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711 Liquino

Remote Control Reference

8.711.1013

98.11 dm

1 The Metrohm Remote Control Language

1.1 General rules

Metrohm instruments have an extensive remote control facility that allows full control of the instrument via the RS 232 interface, i.e. the instrument can receive data from an external controller or send data to an external controller. C_R and L_F are used as terminators for the data transfer. The instrument sends 2xC_R and L_F as termination of a data block, to differentiate between a data line which has C_R and L_F as terminators. The controller terminates its commands with C_R and L_F. If more than one command per line is sent by the controller, ";" is used as a separator between the individual commands.

The data are grouped logically and easy to understand. Thus e.g., for the selection of the dialog language, the following must be sent

&Config.**A**ux.**L**anguage **"english"**

whereby it is sufficient to only transmit the boldface characters, thus:

&C.A.L "english"

The quantities of the commands above are:

Config	configuration data
Aux	auxiliaries, various data
Language	setting the dialog language

The data are hierarchically structured (tree form). The quantities that occur in this tree are called **objects** in the following. The dialog language is an object which can be called up with the

&Config.**A**ux.**L**anguage

command.

If one is in the desired location in the tree, the value of the object can be queried.

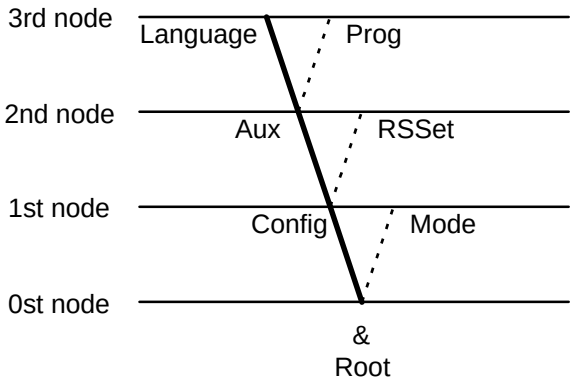
&Config.**A**ux.**L**anguage **$Q** Q means Query

The query command $Q initiates the issuing of the value on the instrument and the value emission is triggered. Entries which start with $, trigger something. They are thus called **triggers**.

Values of objects can not only be queried, they can also be modified. Values are always entered in quotes, for example:
&Config.**A**ux.**L**anguage **"english"**

1.2 Call up of objects

An excerpt from the object tree is represented below:



Rules	Example
The root of the tree is designated by &.	
The branches (levels) of a tree are marked with a dot (.) when calling up an object.	
When calling up an object, it is sufficient to give only as many letters as necessary to uniquely assign the object. If the call is not unequivocal, the first object in the series will be recognized.	Calling up the dialog language **&C**onfig.**A**ux.**L**anguage or **&C.A.L**
Upper- or lowercase letters may be used.	**&C.A.L** or **&c.a.l**
An object can be assigned a value. Values are signified at the beginning and end by quotes ("). They may contain up to 24 ASCII characters.	Entering the dialog language: **&C.A.L"english"**
Numerical values can contain up to 6 digits, a negative sign, and a decimal point. Numbers with more than 6 characters are not accepted; more than 4 decimal places are rounded off. For numbers <1, it is necessary to enter leading zeros.	correct entry of numbers: **"0.1"** incorrect entry of numbers "1,5" or "+3" or ".1"
The current object remains until a new object is called.	entry of another dialog language: **"deutsch"**
New objects can be addressed relative to the old object: A **preceding dot** leads **forwards** to the next level in the tree.	From the root to node 'Aux': **&C.A** Forward from node 'Aux' to 'Prog': .**P**
More than one preceding dot leads one level **backwards** in the tree. n node backwards require n+1 preceding dots.	Jump from node 'Prog' to node 'Aux' and select a new object 'Language' at this level: ..**L**
If you must jump back to the root, enter a preceding &.	Change from node 'Language' via the root to node 'Mode': **&M**

1.3 Triggers

Triggers initiate an action on the instrument, for example, starting a process or sending data. Triggers are marked by the introductory symbol $.

The following triggers are possible:

$G	**G**o	Starts processes, for ex. starting the mode run or setting the RS 232 interface parameters
$S	**S**top	Stops processes
$H	**H**old	Holds processes
$C	**C**ontinue	Continues processes after Hold
$Q	**Q**uery	Queries all information from the current node in the tree forward up to and including the values
$Q.P	**P**ath	Queries the path from the root of the tree up to the current node
$Q.H	**H**ighest Index	Queries the number of son nodes of the current node
$Q.N"i"	**N**ame	Queries the name of the son node with index i, i = 1 - n
$D	**D**etail-Info	Queries the detailed status information
$U	q**U**it	Aborts the data flow of the instrument, for example, after $Q

The triggers $G and $S are linked to particular objects, see the summary table.

All other triggers can be used at any time and at all locations on the object tree.

Examples:

Querying the value of the baud rate: **&C**onfig.**R**SSet.**B**aud **$Q**
Querying all values of the node "RSSet": **&C**onfig.**R**SSet **$Q**
Querying the path of the node "RSSet": **&C**onfig.**R**SSet **$Q.P**
Start mode: **&M**ode **$G**
Querying the detailed status: **$D**

1.4 Status messages

In order to have an efficient control by an external control device, it must also be possible to query status conditions; they provide information on the status of the instrument. The trigger $D initiates output of the status. Status messages consist of the global status, the detailed status and eventual error messages, e.g. $S.Mode.SET;E26. The global status informs on the activity of the process, while the detailed status conditions show the exact activity within the process.

The following **global status conditions** are possible:

$G	Go:	The instrument is executing the last command.
$H	Hold:	The instrument has been held ($H, key <meas/hold> or by an error which effects the hold status)
$C	Continue:	The instrument has been restarted actively after hold
$R	Ready:	The instrument has executed the last command and is ready
$S	Stop:	A process has been aborted in an "unnatural manner". e.g. stopped or aborted because there was an error.

1.5 Detailed status conditions

Status conditions of the global $G:
(Example: Liquino, XDOS mode)

$G.Mode.XDOS	**.Inac**:	instrument at the beginning or at the end of a mode.
	.Run:	instrument in the XDOS mode, running.

$G.Assembly.Fill:	Buret in filling process
$G.Assembly.Prep:	Preparing a dosing unit
$G.Assembly.Empty:	Emptying a dosing unit

Manual modes:

$G.Manual.DOSING	Manual dosing
$R.Manual.DIS	Manual distribution

Status conditions of the global $H:

The status message of the action which has been held appears.

Status conditions of the global $C:

The status conditions of the global $C are identical with the ones of the global status $G. They appear when the process has been restarted actively from the status "Hold" ($C, key <CONTINUE/HOLD> or automatically after elimination of an error).

Status conditions of the global $R:

$R.Mode.XXXX.Inac: instrument in the XXXX mode, inactive.

Status conditions of the global $S:

$S.Mode.XXXX.Inac:	The instrument gives the status from which it has been stopped. The detailed status information is therefore identical to those of the global status $G.

1.6 Error messages

Error messages are added to the status messages and separated from them by the sign ";". These list of error messages applies to all instruments provided with the Metrohm remote control language.

E8 Card read/write error.
Exit: Send new command.

E9 Wrong card, i.e. memory card from an other instrument or card has been removed/inserted during the inquiry.
Exit: Replace card and send new command.

E10 The card has lost data.
Exit: Replace card and end new command.

E18 Card battery low (it is between 2.37...2.64 V).
Exit: Send new command. Change battery.

E20 Check exchange unit.
Exit: Mount Exchange Unit (properly) or &m $S.

E21 Check electrode, short circuit. Replace electrode if necessary.
Exit: Rectify fault or &m $S.

E22 Check electrode, break. See above.
Exit: Rectify fault or &m $S.

E23 Division by zero.
Exit: The error message disappears on next startup or on recalculation.

E24 Check drive unit.
Exit: Connect drive unit (correctly) or &m $S.

E26 Manual stop.
Exit: The error message disappears on next startup.

E27 Stop V reached in SET, STAT, DOS or DOC.
Exit: The error message disappears on next startup.

E28 Wrong object call up
Exit: Send correct path for object. Start path at root.

E29 Wrong value or no value allowed.
Exit: Send correct value or call up new object.

E30 Wrong trigger, this trigger is not allowed or carrying-out of action not possible.
Exit: Send correct trigger (exception: $D) or call up new object.

E31 Command is not possible in active status. Repeat command in inactive status.
Exit: Send new command.

E32 Command is not possible during titration. Repeat command during the conditioning phase or in inactive status.
Exit: Send new command.

E33 Value has been corrected automatically.
Exit: Send new command.

E34 instrument at the end of the titration and sample data is edited; the instrument at rest or editing during filling.
Exit: &m $S.

RS receive errors:

E36 Parity
Exit: <QUIT> and ensure settings of appropriate parameters at both devices are the same.

E37 Framing error
Exit: <QUIT> and ensure settings of appropriate parameters at both devices are the same.

E38 Overrun error. At least 1 character could not be read.
Exit: <QUIT>

E39 The internal working-off buffer of the instrumentis full (>82 characters).
Exit: <QUIT>

RS send errors:

E42 CTS=OFF No proper handshake for more than 1 s.
Exit: <QUIT> Is the receiver switched on and ready to receive?

E43 The transmission of the instrumenthas been interrupted with XOFF for at least 6 s.
Exit: Send XON or <QUIT>

E45 The receive buffer of the instrument contains an incomplete command (L_F missing). Sending from the instrumentis therefore blocked.
Exit: Send L_F or <QUIT>.

E120 Overrange of the primary measured value (pH, U, Ipol, Upol or T with MEAS T). The secondary measured value (temperature) may be instable as well.
Exit: Correct error or &m $S.

E121 Measuring point list overflow (more than 500 measuring points).
Exit: The error message disappears on next startup.

E122 EP overflow.
Exit: The error message disappears on next startup or on recalculation.

E123 Missing EP for calculation.
Exit: The error message disappears on next startup or on recalculation.

E124 Number of EP does not correspond with the set windows.
Exit: The error message disappears on next startup or on recalculation.

E125 Missing fix EP for calculation, has not been defined.
Exit: The error message disappears on next startup or on recalculation.

E126 Fix-EP outside of measuring point list.
Exit: The error message disappears on next startup or on recalculation.

E128 No new mean.
Exit: The error message disappears on next startup or on recalculation.

E129 No new common variable, old value remains.
Exit: The error message disappears on next startup or on recalculation.

E130 Wrong sample. For SET, KFT or DOC with preset titration direction the first measured value lies behind the endpoint.
Exit: The error message disappears on next startup.

E131 No EP set for SET, STAT.
Exit: The error message disappears on next startup.

E132 Silo empty and it has been started with open silo or empty silo has been opened.
Exit: Send a silo entry.

E133 Silo full.
Exit: Send new command.

E134 No method. A method, which is required from the silo memory or in TIP, does not exist.
Exit: The error message disappears on next startup.

E135 Check temp.sensor in MEAS T or with activated temperature monitoring. Temp. sensor may not be connected.
Exit: Correct error or &m $S.

E136 Same buffer in CAL. Measured value of the second buffer differs less than 6 mV from the measured value of the first buffer.
Exit: Rectify error or &m $S.

E137 XXX Bytes are missing so that the method, the silo line could not be stored or not enough RAM for running TIP.
Exit: Send new command.

E149 Rate missing for calculation.
Exit: The error message disappears on next start or on recalculation.

E150 Number of rates does not agree with the set windows or the mean rate C80 could not be calculated.
Exit: The error message disappears on next start or on recalculation.

E151 Fix volume missing for calculation.
Exit: The error message disappears on next startup or on recalculation.

E155 No new silo result (C24 or C25).
Exit: The error message disappears on next start or on recalculation.

E157 No sequence defined in TIP.
Exit. The error message disappears on next start.

E158 A second TIP has been called up in TIP.
Exit: The error message disappears on next start.

E160 No new temporary variable.
Exit: The error message disappears on next start.

E161 Measurement range of the secondary measured value (temperature) exceeded. The primary measured value (pH, U, Ipol, Upol) can also be unstable.
Exit: Rectify error or &m $S.

E162 No ramp end set in DOC.
Exit: The error message disappears on next start or &m $S.

E166 Save lines is "OFF" although a submethod of TIP includes an assignment to C24 or C25.
Exit: The error message disappears on next start. Attention: The data of this sample will not be stored.

E167 Rate too high in DOS. No dispensing possible with the Exchange Unit currently mounted.
Exit: The error message disappears on next start or &m $S.

E170 Fix time missing for calculation.
Exit: The error message disappears on next start or on recalculation.

E171 Rate too low in DOS. No dispensing possible with the Exchange Unit currently mounted.
Exit: The error message disappears on next start or &m $S.

E172 In TIP or DOS a QuickMeas was started, without defining a measuring quantity.
Exit: The error message disappears on next start or &Mode.QuickMeas $S.

E173 The warning interval of the internal buret D0 called.
Exit: Execute prep &a.b.p $G or start next method.

E174 The warning interval of the external buret D1 called.
Exit: Execute prep &a.b.p $G or start next method.

E175 The warning interval of the external buret D2 called.
Exit: Execute prep &a.b.p $G or start next method.

E176 The function &Assembly.Buret.Prep or &Assembly.Buret.Empty was interrupted manually.
Exit. The error message disappears on next start.

E177	Accessing to the memory card, the card was not (properly) inserted. Exit. The error message disappears on next start.
E178	The date of changing the battery of the card is expired. Exit. The error message disappears on next start.
E180	Memory card write-protected. Exit: Send new command.
E181	Memory card not formatted. Exit: Send new command.
E182	Memory card not accessible. Exit: Send new command.
E183	A directory with the same name exists already on the memory card. Exit: Send new command.
E184	Measured value below lower limit. Exit: The error message disappears when again within the limits or &m $S.
E185	Measured value above upper limit. Exit: The error message disappears when again within the limits or &m $S.
E186	Temperature below lower limit. Exit: The error message disappears when again within the limits or &m $S.
E187	Temperature above upper limit. Exit: The error message disappears when again within the limits or &m $S.
E188	Rate below lower limit. Exit: The error message disappears when again within the limits or &m $S.
E189	Rate above upper limit. Exit: The error message disappears when again within the limits or &m $S.

2 The 711 Liquino remote control tree

2.1 &Mode – Operating modes

The remote control tree can be divided into the following main branches:

&	**Root**
├ . **M**ode	Method parameters
├ . **C**onfig	Instrument configuration
├ . **I**nfo	Current data
├ . **S**etup	Instrument setup
├ . **U**serMeth	User-defined methods
├ . **A**ssembly	Instrument components
├ . **Cu**rrData	Determination data
└ . **D**iagnosis	Instrument diagnosis

The following table lists all objects of the remote control tree. For the unambiguous designation of the objects, the underlined characters suffice. The meaning of the individual object is described here in brief, for more detailed information please refer to 'Instructions for use'. The default values of the objects are printed in boldface.

Object	*Meaning*	*Entry range/Selection*
&**M**ode	**Mode**	
	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
. **D**IS	**Manual Distribution**	
	Start or stop of the manual distribution.	
. **V**olume	Volume to be distributed	0.0..**1.000**..99999.9; infinite
. **R**ate	Distribution rate	0.001..166.66; **max**
. **S**elect		
. **M**ode	**Selection of operating mode**	**XDOS**; PIP; CONT; SMPL; SEQ; GLP
. **N**ame	Name of current method	read only
. **P**arameter	Parameters depend on the selected mode, see above.	
*		

The structure of the **&M**ode.**P**arameter sub-branch depends on the selected operation mode (**&M**ode.**S**elect.**M**ode). Changing the operation mode (**XDOS**, **PIP**, **CONT**, **SEQ**, **GLP**) or loading a method modifies the **&M**ode.**P**arameter sub-branch. A method (that can be saved or loaded at will)consists of the entire **&M**ode.**P**arameter sub-branch of the remote control tree.

2.1.1 XDOS – Extended Dosing

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
. Parameter		
. DosPara	**Dosing parameters**	
. Type	Selection of given parameters	**volume&rate**; volume&time; time&rate
. Volume	Volume to be distributed	0.0..**1.0**..99999.9 mL; infinite
. Time	Dosing duration	00:00:01..99:59:59 (hh:mm:ss)
. Rate	Feeding rate	0.001..166.66 mL/min ; **max**
. TempMeas	Temperature measuring	on; **off**
. TDelta	Measuring interval	00:00:01..99:59:59 (hh:mm:ss)
. FillRate	Filling rate	0.001..166.66 mL/min ; **max**
. AutoFill	Automatic filling of empty burets	**on**; off
. Burets	**Buret setup**	
. Setup	Use of one or two burets	**single**; tandem
. Buret1	**Buret 1**	
. Drive	Drive address of first buret	**DOS1**; DOS2; DOS3; DOS4
. DUid	Descriptive name of dosing unit	8 ASCII characters
. PortUse	Type of tubing	**default**; custom
. PortSpec	**Port Specifications**	
. FeedPort	Feeding port (outlet)	**1**..4
. FillPort	Filling port (inlet)	1..**2**..4
. WastePort	Waste port (outlet)	1..**4**
. Buret2	**Buret 2**	
. Drive	Drive address of second buret	DOS1; **DOS2**; DOS3; DOS4
. DUid	Descriptive name of dosing unit	8 ASCII characters
. PortUse	Type of tubing	**default**; custom
. PortSpec	**Port Specifications**	
. FeedPort	Feeding port (outlet)	**1**..4
. FillPort	Filling port (inlet)	1..**2**..4
. WastePort	Waste port (outlet)	1..**4**
. Monitoring	**Monitoring functions**	
. Temp	Temperature monitoring affects the remote output lines according to the selection of the ...**A**larmPins node. (upper limit reached=output 1 active, lower limit reached=output 2 active)	
. Status	**Temperature monitoring**	on; **off**
. LowLim	Lower temperature limit	**-70.0**..200.0 °C
. UpLim	Upper temperature limit	-70.0..**200.0 °C**
. Action	Action if limit is violated	**none**; stop; hold; wait
. AlarmPins	Condition for alarm pin activation	**none**; under; over; all
. Volume	The volume monitoring effects halting of a running method, when the given volume limit is reached.	
. Status	**Volume monitoring**	on; **off**
. CritVol	Volume limit	0.0..**10000.0**..99999.9

. **P**resel	**Preselections**	
. **I**Req	Requests at method start	**off**; id1; id1&2; all
. **P**rompts		
. **I**d1	Request prompt for ID1	14 ASCII characters
. **Id2**	Request prompt for ID2	14 ASCII characters
. **Id3**	Request prompt for ID3	14 ASCII characters
. **Pa**use	Start delay	**00:00:00**..99:59:59 (hh:mm:ss)
. **R**eports	**Report definitions**	
. **T**AutoScale	Autoscaling of temperature curve	**on**; off
. **S**Low	Lower limit of temperature scale	**-70**..200
. **SH**igh	Upper limit of temperature scale	-70..**200**
. **1**		
. **S**elect	Selection of report type	**off**; result; parameter; curve; V-list; T-list; comb. list; ff
:		
. **8**		
. **S**elect		

2.1.2 PIP – Pipetting

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
└ Parameter		
├ PipPara	**Pipetting parameters**	
│ ├ PipVol	Sample volume to be pipetted	0.050..**1.000**…10.000 mL
│ ├ DilVol	Solvent volume for dilution	**0.000**..99.999 mL
│ └ AirGap	Air gap length	5..**10**..100 mm
├ Buret	**Buret setup**	
│ ├ Drive	Drive address	**DOS1**; DOS2; DOS3; DOS4
│ ├ DUid	Descriptive name of dosing unit	8 ASCII characters
│ ├ PortUse	Type of tubing	**default**; custom
│ └ PortSpec	**Port Specifications**	
│ ├ FeedPort	Feeding port (outlet)	**1**..4
│ ├ FillPort	Filling port (inlet)	1..**2**..4
│ └ WastePort	Waste port (outlet)	1..**4**
├ Rates	**Pipetting rates**	
│ ├ FeedRate	Feeding rate	0.001..166.66 mL/min; **max**
│ └ FillRate	Filling rate	0.001..166.66 mL/min; **max**
├ Presel	**Preselections**	
│ └ VReq	Volume request	**off**; on
└ Reports	**Report definitions**	
├ 1		
│ └ Select	Selection of report type	**off**; result; parameter; ff
:		
└ 3		
└ Select		

2.1.3 CONT – Preparation of standard solutions

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
└ . Parameter		
├ . ContPara	**Parameters for CONT-Mode**	
│ ├ . Type	Type of solution preparation	**subst.conc**; mass conc.; mass fraction; volume fraction
│ ├ . Unit	Unit of concentration	**Mol/L**; ppm; g/L; %
│ ├ . Content	Target concentration	0.001..**1.0**..9999.9
│ ├ . TargetVol	Target volume	0.01..**10.0**..9999
│ ├ . Standard	Concentration of the source solution	0.001..**1.0**..9999.9
│ ├ . Factor	Correction factor	0.000001..**1.0**..999999.0
│ ├ . MolarMass	Molar mass of the dissolved substance	0.0001..**1.0**..999999
│ └ . Density	Density of the solvent	0.1..**1.0**..99.9999 g/mL
├ . Buret	**Buret setup**	
│ ├ . Drive	Drive address	**DOS1**; DOS2; DOS3; DOS4
│ ├ . DUid	Descriptive name of dosing unit	read only
│ ├ . PortUse	Type of tubing	**default**; custom
│ └ . PortSpec	**Port Specifications**	
│ ├ . FeedPort	Feeding port (outlet)	**1**..4
│ ├ . FillPort	Filling port (inlet)	1..**2**..4
│ └ . WastePort	Waste port (outlet)	1..**4**
├ . Rates	**Distribution rates**	
│ ├ . FeedRate	Feeding rate	0.001..166.66 mL/min; **max**
│ └ . FillRate	Filling rate	0.001..166.66 mL/min; **max**
├ . Presel	**Preselections**	
│ ├ . IReq	Requests at method start	**off**; id1; id1&2; all
│ ├ . SReq	Sample weight request	off; **on**
│ ├ . CntReq	Target content request	off; **on**
│ └ . Prompts		
│ ├ . Id1	Request prompt for ID1	14 ASCII characters
│ ├ . Id2	Request prompt for ID2	14 ASCII characters
│ └ . Id3	Request prompt for ID3	14 ASCII characters
└ . Reports	**Report definitions**	
├ . 1		
│ └ . Select	Selection of report type	**off**; result;parameter; ff
:		
└ . 3		
└ . Select		

2.1.4 SMPL - Sampling mode

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
└ Parameter		
├ SmplPara	**Sampling parameters**	
│ ├ NumSamples	Number of samples to be processed	**1**..99999; infinite
│ ├ SMPLmode	Manual or automated operation	**manual**; auto
│ └ IntervalT	Interval time between each sample	00:00:00..99:59:59 (hh:mm:ss)
├ Sampling	**Sampling operation**	
│ ├ SMPLVol	Sample volume	0.001..**10.0**..50.0 mL
│ ├ SolvVol	Solvent volume for sample dilution	0.001..**10.0**..50.0 mL
│ ├ SmplRinseVol	Rinsing volume of sample solution	0.001..**10.0**..50.0 mL
│ ├ SmplRinseRep	Repetitions of sample rinsing	1..**3**..10
│ ├ SmplAspRate	Aspiration rate of sample solution	0.001..166.66 mL/min; **max**
│ ├ SmplDosRate	Dosing rate of sample solution	0.001..166.66 mL/min; **max**
│ ├ SolvFillRate	Filling rate of solvent aspiration	0.001..166.66 mL/min; **max**
│ └ AirgapLen	Air gap length	1..**10**..100 mm
├ CellRinsing	**Measuring cell rinsing**	
│ ├ PumpExt	**Use of external pumps for rinsing the cell**	on; **off**
│ ├ SolvRinseRep	Repetitions of solvent rinsing	1..**3**..10
│ ├ External	External pumps settings	
│ │ ├ RinseTime	Duration of cell rinsing (solvent distribution)	00:00:00..99:59:59 (hh:mm:ss)
│ │ └ AspTime	Duration of cell emptying (solvent aspiration)	00:00:00..99:59:59 (hh:mm:ss)
│ └ Internal	**Settings for rinsing without external pumps**	
│ ├ WasteAspVol	Solvent aspiration volume (emptying)	0.1..**10**..500 mL
│ ├ WasteAspRate	Aspiration rate	0.001..166.66 mL/min **max**
│ ├ SolvRinseVol	Solvent rinsing volume (distribution)	0.1..**50**..250 mL
│ └ SolvDosRate	Distribution rate	0.001..166.66 mL/min ; **max**
├ Burets	**Buret setup**	
│ ├ SmplDUid	Descriptive name of dosing unit (DOS1)	8 ASCII characters
│ ├ BeforeSmpl	**Dosing of auxiliar solution before sample distribution**	
│ │ ├ 1		
│ : ├ Drive	Drive address	**off**; DOS2; DOS3; DOS4
│ ├ DUid	Identification of dosing unit	8 ASCII characters
│ ├ DosVol	Volume of auxiliar solution	0.0001..**1.0**..99999.9 mL
│ ├ FeedRate	Feeding rate	0.001..166.66 mL/min; **max**
│ └ FillRate	Filling rate	0.001..166.66 mL/min; **max**
│ └ WaitT	Waiting time after dosing	**00:00:00**..99:59:59 (hh:mm:ss)
│ :		

. 3		
. Drive	..	..
:	..	..
. FillRate	..	..
. WaitT	..	..
. AfterSmpl	**Dosing of aux. solution after sample distribution**	
. 1		
. Drive	Drive address	**off**; DOS2; DOS3; DOS4
. DUid	Descriptive name of dosing unit	8 ASCII characters
. DosVol	Volume of auxiliar solution	0.0001..**1.0**..99999.9 mL
. FeedRate	Feeding rate	0.001..166.66 mL/min; **max**
. FillRate	Filling rate	0.001..166.66 mL/min; **max**
. WaitT	Waiting time after dosing	00:00:00..99:59:59 (hh:mm:ss)
:		
. 3		
. Drive	..	..
:	..	..
. FillRate	..	..
. WaitT	..	..
. AutoCtrl	**Control of external instruments**	
. SmplCtrl	Use of a 730 Sample Changer	**off**; on
. OnSmplCtrl	**Sample Changer controls**	
. StartSmplChng	Interface for Sample changer remote control	**remote**; RS
. RSstartStr	Text string for starting the Sample Changer via RS232	Default: &M;$G
. AwaitAck	Interface for Sample changer acknowledgement	remote; RS; **off**
. RSawaitStr	Acknowledge string to receive	Default: * (= any characters)
. ExtDevice	Use of an external device	on; **off**
. OnExtDev	**Control of a measuring or titration instrument**	
. StartExtDev	Interface for starting the external device	**remote**; RS; off
. RSstartStr	Command string for starting via RS232	Default: &M;$G
. AwaitAck	Interface for external device acknowledgement	remote; RS ;**off**
. RSawaitStr	Acknowledge string to receive	Default: * (= any characters)
. Presel	**Preselections**	
. IReq	Requests at method start	**off**; id1; id1&2; all
. Prompts		
. Id1	Request prompt for ID1	14 ASCII characters
. Id2	Request prompt for ID2	14 ASCII characters
. Id3	Request prompt for ID3	14 ASCII characters
. Reports	**Report definitions**	
. 1		
: . Select	Selection of report type	**off**; result; parameter; ff
. 3		
. Select		

2.1.5 SEQ - Sequence Mode

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
└ . Parameter		
├ . Sequence	**Sequence parameters**	
│ ├ . AutoStart	Number of sequences to be executed	1..99999, infinite
│ ├ . 1	**Sequence node**	
│ : ├ . Select	Command selection	**NO OPERATION**; METHOD; PAUSE; TIMER; SCAN; CONTROL; ENDSEQ
│ :		
│		
│ :		
│ └ . 75	*Up to 75 nodes can make up a sequence. Each sequence node carries one of the following commands or child-nodes respectively. The content of the '**S**elect'-node determines the command and its parameters.*	
│ ├ . Select		
: :		
:		
└ . Method	**Method to be executed**	
└ . Name	Method name	8 ASCII characters
:		
└ . Pause	**Sequence delay**	
└ . Time	Waiting time before continuation of the sequence	hh:mm:ss
:		
└ . Timer	**Timer function**	
├ . Date	Date for continuation of the sequence	YYYY-MM-DD
└ . Time	Time for continuation of the sequence	hh:mm:ss
:		
└ . Scan	**Interface scan**	
├ . Address	Interface address	**Remote**; RS
├ . Pattern	Bit pattern for Remote scan	5 bits (1, 0 or ∗)
└ . String	Text string for RS232 scan	..15 ASCII characters Default: ∗ (= any characters)
:		
└ . Ctrl	**Output data or signals**	
├ . Address	Interface address	**Remote**; RS
├ . Pattern	Bit pattern for setting the Remote lines	4 bits (1, 0 or ∗)
└ . String	String to be sent via RS232 interface	15 ASCII characters

Example of a single command in a sequence:

```
: :
│ ├ . 5                    — Step 5 of the sequence
: : ├ . Select"METHOD"      — Command selection
    └ . Method
      └ . Name"Chloride"    — Method name
```

:		
├ . **P**resel	**Preselections**	
│ ├ . **I**Req	Requests at method start	**off**; id1; id1&2; all
│ └ . **P**rompts		
│ ├ . **I**d1	Request prompt for ID1	8 ASCII characters
│ ├ . **Id2**	Request prompt for ID2	8 ASCII characters
│ └ . **Id3**	Request prompt for ID3	8 ASCII characters
│		
└ . **R**eports	**Report definitions**	
├ . **1**		
: └ . **S**elect	Selection of report type	**off**; parameter; ff
└ . **2**		
└ . **S**elect		

2.1.6 GLP - Dosing test mode

Object	*Meaning*	*Entry range/Selection*
&Mode	**Mode**	
:	Start, stop or hold of the current method. Interrupted methods may be continued.	$G; $S; $H; $C
*		
└ .Parameter		
├ .GlpPara	**Dosing test parameters**	
│ ├ .Drive	Drive address	**DOS1**; DOS2; DOS3; DOS4
│ ├ .DUid	Descriptive name of dosing unit	8 ASCII characters
│ ├ .PortUse	Type of tubing	**default**; custom
│ ├ .PortSpec	**Port Specifications**	
│ │ ├ .FeedPort	Feeding port (outlet)	**1**..4
│ │ ├ .FillPort	Filling port (inlet)	1..**2**..4
│ │ └ .WastePort	Waste port (outlet)	1..**4**
│ └ .LiqTemp	Temperature of the distributed liquid	-70.0..**20.0**..200.0
│		
├ .Options	**Dosing options**	
│ ├ .Liquid	Type of liquid	**water**; other
│ ├ .OtherLiq	Settings for non-aqueous liquids	
│ │ ├ .Name	Name of liquid	13 ASCII characters
│ │ ├ .Density	Density of the liquid	0.01..**1.0**..20.0 g/L
│ │ ├ .FeedRate	Feeding rate	0.001..166.66 mL/min; **max**
│ │ └ .FillRate	Filling rate	0.001..166.66 mL/min; **max**
│ ├ .WeightFrom	Sample weight input by	**balance**; keyboard
│ └ .BalID	Balance identification	8 ASCII characters
│		
├ .Presel	**Preselections**	
│ ├ .IReq	Requests at method start	off; id1; id1&2; **all**
│ └ .Prompts		
│ ├ .Id1	Request prompt for ID1	read only
│ ├ .Id2	Request prompt for ID2	read only
│ └ .Id3	Request prompt for ID3	read only
│		
└ .Reports	**Report definitions**	
├ .1		
: └ .Select	Selection of report type	**off**; result; parameter; curve; detail; ff
└ .7		
└ .Select		

2.2 &Configuration

Object	*Meaning*	*Entry range/Selection*
&Config		
. PeriphUnit	**Settings of peripheral units**	
. CharSet	External printer definition	**IBM**; Epson; Seiko; Citizen; HP DeskJ
. Balance	Selection of balance	**Sartorius**; Mettler; Mettler AT; AND; Precisa
. Aux	**Basic settings**	
. Language	Dialog language	**english**; deutsch
. Set	Date and time setting	$G
. Date	Date	YYYY-MM-DD
. Time	Time	hh:mm:ss
. DevName	Device label	8 ASCII characters
. Prog	Program version	711.011(read only)
. Contrast	Display contrast	0..**3**..7
. Beeper	Beeper	off; **on**
. 1stTimePrep	Automatic PREP warning	off; **on**
. Manual	**Settings for manual operation of the dosing drives**	
. 1	**Drive address (DOS1)**	
. General		
. DosUnit	Identification of the mounted Dosing unit	**default**; any 12 ASCII characters
. FeedTo	Feeding port of the dosing unit	**1**..4
. FillFrom	Filling port of the Dosing unit	1..**2**..4
. FillRate	Filling rate	0.001..166.666 mL/min; **max**
. AutoFill	Automatic filling after distribution	on; **off**
. Dosing	Settings for manual dosing	
. Type	Increasing or constand feeding rate	const;**increasing**
. FeedRate	Nominal feeding rate	0.001..166.666 mL/min;**max**
. Slope	Slope for increasing feeding rate	1..**4**..10
. 4	**Drive address (DOS4)**	
. General	..	
. Slope	..	
. DosUnits	**Configuration of the Dosing units**	
. DUSelect	Selected Dosing unit	12 ASCII characters
. 1	**Number of the Dosing unit**	
. ID	Identification of the Dosing unit	**default**; any 12 ASCII characters
. Tubes	Tube definitions	
. Len1	Tube length (port 1)	0..**400**..9999 mm
. Dia1	Tube diameter (port 1)	0.1..**2.0**..9.0 mm

:		
. **Len2**	Tube length (port 2)	0..**250**..9999 mm
. **Dia2**	Tube diameter (port 2)	0.1..**2.0**..9.0 mm
. **Len3**	Tube length (port 3)	**0**..9999 mm
. **Dia3**	Tube diameter (port 3)	0.1..**0.0**..9.0 mm
. **Len4**	Tube length (port 4)	**0**..9999 mm
. **Dia4**	Tube diameter (port 4)	0.1..**0**..9.0 mm
. **10**	**Number of the Dosing unit**	
. **I**D	Identification of the Dosing unit	**default**; any 12 ASCII characters
. **T**ubes	Tube definitions	
:	..	
. **R**Sset	**Settings of the RS232 serial interface**	$G
. **B**aud	Baud rate	57600; 38400; 19200; **9600**; 4800; 2400; 1200; 600; 300
. **D**ataBit	Data bits	7; **8**
. **S**topBit	Stop bits	**1**; 2
. **P**arity	Parity	even; odd; **none**
. **H**andsh	Handshake	**Hardware**; SWchar; SWline; none
. **Re**ports	**Configuration of printed reports**	
. **H**eader1	First line of the report header	21 ASCII characters
. **Header2**	Second line of the report header	21 ASCII characters
. **Header3**	Third line of the report header	21 ASCII characters
. **G**LPErrLim	**Configuration of the GLP limits**	
. **2**ml	**Limits for 2 mL-Dosing units**	
. **E**rrMax	Maximum volume error	1..**6**..999 µL
. **S**lope	Maximum slope deviation	0.001..**0.003**..0.1
. **I**nter	Maximum intercept (Y-axis)	1..**6**..99 µL
. **5**ml	**Limits for 5 mL-Dosing units**	
. **E**rrMax	Maximum volume error	1..**15**..999 µL
. **S**lope	Maximum slope deviation	0.001..**0.003**..0.1
. **I**nter	Maximum intercept (Y-axis)	1..**15**..99 µL
. **1**0ml	**Limits for 10 mL-Dosing units**	
. **E**rrMax	Maximum volume error	1..**30**..999 µL
. **S**lope	Maximum slope deviation	0.001..**0.003**..0.1
. **I**nter	Maximum intercept (Y-axis)	1..**20**..99 µL
. **2**0ml	**Limits for 20 mL-Dosing units**	
. **E**rrMax	Maximum volume error	1..**60**..999 µL
. **S**lope	Maximum slope deviation	0.001..**0.003**..0.1
. **I**nter	Maximum intercept (Y-axis)	1..**30**..99 µL
. **50**ml	**Limits for 50 mL-Dosing units**	
. **E**rrMax	Maximum volume error	1..**150**..999 µL
. **S**lope	Maximum slope deviation	0.001..**0.003**..0.1
. **I**nter	Maximum intercept (Y-axis)	1..**50**..99 µL

2.3 &Info - Instrument data

Object	*Meaning*	*Entry range/Selection*
&Info		
. Report	**Report output**	$G
. Select	Report selection	result; parameter; curve: V-list; T-list; comb. list; config; user methods; current dir.; memory card; ff
. ActualInfo	Actual data	
. Buret	**Buret data**	
. 1	**DOS1**	
. Type	Type of dosing device	read only
. State	Drive status	read only
. CylVol	Cylinder volume	read only
. ActVol	Actual volume	read only
. ActPort	Actual port	read only
. LastPistDir	Piston direction	read only
. PistPos	Actual piston position	read only
. 4	**DOS4**	
. Type	..	
. PistPos	..	
. SMPL	**SMPL mode data**	
. Current	Current sample counter	read only
. SEQ	**SEQ mode data**	
. Current	Current sample counter (auto start)	read only
. Inputs	**Remote interface data**	
. Status	Status of input lines	read only
. Outputs	**Remote interface data**	
. Status	Status of the output lines	read only
. Display	**Display content**	
. L1	Display line 1	24 ASCII characters
. L2	Display line 2	24 ASCII characters

2.4 &Setup - Instrument setup

Object	*Meaning*	*Entry range/Selection*
&Setup		
├ . Keycode	Sending of key codes	on; **off**
:		

Code	Key	Code	Key
1	<HOLD / CONTINUE>	16	<7 / DOSING>
2	<STOP>	17	<4 / PREP>
3	<START>	18	<1 / CUR DATA>
4	<CONFIG>	19	<0 / MEM CARD>
5	<PARAM>	20	<HOME>
6	<USER METHOD>	21	<END>
7		22	<CLEAR>
8	<9 / TEMP>	23	<ENTER / YES>
9	<6 / EXCH>	24	<↑>
10	<3 / EMPTY>	25	<↓>
11	<* / MODE>	26	<SELECT / DOS / NR>
12	<8 / DISPENSE>	27	<QUIT / NO>
13	<5 / FILL>	28	<MANUAL / MAN OFF>
14	<2 >	29	<ALPHA>
15	<. / PRINT>	30	<INSERT>
		31	<DELETE>

:	The key code is sent together with a log time which is measured from the power-up of the instrument. Format: Log time (in sec.) - key code

├ . Trace	Message output on changed values	on; **off**
├ . Tree	**Sending format of path info**	
│ ├ . Short	Short format of path info	on; **off**
│ └ . ChangedOnly	Paths of modified values only	on; **off**
├ . Lock	**Locking of key functions**	
│ ├ . Keyboard	Lock all keys	on; **off**
│ ├ . Config	Lock <CONFIG> key	on; **off**
│ ├ . Parameter	Lock <PARAM> key	on; **off**
│ ├ . UserMeth	User method functions	
│ │ ├ . Recall	Lock method loading	on; **off**
│ │ ├ . Store	Lock method storing	on; **off**
│ │ └ . Delete	Lock method deletion	on; **off**
│ └ . Display	Lock display functions	on; **off**
├ . Mode	**Waiting interval settings**	
│ ├ . StartWait	Waiting time after method start	on; **off**
│ └ . FinWait	Waiting time after run	on; **off**
├ . SendMeas	**Automatic sending of measured values**	
│ ├ . Status	Connect/disconnect sending	on; **off**
│ └ . Interval	Time interval of automatic sending	1..**10**..16200 s
:		

:

├ . **A**utoInfo	**Automatic messages on changes**	
│ ├ . **S**tatus	Switch AutoInfo on/off	**on**; off
│ ├ . **P**	Message when power on (R$.Mode.XXXX.Inac)	on; **off**
│ ├ . **E**	Message on error occurrence (!*InstrName*".E;E*xx*")	on; **off**
│ ├ . **W**	Message on warning occurrence	on; **off**
│ ├ . **R**	Messages during a method run	
│ │ ├ . **R**	Message when ready (R$.Mode.XXXX.Inac)	on; **off**
│ │ ├ . **G**	Message when method started (!*InstrName*".R.G")	on; **off**
│ │ ├ . **S**	Message when method stopped (!*InstrName*".R.S")	on; **off**
│ │ ├ . **H**	Message when method in "hold" state (....."."R.H")	on; **off**
│ │ ├ . **C**	Message when Method continued (....."."R.C")	on; **off**
│ │ ├ . **Re**	Message when request activ (....."."R.Re")	on; **off**
│ │ ├ . **M**b	Message when manual mode entered (....."."R.Mb")	on; **off**
│ │ ├ . **Me**	Message when manual mode ended (....."."R.Me")	on; **off**
│ │ ├ . **GC**	Message start command received (....."."R.GC")	on; **off**
│ │ └ . **F**	Message when method finished (....."."R.F")	on; **off**
│ ├ . **I**	Message when Input lines changed (....."."R.F")	on; **off**
│ └ . **O**	Message when output lines changed (....."."R.F")	on; **off**
│		
├ . **G**raphics	**Settings of curve output**	
│ ├ . **W**idth	Width of the curve depending on page width	0.30..**0.5**..1.00
│ └ . **H**eight	Height of the curve depending on page height	0.30..**0.5**..1.00
│		
├ . **P**owerOn	RESET (Power on)	$G
│		
├ . **I**nitialize	Memory initialization	$G
│ └ . **S**elect	Selection of the tree branch	**all**; param; config; user meth; setup;assembly
│		
├ . **R**amInit	Initialization of the working memory	$G
│		
└ . **Ins**trNo	Device identification	$G
└ . **V**alue	Name of the device	8 ASCII characters

2.5 &UserMeth - user defined methods

Object	*Meaning*	*Entry range/Selection*
&UserMeth	**File operations**	
├ .FreeMem	Memory available	read only
├ .Recall	**Loading of methods**	$G
│ └ .Name	Method name	8 ASCII characters
├ .Store	**Saving of methods**	$G
│ └ .Name	Method name	8 ASCII characters
├ .Delete	**Deleting of methods**	$G
│ └ .Name	Method name	8 ASCII characters
├ .DelAll	**Deleting of all methods**	$G
└ .List	**List of stored methods**	
├ .1		
: ├ .Name	Method name	read only
├ .Mode	Mode	read only
├ .Bytes	Method size in bytes	read only
└ .Checksum	Checksum of method	read only
:		
└ .x	up to x methods, depending on memory available	
├ .Name	..	..
:		
└ .Checksum	..	..

Remark on file operations

First set the file names (node: `.Name`), then send the trigger $G for the corresponding function:.

Example: Loading a method

```
&U.R.N"Chloride"
&U.R;$G
```

2.6 &Assembly - Instrument components

Object	*Meaning*	*Entry range/Selection*
&Assembly		
. Drive	**Drive address**	**1**..4
. DosingUnit	Identification of Dosing unit	12 ASCII characters
. Rates	**Rates of the dosing drive**	
. Forward	Forward rates	
. Select	Type of rate control	**digital**; waitticks
. Digital	Digital rate	0.001..166.666 mL/min; **max**
. Waitticks	Rate in wait ticks	**225**..65535
. Reverse	Reverse rates	
. Select	Type of rate control	**digital**; waitticks
. Digital	Digital rate	0.001..166.666 mL/min; **max**
. Waitticks	Rate in wait ticks	**225**..65535
. CompiledSteps	**Compiled buret functions**	
. Dos	**Dosing**	$G; $S; $H
. Volume	Volume to be distributed	**0.0**..99999.9 mL
. FillFrom	Filling port (inlet)	1..**2**..4
. FeedTo	Dosing port (outlet)	**1**..4
. Fill	**Buret filling**	$G; $S; $H
. FillFrom	Filling port (inlet)	1..**2**..4
. ExchPos	**Stopcock to exchange position**	$G; $S; $H
. FillFrom	Filling port (inlet)	1..**2**..4
. Prep	**PREP function**	$G; $S; $H
. Waste	Waste port	**1**..4
. FillFrom	Filling port (inlet)	1..**2**..4
. Empty	**Buret emptying**	$G; $S; $H
. ToPort	Empty port (outlet)	**1**..4
. BasicSteps	**Basic buret functions**	
	Use these functions with great care. Improper use of the piston functions may lead to hardware damage of the dosing unit or the dosing drive.	
. Cock	**Stopcock positioning**	$G
. Pos	Target port	**1**..4
. Dir	Direction of stopcock rotation	**desc**; asc
. GoPos	**Piston positioning**	$G; $S; $H
. Pos	Target position	**0**..10000 pulses
. MoveRel	**Relative piston positioning**	$G; $S; $H
. Delta	Number of pulses to move the piston	-50.0..**0**..50.0
. ToEnd	**Stopcock to end position**	$G; $S; $H
. ZeroAdjust	**Zero adjustment**	$G; $S; $H
:		

: ├ . **T**emp	**Temperature read-out**	read only
│ └ . **O**utputs		
├ . **S**etLines	**Setting the output lines (Remote socket)**	$G
│ ├ . **L**1	Line 1 = output 0	**off**; active; inactive
│ ├ . **L2**	Line 2 = output 1	**off**; active; inactive
│ ├ . **L3**	Line 3 = output 2	**off**; active; inactive
│ ├ . **L4**	Line 4 = output 3	**off**; active; inactive
│ ├ . **L5**	Line 5 = output 4	**off**; active; inactive
│ ├ . **L6**	Line 6 = output 5	**off**; active; inactive
│ ├ . **L7**	Line 7 = output 6	**off**; active; inactive
│ └ . **L8**	Line 8 = output 7	**off**; active; inactive
└ . **R**esetLines	**Reset all output lines**	$G

How to use the remote output lines

During the run of a single mode (XDOS, SMPL, PIP, CONT, GLP) the remote output lines will be set automatically to indicate the instrument status.
In a sequence run (SEQ mode) the remote output lines may be set via the CONTROL command or by remote access via the RS232 interface.
One can set the output lines separately. First define the line status of any line (nodes **&A**ssembly**.O**utputs**.S**etLines.**L**x), then set the status of all lines by sending the trigger '**&A**ssembly**.O**utputs**.S**etLines; $G'.
The selections of the output lines are:

off	lock the current line status
active	set line active (1)
inactive	reset line to inactive (0)

Locked lines (selection: *off*) are not affected by the trigger '...**S**etLines;$G'.

The trigger '**&A**ssembly**.O**utputs**.R**esetLines;$G' resets all output lines (even locked lines) to inactive.

2.7 &MemoryCard - File operations

&MemoryCard		
.Recall	Loading of methods	$G
.Name	Method name	8 ASCII characters
.Store	Saving of methods	$G
.Name	Method name	8 ASCII characters
.Delete	Deleting of methods	$G
.Name	Method name	8 ASCII characters
.ChangeDir	**Change directory**	$G
.Name	Directory name	10 ASCII characters
.Checksum	Checksum of directory	$G
.Value	Checksum value	read only
.CreateDir	Create directory	$G
.Name	Directory name	10 ASCII characters
.DelDir	Delete directory	$G
.Name	Directory name	10 ASCII characters
.Backup	Backup of internal memory	$G
.Name	Directory name	10 ASCII characters
.Reload	Reload backup from card	$G
.Name	Directory name	10 ASCII characters
.Format	Formatting the card	$G
.CardLabel		
.Name	Card label	8 ASCII characters
.FreeMem	Memory available	read only
.BatteryChange	Setting the date for next battery change	$G
.Date	Date	YYYY:MM:DD
.List	**Lists of directories**	
.Card	Content of the memory card	
.1	First directory	
.Name	Directory name	read only
.Bytes	Directory size in bytes	read only
:		
.x	Last directory	
.Name	Directory name	read only
.Bytes	Directory size in bytes	read only
.ActDir	**Content of the current directory**	
.1		
.Name	Directory name	read only
.Mode	Mode	read only
.Bytes	File size in bytes	read only
.Checksum	Checksum of method	read only
.x		
:		

2.8 &CurrData - Identifications for a determination

&CurrData		
. Id1	Identification 1	8 ASCII characters
. Id2	Identification 2	8 ASCII characters
. Id3	Identification 3	8 ASCII characters
. Smpl	Sample size (CONT mode only)	0.00001..1.000..1000.000
. Cnt	Content (CONT mode only)	0.001..1.000..9999.9

2.9 &Diagnose - Instrument diagnosis

&Diagnose		
. Init	**RAM initialization**	$G
. Select	Selection of memory range to initialize	**all**, param, config, user meth, setup, assembly
. RamTest	RAM integrity test	$G
. LcdTest	Display test	$G, $S
. ContrastTest	Display contrast test	$G, $S
. KeyTest	Keyboard test	$G, $S
. IoTest	Remote socket test	$G
. RsTest	RS232 interface test	$G
. EbusTest	Dosino interface test	$G
. BeeperTest	Beeper test	$G, $S
. CardTest	Memory card test	$G
. CardIfTest	Memory card interface test	$G
. Dosino	Dosino test	$G, $S
. TempAdjust	Temperatur measuring test	$G
. SimulateKey	Keycode simulation	1..31, see page 14
. PowerOn	'Power on' simulation	$G
. InstrNo	Instrument number	not accessible via RS232 interface

3 Properties of the RS 232 Interface

3.3 Data Transfer Protocol

Metrohm instruments are configured as DTE (Data Terminal Equipment).

The RS 232 interface has the following technical specifications:

- Data interface according to the RS 232C standard, adjustable transfer parameters, see pages 8 and 154.
- Max. line length: 512 characters
- Control characters: C_R (ASCII DEC 13)
  L_F (ASCII DEC 10)
  XON (ASCII DEC 17)
  XOFF (ASCII DEC 19)
- Cable length: max. 15 m

Start	7 or 8 Data Bit	Parity Bit	1 or 2 Stop Bit

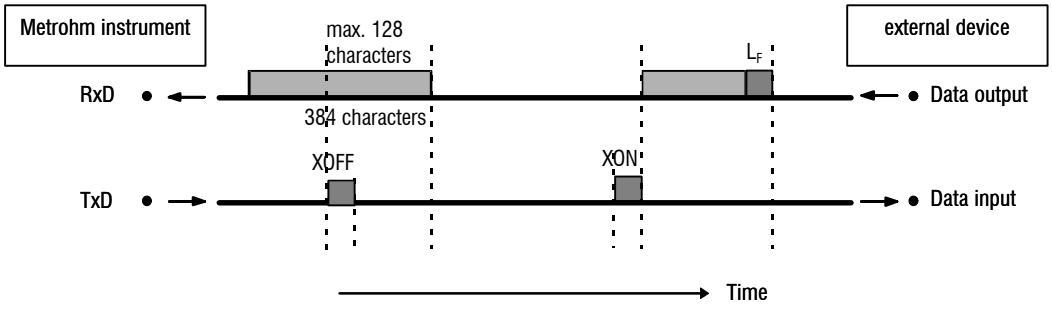
Only a shielded data cable (for example, METROHM D.104.0201) may be used to couple Metrohm instruments with foreign devices. The cable shield must be properly grounded on both instruments (pay attention to current loops; always ground in a star-head formation). Only plugs with sufficient shielding may be used (for example, METROHM K.210.0381 with K.210.9045).

3.4 Handshake

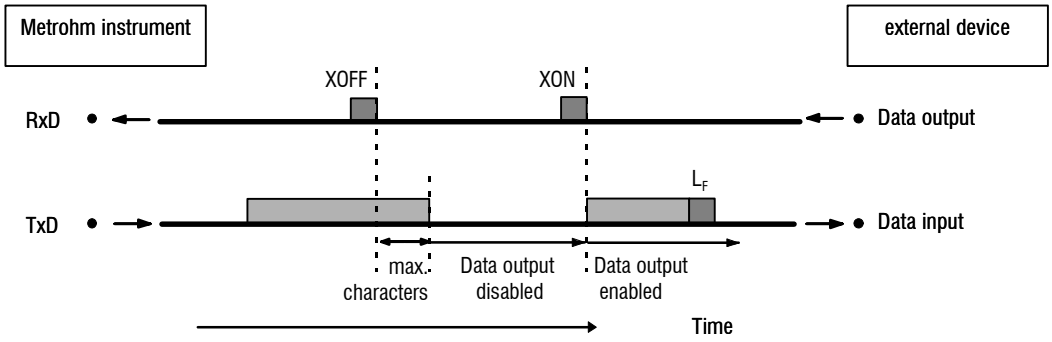
Software-Handshake, SWchar

Handshake inputs on the instrument (CTS) are not checked.
Handshake outputs (DTR, RTS) are set by the instrument.
The instrument sends XOFF when its input buffer contains 384 characters. After this it can receive 128 extra characters (including L_F).

Metrohm instruments as Receiver :



Metrohm instrument as Sender :

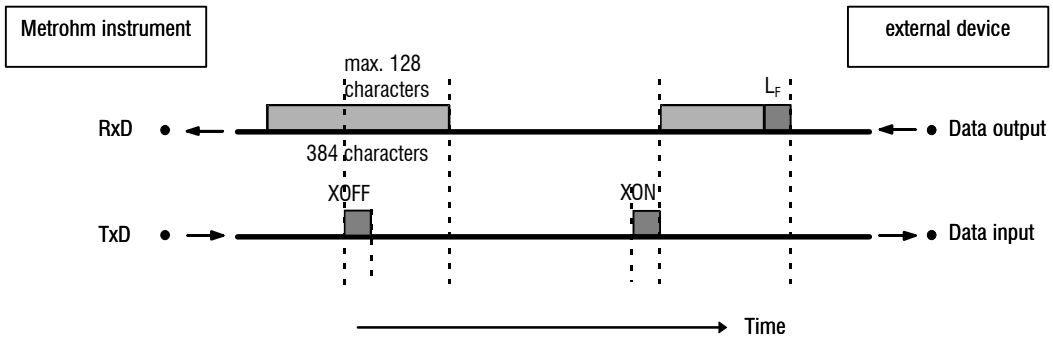


max. characters: 2 characters at 300...9600 baud
16 characters at ≥ 19200 baud

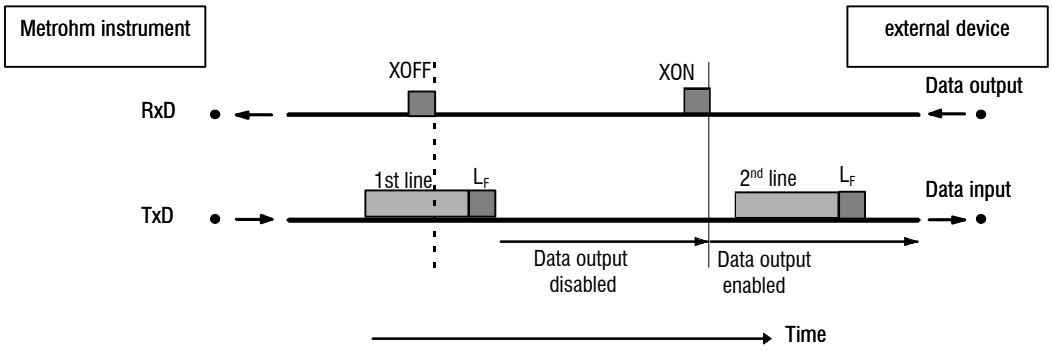
Software-Handshake, SWline

Handshake input ports on the instrument (CTS) are not checked.
Handshake output ports (DTR, RTS) are set by the instrument.
The instrument has an input buffer which can accept up to 512 characters.

Metrohm instrument as Receiver :



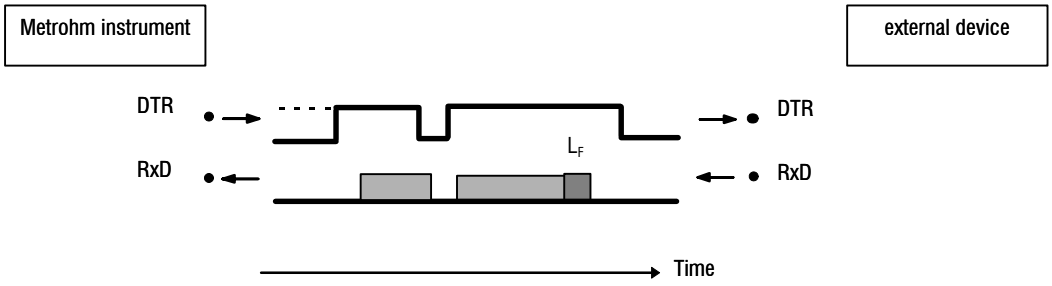
Metrohm instrument as Sender:



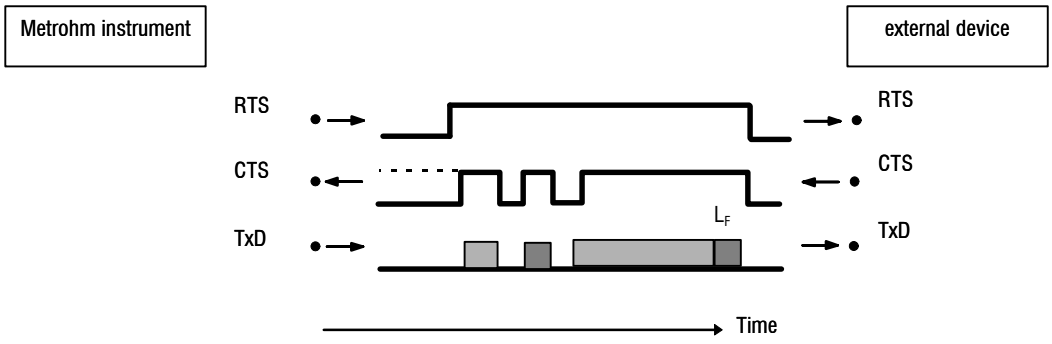
The instrument's transmission can be stopped by the external device with XOFF. After XOFF is received the Metrohm instrument completes sending the line already started. If data output is disabled for more than 6 s by XOFF, E43 appears in the display.

Hardware-Handshake, HWs

Metrohm instrument as Receiver :



Metrohm instrument as Sender:



The data flow can be interrupted by deactivating the CTS line.

3.5 Pin Assignment

RS232C Interface

Transmitted Data (TxD).
If no data are transmitted, the line is held in the “ON” condition. Data will only be sent when CTS is in the ”ON” condition.

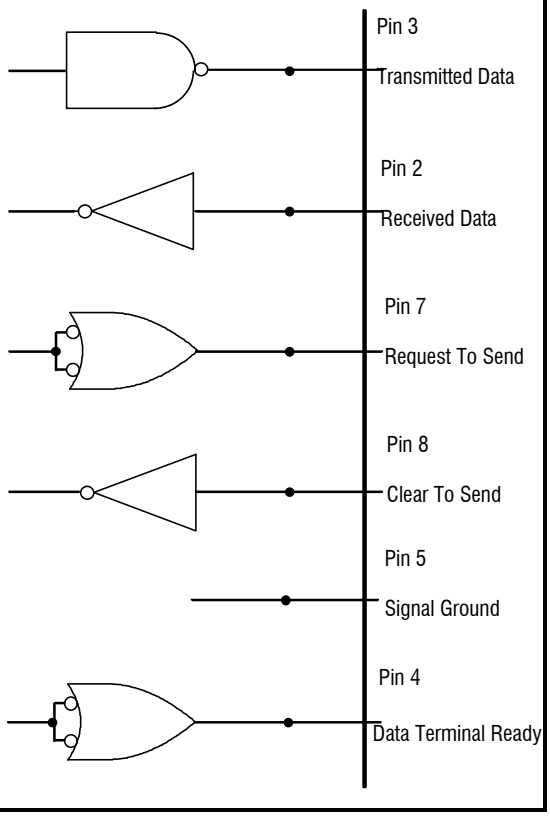
Received Data (RxD)

Request to Send (RTS)
ON condition: instrument is ready to send data.

Clear to Send (CTS)
ON condition: Remote station is ready to receive data.

Signal ground (GND)

Data Terminal Ready (DTR)
ON condition: Instrument is ready to receive data.



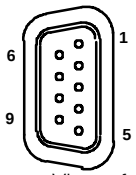
Protective earthing
Direct connection from cable plug to the protective ground of the instrument.

Polarity allocation of the signals
- Data lines (TxD, RxD)
  voltage negative (<-3 V): signal state ”ON”
  voltage positive (>+3 V): signal state ”ZERO”
- control or message lines (CTS, RTS, DTR)
  voltage negative (<-3 V): OFF state
  voltage positive (>+3 V): ON state

In the transitional range from +3 V to -3 V the signal state is undefined.

Driver 14C88 according to EIA RS 232C specification
Receiver 14C89 " "

Contact arrangement at plug (female) for RS 232C socket (male)



View of soldered side of plug

Ordering numbers:
K.210.0381 and K.210.9045

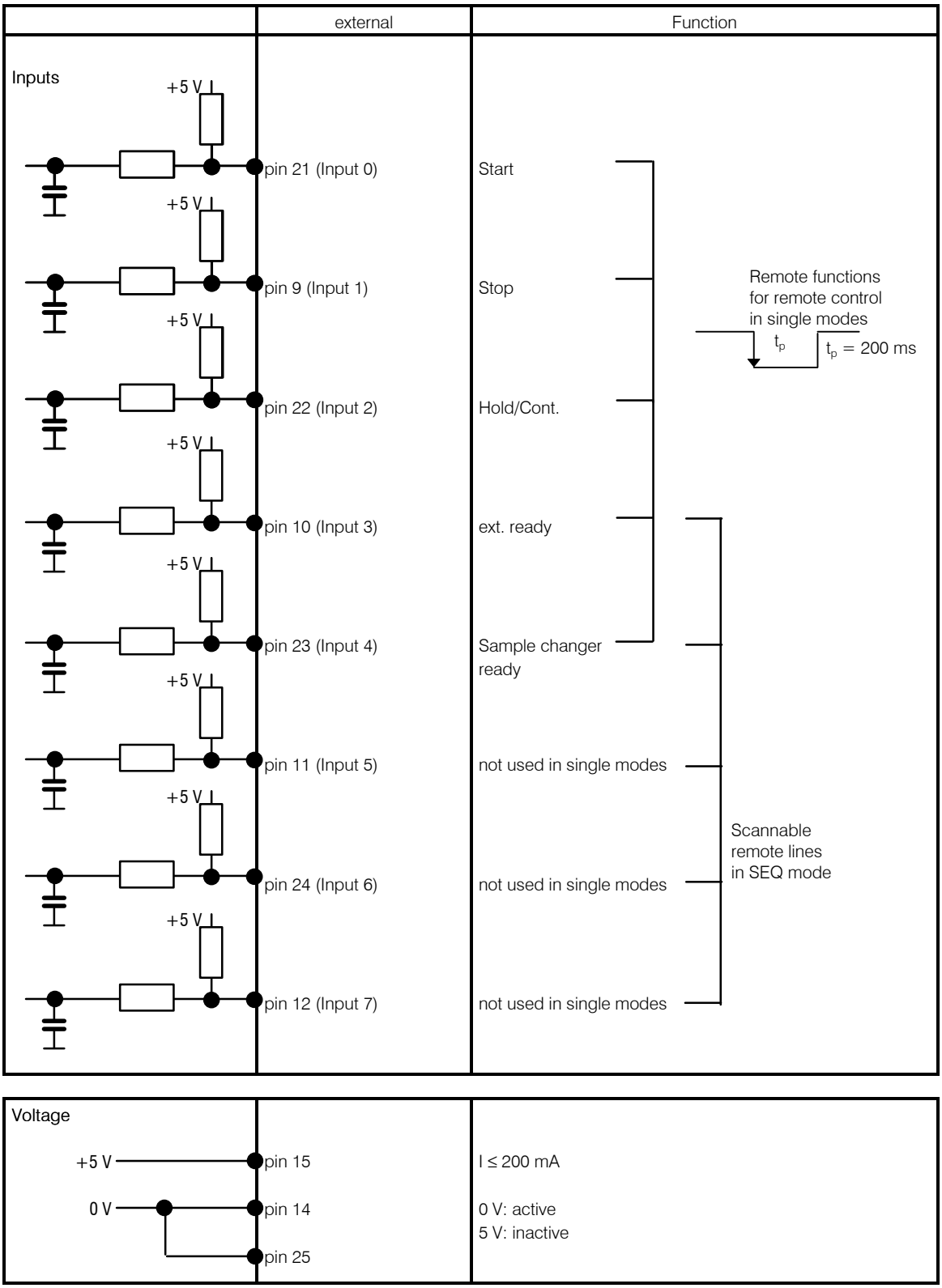
No liability whatsoever will be accepted for damage or injury caused by improper interconnection of instruments.

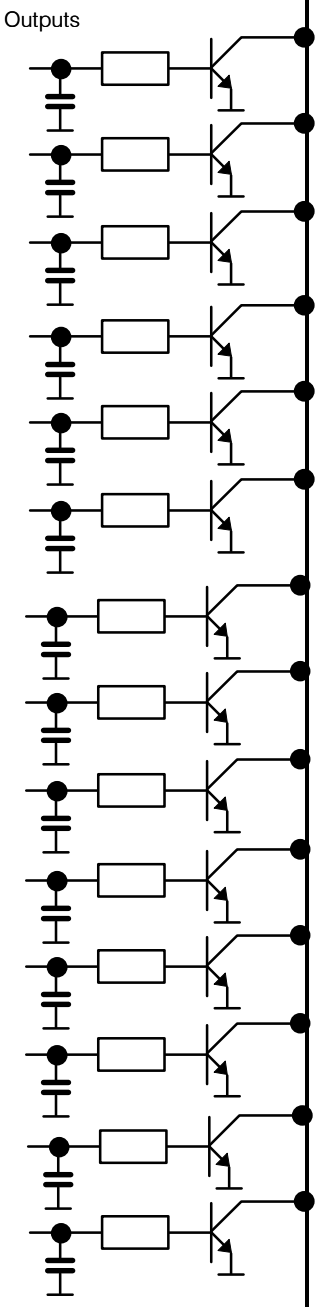
3.6 What can you do if data transfer fails?

Problem	Questions for remedial action
No characters can be received on a connected printer.	- Are the instruments switched on and cables plugged in correctly? - Is the printer set to ”on-line”? - Are baud rate, data bit and parity the same on both instruments? - Is the handshake set properly? If everything seems to be OK, try to print a report with the key sequence <PRINT><ENTER>.
No data transmission and the display of the instrument shows an error message.	- **error 42**: Transmission error. Is the printer set to "on-line"? Is the connection cable properly wired? - **error 43**: Data output of the instrument disabled for longer than 6 s by XOFF. - **error 36-39**: Receive error. Are the RS settings the same on both devices?
The received characters are garbled.	- Are the RS settings the same on both devices? - Has the correct printer been selected? - Data transfer has been interrupted on the hardware side during the printout of a curve. Re-establish connections and switch printer off/on.
Wrong line spacing.	The printer does not emulate completely the preset mode. Usually these problems arise with the IBM mode. Set the printer to a different mode (e.g. Epson).
Printout of a curve is not ok. Other reports are printed ok.	Handshake is necessary for the printout of curves. - Is your cable correctly wired? (The DTR of the printer has to be connected to the CTS of the instrument.) - Set "HWs" for the handshake of the instrument. Configure the printer such that its DTR is set (possibly with DIP switches).

4 The Metrohm Remote Interface

4.1 Pin assignment of the Liquino Remote socket





pin 5 (Output 0)	ready inactive during determination
pin 18 (Output 1)	upper limit reached (temperature or volume monitoring in XDOS)
pin 4 (Output 2)	lower limit reached (temperature monitoring in XDOS)
pin 17 (Output 3)	End of determination EOD
pin 3 (Output 4)	activate 1 (auxiliar dosing device)
pin 16 (Output 5)	activate 2 (auxiliar dosing device)
pin 1 (Output 6)	external START (measuring instrument)
pin 2 (Output 7)	start Sample changer
pin 6 (Output 8)	not used
pin 7 (Output 9)	not used
pin 8 (Output 10)	not used
pin 13 (Output 11)	not used
pin 19 (Output 12)	not used
pin 20 (Output 13)	not used

Output 4 .. 7
may be freely set
in SEQ mode,
using the CONTROL
command

For all outputs:

V_{CE0} = 40 V
I_C = 20 mA
t_{Pulse} > 100 ms

Ordering numbers for plug:
K.210.9004 (shell) and K.210.002

No liability whatsoever will be accepted for damage caused by improper interconnection of instruments.

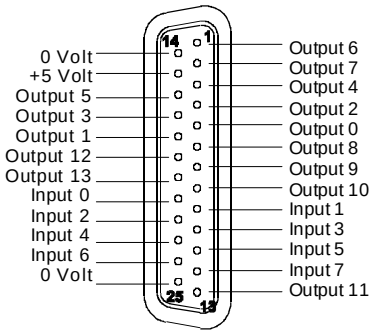
4.2 Remote functions of the Liquino Remote socket

Pin 1	Output 6	external Start (in SMPL) **
Pin 2	Output 7	Start Sample Changer (in SMPL) **
Pin 3	Output 4	activate 1 (external pump in SMPL) **
Pin 4	Output 2	lower limit reached (in SMPL)
Pin 5	Output 0	ready
Pin 6	—	not used
Pin 7	—	not used
Pin 8	—	not used
Pin 9	Input 1	Stop
Pin 10	Input 3	external ready (in SMPL) *
Pin 11	Input 5	scannable remote line *
Pin 12	Input 7	scannable remote line *
Pin 13	—	not used
Pin 14	0 Volt	ground
Pin 15	+5 Volt	source voltage
Pin 16	Output 5	activate 2 (external pump in SMPL) **
Pin 17	Output 3	End of determination EOD
Pin 18	Output 1	upper limit reached (in SMPL)
Pin 19	—	not used
Pin 20	—	not used
Pin 21	Input 0	Start
Pin 22	Input 2	Hold / Cont.
Pin 23	Input 4	Sample Changer ready (in SMPL) *
Pin 24	Input 6	scannable remote line
Pin 25	0 Volt	ground

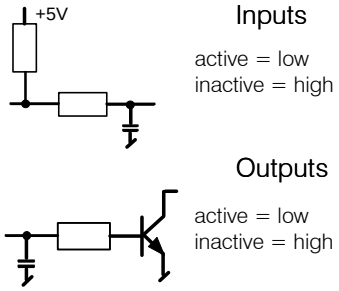
* Input 3…7 are scannable in SEQ mode (SCAN command)
** Output 4…7 may be freely set in SEQ mode (CONTROL command)

Use of the Remote socket
Particular instrument functions can be triggered by activating the individual pins (connection pins) of a remote socket. The instrument itself activates certain pins according to the instrument's condition and transmits signal pulses when particular events occur.
The functions which are used for remote control in an automated system are allocated to logical remote lines. They are subdivided into input lines (signal inputs to trigger functions, e. g. START or STOP) and output lines (signal outputs to display the instrument's condition or events, e. g. 'ready' or 'End of Determination' =EOD).

The pin assignation of a 25-pin remote plug can be seen from the information given below.



Remote plug
(with 25 pins)



Electrical switching of the inputs
and outputs of the remote socket

Standard allocation of the remote lines in Metrohm instruments:

Remote lines	Pin	Function
Input 0	21	Start
Input 1	9	Stop
Input 2	22	Enter
Input 3	10	Clear
Input 4	23	Sample Ready
Input 5	11	not used
Input 6	24	not used
Input 7	12	not used
Output 0	5	Ready
Output 1	18	Conditioning ok
Output 2	4	Determination busy
Output 3	17	EOD (End of Determination)
Output 4	3	L1
Output 5	16	Error
Output 6	1	Activate L3
Output 7	2	Pulse for recorder

Output lines 8…13 are mostly not used as standard.

Remark: Standard pin assignments are only activated in an instrument's single mode (not in sequence functions).

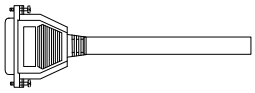
The standard Remote lines

Assignation of the remote socket according to pins:

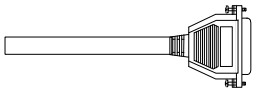
Pin	I/O lead	Function
1	Output 6	L3 activate
2	Output 7	Pulse for recorder
3	Output 4	L1
4	Output 2	Determination busy
5	Output 0	Ready
6	Output 8	not used
7	Output 9	not used
8	Output 10	not used
9	Input 1	Stop
10	Input 3	Clear
11	Input 5	not used
12	Input 7	not used
13	Output 11	not used
14	0 Volt	
15	+5 Volt	
16	Output 5	Error
17	Output 3	EOD (End of Determination)
18	Output 1	Conditioning ok
19	Output 12	not used
20	Output 13	not used
21	Input 0	Start
22	Input 2	Enter
23	Input 4	Sample Ready
24	Input 6	not used
25	0 Volt	

The pin assignation or the allocation of functions of the remote lines may differ slightly from one Metrohm instrument to another. Consult the 'Instructions for use' of your instrument.

Wiring of the Metrohm Standard Remote cable e.g. 6.2141.020 (25-pin)

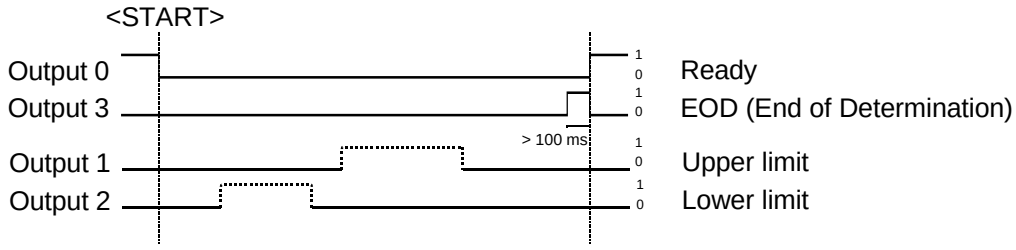


Output 0 (Pin 5)	(Pin 21) Input 0
Output 1 (Pin 18)	(Pin 9) Input 1
Output 2 (Pin 4)	(Pin 22) Input 2
Output 3 (Pin 17)	(Pin 10) Input 3
Output 4 (Pin 3)	(Pin 23) Input 4
Output 5 (Pin 16)	(Pin 11) Input 5
Output 6 (Pin 1)	(Pin 24) Input 6
Output 7 (Pin 2)	(Pin 12) Input 7
Output 8 (Pin 6)	(Pin 6)
Output 9 (Pin 7)	(Pin 7)
Output 10 (Pin 8)	(Pin 8)
Output 11 (Pin 13)	(Pin 13)
Output 12 (Pin 19)	(Pin 19)
Output 13 (Pin 20)	(Pin 20)
Input 0 (Pin 21)	(Pin 5) Output 0
Input 1 (Pin 9)	(Pin 18) Output 1
Input 2 (Pin 22)	(Pin 4) Output 2
Input 3 (Pin 10)	(Pin 17) Output 3
Input 4 (Pin 23)	(Pin 3) Output 4
Input 5 (Pin 11)	(Pin 16) Output 5
Input 6 (Pin 24)	(Pin 1) Output 6
Input 7 (Pin 12)	(Pin 2) Output 7
(Pin 6)	(Pin 6) Output 8
(Pin 7)	(Pin 7) Output 9
(Pin 8)	(Pin 8) Output 10
(Pin 13)	(Pin 13) Output 11
(Pin 19)	(Pin 19) Output 12
(Pin 20)	(Pin 20) Output 13
0 V (Pin 14)	0 V (Pin 14)
0 V (Pin 25)	0 V (Pin 25)
+5 Volt (Pin 15)	+5 Volt (Pin 15)



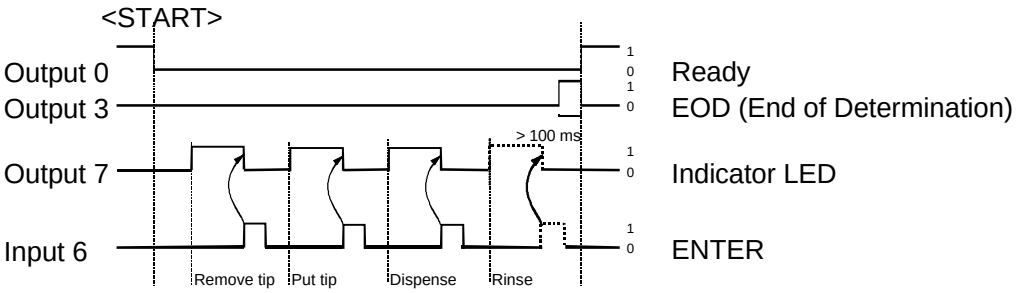
4.3 Liquino Remote lines during a determination

XDOS Mode



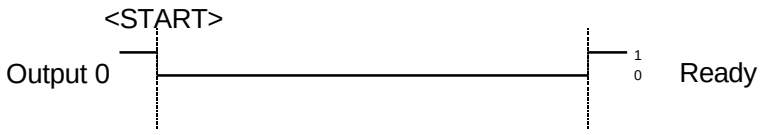
The output lines 1 and 2 are used with the temperature monitoring function. Activation of Output 1 or Output 2 indicates a violation of the temperature limits.

PIP Mode

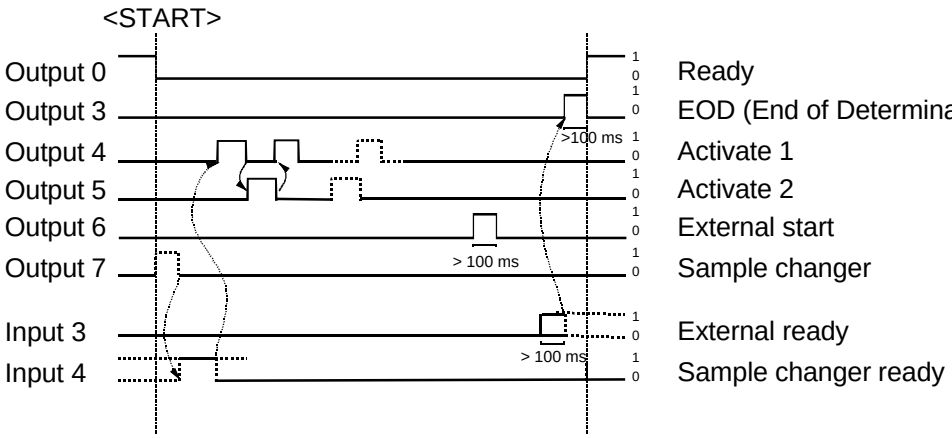


The remote lines Output 7 and Input 6 are used for remote communication of the pipetting set. They can also be used in automated systems.

CONT Mode



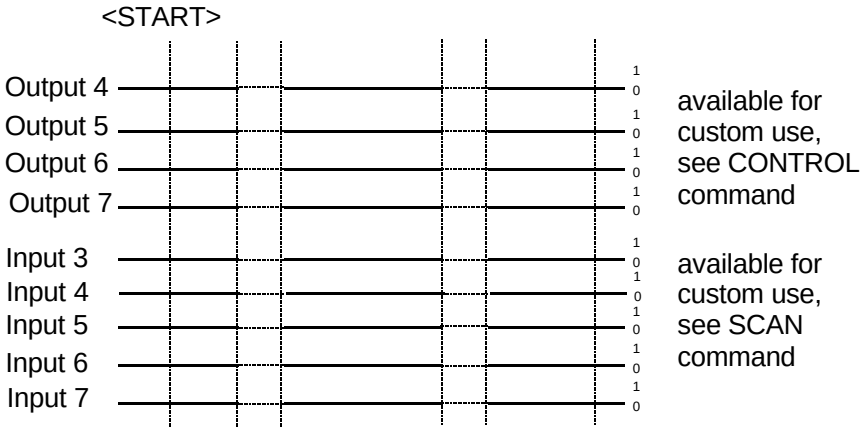
SMPL Mode



Assignments of the Output lines:

Output 4 (Activate 1) :	use for an aspirating pump (emptying cell)
Output 5 (Activate 2) :	use for an dispensing pump (rinsing cell)
Output 6 (External start) :	use for the start of a titration or measuring instrument
Output 7 (Sample changer) :	may be used for remote control of a sample changer
Input 3 (External ready) :	use for the detection of the EOD pulse of the titration or measuring instrument
Input 4 (Sample changer ready) :	the ready signal of a 730 Sample changer has to be programmed in the Sample changer method (use Output 4).

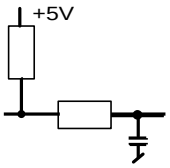
SEQ Mode



5 Technical specifications

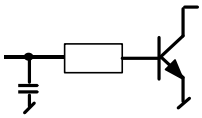
Short description	Compact, multi functional dosing and control instrument for analytical laboratory use and synthesis. Connection of 4 dosing drives and 1 temperature sensor possible.	
Dimensions	*Height:* 208 mm *Width:* 96 mm *Depth:* 208 mm	
Weight	2,36 kg (without accessories and keyboard)	
Housing	Metal case, multiple stove-enamel Upper part PUR (Polyurethane) non inflammable Fire classification UL94HB(IEC707), lacquered	
	Keyboard case:	Crastine (PBTB), aluminized inside
	Keayboard foil:	Polyester, chemical resistant
Power supply	*Voltage selector*	100/115/230/240V
	Settings with other supply voltages:	110 V --> 115 V 117 V --> 115 V 120 V --> 115 V 220 V --> 230 V
	Tolerance	± 10%
	Frequency	50 - 60 Hz
	Power input	approx. 28 VA
	Fuses	T315 mA for 100 and 115 V T120 mA for 230 and 240 V
Ambient temperature	*Nominal operating range*	5…40°C (at 20…80 % atmospheric humidity)
	Storage, transport	-20…60°C at 60°C < 50 % atmospheric humidity at 50°C < 85 % atmospheric humidity at 40°C < 95 % atmospheric humidity
Working memory (RAM)	Battery backed, 2 x 32 KB x 8	
Real time clock Supporting battery	Battery backed Lithium 3.6V, 0.85Ah, Order No. Q.005.0001 *Not to be exchanged by customer!*	
Memory card	*Type*	Memory Card, JEIDA 4.x / PCMCIA 2.x (68 Pins)
	Memory c*apacity:*	128 KByte to 2 Mbyte (SRAM) Order No. 6.2245.010 (128 Kbyte)
External display	LCD, 2 x 24 characters, character height 5 mm	
Keyboard	Tactile touch keyboard with action point, splashwater-proof	
RS232-Interface	Socket D-subminiature 9-pin Connection for PC, printer or balance programmable for serial data communication with external devices.	
Option	Cable RS232C - IBM PC AT, D-subminiature 9-pin --> D-subminiature 25-pin, Order No. 6.2125.010	

Remote-Interface	Socket D-subminiature 25-pin Programmable parallel interface for control of external devices 8 x input 5V TTL or CMOS active = low >100 ms inactive = high 8 x output open collector < 40V < 20mA active = low >200 ms inactive = high



Input t_p t_p >20 ms

Output t_p t_p >200 ms
V_{CEO} = 40 V
I_C = 20 mA



Dosing drives	4 connectors for dosing drives, socket MiniDIN 8-pin. 2 drives may be active concurrently.
Drive type	Metrohm 700 Dosino
Options	Adapter cable for 700 Dosino with D-subminiature plug, Order No. 6.2134.020

Temperature measuring	*Sensor*	PT100, socket MiniDIN 4-pin.
	Measuring mode	four-wire mode
	Constant current	5 mA
	Measuring range	-40 ... 240 °C

Measuring inaccuracy	1% of measured value ± 1°C ± sensor tolerance
Option	sensor cable plug , Order No. K.106.0400

Safety specifications

Constructed and tested to IEC 1010 / EN 61010 / UL 3101-1,
Safety class I, EN 60 947-1 degree of protection IP2L1

The instruction manual contains information and warnings which the user should follow to guarantee the safe operation of the in-strument.

Electromagnetic Compatibility (EMC)

Emitted interference	Standards met: EN 50081-1 01.92, EN 55011 (class B), EN 55022 (class B) and NAMUR.
Immunity to interference	Standards met: EN 50082-1 01.92, IEC801-2 to IEC801-6, EN 60555-2 and NAMUR

6 Index