analyser.SI220.MassScaleCalibration.Slope		
		Two parameters are used for coarse tuning, to shift and to shrink or stretch the mass scale. This way you can match the actual peaks with the nominal mass numbers.
	0.9850…1.0150	Shrink and stretch the mass scale for values < 1 and > 1, respectively.
Hardware.Modules.Analyser.SI220.ScanStairTable.ActualValues		
		Data points on the mass scale have to be input for mass scale fine tuning: nominal (reference values) and corresponding actual mass numbers. These points are used for linear interpolation of mass numbers located in between. The fine tuning is based on the coarse tuning and compensates nonlinearity of the mass scale.
	0.5…299.5	Measured mass number: +/- 0.5 amu around the nominal mass number (Hardware.Modules.Analyser.SI220.ScanStairTable.ReferenceValues)
Hardware.Modules.Analyser.SI220.ScanStairTable.Command		
		The data points (nominal and actual mass numbers) for the mass scale fine tuning are stored in a table. These points are used for linear interpolation of mass numbers located in between.
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = save table	Save the current data points to the table.
	2 = restore table	Restore the table.
	3 = set default values	Set the default values.
	4 = set values	Set the current values.
	5 = get values	Get values.
Hardware.Modules.Analyser.SI220.ScanStairTable.Count		
		The data points (nominal and actual mass numbers) for the mass scale fine tuning are stored in a table. These points are used for linear interpolation of mass numbers located in between.
	0	No fine tuning of the mass scale is performed.
	1…48	Max. 48 data points (table rows) are allowed for mass scale fine tuning.

OPC name	Value	Details
Hardware.Modules.Analyser.SI220.ScanStairTable.ReferenceValues		
		Data points on the mass scale have to be input for mass scale fine tuning: nominal (reference values) and corresponding actual mass numbers. These points are used for linear interpolation of mass numbers located in between. The fine tuning is based on the coarse tuning and compensates nonlinearity of the mass scale.
	1…299	Reference value: The actual value must be +/- 0.5 amu around the nominal mass number.
Hardware.Modules.Analyser.SI220.ScanStairTable.Status		
		The data points (nominal and actual mass numbers) for the mass scale fine tuning are stored in a table. These points are used for linear interpolation of mass numbers located in between.
	0 = no error	No error has occurred.
	1 = stairtable saved	The table is saved.
	2 = stairtable restored	The table is restored.
	3 = stairtable set to default	The default values are set in the table.
	4 = stairtable set	The current values are set in the table.
	5 = stairtable gotten	The table is got.
	253 = error stairtable not correct	An error has occurred. The table is not correct.
	254 = error stairtable not loaded	An error has occurred. The table could not be loaded.
	255 = internal error	An internal error has occurred.
Hardware.Modules.Analyser.SI220.SimulationMode		
		Simulation mode of the device. For detailed information, please see → 72.
	0 = OFF	Simulation switched off: Real operation (normal measurement).
	1 = INTERN	Simulation via QC internal measurement path.
	2 = EXTERN	Simulation via QC external connection. Only for factory use, additional hardware required.
Hardware.Modules.External.IO220-1.Detection		
		Indicates whether an Input/Output-module (IO220) has been automatically detected or not.
	0 = not found	No IO-module is found.
	1 = found, ok	An IO-module is found, and correct functioning is detected.
	2 = found, error	An IO-module is found, but an error is detected.
Hardware.Modules.External.IO220-1.FirmwareVersion		
	$0…2^{32} - 1$	Firmware version of the installed input/output module IO 220. Automatically detected.
Hardware.Modules.External.IO220-1.Status		
	$0…2^{8} - 1$	Status of the input/output module IO 220. Only for factory use (service and test purposes).
Hardware.QMA		
		Device type of the quadrupole mass analyser QMA. The unit detects the installed hardware automatically, as far as possible, and displays them.
	0 = 200	Device QMA200.

OPC name	Value	Details
Hardware.QMH		
		Indicates the installed RF stage, which defines the mass range. The unit detects the installed hardware automatically, as far as possible, and displays them.
	0 = none	No QMH detected.
	1 = 221	QMH221: available mass range 1…100 amu.
	2 = 222	QMH221: available mass range 1…200 amu.
	3 = 223	QMH221: available mass range 1…300 amu.
Hardware.RF.Command		
		Define RF stage settings
	0 = no command	A command is executed when the command item is unequal zero. Afterwards the command item is reset to zero. This implies that the command has been accepted.
	1 = load	Load settings.
	2 = save	Save the current settings.
	3 = restore	Restore settings.
Hardware.RF.HardwareSettings.CAL_HIGH_MASS		
		Factor for mass scale calibration (slope), to match the actual peaks with the nominal mass numbers.
	0…65535	Shrink and stretch the mass scale.
Hardware.RF.HardwareSettings.CAL_LOW_MASS		
		Offset for mass scale calibration (offset), to match the actual peaks with the nominal mass numbers.
	0…1023	Shift the mass scale.
Hardware.RF.HardwareSettings.Description		
	ASCII string	Comment on the RF hardware settings.
Hardware.RF.HardwareSettings.LINEAR_H		
	0…1023	Currently not used.
Hardware.RF.HardwareSettings.RESOL_COARSE		
	0…65535	Factor for resolution. Affects to all peaks: increasing the value reduces the peak width.
Hardware.RF.HardwareSettings.RESOL_LOW		
	0…65535	Offset for resolution. Affects peaks with mass numbers 0…4.
Hardware.RF.HardwareSettings.RESOL_MAX		
	0…1023	Factor for resolution at low mass range; value is of minor influence.
Hardware.RF.HardwareSettings.RF_LOW_AMPLITUDE		
	0…1023	Factory setting only.
Hardware.RF.HardwareSettings.SerialNumber		
	ASCII string	Serial number of the RF stage. Set at the factory.

OPC name	Value	Details
Hardware.RF.ParameterSet		
		Only used by the manufacturer. Define the use of the settings User, System or Board.
	0 = user	User defined parameter set.
	1 = system	System specific parameter set.
	2 = board	Board specific parameter set.
Hardware.RF.Polarity		
		Switch the polarity of the rod system for separating ions by the m/e-ratio.
	0 = pos	0 = normal (positive).
	1 = neg	1 = inverse (negative).
Hardware.RF.Status		
		Status of the loading, saving, or restoring process for RF parameter sets.
	0 = no error	No error has occurred.
	1 = set loaded	The parameter set is loaded.
	2 = saving sets	The parameter sets are being saved.
	3 = sets saved	The parameter sets have been saved.
	4 = set restored	The parameter set is restored.
	254 = set for board not allowed	The parameter set is not allowed for the installed board.
	255 = error loading from eeprom	An error has occurred. The parameter set could not be loaded from the EEPROM.
Hardware.RF.Temperature		
		Temperature monitoring for the RF stage.
	0.0…100.0°C	0.00 = low 50.00 = no. 3 - Warning: RF temperature high 80.00 = no. 5 - Error: RF temperature protection The RF-stage will be switched off when the temperature exceeds 80°C.
Hardware.RF.TuneVoltage_ActualValue		
		The high frequency voltage of the RF generator is applied to the rod pairs of the QMG to separate ions. The output resonant circuit of the generator has to be matched to the QMG rod system.
	0.0…5.0 V	Tuning the RF generator requires to turn the tuning screw.

OPC name	Value	Details
HardwareTesting.QC220.~		
		Only used by the manufacturer for service and test purposes of the QC220.
	HardwareTesting.QC220.AiEmiCur	Analog input, emission current
	HardwareTesting.QC220.AiFilCur	Analog input, filament current
	HardwareTesting.QC220.AiMeas	Analog input, measurement
	HardwareTesting.QC220.AiRes1	Analog input, resolution 1
	HardwareTesting.QC220.AiRes2	Analog input, resolution 2
	HardwareTesting.QC220.AiRes3	Analog input, resolution 3
	HardwareTesting.QC220.AiSemV	Analog input, SEM high voltage
	HardwareTesting.QC220.AiTempV	Analog input, RF stage temperature
	HardwareTesting.QC220.AiTuneV	Analog input, RF tuning
	HardwareTesting.QC220.AoCath	Analog output, cathode voltage
	HardwareTesting.QC220.AoEmiss	Analog output, emission current
	HardwareTesting.QC220.AoExtr	Analog output, extraction voltage
	HardwareTesting.QC220.AoFAxis	Analog output, field axis voltage
	HardwareTesting.QC220.AoFilProt	Analog output, filament protection current
	HardwareTesting.QC220.AoFocus	Analog output, focus voltage
	HardwareTesting.QC220.AoIonRef	Analog output, ion reference voltage
	HardwareTesting.QC220.AoMass	Analog output, mass number
	HardwareTesting.QC220.AoRes1	Analog output, resolution 1
	HardwareTesting.QC220.AoResol	Analog output, resolution
	HardwareTesting.QC220.AoSem	Analog output, SEM high voltage
	HardwareTesting.QC220.DigIn	Digital input
	HardwareTesting.QC220.DigOut	Digital output
	HardwareTesting.QC220.DigRes	Digital reset
	HardwareTesting.QC220.Status	Status of the hardware test
HardwareTesting.QC220.Mode		
		Only used by the manufacturer for service and test purposes of the QC220.
	0 = off	Test mode off.
	1 = IO test	Test of the IO-module.
	2 = systemtest	Test of the entire system.
NamespaceVersion		
	0…65535	Namespace version of the OPC items.

7 Data Handling

This chapter describes the measurement data handling of the QMG220. Three ways are used to read out measuring data.

7.1 Channels.Actuality.ActualChannel.~

OPC items of the "Channels.Actuality.ActualChannel.~" type contain the current measuring data using a refresh rate of 250 ms:

- Channels.Actuality.ActualChannel.Channel
- Channels.Actuality.ActualChannel.MassMode
- Channels.Actuality.ActualChannel.MassValue
- Channels.Actuality.ActualChannel.MeasureValue

Example: Displaying the continuous variation of the mass.

7.2 Channels.Actuality.~

OPC items of the "Channels.Actuality.~" type contain arrays of all 128 channels. For sample measurements, the measuring data of each channel are separately saved and continuously updated:

- Channels.Actuality.MassValue
- Channels.Actuality.MeasureValue
- Channels.Actuality.Status
- Channels.Actuality.TimeStamp

Example: Sample measurements of several channels which are to be read in cycles (polling).

7.3 General.DataPump.~

OPC items of the "General.DataPump.~" type read the data out from ring buffer:

- General.DataPump.Data

Example: Measurements that require no data loss (scan).

You have to set the ring buffer mode to "Data loose" when no data are read out from the ring buffer.

7.3.1 Ring buffer Access

Ring buffer Mode

The following ring buffer modes are defined:

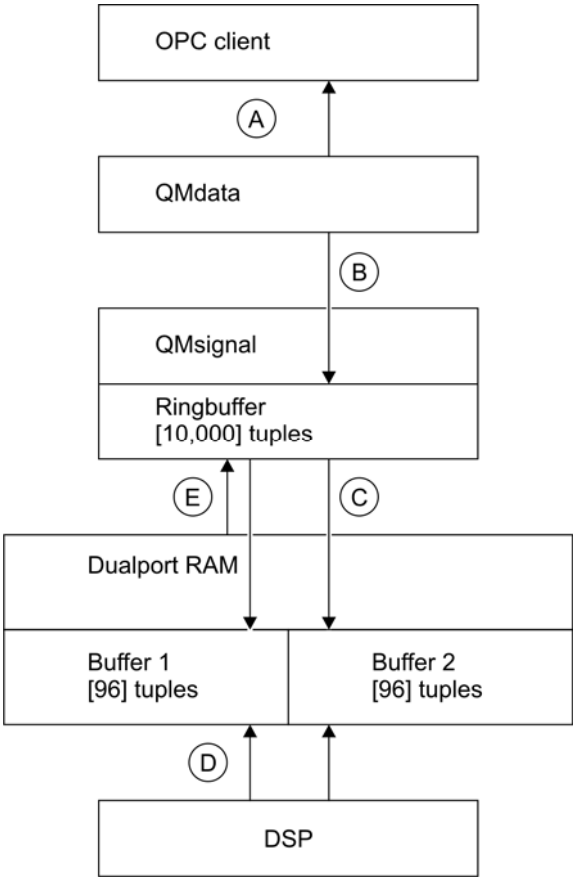
0: The ring buffer retrieves data from the signal processor at maximum speed. The data are deleted when the ringbuffer is full.

1: The ring buffer retrieves data from the signal processor only when there is free space in the ring buffer.

2: The ring buffer retrieves data from the signal processor only when the ring buffer is empty and all OPC items have been sent.

Data

The "ComplexData" item (namespace "General.DataPump.Data") outputs the results of the measurement. The following diagram illustrates the data handling.



A Client contains the "Data" item in a group of "Update Rate" = 0

B Read out contents of the ring buffer every 1 ms. Forward modifications to the client(s)

C Read out buffer after an interrupt, and add header to tuples. Write result into ring buffer

D Write into buffer, and trigger interrupt in case of QM signal

E Interrupt

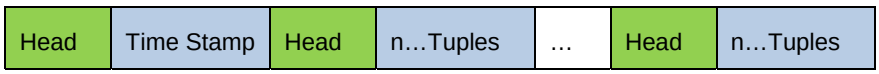
QMdata forwards the data only to those clients for which the "Data" item has been added. These clients will then be notified that new data can be read in the item. If no client has created a "Data" item also no data will be read out from the ringbuffer. This can quickly result in a ring buffer overflow.

The "Data" item is notified when a modification occurs. Therefore, the "Update Rate" zero is required for the group that contains this item.

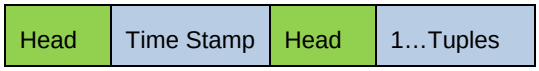
7.3.2 Data Description

SCAN and PEAK Data

For fast measurements, n corresponds to the maximum buffer width (96-tuples). For slower measurements, the interrupt will be triggered in advance resulting in lesser n. Therefore, n is specified in every head.



SAMPLE Data



See → 🗎 59 for a detailed description of the data.

7.3.3 Measurement Data

Description

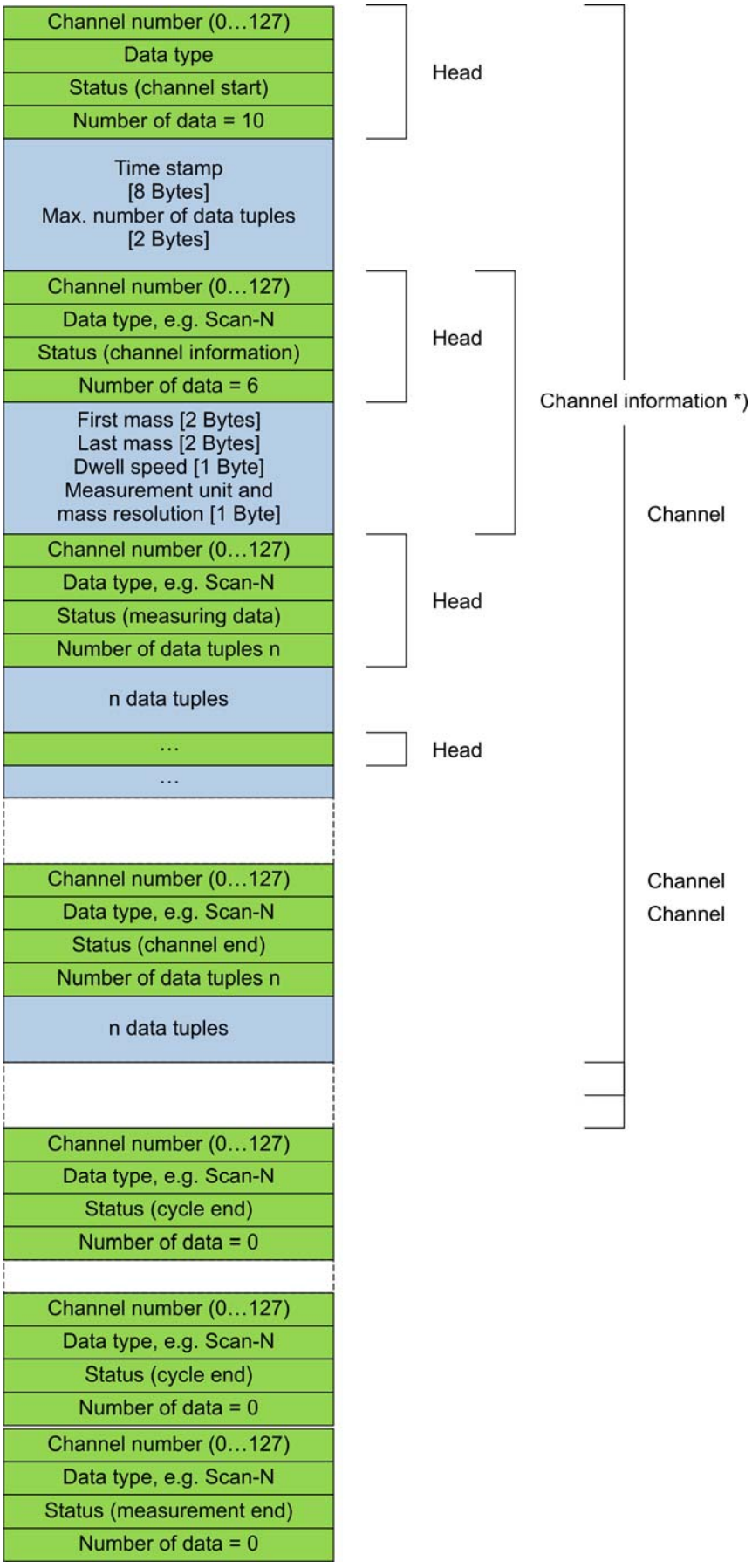
A very fast transfer rate is required for the measuring data. Therefore, the measuring data are read out from the shared memory and written immediately into the ring buffer (FIFO).

Actual measuring data for Sample measurement

In the course of a Sample measurement the measuring data of each channel are saved separately, and are continuously updated.

The pointers to the 128 channel measuring data are passed when the program starts.

7.3.4 Ring buffer



7.3.4.1 Data Packets

The measuring data are stored in packets into the ring buffer. Each data packet starts with a header. Amongst others the header contains the length of the data packet (number of data tuples) to determine the end of the data packet.

All measuring data of one channel are combined. A channel starts with the data packet "Channel Start" that contains the time stamp and the maximum number of data tuples. The data packet "Channel Information" follows, except for Sample. After the last data packet of a channel the additional data packet "Channel End" is stored into the ring buffer

The data packet "Channel End" can also contain measuring data. As a consequence, at least two data packets per channel are stored into the ring buffer:

- Data packet "Channel Start" (always)
- Data packet "Channel Information" (except for Sample)
- (Data packets "Continuous Measuring Data")
- Data packet "Channel End (always)

One measurement interval, i.e. channel start to channel end, can be run repeatedly (multiple cycles). After each cycle a block with status "Cycle End" is written into the ring buffer.

Channel information *:

The "Sample-Table", "Offset-Measure", and "Analog-Input" jobs do not require the "Channel Information" data block. Therefore, the data block is not sent for these jobs to avoid needless data load.

7.3.4.2 Data Elements

Channel number
[1 Byte]

0..127

Data type (JobMode)
[1 Byte]

0	Sample-Table
1	Scan-Normal
2	Scan-FIR
3	Scan-Stair-Table
4	Peak-Level
5	Peak-FIR
6	Adjust-Coarse
7	Adjust-Fine
15	Offset-Measure
16	Analog-Input
17	Total Pressure
255	Job Break

Status
[1 Byte]

0	Continuous measuring data
1	Channel start (time stamp, max. number of data tuples)
2	Channel end
3	Channel aborted
4	Cycle end
5	Channel information
6	Measurement end

Number of data
[1 Byte]

With "Channel Start" and "Channel Information":
Size in Bytes of the following data.

Date and time stamp [8 Bytes]	64 Bit Integer, number of 100 ns intervals since 1 January 1601.
Max. number of data tuples [2 Bytes]	Maximum number of data tuples.
First-Mass [2 Bytes]	FirstMass in integer format.
Last-Mass [2 Bytes]	LastMass in integer format.
Dwell-Speed [1 Byte]	DwellSpeed in integer format.
Measurement unit and Mass-Resol [1 Byte]	Bit0…1: not used Bit2…3: Unit (0 = Ampere, 1 = cps, 2 = Volt, 3 = mbar) Bit4…5: Mass resolution (0 = 1/64, 1 = 1/32, 2 = 1/16, 3 = 1/8) Bit6…7: not used
Number of data tuples [1 Byte]	With "Continuous Measuring Data" and "Channel End": Number of the following data tuples.
Data tuple [1 data tuple = 8 Bytes]	Intensity [4 Bytes]: Floating format, Ampere, Volt, mbar Data type "Analog Input" indicates the voltage (0…10V) Data type "Total Pressure" indicates the pressure in mbar Mass [2 Bytes]: Mass in integer format Status1 [1 Byte]: Bit0…1: out of range (0 = okay, 1 = overflow, 2 = underflow) Bit2…3: unit (0 = Ampere, 1 = cps, 2 = Volt, 3 = mbar) Bit4…5: mass resolution (0 = 1/64, 1 = 1/32, 2 = 1/16, 3 = 1/8) Bit6…7: not used Status2 [1 Byte]: Adjust mode status
Data tuple [1 data tuple = 8 Bytes]	With data type = "Analog-Input" AnalogIn-Wert [4 Bytes] Floating format, 0…10 Volt Mass [2 Bytes]: Mass in integer format = 0 Status1 [1 Byte]: Bit0…1: out (2 = Volt) Bit4…5: mass resolution (0 = 1/64, 1 = 1/32, 2 = 1/16, 3 = 1/8) Bit6…7: not used Status2 [1 Byte] Adjust mode status = 0

Data tuple [1 data tuple = 8 Bytes]	With data type = "Total Pressure"	
	AnalogIn value [4 Bytes]:	Floating format, mbar
	Mass [2 Bytes]:	Mass in integer format = 0
	Status1 [1 Byte]:	Bit0…1: out of range (0 = okay, 1 = overflow, 2 = underflow) Bit2…3: unit (3 = mbar) Bit4…5: mass resolution (0 = 1/64, 1 = 1/32, 2 = 1/16, 3 = 1/8) Bit6…7: not used
	Status2 [1 Byte]:	Adjust-Mode Status = 0

7.3.4.3 Technical Data

Size:	2MB
Start position:	QMdata starts reading from the start position and afterwards modifies this position
End position:	QMsignal starts writing from the end position and afterwards modifies this position

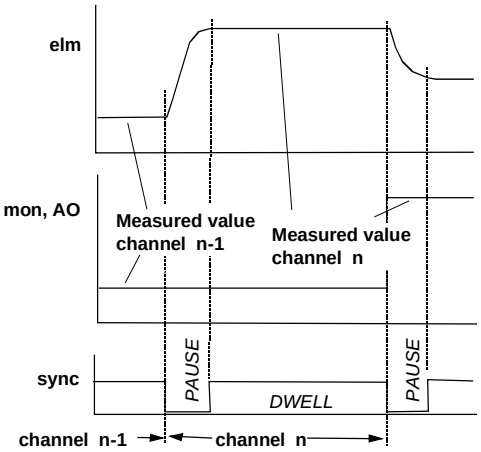
8 Mass Scan Modes

8.1 Mass Scan Modes

This chapter describes the available options for the OPC item Channels.Parameters.Mass.MassMode.

SAMPLE

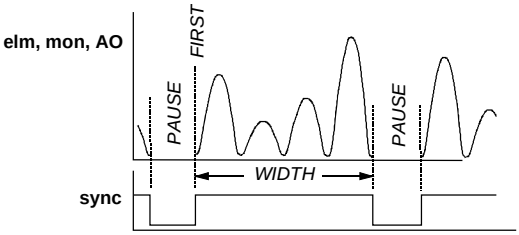
With "SAMPLE" (Channels.Parameters.Mass.MassMode = SAMPLE) the measurement is performed on the constant mass number. In most cases it will be set to a peak top (*ADJUST,* see → 66 and following).



After the *DWELL* time has expired the measured value averaged across this time is output.

SCAN-N

The "SCAN-Normal" mode (Channels.Parameters.Mass.MassMode = SCAN-N) is used for recording an analog spectrum across the range defined with "FirstMass" and "Width" (OPC items Channels.Parameters.Mass.FirstMass and Channels.Parameters.Mass.Width*).*



The number of steps per mass depends on Speed and the mass range (OPC items Channels.Parameters.Mass.DwellSpeed and Hardware.MassRange).

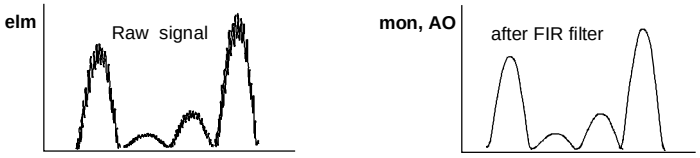
With *SCAN-N* the average value of the mass signal is output with each mass step.

Example: With "Speed" 0.1 s/amu and mass scale resolution 1/32 amu there is an integration time per step of 100 ms/amu × 1/32 amu = 3.125 ms

With *SCAN-N* you obtain a direct image of the measured values captured by the measuring amplifier. This mode is particularly suitable for analyzing raw data, e.g. for optimizing parameter values.

SCAN-F

With "SCAN-F" (Channels.Parameters.Mass.MassMode = SCAN-F) the measured values are additionally subjected to an FIR filter algorithm (Finite Impulse Response).



The FIR filter largely eliminates noise and interference so that also very small peaks can be detected against the background. Statistical intensity fluctuations frequently account for the major portion of the noise are particularly well suppressed by the FIR filter. For this reason you should always use *SCAN-F*, except in the few special cases were raw data are actually required.

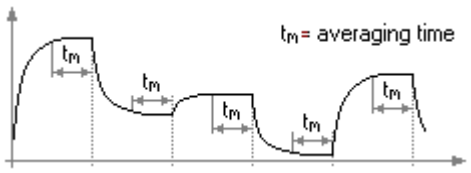
SCAN-S

With mass mode "STAIR" (Channels.Parameters.Mass.MassMode = SCAN-S) integer mass jumps across the range "FirstMass"..."Width" are performed. A bargraph spectrum is created.

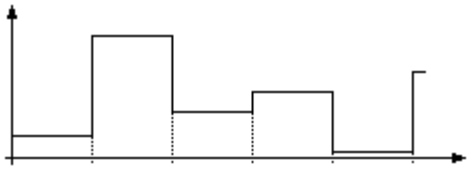
After each mass jump the average value across approx. half the dwell time is formed.

Example: With "Speed" 0.1 s/amu the averaging time is ≈ 50 ms.

elm



AO, mon
The measured value appears after the average has been formed, that is, delayed by one mass

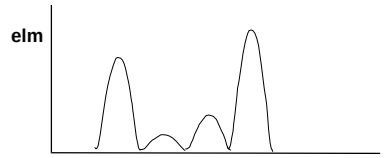


The start mass of each channel must be on a peak maximum. See → 🗎 66 and following. If the peak maximums are not hit, large measuring errors are unavoidable. For this reason you should limit "Width" per channel to approx. 10 % of the mass range. In this way you can compensate deviations of the mass scale by correcting the corresponding starting mass "FirstMass".

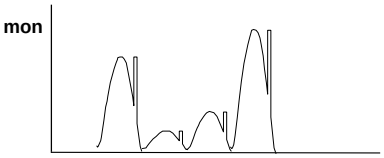
PEAK

The "PEAK" mode (Channels.Parameters.Mass.MassMode = PEAK-L or PEAK-F, peak processing) is an intelligent data reduction process which searches the spectrum for peaks in real time mode. Instead of 64 measured values per amu only the **intensity and mass number** of detected peaks are output on the computer interface.

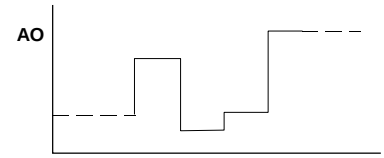
Mass scan is same as with *SCAN*



The marker at **mon** means that a peak of the displayed height has been detected



The value at **AO** remains until a new peak is detected



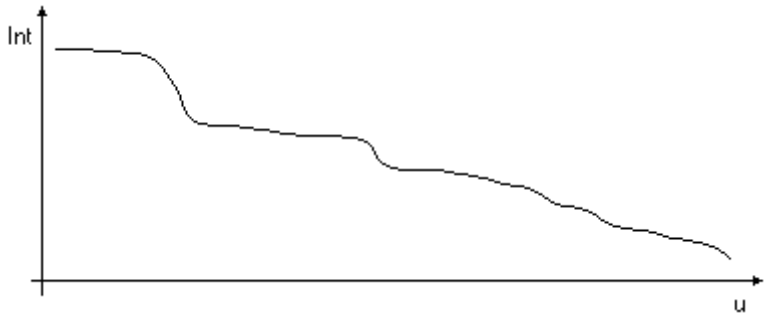
Peak Processing runs with all "Speed" (Channels.Parameters.Mass.DwellSpeed) settings. The peak search extends across the range defined with "FirstMass" and "Width". The peak criteria of General.Cycle.MeasureMode = ADJ_COARSE apply, see → 66 and following.

There are two methods:

- With "PEAK-L" (Level) the peak processing algorithm is applied to the normal spectrum ("SCAN-N").
- With "PEAK-F" the peak processing algorithm is applied to the measured values processed with the FIR filter. This is advantageous because parasitic signals have largely been removed from the measured values so that a very low threshold (Channels.Parameters.Mass.Threshold) can be used.

8.2 Integral spectrum

With Channels.Parameters.Mass.Resolution = 0 an integral spectrum is created that can be used, e.g. for total pressure measurement. See → 🕮 [2].



8.3 Adjust

With General.Cycle.MeasureMode = ADJ_COARSE or ADJ_FINE you can automatically optimize the mass number *MASS* to the peak maximum in "Sample" or "SCAN-S" mode.

The measurement channel must be enabled (Channels.Parameters.General.State = ENABLE).

This possibility is advantageously used, for example, to optimize the system after turn on and particularly after several parameters have been changed.

8.3.10 Adjust COARSE

With General.Cycle.MeasureMode = ADJ_COARSE a range of ±½ u around the mass number Channels.Parameters.Mass.FirstMass is normally searched for a peak. The search range will possibly be enlarged by ±¼ u.

If possible use Channels.Parameters.Amplifier.AutoRangeMode = AUTO, it will be easier to obtain a result.

Peak criteria:

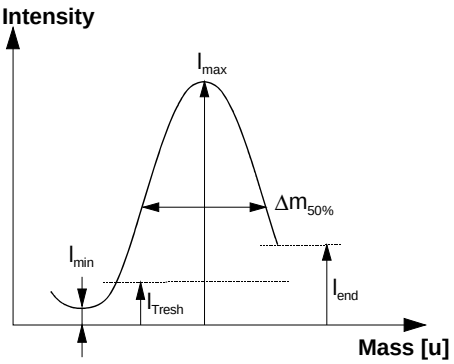
Four criteria must be met for a peak to be detected:

a) $I_{max} > 2\ I_{min}$

b) $I_{end} < 0.5\ I_{max}$

c) $I_{max} > I_{tresh}$

d) $\Delta m_{50\%} \geq ½\ u^{*)}$ at $½\ I_{max}$



*) ¼ u with Channels.Parameters.Mass.MassMode = PEAK

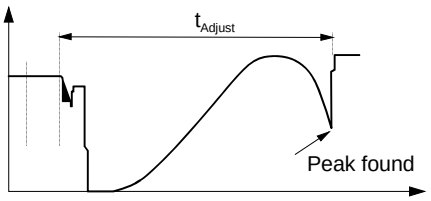
Time: $t_{Adjust} \approx 0.5…1.25$ "Dwell"

Start:

- Stop measuring cycle: General.Cycle.Command = stop
- Choose "SAMPLE" mode: Channels.Parameters.Mass.MassMode = SAMPLE
- Choose General.Cycle.MeasureMode = ADJ_COARSE
- Choose General.Cycle.CycleMode = MONO, or MULTI
- Start ADJUST measurement: General.Cycle.Command = run

Procedure: Signal **mon**

With successful ADJUST the mass number "FirstMass" of the measured channel is updated with the new value. If unsuccessful it remains unchanged.



Status message:

Channels.Actuality.Status or ComplexData Adjust mode status

Status code:

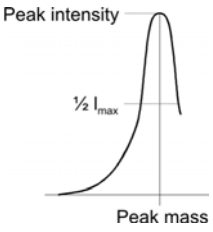
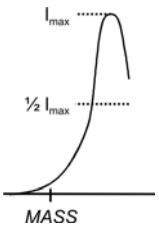
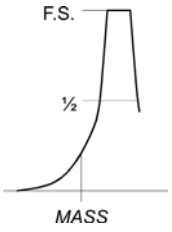
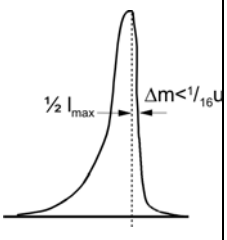
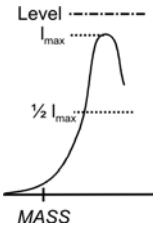
	Peak width	Intensity		Mass number *MASS*		
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit=1: Symbol:	too narrow **I**	<*THRESH* ↑	too high ↓	too low *) →	too high ←	too low →

*) and intensity not dropped back to ½

Adjust the actual peak positions to the nominal mass numbers: change the parameters while the measurement is running. You can observe the effect of modified parameters during the next measurement task and iteratively tune the mass scale.

- "Hardware.Modules.Analyser.SI220.MassScaleCalibration.Offset" shifts the mass scale,
- "Hardware.Modules.Analyser.SI220.MassScaleCalibration.Slope" shrinks and stretches the mass scale.

Examples:

			
000000 : OK	000001 : → increase "FirstMass"	000100 : → increase "FirstMass"	010010 : ↑ ← decrease "FirstMass"
			
001000 : ↓ increase Range *)	100000 : **I** Peak too narrow, repeat, investigate shape	001010 : ↓ ← increase Range *) decrease "FirstMass"	010100 : ↑ → decrease Range *) or Threshold, and increase "FirstMass"

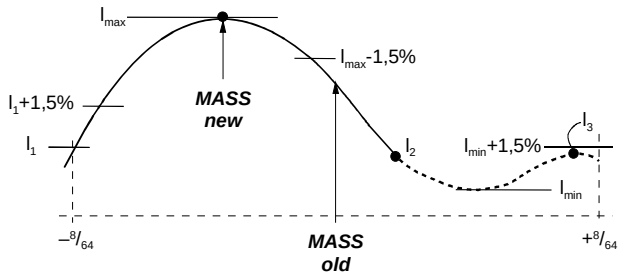
*) or preferably use Channels.Parameters.Amplifier.AutoRangeMode = AUTO

8.3.20 Adjust FINE

A peak maximum within the range of ± ½ u around the mass number "FirstMass" is searched. In this case Channels.Parameters.Amplifier.AutoRangeMode = AUTO is recommended, too.

Peak criteria:

a) I_{max} > I1+1,5%
b) I2 < Imax -1,5%
c) Imax >THRESH
d) No overdriving
e) I3 < I_{min} +1,5%



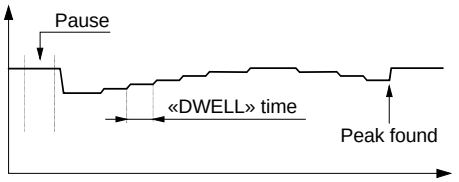
Time: t_{Adjust} ≈ 16 "Dwell"

Start:

If you are not sure that a peak is located within the searched range, first perform an ADJUST COARSE. Start as described under COARSE, however with General.Cycle.MeasureMode = ADJ_FINE.

Procedure: Signal ***mon***

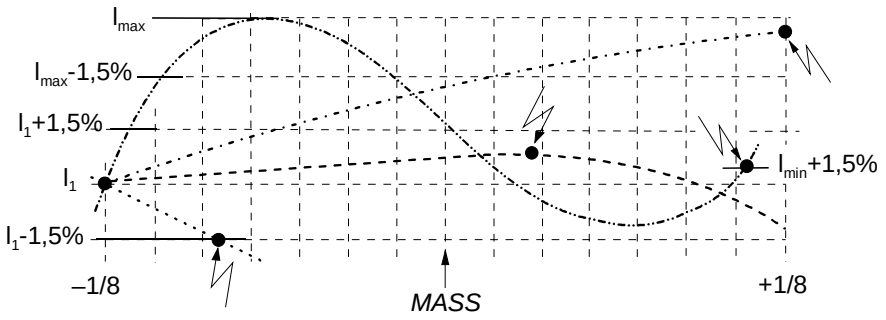
With successful ADJUST the mass of the measured channel is updated with the new value, if it was unsuccessful it remains unchanged.



Status message:
As in ADJUST-COARSE, however, without information on mass number and peak width.
Bits 1, 2 and 5 are always zero.

	---	Intensity		Mass number *MASS*		
	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit=1: Symbol:	---	<*THRESH* ↑	too high ↓	---	---	no Peak → ←

Examples of unsuccessful fine searches:



9 Trip Functions and Watch Logic

9.1 Description

The TRIP functions can monitor measurement values of sample measurements (mass mode SAMPLE) and analog input measurements (detector type ANALOGIN).

With "halt", the trip function status is OFF.

Each measurement channel provides two trip functions, TRIP A and TRIP B. They can be assigned without restriction to the output bits of the CAN modules.

Two or more trip functions are conjuncted (logic AND) if they are assigned to the same DO bit. No warning appears if a DO bit is already used.

Each measurement channel provides the following trip variables:

- Type
- Level A
- DO-A
- Level B
- DO-B

9.2 Functions

9.2.1 Vacuum Monitor

Procedure:

- Select trip type "ABS".
- Enter the threshold value "Level A".
- Set the digital output Bit "DO-A".

DO-A is set to "high" if the measured value falls below the reference value "Level A". Otherwise, DO-A is set to "low".

9.2.2 Pressure Monitor

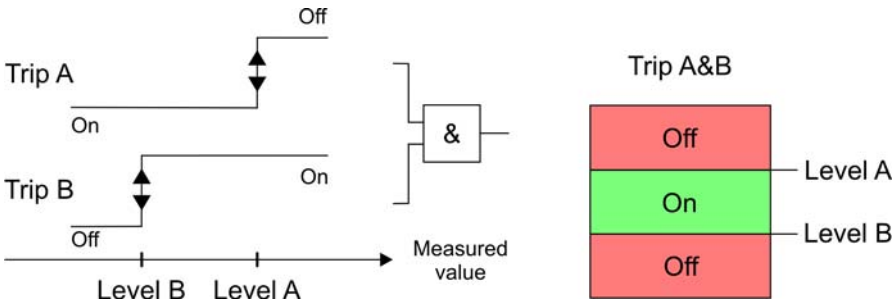
Procedure:

- Select trip type "ABS".
- Enter the threshold value "Level B".
- Set the digital output Bit "DO-B".

DO-B is set to "high" if the measured value exceeds the reference value "Level B". Otherwise, DO-B is set to "low".

9.2.3 Windows Comparator

Assign the vacuum monitor and the pressure monitor to the same output. The return of the two trip functions will be conjuncted (logic AND) thus resulting the windows comparator.



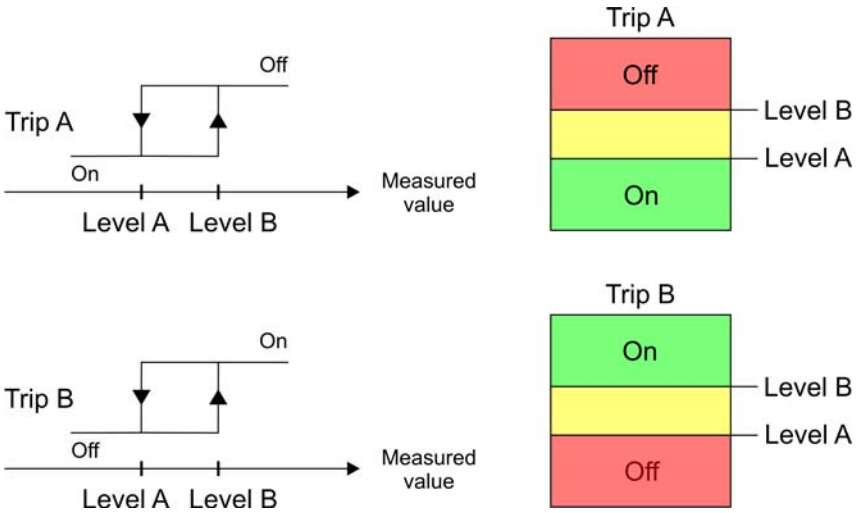
9.2.4 Hysteresis Function

Use the hysteresis to prevent permanent switching due to fluttering signals.

Procedure:

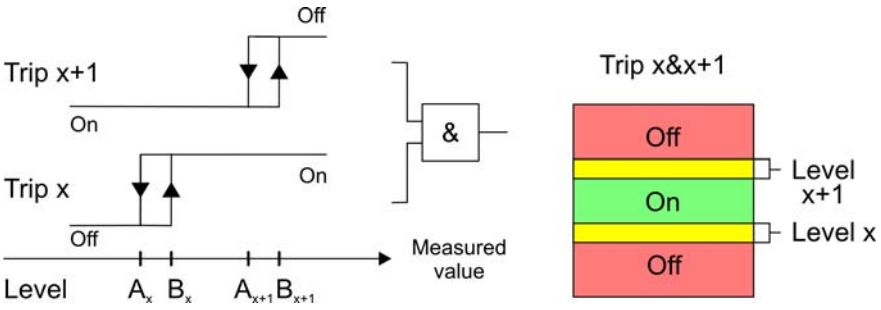
- Select trip type "HYST".
- Enter the lower threshold value "Level A".
- Enter the upper threshold value "Level B".
- Set the digital output Bits "DO-A" and "DO-B".

DO-A is set to "high" if the measured value falls below "Level A", and set to "low" if the measured value exceeds "Level B". DO-B is inverse to DO-A.



9.2.5 Windows and Hysteresis

Use the trip function "hysteresis" for two channels and the same output (DO). The two signals will be conjuncted (logic AND).



The outputs for "hysteresis" are set when a measurement cycle is finished.

10 Offset and Simulation

10.1 Offset Measurement

The offset values of the electronic circuit for signal processing (electrometer EP220, amplifier, Mux, filter, etc.) are individually determined for the 8 available detector measuring ranges. The values are stored into a memory array. The determined offset values will be applied to future measurements (sample, scan, etc.) by automatically correcting the measured values.

Entire measuring time to determine the offset value: approx. 6.35 s

10.2 Simulated Spectrum

The simulation approximates the spectrum of air up to mass number 64, i.e. the intensity is output as a function of the mass number. For higher mass numbers, this spectrum is repeated "modulo 64 (mass number)".

The simulated spectrum allows you to start and test all measuring modes, such as SCAN-N, SCAN-F, SCAN-Stair, SAMPLE, PEAK-PROCESSING, ADJUST etc., without using an analyzer. You can choose between an internal and an external simulation.

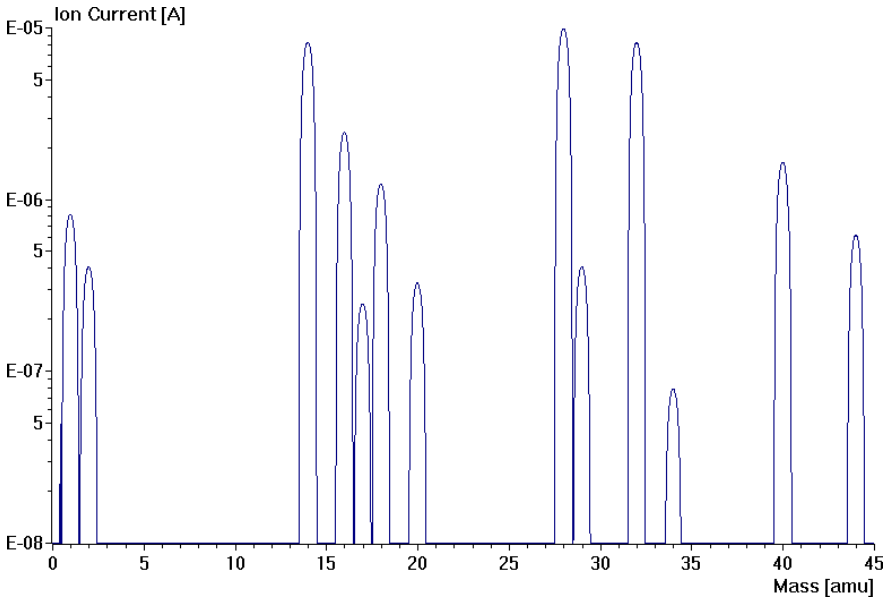
10.2.1 Internal Simulation of Ion Currents

The mass number DAC outputs the simulated spectrum using the" Fix Range Mode" (Channels.Parameters.Amplifier.AutoRangeMode). The following table lists the intensities for various gases (mass numbers) resulting from the signal processing.

Mass number	Gas type	Intensity [A]
1	H^+	8.290×10^{-7}
2	H_2^+	4.095×10^{-7}
14	$N^+ + N_2^{++}$	8.153×10^{-6}
16	$O^+ + O_2^{++}$	2.438×10^{-6}
17	OH^+	2.445×10^{-7}
18	H_2O^+	1.225×10^{-6}
20	Ar^{++}	3.232×10^{-7}
28	N_2^+	9.698×10^{-6}
29	$^{14}N^{15}N^+$	3.941×10^{-7}
32	O_2^+	7.835×10^{-6}
34	$^{16}O^{18}O^+$	7.299×10^{-8}
40	Ar^+	1.542×10^{-6}
44	CO_2^+	5.807×10^{-7}

As an example, the following figures shows the related simulated spectrum:

- Scan speed 1s/u
- Scan-N



10.2.2 External Simulation of Ion Currents

The external simulation provides the option to include also the EP220 electrometer in the simulation. However, an "additional box" is required for this.

11 Application Examples

11.1 MID Measurement

This chapter uses an MID (Multiple Ion Detection) measurement as application example of the OPC interface for the QMS220.

Application example:

The PrismaPlus™ should be started after a "Power on", and then measuring seven gases (similar like in the "Faraday Airdemo MID.qmt" QUADERA® template).

11.1.1 Using Simulation

Prerequisites:

- A QMS220 is connected, with or without analyzer.

Device configuration:

OPC name	Value	Details
Hardware.Modules.Analyser.SI220.SimulationMode		
	1	Internal simulation ON
General.DataPump.Mode		
	0	DATA-LOOSE

Channels Parameters 0…6:

OPC name	Value	Details
Channels.Parameters.Mass.FirstMass		
	14;16;18;28;32;40;44	Mass
Channels.Parameters.Mass.DwellSpeed		
	5;5;5;5;5;5;5	Dwell per amu 100 ms
Channels.Parameters.Mass.MassMode		
	0;0;0;0;0;0;0	SAMPLE measurement on mass value
Channels.Parameters.Amplifier.AutoRangeMode		
	0;0;0;0;0;0;0	FIX Range
Channels.Parameters.Amplifier.DetectorRange		
	0;0;0;0;0;0;0	1E-5 A electrometer range
Channels.Parameters.Detector.DetectorType		
	0;0;0;0;0;0;0	FARADAY ion detection

Cycle Parameters:

OPC name	Value	Details
General.Cycle.CycleMode		
	1	MULTI
General.Cycle.MeasureMode		
	0	CYCLE normal measurement operation
General.Cycle.NumberOfCycles		
	0	The measurement cycle is repeated endlessly
General.Cycle.BeginChannel		
	0	Start channel of the measurement cycle
General.Cycle.EndChannel		
	6	Ending channel of the measurement cycle

Notice:
New or modified parameters for the measurement tasks are accepted by the device only after the measurement has been restarted.

Start MID:

OPC name	Value	Details
General.Cycle.Command		
	1	RUN, i.e. start of the measurement
General.Cycle.Status		
	-	1 = halt, 5 = run multi

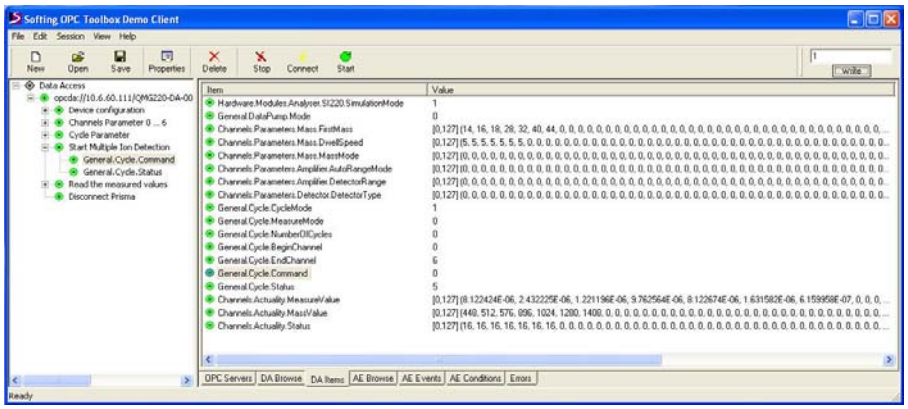
The measuring cycle for the seven gases takes about 0.756 s:
0.1 s/gas + pause time

Read the measured values:

OPC name	Display	Details
Channels.Actuality.MeasureValue		
		Display the peak intensity
Channels.Actuality.MassValue		
		Display the mass
Channels.Actuality.Status		
		Display the status

Screenshot Example

The following screenshot uses the Demo OPC Client made by Softing AG to show the names of the above OPC items and their values.



Disconnect Prisma:

OPC name	Value	Details
General.Cycle.Command		
	2	STOP the measurement
Hardware.Modules.Analyser.SI220.SimulationMode		
	0	Simulation OFF

11.1.2 No Simulation

Prerequisites:

- A QMS220 is connected, with analyzer.
- The ion source is optimized, e.g. by using QUADERA®.
- Feed a suitable test gas, such as air, into the vacuum chamber.

Device configuration:

OPC name	Value	Details
Hardware.Modules.Analyser.SI220.SimulationMode		
	0	Simulation OFF
General.DataPump.Mode		
	0	DATA-LOOSE

Ion source configuration:

OPC name	Value	Details
Analyser.Detector.Type		
	0	FARADAY
Analyser.Filament.Command		
	1	Filament on
Analyser.Filament.EmissionStatus		
	-	0 = filament off, 1 = filament on
General.ErrorsWarnings.Static.Error		
	-	See → 46

Channels Parameters 0…6:

OPC name	Value	Details
Channels.Parameters.Mass.FirstMass		
	14;16;18;28;32;40;44	Mass
Channels.Parameters.Mass.DwellSpeed		
	5;5;5;5;5;5;5	Dwell per amu 100 ms
Channels.Parameters.Mass.MassMode		
	0;0;0;0;0;0;0	SAMPLE measurement on mass value
Channels.Parameters.Amplifier.AutoRangeMode		
	1;1;1;1;1;1;1	AUTO Range
Channels.Parameters.Detector.DetectorType		
	0;0;0;0;0;0;0	FARADAY ion detection

Cycle Parameters:

OPC name	Value	Details
General.Cycle.CycleMode		
	1	MULTI
General.Cycle.MeasureMode		
	0	CYCLE normal measurement operation
General.Cycle.NumberOfCycles		
	0	The measurement cycle is repeated endlessly
General.Cycle.BeginChannel		
	0	Start channel of the measurement cycle
General.Cycle.EndChannel		
	6	Ending channel of the measurement cycle

Notice:
New or modified parameters for the measurement tasks are accepted by the device only after the measurement has been restarted.

Start MID:

OPC name	Value	Details
General.Cycle.Command		
	1	RUN, i.e. start of the measurement
General.Cycle.Status		
	-	1 = halt, 5 = run multi

The measuring cycle for the seven gases takes about 0.756 s:
0.1 s/gas + pause time

Read the measured values:

OPC name	Display	Details
Channels.Actuality.MeasureValue		
		Display the peak intensity
Channels.Actuality.MassValue		
		Display the mass
Channels.Actuality.Status		
		Display the status

Disconnect PrismaPlus™:

OPC name	Value	Details
General.Cycle.Command		
	2	STOP the measurement
Analyser.Filament.Command		
	2	Filament off
Analyser.Filament.EmissionStatus		
	-	0 = filament off, 1 = filament on

11.2 Scan Measurement

This chapter uses a SCAN measurement as application example of the OPC interface for the QMS220.

Application example:

The PrismaPlus™ should be started after a "Power on“, and then scanning the mass range from 0 to 50 (similar like in the "Faraday Airdemo Scan Analog.qmt" QUADERA® template).

11.2.1 Using Simulation

Prerequisites:

- A QMS220 is connected, with or without analyzer.

Device configuration:

OPC name	Value	Details
Hardware.Modules.Analyser.SI220.SimulationMode		
	1	Internal simulation ON
General.DataPump.Mode		
	0	DATA-LOOSE

Channels Parameters 0:

OPC name	Value	Details
Channels.Parameters.Mass.FirstMass		
	0	Mass
Channels.Parameters.Mass.Width		
	50	Mass range to be scanned
Channels.Parameters.Mass.DwellSpeed		
	8	Speed, 1 s per amu
Channels.Parameters.Mass.MassMode		
	1	SCAN-N (standard scan)
Channels.Parameters.Amplifier.AutoRangeMode		
	0	FIX Range
Channels.Parameters.Amplifier.DetectorRange		
	0	1E-5 A electrometer range
Channels.Parameters.Detector.DetectorType		
	0	FARADAY ion detection

Cycle Parameters:

OPC name	Value	Details
General.Cycle.CycleMode		
	1	MULTI
General.Cycle.MeasureMode		
	0	CYCLE normal measurement operation
General.Cycle.NumberOfCycles		
	0	The measurement cycle is repeated endlessly
General.Cycle.BeginChannel		
	0	Start channel of the measurement cycle
General.Cycle.EndChannel		
	0	Ending channel of the measurement cycle

Notice:
New or modified parameters for the measurement tasks are accepted by the device only after the measurement has been restarted.

Start Scan:

OPC name	Value	Details
General.Cycle.Command		
	1	RUN, i.e. start of the measurement
General.Cycle.Status		
	-	1 = halt, 5 = run multi

The scan over the mass range 50 takes about 50.008 s:
1 s/amu + pause time

Read the measured values:

OPC name	Display	Details
Channels.Actuality.ActualChannel.MassValue		
		Display the current mass value
Channels.Actuality.ActualChannel.MeasureValue		
		Display the current measuring value

You can also use the ring buffer to read the measured values. This is absolutely required when a faster scan speed is used. Otherwise, measured data will be lost.
See also → 56.

Read the ring buffer:

OPC name	Value	Details
General.DataPump.Mode		
	1	HOLD
OPC name	**Display**	**Details**
General.DataPump.Data		
		Complex data structure

Disconnect PrismaPlus™:

OPC name	Value	Details
General.Cycle.Command		
	2	STOP the measurement
Hardware.Modules.Analyser.SI220.SimulationMode		
	0	Simulation OFF

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