

Working with Evaluation Results

The individual numerical result parameter values and QC results of any RheoWin Job evaluation element are stored internally using unique result parameter names, so that the result values can be retrieved by other elements, in the same Job, for further calculations (by the Math element), for display (by the Message element) and for exporting (by the Export element).

This document describes the naming convention of the result parameter names and how to use the result parameter names, and thus the result parameter values, in other elements.

Note Example Jobs for the functionality described in the following paragraphs are part of the RheoWin installation, see the Job files in the default RheoWin \Jobs\# Examples\07. Data Evaluation directory.

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Storing Result Parameters

The results of all RheoWin Job evaluation element are always automatically stored internally in three different ways:

1. The **complete result in text form** of an evaluation element is stored using the result parameter name with the format

R_IDx_TXT

where **R** stands for **Result**, the **x** in **IDx** stands for the **ID** number of the evaluation element in the Job and **TXT** for the complete result text. This text is identical to the text displayed in the **Info** area of the Job run window.

In most evaluation elements this text can be configured using the options in the **Numerical** box on the **Layout** page of the element editor.

2. The **individual numerical result values** of an evaluation element are stored using result parameter names with the following formats

R_IDx_Py

and

R_IDx_Py_z

where **R** stands for **Result**, the **x** in **IDx** stands for the **ID** number of the evaluation element in the Job, and **Py** and **Py_z** stand for the individual result **Parameter** of that element. Certain elements (like the curve fit element) only use the first format, while other elements (like the interpolation element) use the second format or both formats.

Note that for $y \leq 9$, **y** **must** always be written as 01, 02, etc. that is with a leading zero.

3. The **QC result** of an evaluation element is stored using the result parameter name with the format

R_IDx_QC

where **R** stands for **Result**, the **x** in **IDx** stands for the **ID** number of the evaluation element in the Job and **QC** for the result (true or false) of the QC check on the **QC** page of the element editor.

Note Not all evaluation elements necessarily support all three of the above mentioned result formats.

Using Result Parameters in General Elements

Result parameters can be used in the following general elements.

Message Element

Any evaluation result can be displayed in a RheoWin Message window (see [Figure 3](#)) using the Message element. The resulting message text can also be displayed in a report, see [“Export to report”](#) on [page 4](#).

❖ **To display the complete result text in a RheoWin message window**

1. Place the result parameter name **R_IDx_TXT**, where **x** stands for the ID number of the evaluation element in the Job, at the desired position in the text in the **Message** edit field in the Message element editor, see [Figure 2](#).

❖ **To display an individual result value in a RheoWin message window**

1. Place the result parameter name **R_IDx_Py** or **R_IDx_Py_z**, where **x** stands for the ID number of the evaluation element in the Job and **y** and **z** indicate the individual result value (depending on the element), at the desired position in the **Message** edit field in the Message element editor, see [Figure 2](#).

Note For $y \leq 9$, **y** must be always be written as 01, 02, etc. that is with a leading zero.

❖ **To display a QC result in the RheoWin message window**

1. Place the result parameter name **R_IDx_QC**, where **x** stands for the ID number of the evaluation element in the Job, at the desired position in the **Message** edit field in the Message element editor, see [Figure 2](#).

When the Message element is executed during a Job run, all result parameter names in the message text are replaced by the corresponding result parameter values (texts). See [Figure 2](#), [Figure 2](#) and [Figure 3](#), which are created using the example Job Evaluation-only (02, Interpolation).rwj, in the default RheoWin \Jobs\# Examples\07. Data Evaluation directory.

For many but not all evaluation elements the individual result parameter values are stored together with their currently selected physical unit. When this is the case, the physical unit is written behind the value in the RheoWin message window, see [Figure 3](#).

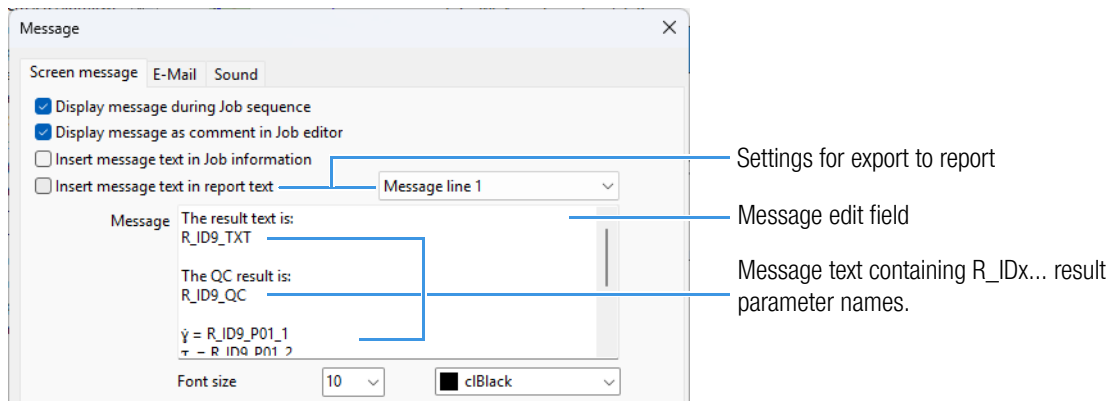
[Figure 2](#) shows the element sequence of a simple Job which illustrates how the results of the interpolation element can be displayed in a RheoWin Message during a Job run.

Figure 1. Element sequence of example Job: Evaluation-only (02, Interpolation).rwj

1	ID 2: File load	Name: FlowCurve (simulator).rwj
2	ID 9: Interpolation / x-th datapoint	(y = a + bx, d)
3	ID 5: Message	The result text is: R_ID9_TXT The QC result is: R_ID9_QC $\dot{\gamma}$ = R_ID9_P01_1 τ = R_ID9_P01_2 η = R_ID9_P01_3 $\dot{\gamma}$ = R_ID9_P02_1 τ = R_ID ...
4	ID 6: Pause	Show data window and wait

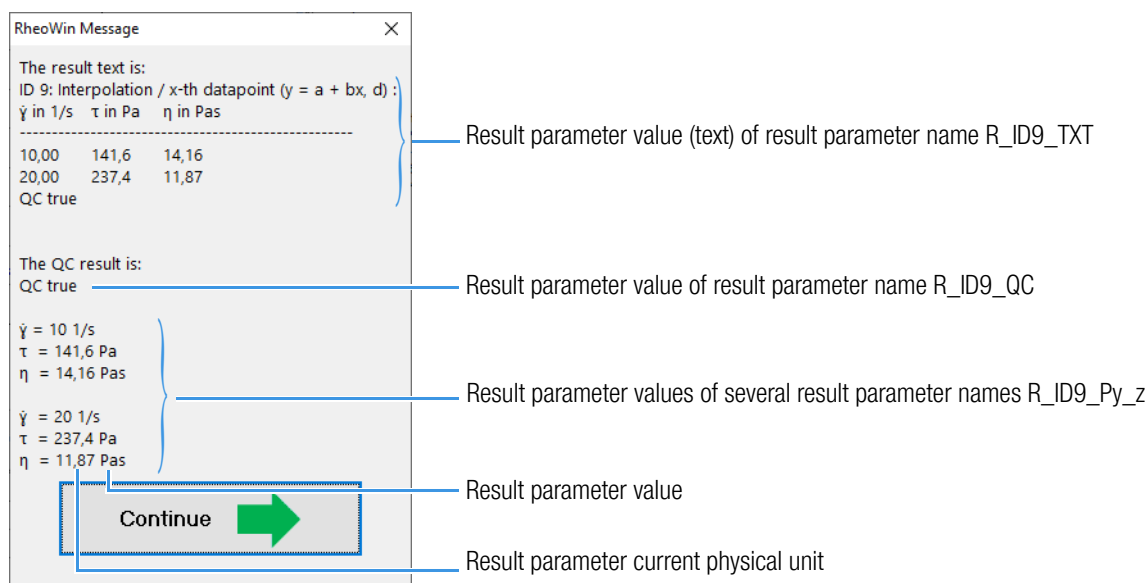
[Figure 2](#) shows the Message text with the various R_IDx... parameter names in between user defined other text.

Figure 2. Message text in the editor of the Message element



[Figure 3](#) shows the RheoWin Message window during run time, note that the various R_IDx... parameter names are automatically replaced by the parameter values plus their physical units.

Figure 3. Message text in the RheoWin Message window during run time



Export to report

Message texts can be stored in upto 5 different report variables with the names **Message line x**, with $1 \leq x \leq 5$. By using these variables in a report template, the text which is to be displayed in a report can be configured completely freely (in a message element).

The same **Message line x** variable can be used in multiple message elements, when doing so the new text of subsequent message elements is appended to the existing text of the previous message elements.

❖ To export a message text to a report

1. In the Message element editor activate the **Insert message text in report text** option, see [Figure 2](#)
2. Select the **Message line x** variable in which the message text is to be stored, see [Figure 2](#).
3. Insert the **Message line x** variable at the desired position in a report template, see the example Job DIN 54458 MARS iQ Air.rwj, in the default RheoWin \Jobs\# Examples\04. MARS iQ Air\05. Measurements acc. to standards\Adhesives (DIN 54458 + DIN 17408) directory.

Display on MARS iQ touchscreen

Since all RheoWin messages created with the Message element are automatically displayed on the MARS iQ touchscreen, any evaluation result can also be displayed on the MARS iQ touchscreen.

❖ To display evaluation results on the MARS iQ touchscreen

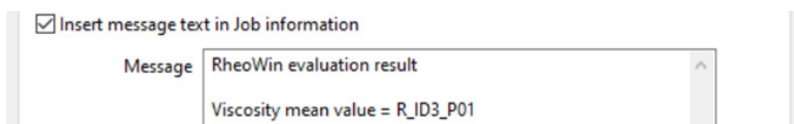
1. Define a Job with any evaluation element and the message element, see [Figure 4](#).

Figure 4. A (simple+ Job with an evaluation element and the message element



2. In the Message element define the result text that is to be displayed, see [Figure 5](#).

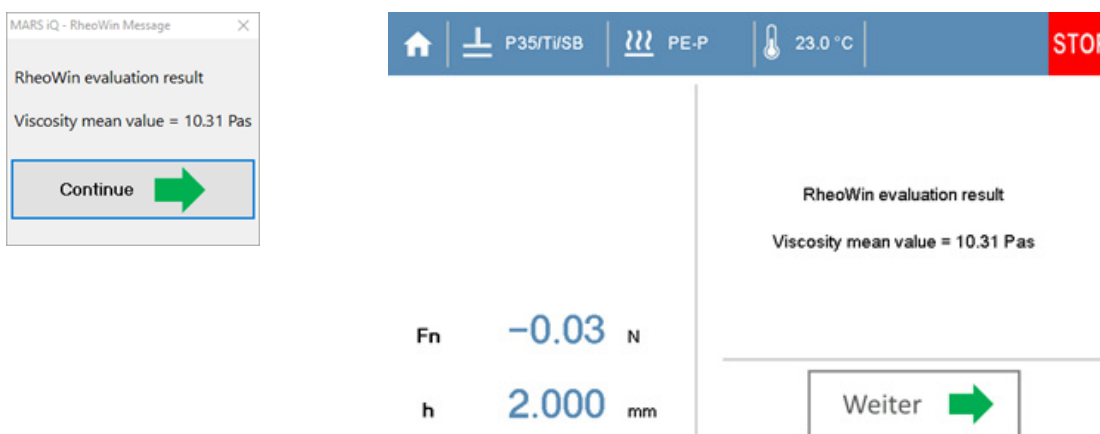
Figure 5. Definition of result text in Message element editor



3. Run the Job.

During Job run the message is displayed on the computer screen (see [Figure 6](#) left) and on the MARS iQ touchscreen (see [Figure 6](#) right) simultaneously.

Figure 6. Message display on computer screen (left) and MARS iQ touchscreen (right)



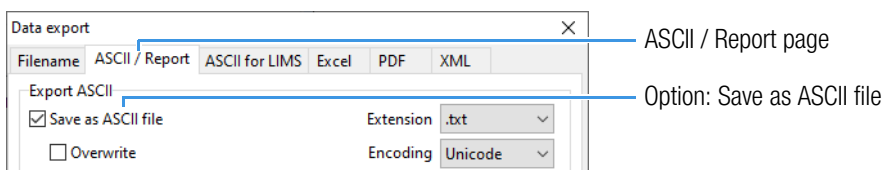
Export Element

Any evaluation result can be exported to a file in various formats using the Export element.

❖ To export any result value/text to a file

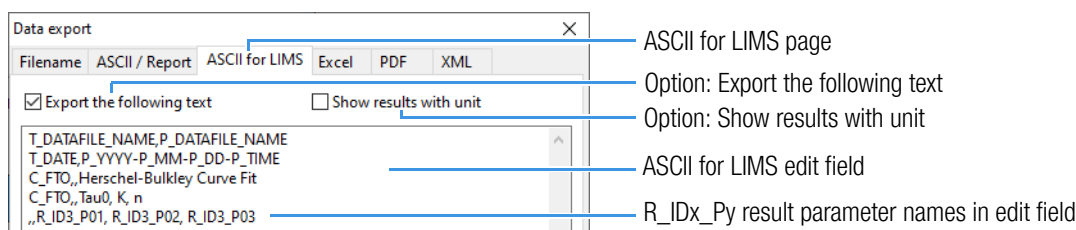
1. In the Export element editor select the **ASCII / Report** page.
2. On the ASCII / Report page activate the **Save as ASCII file** option, see [Figure 7](#).

Figure 7. ASCII / Report page in Data export element editor



3. In the Export element editor select the **ASCII for LIMS** page.
4. On the ASCII for LIMS page activate the **Export the following text** option, see [Figure 8](#).

Figure 8. ASCII for LIMS page in Data export element editor



5. Continue with one of the three following procedures.

❖ **To export the complete result text to a file**

1. Place the result parameter name **R_IDx_TXT**, where **x** stands for the ID number of the evaluation element in the Job, at the desired position in the text in the edit field on the ASCII for LIMS page in the Export element editor, see [Figure 8](#).

❖ **To export an individual result value to a file**

1. Place the result parameter name **R_IDx_Py** or **R_IDx_Py_z**, where **x** stands for the ID number of the evaluation element in the Job and **y** and **z** indicate the individual result value (depending on the element), at the desired position in the edit field on the ASCII for LIMS page in the Export element editor, see [Figure 8](#).

Note For $y \leq 9$, **y** must be always be written as 01, 02, etc. that is with a leading zero.

2. On the ASCII for LIMS page activate the **Show results with unit** option in case the physical unit of the value is to be written behind the value in the exported file.

❖ **To export a QC result to a file**

1. Place the result parameter name **R_IDx_QC**, where **x** stands for the ID number of the evaluation element in the Job, at the desired position in the edit field on the ASCII for LIMS page in the Export element editor, see [Figure 8](#).

When the Export element is executed during a Job run, all result parameter names in the export text are replaced by the corresponding result parameter values (texts).

Export Element and Message Element

In both the Message edit field (see [Figure 2](#)) in the Message element editor and in the ASCII for LIMS edit field (see [Figure 8](#)) in the Export element editor, quantity symbols and name as well as the current unit of a quantity can be displayed/exported by placing certain parameter names in the text.

This feature can be used for creating a table header in an exported Excel file or for displaying/exporting the unit of a result parameter value for elements which do not already offer that functionality (for example the Curve fit element).

❖ **To export/display the current unit of a quantity**

1. In the text exported/displayed by these two elements the parameter name **CU_Qxxx** is replaced by the **current unit** of the selected quantity.

❖ **To export/display the name of a quantity**

1. In the text exported/displayed by these two elements the parameter name **QN_Qxxx_y** is replaced by the **name** of the selected quantity.

❖ **To export/display the symbol of quantity**

1. In the text exported/displayed by these two elements the parameter name **QS_Qxxx_y** is replaced by the **symbol** of the selected quantity.

In the above mentioned parameter names **CU_Qxxx**, **QN_Qxxx_y** and **QS_Qxxx_y**, **CU** stands for Current Unit, **QN** for quantity name, **QS** for quantity symbol, **Q** für Quantity, **xxx** is the RheoWin quantity number and **y** the RheoWin subquantity number.

Note The quantity number xxx must always be written with 3 digits. Quantity 17 (Viscosity) much written as 017, quantity 3 (Shear rate) much be written as 003.

The RheoWin quantity number and sub-quantity number are displayed in the **Configuration > Quantities/Units > Edit > General > Quantity #** edit field for any quantity and the **Configuration > Quantities/Units > Edit > Subquantity > Edit > Subquantity #** edit field age for any sub-quantity (of a quantity).

See the example Job **QS_Qxxx_y** and **CU_Qxxx** demo.rwj in the 08. Data export directory on how to **QS_Qxxx_y** and **CU_Qxxx**.

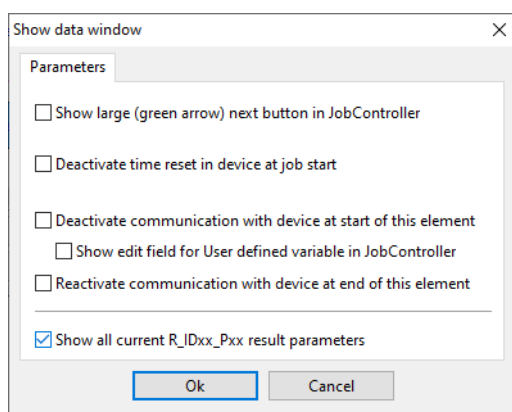
Show Data Element

Since it is not always obvious which **R_IDx_Px** or **R_IDx_Py_z** result parameter name corresponds to which result parameter of an evaluation element, the Show data element can be used to display a list of all result parameter names with their values which are available in the current Job.

❖ **To display a list of all result parameter names and their values**

1. Place the **Show Data** element in the Job at a position after all Evaluation elements, see [Figure 2](#).
2. Activate the option **Show all current R_IDxx_Pxx result parameters** in the editor of the Show Data element, see [Figure 9](#)

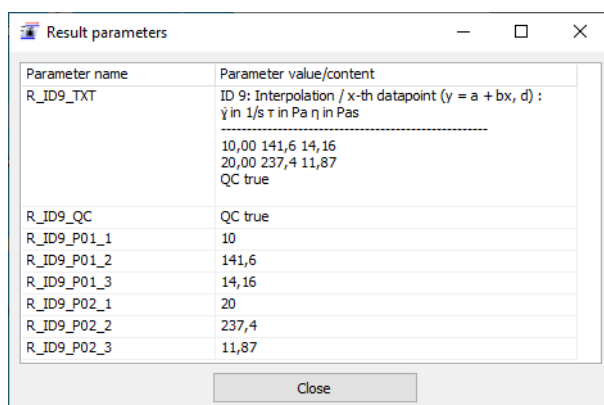
Figure 9. Editor of the Show data element



3. Run the Job.

When the Show data element is executed a window containing a list with all current result parameter names and their values is displayed, see [Figure 10](#).

Figure 10. Result parameters window



4. Click the **Close** button, to close the Result parameters window.

Note The list with the result parameters is meant as a help function, that is for a better understanding of the naming convention of the R_IDx... result parameter names and for use during the "design" or "test" phase of a job only.
When the Job is working properly this option should be deactivated.

See the example Job Evaluation-only (12, Math element).rwj, in the default RheoWin \Jobs\# Examples\07. Data Evaluation directory, for an example of this option.

Using Result Parameters in Measurement Elements

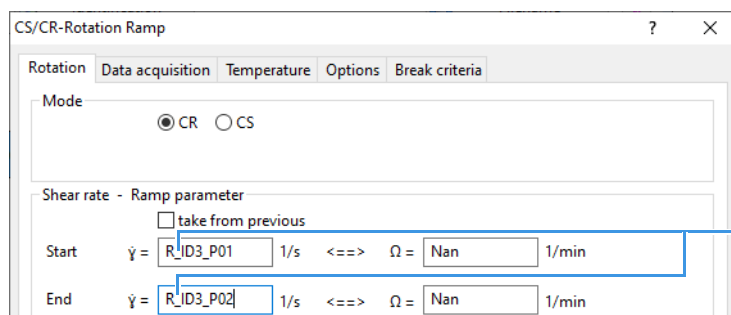
Result parameters can be used in the following measurement elements. On request this feature can be implemented in other measurement elements.

Note When a result parameter name is entered in the Strain, Shear stress or Shear rate edit field of a measurement element, the text Nan (Not a number) is displayed in the angle, torque, angular velocity field because it is not possible to calculate that value.

ROT Ramp Element

In the editor of the ROT Ramp element result parameter names can be used in the **Shear stress** and **Shear rate** edit fields on the **Rotation** page and in the **T =** edit field on the **Temperature** page of the element editor, see Figure 11 and Figure 14.

Figure 11. Rotation page in the editor of the Rotation Ramp element



In these edit fields a R_IDx_Py or R_IDx_Py_z result parameter name can be entered instead of a numeric value

Creep Element

In the editor of the Creep element result parameter names can be used in the **Shear stress** edit field on the **Rotation** page and in the **T =** edit field on the **Temperature** page of the element editor, see Figure 12 and Figure 14.

Figure 12. Rotation page in the editor of the Creep element

CS Creep Test

Rotation Data acquisition Temperature Options Break criteria

Mode

☒ CS

Shear stress

☐ take from previous

τ = R_ID3_P01 Pa <==> M = Nan μNm

In this edit field a R_IDx_Py or R_IDx_Py_z result parameter name can be entered instead of a numeric value

OSC Frequency Sweep Element

In the editor of the OSC Frequency Sweep element result parameter names can be used in the **Shear stress**, **Strain** and **Shear rate** amplitude edit fields on the **Oscillation** page and in the **T =** edit field on the **Temperature** page of the element editor, see Figure 13 and Figure 14.

Figure 13. Oscillation page in the editor of the Oscillation Frequency Sweep element

Oscillation Frequency Sweep

Oscillation Data acquisition Temperature Axial Break criteria

Mode

☐ CS ☒ CD ☐ CD-AutoStrain ☐ CR

☐ Fast OSC ☐ Non-const. ampl.

Strain

☐ take from previous

γ₀ = R_ID3_P01 - <==> φ₀ = Nan rad

In this edit field a R_IDx_Py or R_IDx_Py_z result parameter name can be entered instead of a numeric value

Figure 14. Temperature page in the editor of the Oscillation Frequency Sweep element

Oscillation Frequency Sweep

Oscillation Data acquisition Temperature Axial Break criteria

☐ take from previous

T = R_ID2_P02 °C

Continue immediately

In this edit field a R_IDx_Py or R_IDx_Py_z result parameter name can be entered instead of a numeric value

During Job run-time the parameter names are replaced by the corresponding values, when the values are within the allowed range. When a value is not within the allowed range an error message is displayed and the Job is stopped.

Using Result Parameters in Evaluation Elements

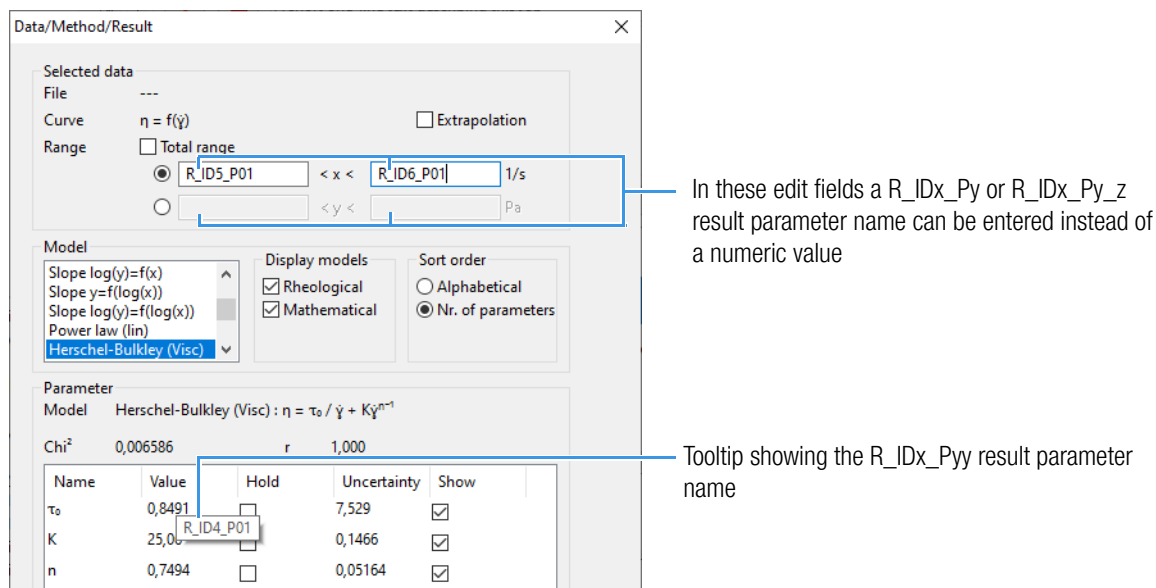
Result parameters can be used in the following evaluation elements. On request this feature can be implemented in other evaluation elements.

Curve Fit Element

On the **Data/Method/Result** page in the editor of the Curve Fit element the user can enter a R_IDx_Py or R_IDx_Py_z result parameter name instead of a numerical value in the two **x Range** edit fields and the **y Range** edit fields, see Figure 15.

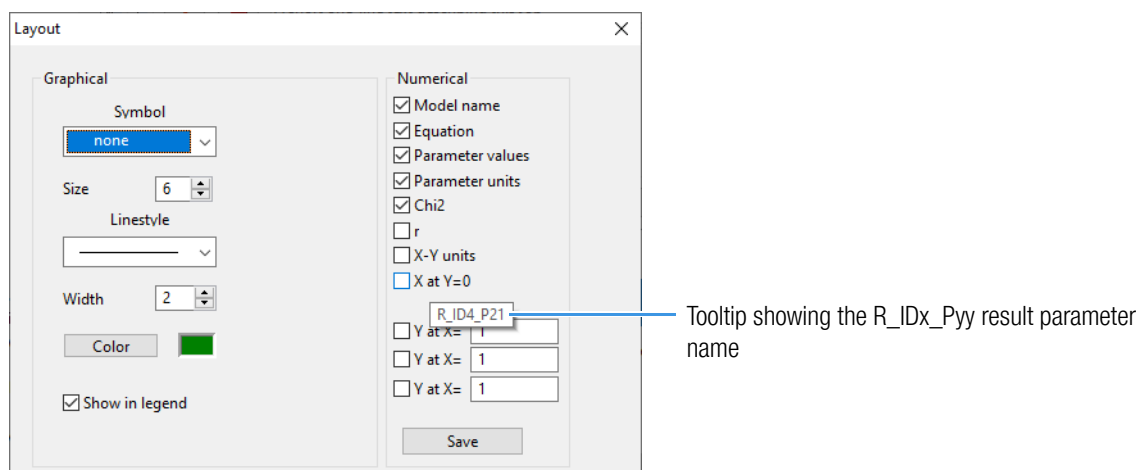
While hovering the mouse pointer over a **Name** or **Value** list item in the **Parameter** area of the **Layout** page, a tool tip will display the R_IDx_Pyy result parameter name for that result value, see Figure 15.

Figure 15. Data/Method/Result page in the editor of the Advanced Curve Discussion element



While hovering the mouse pointer over the **X at Y=0** item or one of the three **Y at X=** items in the **Numerical** area of the **Layout** page, a tool tip will display the R_IDx_Pyy_z result parameter name for that result value see Figure 16.

Figure 16. Data/Method/Result page in the editor of the Advanced Curve Discussion element

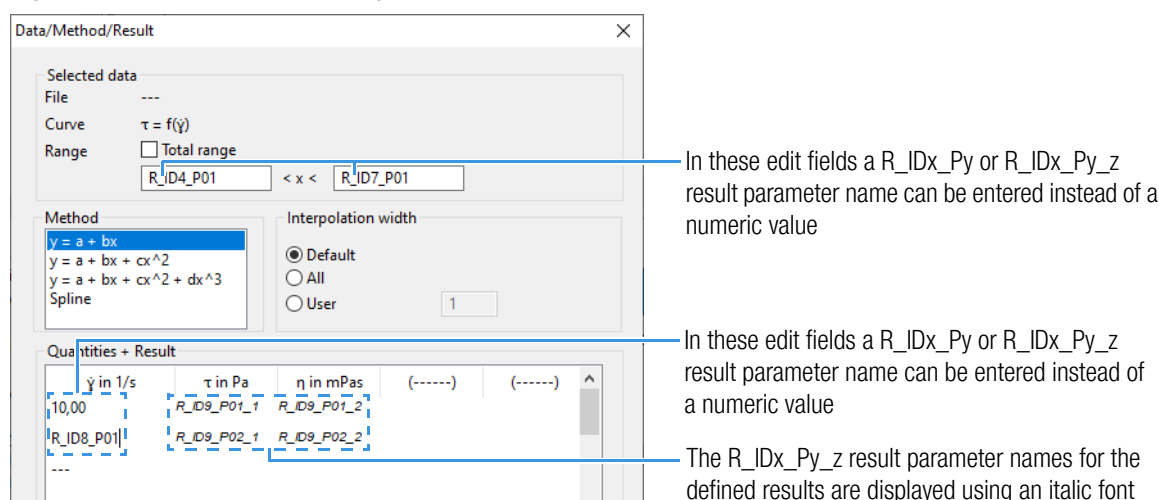


Interpolation Element

On the **Data/Method/Result** page in the editor of the Curve Fit element the user can enter a R_IDx_Py or R_IDx_Py_z result parameter name instead of a numerical value in the two **x Range** edit fields and in the edit fields in the first column of the table, see Figure 17.

The $R_IDx_Py_z$ result parameter names for the defined results are displayed (using an italic font) in the table.

Figure 17. Data/Method/Result page in the editor of the Advanced Curve Discussion element



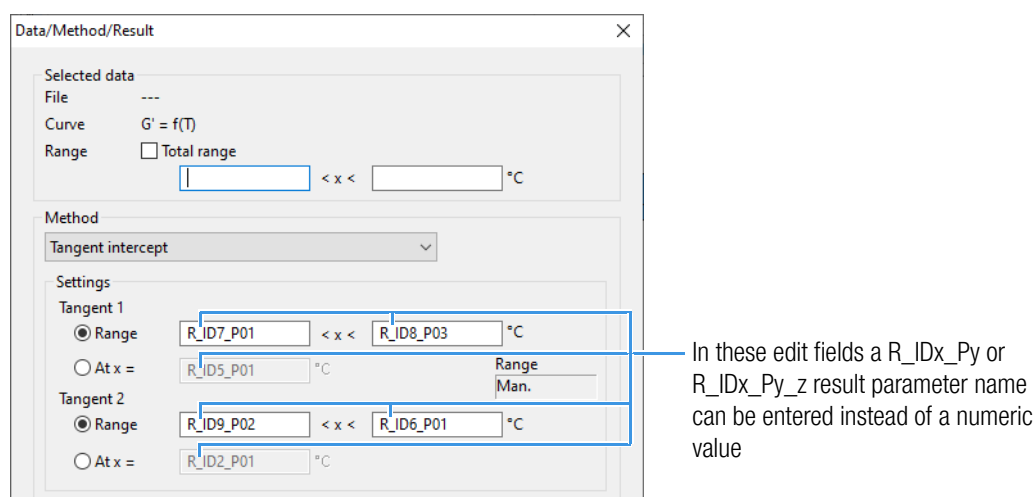
Advanced Curve Discussion Element

On the **Data/Method/Result** page in the editor of the Advanced Curve Discussion element the user can enter a R_IDx_Py or $R_IDx_Py_z$ result parameter name instead of a numerical value in the four **Range** edit fields and the two **At x** edit fields when the **Tangent intercept** method is selected, see Figure 18.

See the following two example Jobs:

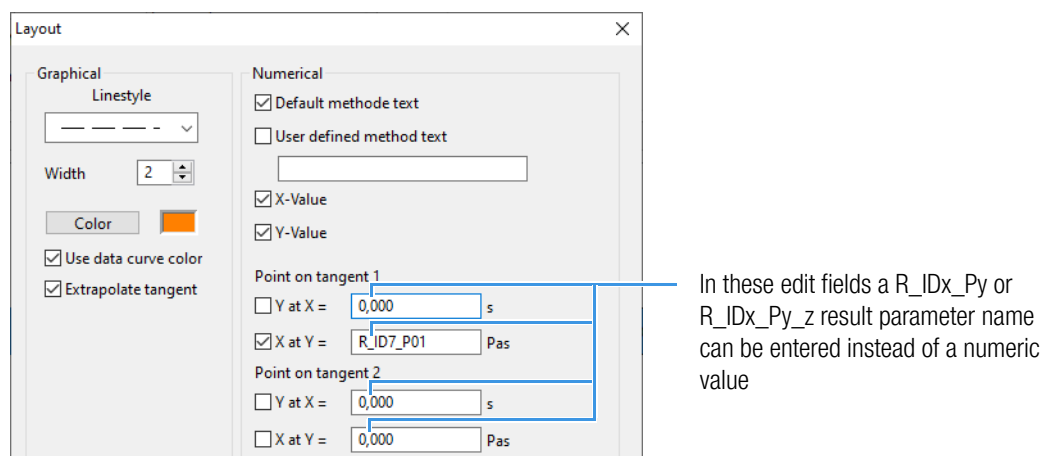
Evaluation-only (15, AdvancedCurveDiscussion with R_IDx_Py).rwj and
Evaluation-only (16, AdvancedCurveDiscussion with R_IDx_Py).rwj in the default
RheoWin \Jobs\# Examples\07. Data Evaluation directory, for an example of this feature.

Figure 18. Data/Method/Result page in the editor of the Advanced Curve Discussion element



On the **Layout** page in the editor of the Advanced Curve Discussion element the user can enter a R_IDx_Py or $R_IDx_Py_z$ result parameter name instead of a numerical value in the four **Point on tangent** edit fields, see Figure 19.

Figure 19. Layout page in the editor of the Advanced Curve Discussion element



Math Element

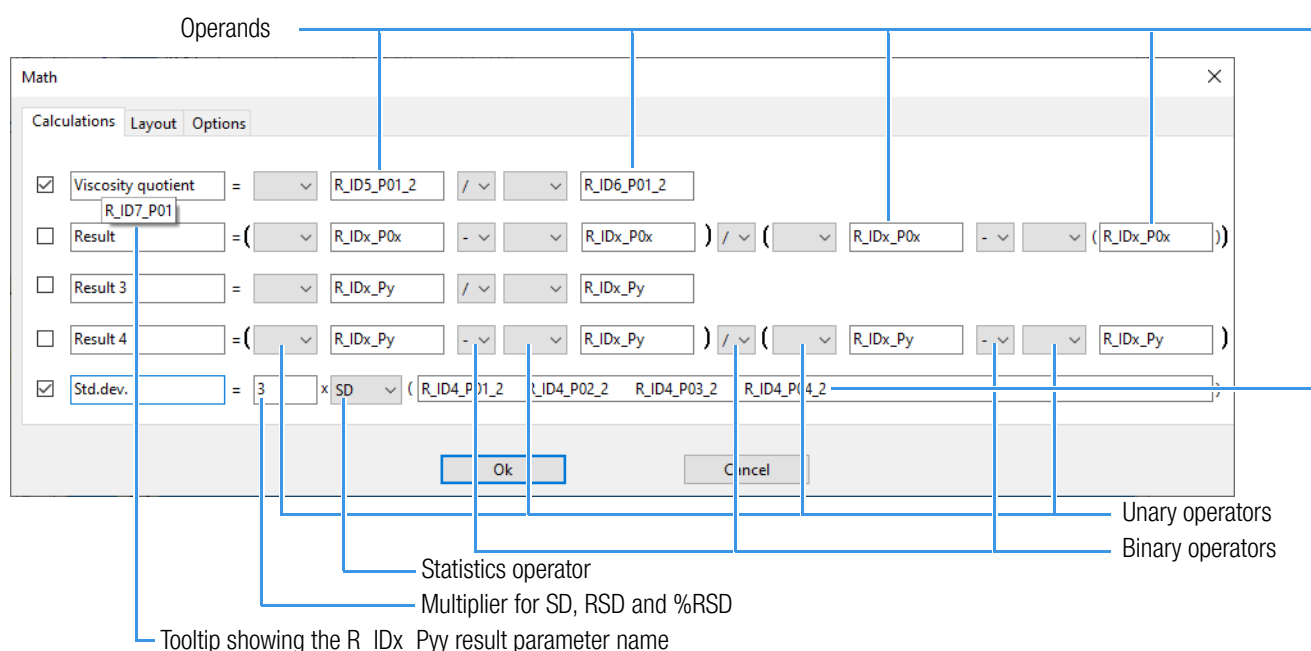
With the **Math** element calculations can be made with numerical result values of any evaluation element. On the **Calculation** page of the element editor the user can select and define one or more equation(s), see [Figure 20](#).

While hovering the mouse pointer over a Result name edit field on the [Calculation](#) page of the element editor, a tool tip shows the R_IDx_Pyy_z result parameter name for that result value.

The five result values of the Math element are stored internally using a R_IDx_Py result parameter name and can be used in other job elements.

On the **Layout** page of the element editor the user can select how the equation is displayed in the **Protocol/Info** window during Job run and in DataManager.

Figure 20. Editor of the Math element



Note The Math element is not available in the RheoWin DataManager. The result(s) of the Math element however is stored in the *.rwd data file and displayed in the DataManager Protocol/Info window, but the result is not updated when the evaluation result(s) it is based on are modified/recalculated in DataManager.

User definable equations

The Math element contains the following four user definable equations with different levels of complexity:

- Result1 = $\text{operator}(\text{operand1}) \text{ operator1 } \text{operator}(\text{operand2})$
- Result2 = $(\text{operator}(\text{operand1}) \text{ operator1 } \text{operator}(\text{operand2}))$
 operator3
 $(\text{operator}(\text{operand3}) \text{ operator2 } \text{operator}(\text{operand4}))$
- Result3 = $\text{operator}(\text{operand1}) \text{ operator1 } \text{operator}(\text{operand2})$
- Result4 = $(\text{operator}(\text{operand1}) \text{ operator1 } \text{operator}(\text{operand2}))$
 operator3
 $(\text{operator}(\text{operand3}) \text{ operator2 } \text{operator}(\text{operand4}))$

For any **operand** the following can be entered:

- A result parameter name R_IDx_Py or R_IDx_Py_z, that is a result value saved by an another element, for example an evaluation element (see “Storing Result Parameters” on page 1) or another Math element, in the same Job.
- A result parameter name R_IDx_Pyy (y=01, 02, 03) or (shorter) R1, R2, R3 that is the result of another equation in the same Math element (where x is the ID number of the Math element itself).

Note The four equations are always calculated in the same top-down order. That means that the result R_IDx_P1 or R1 of the first equation can be used in equation 2, 3 and 4, etc., but that, for example the result R_IDx_P3 or R3 of equation 3 can not be used in equation 2 and that the result of equation 4 can **not** be used in any other equation.

- A numeric value.

The **binary operator(s)**¹ and **unary operators**² can be selected from drop-down lists.

The following (basic) **binary operators** are available: +, -, x, /, ^ (and none).

The following **unary operators** are available: (none,) sqr, cube, sqrt, invers, 10^, e^, log, ln, abs, sin, cos, tan, arcsin, arccos, arctan, ↓decade, ↑decade, round.

(The two **decade** functions respectively return the lower and upper full decade relative to the operand value. Two examples: ↓decade(83) = 10, ↑decade(26) = 100.)

This enables the RheoWin user to define equations like:

result1 = A + B, result1 = A - B, result1 = A / B, result1 = A x B, result1 = A ^ B

result2= (A + B) / (C - D), result2 = (A - B) / C

result3= sqrt(A) + sin(B)

result4= (ln(A) + log(B)) / (e^(C) - 10^(D))

¹ A binary operator is an operator that acts on two operands.

² A unary operator is an operator that acts on only one operand.

with for example $A = R_ID8_P02_1$ (a result parameter name) or $A = 10.5$ (a numeric value), etc.

By selecting no operator for any binary operator parts of the equation can be “disabled” and will then be hidden (not visible).

A practical example for the use of the Math element is to calculate the quotient of two viscosity values where the two viscosity values are mean values, calculated with the CurveDiscussion element. This is shown in the example Job Evaluation-only (12, Math element).rwj, which is available in the default RheoWin \Jobs\# Examples\07. Data Evaluation directory.

Statistics equation

The Math element contains one equation for statistics. With this equation the **Min** (minimum), **Max** (maximum), **Sum** (sum), **Mean** (mean), **SD²** (variance), **SD** (standard deviation), **RSD** (relative standard deviation) as well as the **%RSD** (percentual relative standard deviation) of up to 10 values can be calculated.

The values must be entered in the edit field behind the statistics operator as $R_IDx_Py_z$ parameters separated by one or more spaces.

The edit field for the multiplier for the three standard deviation values is only displayed when the **SD**, **RSD** or **%RSD** operator is selected.

See the example file Evaluation-only (18, Math, Statistics).rwj.