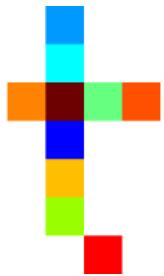




LEVEL^{UP} WORKSHOP I

Part A

0201 - Setup and Upload



In this lesson we will prepare a project for the Workshop and learn how to upload an FCS file to Tercen.

- 1 Starting from **Workshop II** project in the LevelUpWorkshops Team

The screenshot shows the Tercen software interface. At the top, there is a navigation bar with a house icon, the text "LevelUpWorkshopsTeam", and a highlighted "Workshop II" link. Below the navigation bar, the main title "LevelUpWorkshopsTeam" is displayed next to a small icon of a grid of squares. There are two tabs at the top of the main area: "Project" (which is underlined in blue) and "Activities". Under the "Project" tab, there is a section for the "Workshop II" project, which is locked (indicated by a padlock icon). The description "No description provided." is shown. At the bottom of the main area, there are several buttons: "New data set" (with a grid icon), "New workflow" (with a people icon), "New file" (with a document icon), "Upload file" (with a folder icon), and "Upload" (with a plus icon). A blue banner at the bottom of the screen displays a message: "MartinE updated workflow [join example](#)".

2 Click "Clone project"

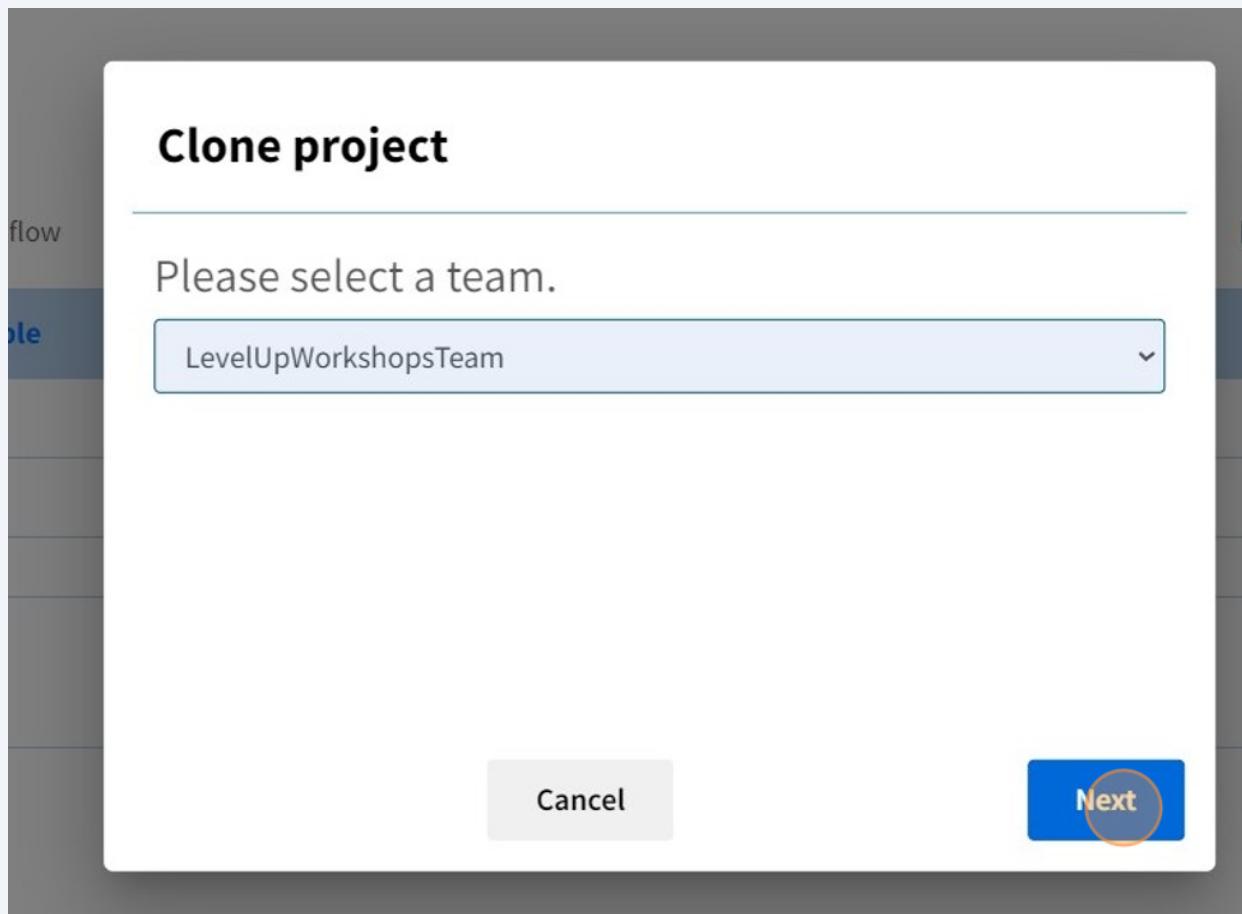
The screenshot shows the Tercen platform interface. At the top, there is a navigation bar with the Tercen logo, a search bar labeled "Search Tercen", and links for "Learn" and "Explore". Below the navigation bar, the URL "LevelUpWorkshopsTeam > Workshop II" is displayed. The main content area has a header "LevelUpWorkshopsTeam" with a small icon. Below the header, there are two tabs: "Project" (which is selected) and "Activities". Under the "Project" tab, there is a section titled "Workshop II" with the sub-section "No description provided.". Below this, there is a toolbar with several icons: "New data set", "New workflow", "New file", "Upload file", "Upload workflow", "Project settings", and "Clone project". The "Clone project" icon is highlighted with a large orange circle. To the right of the toolbar, there is a timestamp "34 minutes ago". Below the toolbar, there is a list of recent activity items:

- MartinE updated workflow [join example](#) 34 minutes ago
- README.md 1 hours ago
- Example Files 1 hours ago

At the bottom of the page, there is a section titled "Workshop I" with a table header row containing columns for "Number", "Agenda", "Type", "Time", and "Working link".

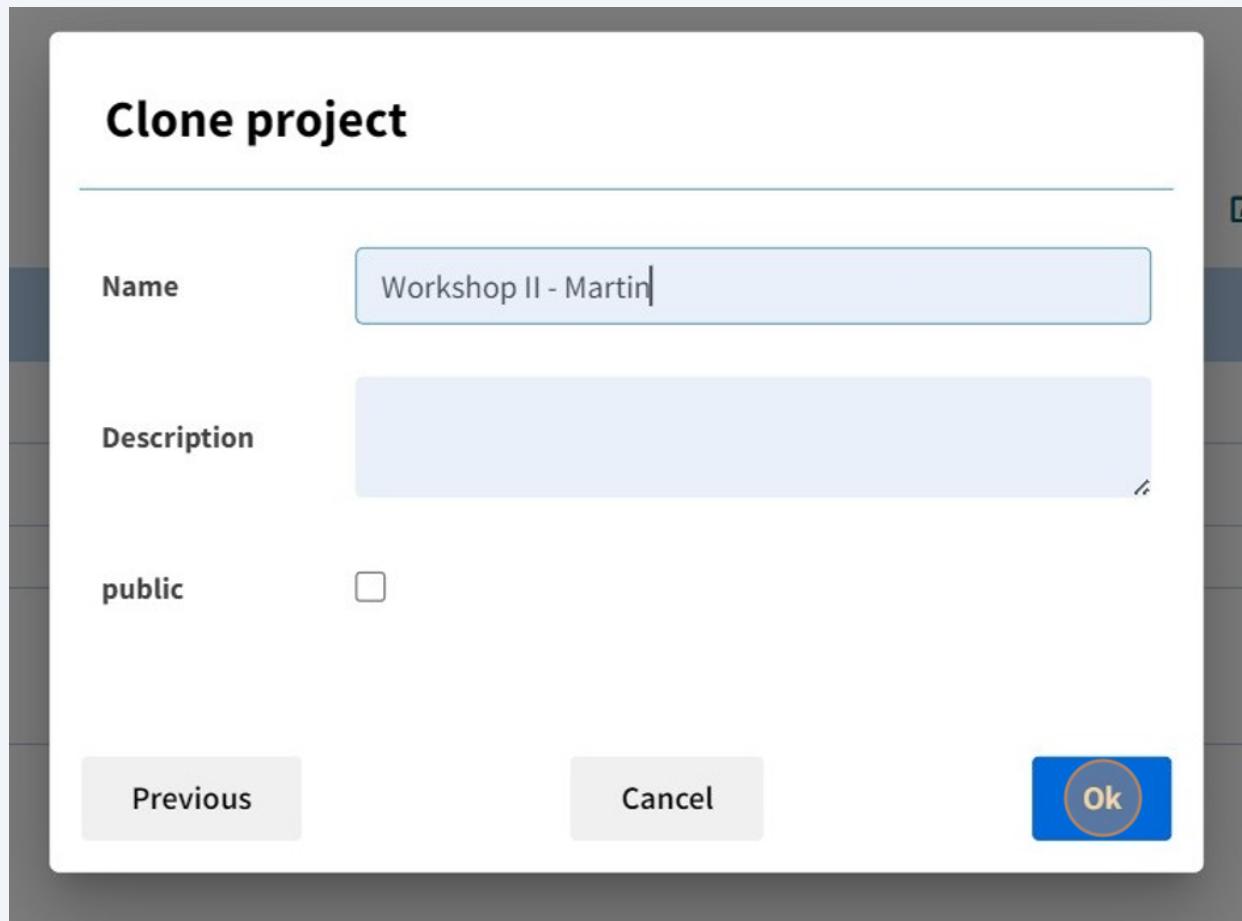
3

Save to **LevelUpWorkshopsTeam**



4 Add your name to the Project name.

Click "Ok"



5 Click "Example Files"

The screenshot shows a project titled "Workshop II - Martin" with a description "No description provided.". The interface includes standard file management buttons: "New data set", "New workflow", "New file", "Upload file", and "Upload". Below these are two items: "README.md" and a folder named "Example Files", which is circled in orange. A large preview window below shows the contents of the "Example Files" folder, which only contains "README.md".

6 Export the Sample FCS files to your local drive

The screenshot shows the "Example Files" folder within the "Workshop II - Martin" project. The folder contains two files: "Sample FCS files.zip" and "file_annotation.csv". A button labeled "Export" is highlighted with an orange circle. The top navigation bar includes "Search Tercen", "Learn", "Explore", and a user icon.

7 Download the file_annotation.csv as well

The screenshot shows the Tercen platform interface. At the top, there's a navigation bar with the Tercen logo and a search bar. Below it, a breadcrumb navigation shows the path: Home > LevelUpWorkshopsTeam > Workshop II - Martin > Example Files. On the left, there's a sidebar with a user icon and the team name "LevelUpWorkshopsTeam". The main content area has tabs for "Project" and "Activities", with "Project" selected. It displays a section titled "Workshop II - Martin" with a note "No description provided.". Below this, there's a file list with two items: "Sample FCS files.zip" and "file_annotation.csv". To the right of the file list is a toolbar with icons for New data set, New workflow, New file, Upload file, Upload workflow, and Project settings. A button labeled "Export" is highlighted with a red circle.

8 Return to the main Project

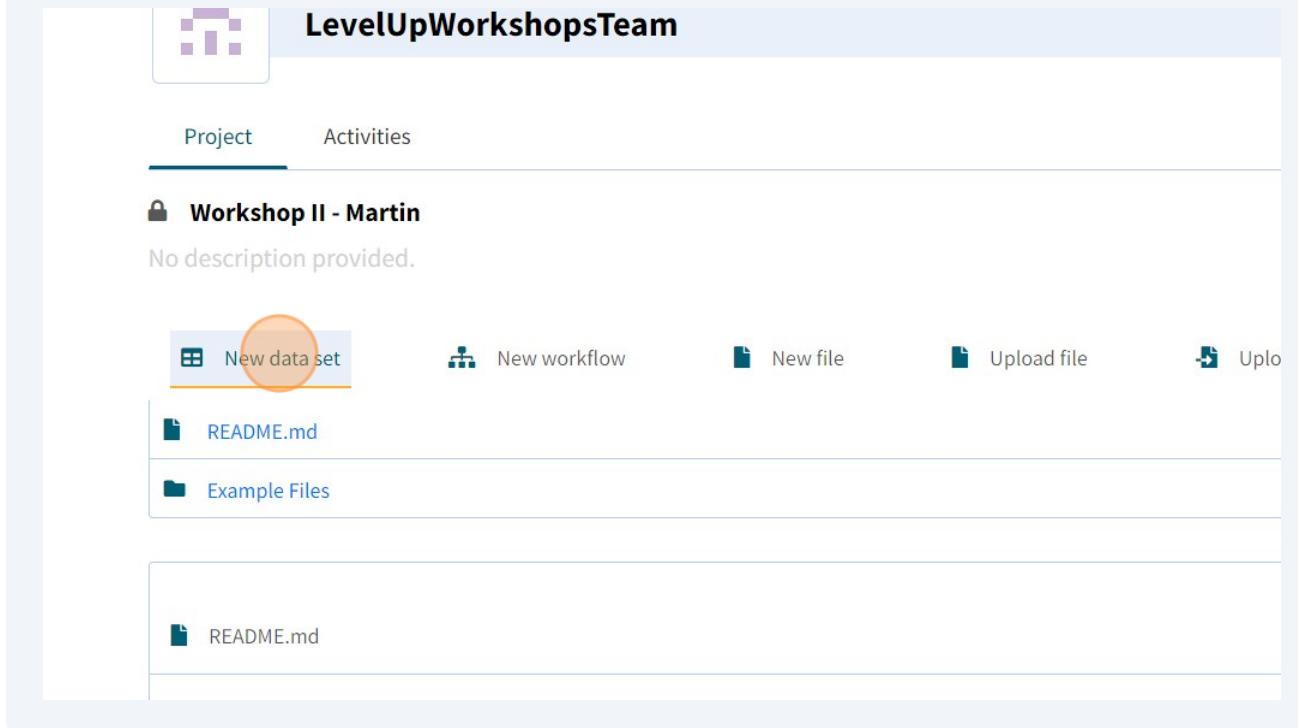
This screenshot shows the same Tercen interface as the previous one, but with a focus on the breadcrumb navigation. The "Workshop II - Martin" link in the "Example Files" section of the breadcrumb is highlighted with a red circle. The rest of the interface is identical to the previous screenshot, showing the project details and file list.

9

Tercen has special upload operators that are configured for instrument file types.

FCS files use one of these.

Click "New data set"

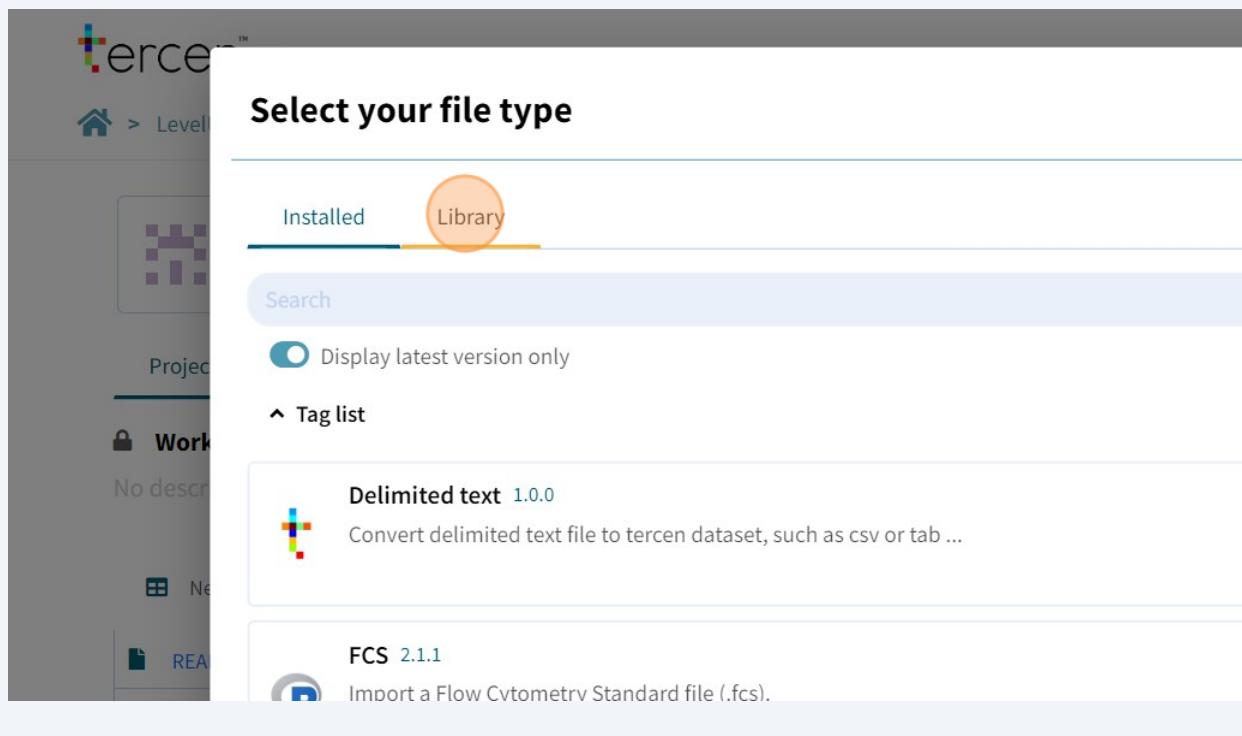


The screenshot shows a software interface for managing projects. At the top, there's a logo and the text "LevelUpWorkshopsTeam". Below that, a navigation bar has "Project" underlined and "Activities". The main content area is titled "Workshop II - Martin" with a lock icon, and it says "No description provided.". Below this, there are several buttons: "New data set" (which is circled in orange), "New workflow", "New file", "Upload file", and "Upload". Under these buttons, there are two items: "README.md" and "Example Files". A large, empty rectangular area is visible below these items.

10

By using "Library" you will always get the latest version of any operator.

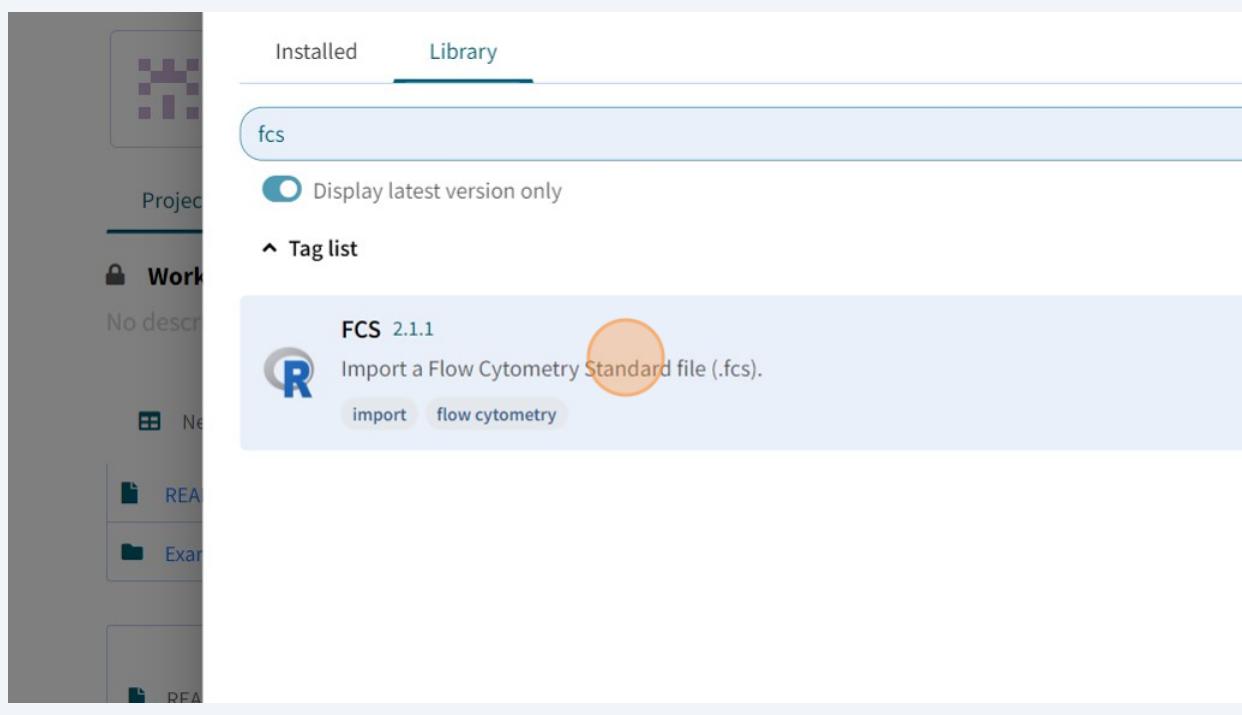
(NB: Version numbers may be different in the screenshot to the live system.)



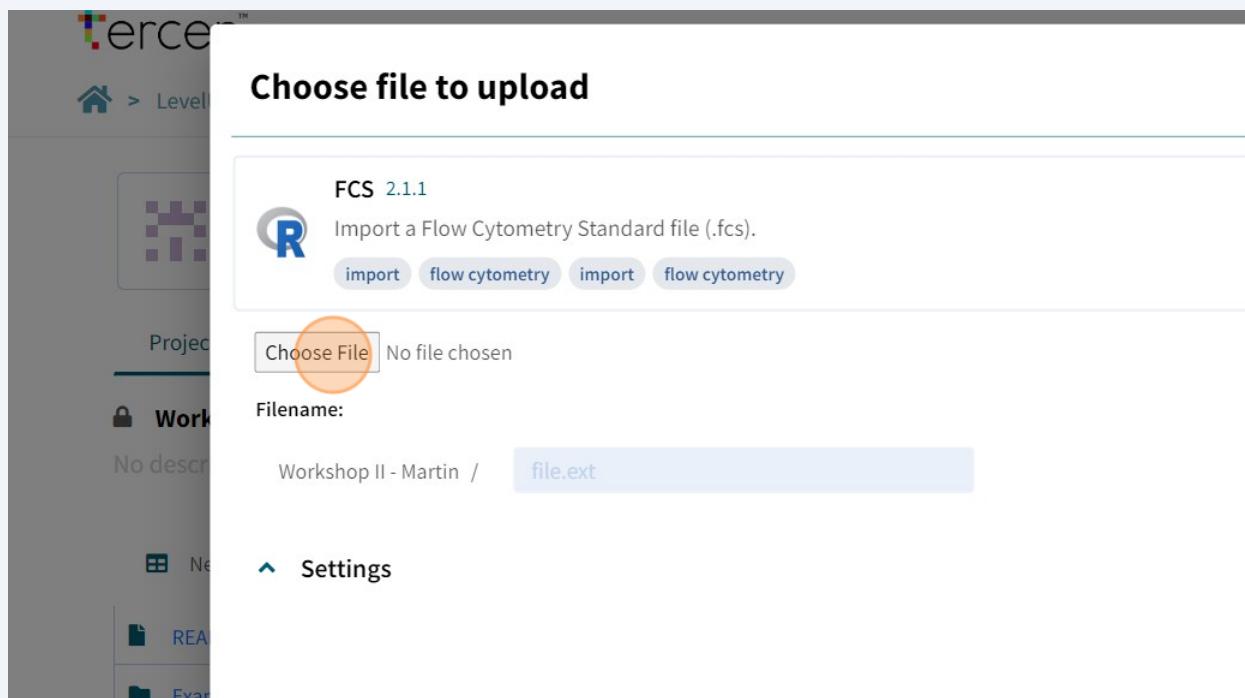
11

Search for the FCS operator.

Select it.

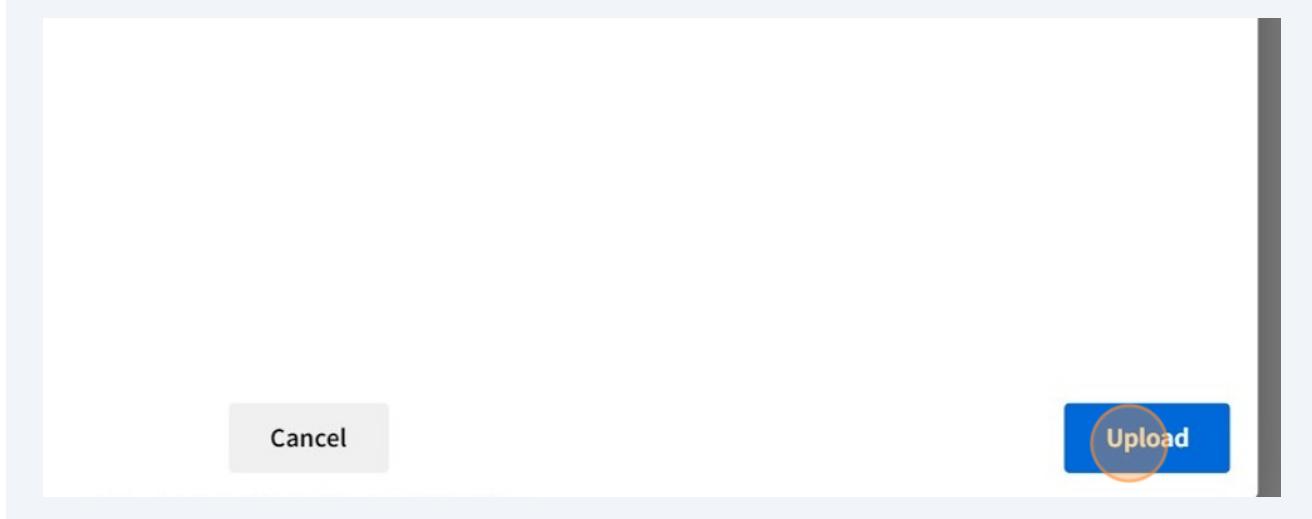


12 Browse to your download folder.



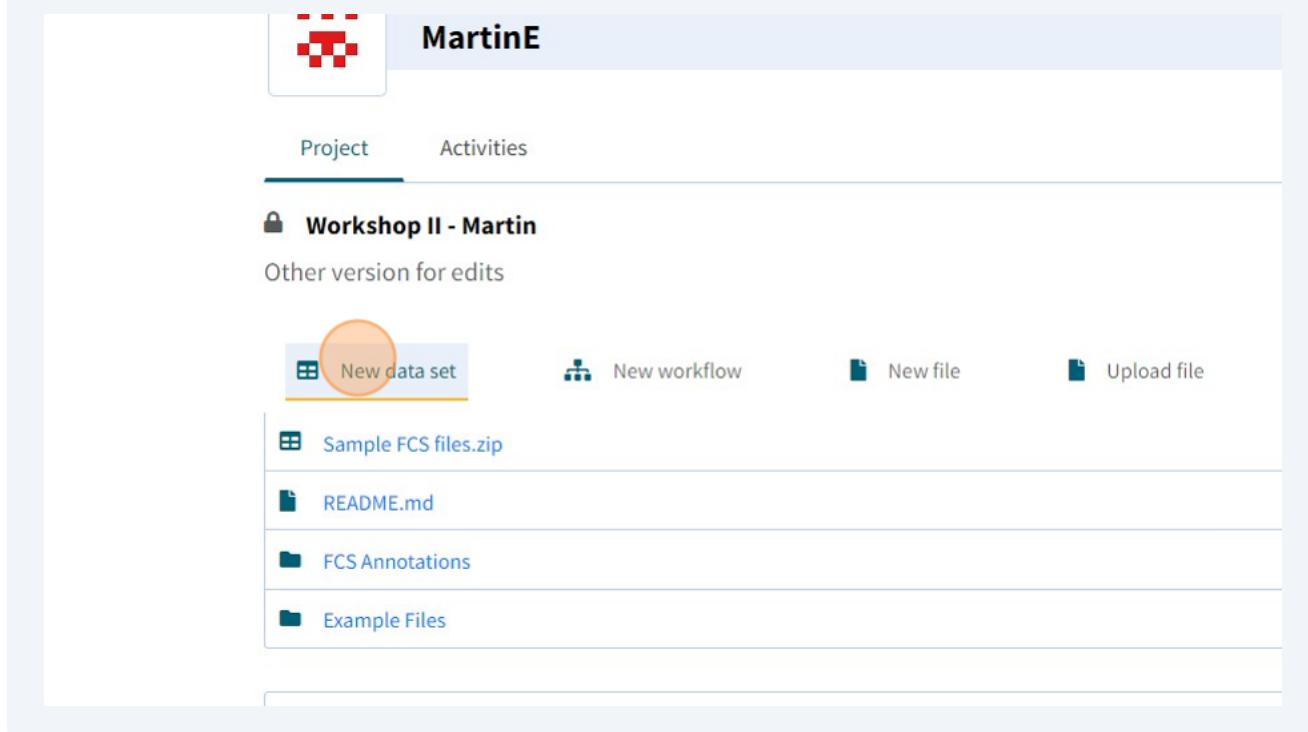
13 Choose **Sample FCS Files.zip**

Click "Upload"



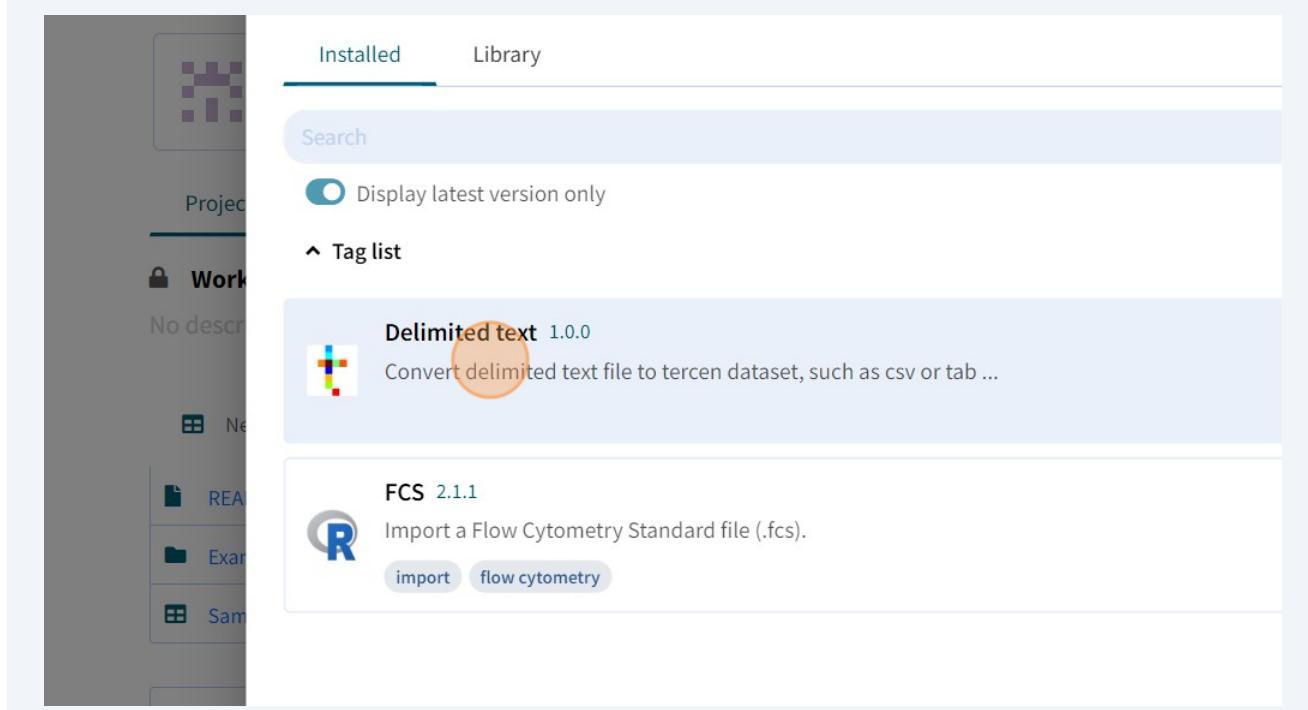
14 Now lets upload the Annotation Data

Click "New data set"



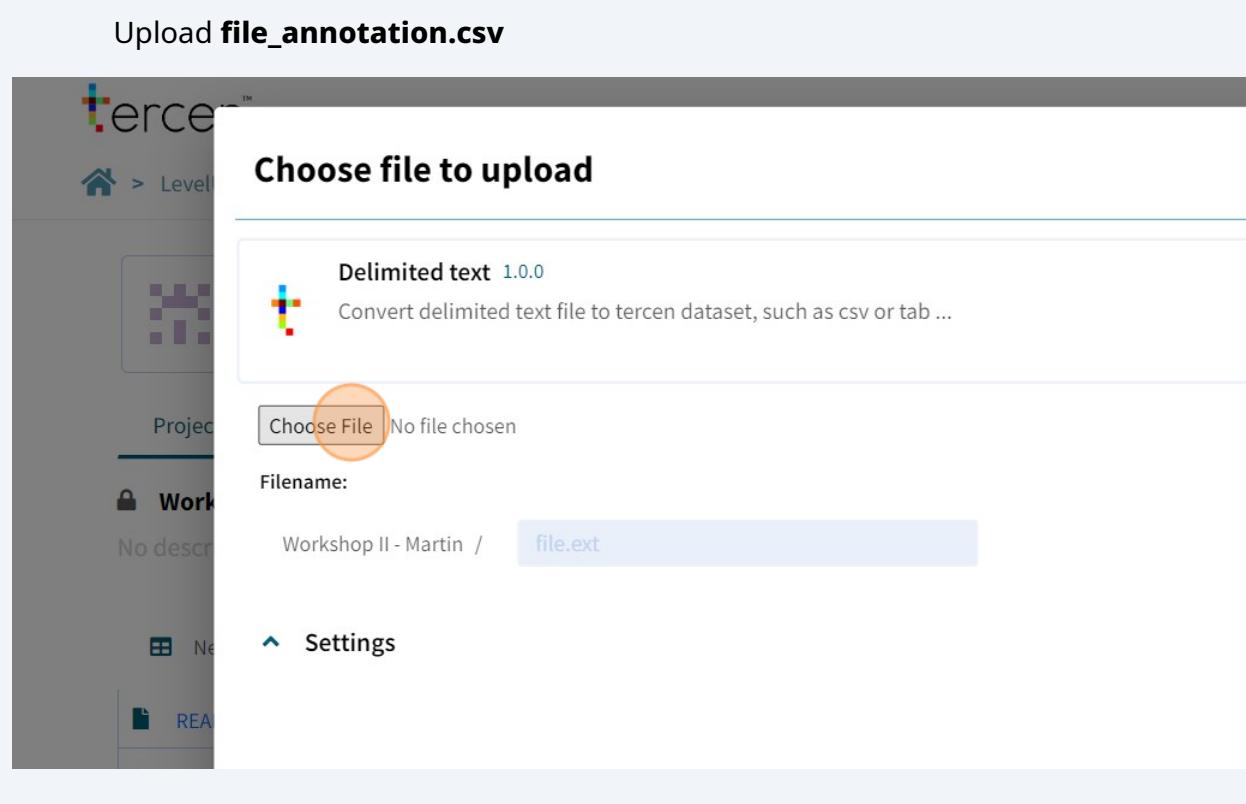
The screenshot shows the MartinE software interface. At the top, there is a logo and the text "MartinE". Below the logo, there are two tabs: "Project" and "Activities", with "Project" being the active tab. Under the "Project" tab, it says "Workshop II - Martin" and "Other version for edits". In the center, there is a list of files and folders: "Sample FCS files.zip", "README.md", "FCS Annotations", and "Example Files". At the bottom of this list, there are four buttons: "New data set" (which is highlighted with an orange circle), "New workflow", "New file", and "Upload file".

15 Select Delimited Text

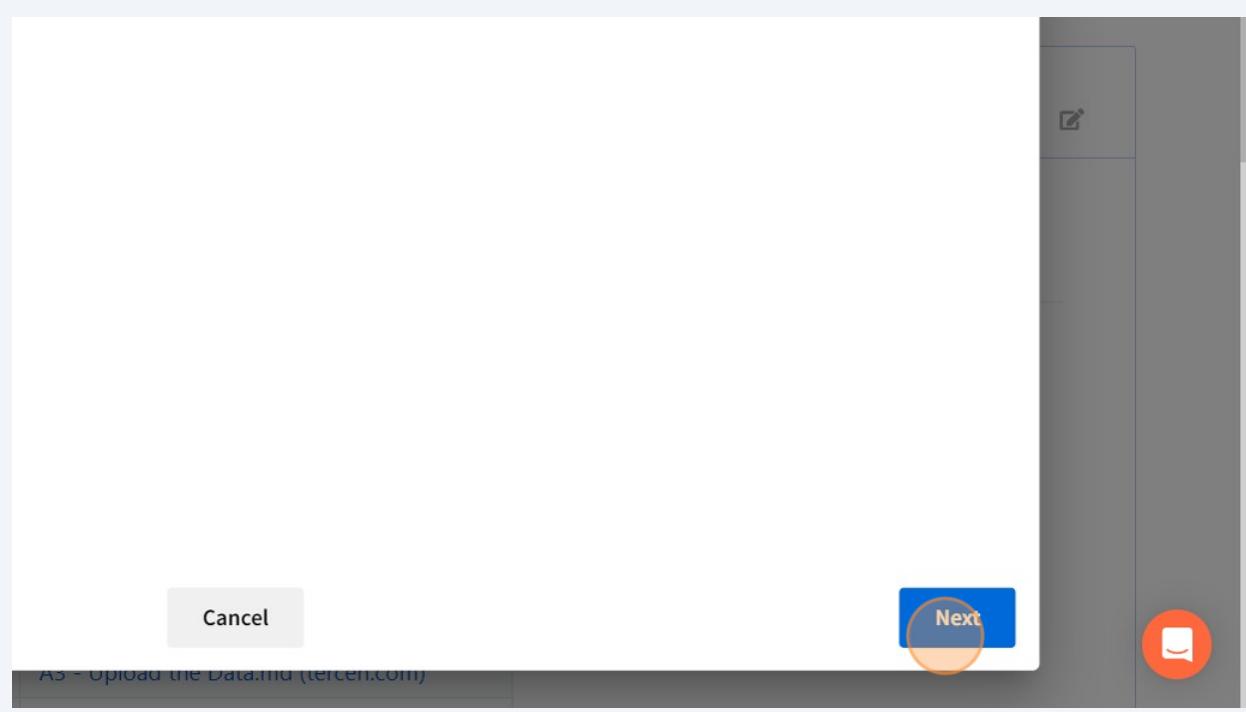


The screenshot shows the Cytobank interface. On the left, there is a sidebar with a "Project" icon and a "Workshop" section. The main area has two tabs: "Installed" and "Library", with "Installed" being the active tab. There is a search bar and a checkbox for "Display latest version only". Below these, there is a "Tag list" section with a "Delimited text" entry. The "Delimited text" entry includes a "1.0.0" version number, a "Convert delimited text file to tercen dataset, such as csv or tab ..." description, and a small icon. Below this, there is another entry for "FCS 2.1.1" which imports Flow Cytometry Standard files (.fcs) and has tags "import" and "flow cytometry".

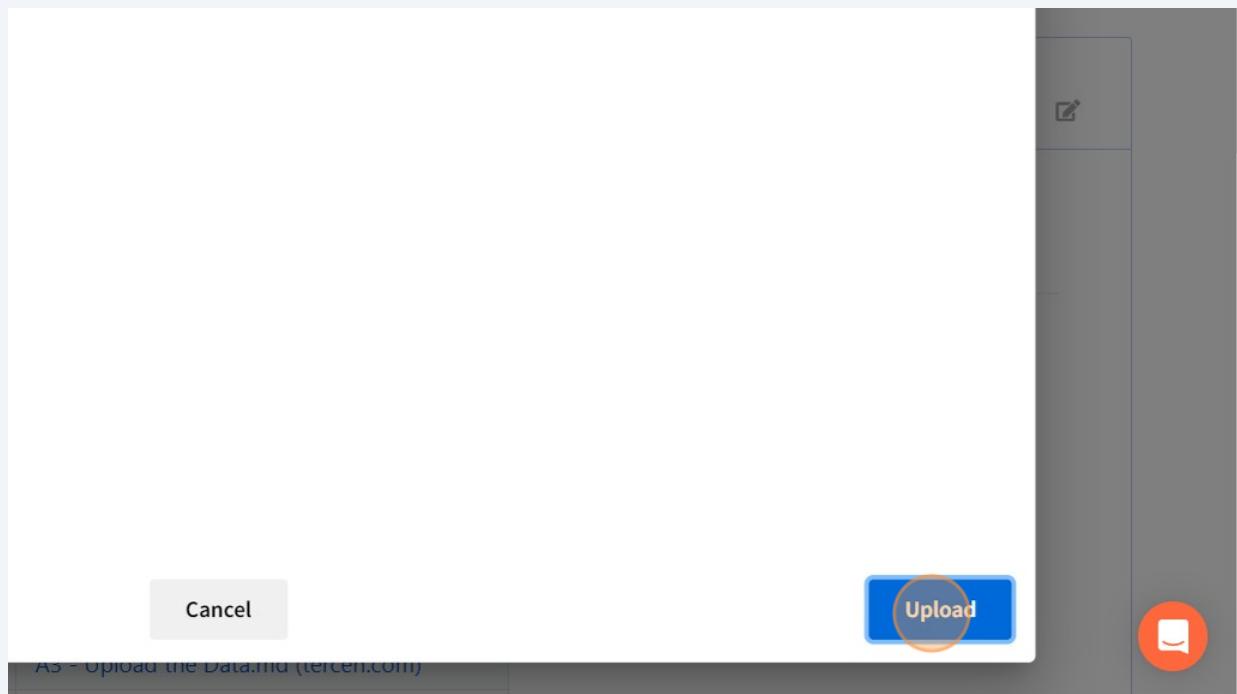
- 16 Browse to your download location.



- 17 Click "Next"



18 Click "Upload"



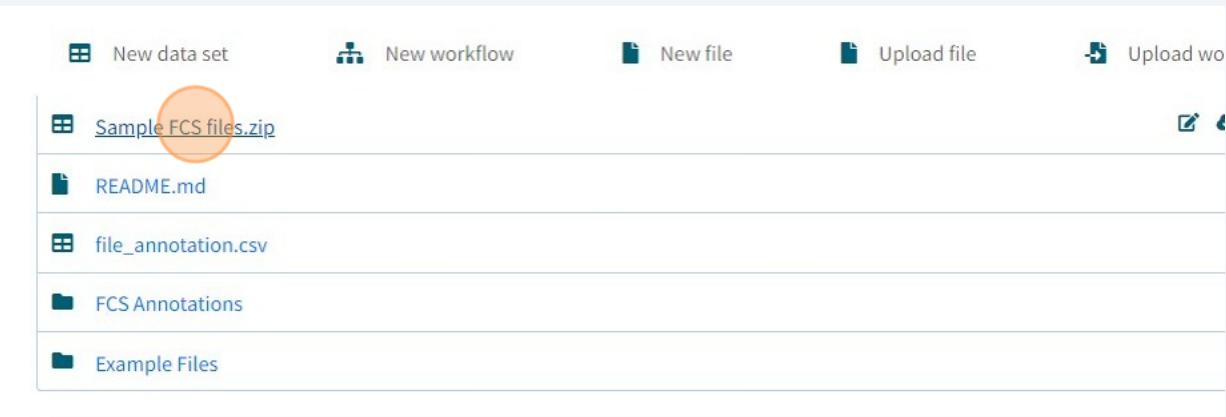
19 FCS files can be uploaded individually or combined into a .zip file and uploaded as a batch.

When doing batch upload Tercen creates one big data table for all of the FCS files combined

It creates a reference table that keeps track of which FCS file any data might have come from.

To examine the FCS data table.

Click "Sample FCS files.zip"



20 The reference table can be seen on the Table 2 tab.

The screenshot shows a Tercen project page titled "Sample FCS files.zip". The "Table 2" tab is highlighted with an orange circle. Below it, a table displays 16 rows of data across 16 columns. The columns are labeled with various FCS parameters like FSC-A, SSC-A, AARD-A, etc. The first row of data is as follows:

#	FSC-A (numeric)	FSC-H (numeric)	SSC-A (numeric)	AARD-A (numeric)	APC-H7-A (numeric)	Ax488-A (numeric)	Ax647-A (numeric)	Ax700-A (numeric)	PE-A (numeric)	PE-Cy5-A (numeric)	PE-Cy7-A (numeric)	PE-TxRed-A (numeric)	PacBlue-A (numeric)	Time (int32)	field (int32)	event_i (int32)
1	33391.44	32856.0	13424.25	222.0	82.84	36.75	58.52	19.0	343.44	1053.36	152.64	1412.64	86.25	0	1	1
2	134460.0	119544.0	34686.0	186.75	229.52	62.25	81.32	714.4	830.16	1810.08	470.88	3285.36	135.0	0	1	2
3	106458.48	94119.0	33408.75	168.0	709.84	63.0	177.08	2197.92	786.96	2070.0	562.32	3129.12	147.0	0	1	3
4	133750.08	115251.0	49335.75	294.0	225.72	84.0	88.92	697.68	1060.56	1977.12	406.8	3620.16	148.5	0	1	4
5	111611.52	98348.0	40650.75	934.5	538.08	84.0	231.04	1402.2	81.36	814.32	352.08	7.92	4303.5	0	1	5
6	76180.32	63698.0	35274.0	233.25	649.8	57.75	139.84	1744.2	937.44	2206.8	538.56	3810.24	193.5	0	1	6
7	132429.61	118017.0	33083.25	159.0	37.24	87.75	235.6	137.56	4190.4	2003.04	367.2	1602.72	94.5	0	1	7
8	133997.05	118019.0	39651.0	206.25	259.16	50.25	133.0	869.44	719.28	1912.32	532.8	2726.64	107.25	0	1	8
9	135452.89	118054.0	47211.0	268.5	250.8	97.5	106.4	813.2	688.32	1490.4	330.48	2809.44	178.5	0	1	9

21 Navigate back to the Tercen project.

Click "file_annotation.csv"

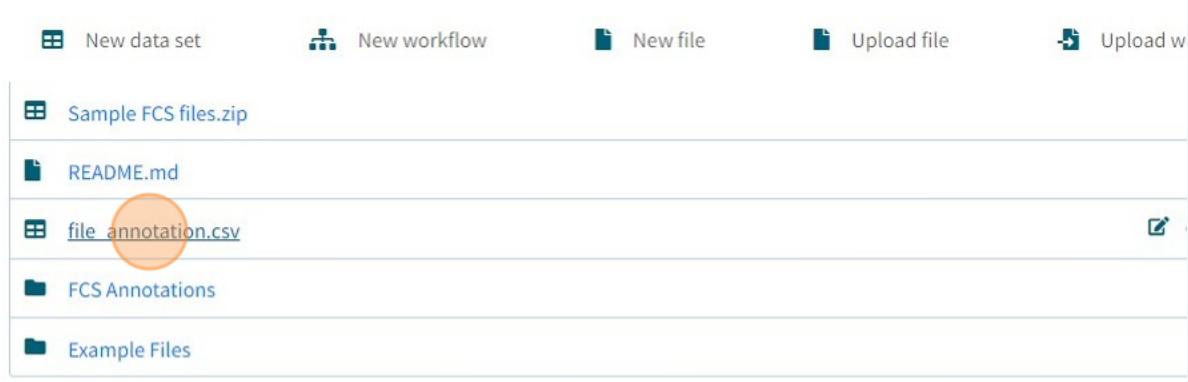
The screenshot shows the "Sample FCS files.zip" project page. The "file_annotation.csv" file is highlighted with an orange circle. The page also lists other files like "README.md" and "Example Files".

File list:

- Sample FCS files.zip
- README.md
- file_annotation.csv
- Example Files

22 Navigate back to the Tercen project.

Click "file_annotation.csv"



The screenshot shows a file browser interface with the following structure:

- New data set
- New workflow
- New file
- Upload file
- Upload w

Sample FCS files.zip

- README.md
- file_annotation.csv** (highlighted with an orange circle)
- FCS Annotations
- Example Files

README.md

Workshop II

23 You can see it is a simple table which tells which file is from the control group and which is from the treatment group.

Columns / Rows: 2 / 2

1 Previous Next Download

#	filename	Condition
	(character)	(character)
1	LD1_NS+NS_A01_exp.fcs	Control
2	LD1_PI+PI_D01_exp.fcs	Treatment

- 24** Navigate back to the Workshop II project screen.

The upload operator has created a supplementary file with any channel annotations that are in the FCS file.

We will be able to **Join** them in later reports.

Click "FCS Annotations"

The screenshot shows a user interface for managing files and projects. At the top, there are several navigation icons: 'New data set' (grid icon), 'New workflow' (flowchart icon), 'New file' (document icon), 'Upload file' (cloud icon), and 'Upload' (arrow icon). Below these, a list of files is displayed in a table-like structure:

	Sample FCS files.zip
	README.md
	file_annotation.csv
	<u>FCS Annotations</u>
	Example Files

Below the file list, there is a large, empty rectangular area with a thin gray border. In the bottom-left corner of this area, the text 'Workshop II' is centered in a large, bold, dark font.

25 Click the file that was created.

Note there is a time-stamp on the example file below.

The channel annotations file will be created on every run of the upload operator.

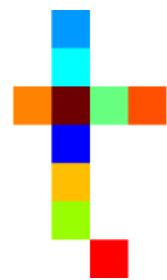
Click the file.

The screenshot shows a software interface with a navigation bar at the top. The 'Project' tab is selected, showing the title 'Workshop II - Martin'. Below the title, there is a link 'Other version for edits'. A horizontal toolbar follows, featuring icons for 'New data set', 'New workflow', 'New file', 'Upload file', and 'Up'. Underneath the toolbar, a breadcrumb trail reads 'Workshop II - Martin / FCS Annotations'. A list of files is displayed, with the first item, 'Channel-Descriptions-Sample FCS files.zip-10/06/23-08:28:53', highlighted by an orange circle.

26 **channel_name** and **channel_description** can be different.

#	channel_name (character)	channel_description (character)	channel_id (int32)
1	FSC-A	FSC-A	1
2	FSC-H	FSC-H	2
3	SSC-A	SSC-A	3
4	AARD-A	Dead	4
5	APC-H7-A	HLA-DR	5
6	Ax488-A	p-ERK1_2	6
7	Ax647-A	Blank	7
8	Ax700-A	CD3	8
9	PE-A	Perforin	9
10	PE-Cy5-A	CD38	10
11	PE-Cy7-A	IFNg	11
12	PE-TxRed-A	CD4	12
13	PacBlue-A	CD8	13

0202 - Join Metadata



This guide provides step-by-step instructions on how to use the Join step to merge donor annotations and cytokine data and then analyse them together in new projections.

1 First, the **Key** Concept.

Databases often relate pieces of information together with a code that they call a "key".

In simple terms, a "key" is match made between two tables because they each have a column that has the same data in it.

There are many practical "keys" in a typical biology experiment. Obvious examples are Patient ID and Sample ID.

A typical scenario, where a biologist would use a key, is where an instrument produces results labelled with a Patient ID and the biologist has a separate file of relevant information about that patient, such as their age, treatment condition, etc.

Tercen can merge data files together if they have a "key" to do the matching.

We call this step a **Join**

Key

The diagram illustrates the concept of a 'Key' in data joining. It shows two CSV files: 'grifol_cytokine_data.csv' and 'donor_annotation.csv'. A blue bracket labeled 'Key' spans both files, indicating that the matching occurs between the 'Sample ID' column in the first file and the 'SUBJECT ID' column in the second file. Arrows point from the 'Key' label to the respective columns in each table.

grifol_cytokine_data.csv								
A	B	C	D	E	F	G	H	
1	Sample ID	FN-gamma	IL-12p70	IL-13	IL-1beta	IL-2	IL-4	IL-5
2	3130035837	0	0	0	0	0	0	0
3	3130035967	0	0	0	0	0	0	0
4	3370452578	0	0	0	0	0	0	0
5	3370452632	0	0	0	0	0	0	0
6	3370452658	0	0	0	0	0	0	0
7	3370452662	30.06	0	0	0	0	0	0
8	3370452888	0	0	0	0	0	0	0
9	3370452917	6.39	0	0	0	0	0	0
10	3370452941	0	0	0	0	0	0	0
11	3370456329	0	0	0	0	0	0	0
12	3400334878	27.22	0	0	0	0	0	0
13	3400334880	0	0	0	0	0	0	0
14	3400334974	0	0	0	0	0	0	0
15	3400335283	0	0	0	0	0	0	0
16	3400335823	0	0	0	0	0	0	0
17	3400336107	3.44	0	0	0	0	0	0
18	3400336110	0	0	0	0	0	0	0
19	3400336121	0	0	0	0	0	0	0
20	3400336138	26.15	5.12	0	0	10.7	0	2.55
21	3400336234	0	0	0	0	0	0	0

donor_annotation.csv								
A	B	C	D	E	F	G		
1	SUBJECT ID	AGE	AGEG	AGEGR1C	RACEGRP	SEXN	SEXC	
2	3130035837	23	1	18-29	Caucasian	1	Female	
3	3130035967	27	1	18-29	Caucasian	1	Female	
4	3370452578	27	1	18-29	African-Ar	0	Male	
5	3370452632	23	1	18-29	Other	0	Male	
6	3370452658	40	3	40-49	African-Ar	0	Male	
7	3370452662	38	2	30-39	African-Ar	1	Female	
8	3370452888	24	1	18-29	African-Ar	0	Male	
9	3370452917	35	2	30-39	African-Ar	0	Male	
10	3370452941	26	1	18-29	African-Ar	0	Male	
11	3370456329	28	1	18-29	Caucasian	0	Male	
12	3400334878	46	3	40-49	Caucasian	0	Male	
13	3400334880	35	2	30-39	Caucasian	0	Male	
14	3400334974	20	1	18-29	Caucasian	0	Male	
15	3400335283	19	1	18-29	Other	0	Male	
16	3400335823	29	1	18-29	Caucasian	1	Female	
17	3400336107	38	2	30-39	Caucasian	0	Male	
18	3400336110	19	1	18-29	Caucasian	1	Female	
19	3400336121	25	1	18-29	Caucasian	0	Male	
20	3400336138	21	1	18-29	African-Ar	1	Female	
21	3400336234	18	1	18-29	Caucasian	0	Male	

2 The most typical "Key" in a Flow Cytometry experiment is the file name that the instrument exports.

The most common extra annotation that experimenters want to add is whether the file comes from a control or treatment group.

- 3 Click "Workshop II - Martin"

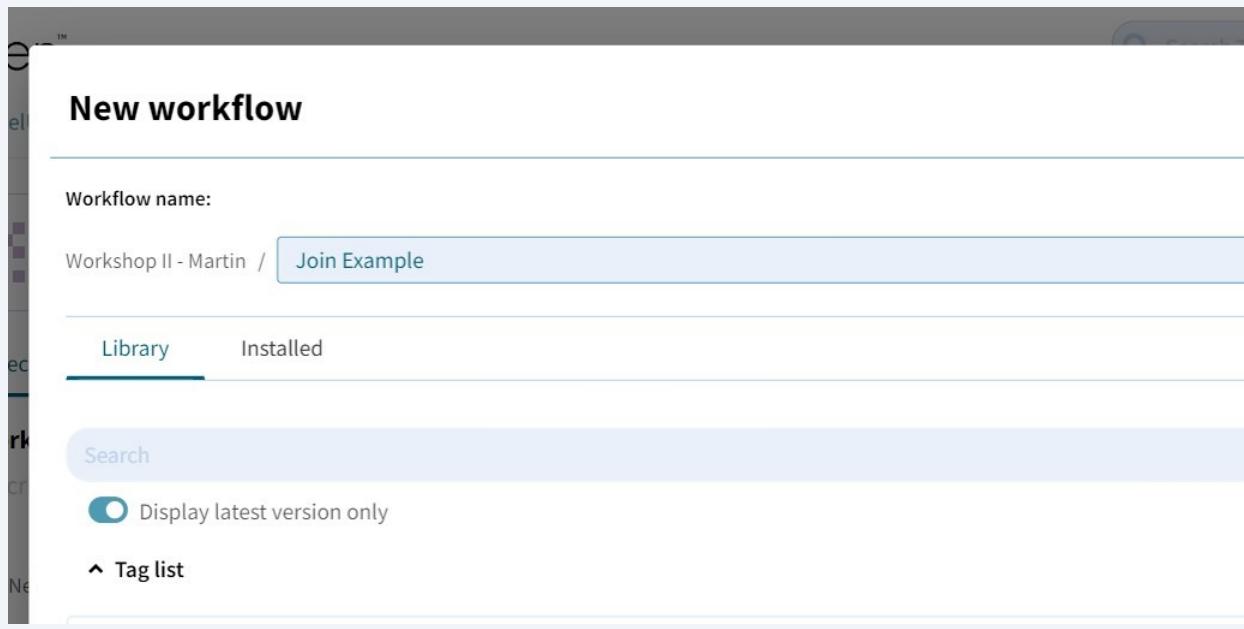
The screenshot shows the tercen™ software interface. At the top, there is a navigation bar with a home icon, followed by 'LevelUpWorkshopsTeam' and 'Workshop II - Martin'. The 'Workshop II - Martin' link is highlighted with an orange circle. Below the navigation bar, there is a sidebar with a purple square icon and the text 'LevelUpWorkshopsTeam'. Underneath the sidebar, there are two tabs: 'Project' (which is selected and underlined) and 'Activities'. In the main content area, there is a section titled 'Workshop II - Martin' with a lock icon. Below it, it says 'No description provided.' At the bottom of the screen, there is a blue banner with a red star icon and the text 'MartinE updated data file_annotation.csv'. Below the banner, there are several icons for creating new datasets, workflows, files, and uploading files.

- 4 Click "New workflow"

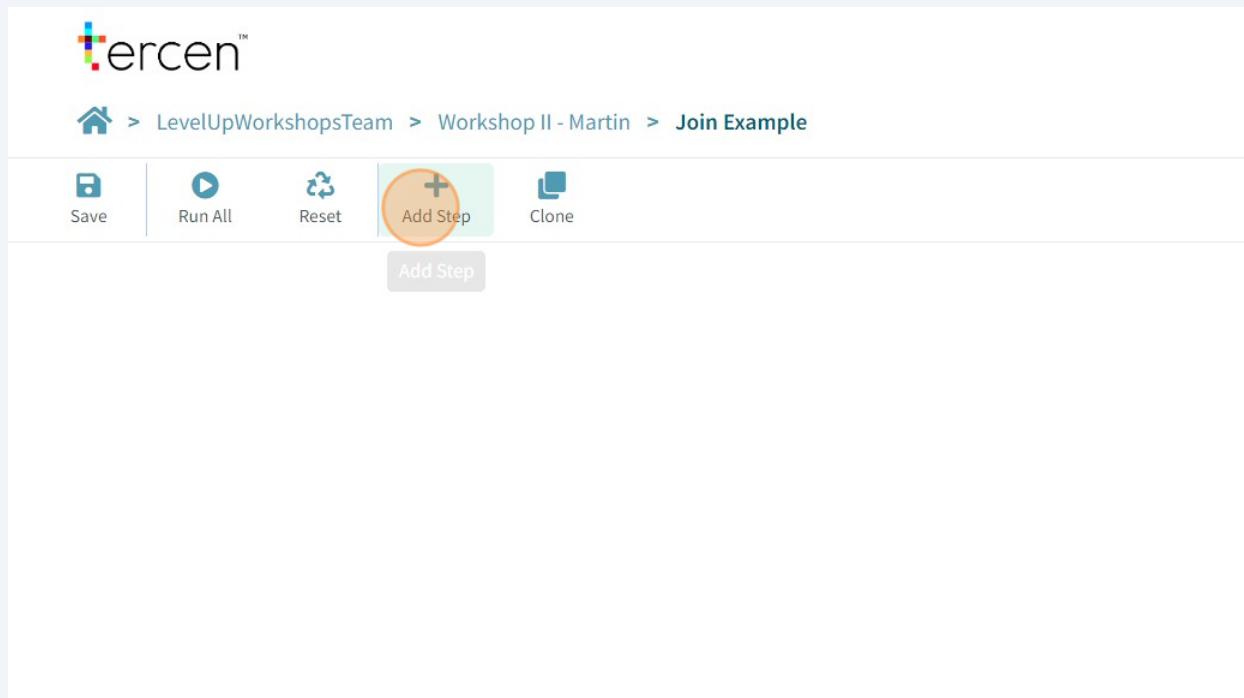
The screenshot shows the tercen™ software interface, similar to the previous one but with a different focus. It features a sidebar with a purple square icon and the text 'LevelUpWorkshopsTeam'. The 'Project' tab is selected. In the main content area, there is a section titled 'Workshop II - Martin' with a lock icon. Below it, it says 'No description provided.' At the bottom of the screen, there is a blue banner with a red star icon and the text 'MartinE updated data file_annotation.csv'. Below the banner, there are several icons for creating new datasets, workflows, files, and uploading files. The 'New workflow' icon is highlighted with an orange circle. A list of files is visible at the bottom of the screen, including 'Sample FCS files.zip', 'README.md', 'file_annotation.csv', and 'Example Files'.

5 Name the workflow **Join Example**

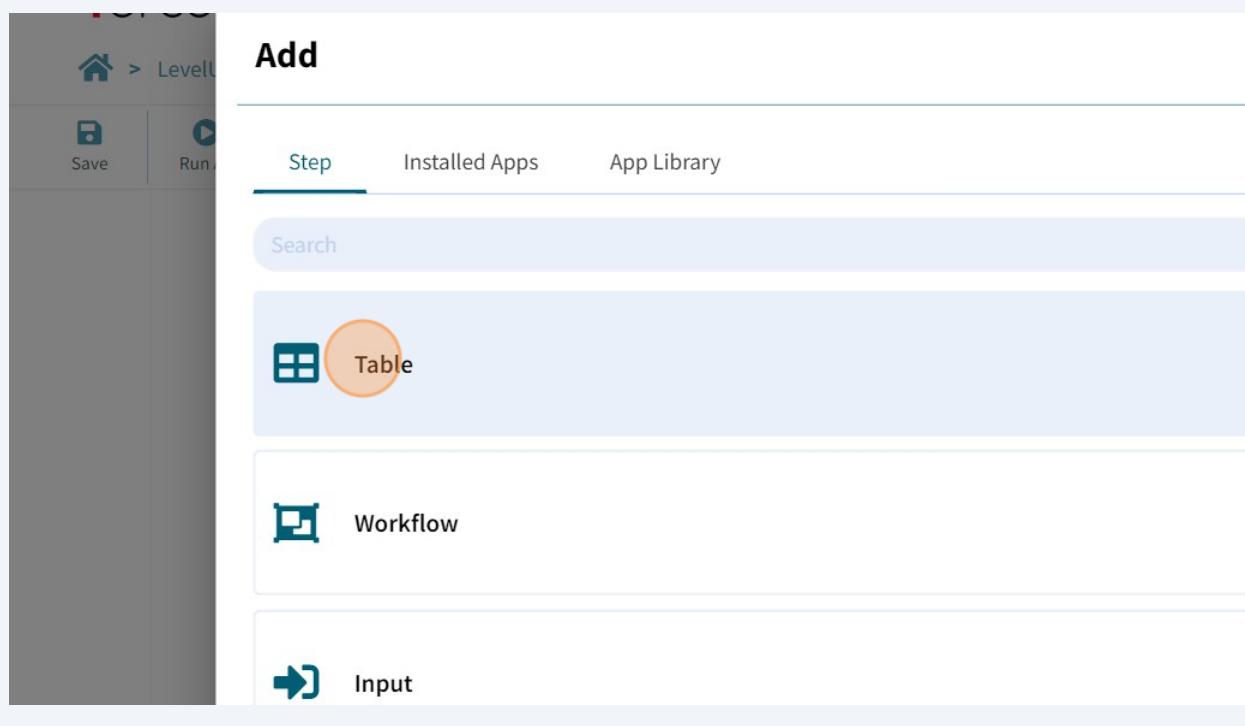
Click "Ok" when done



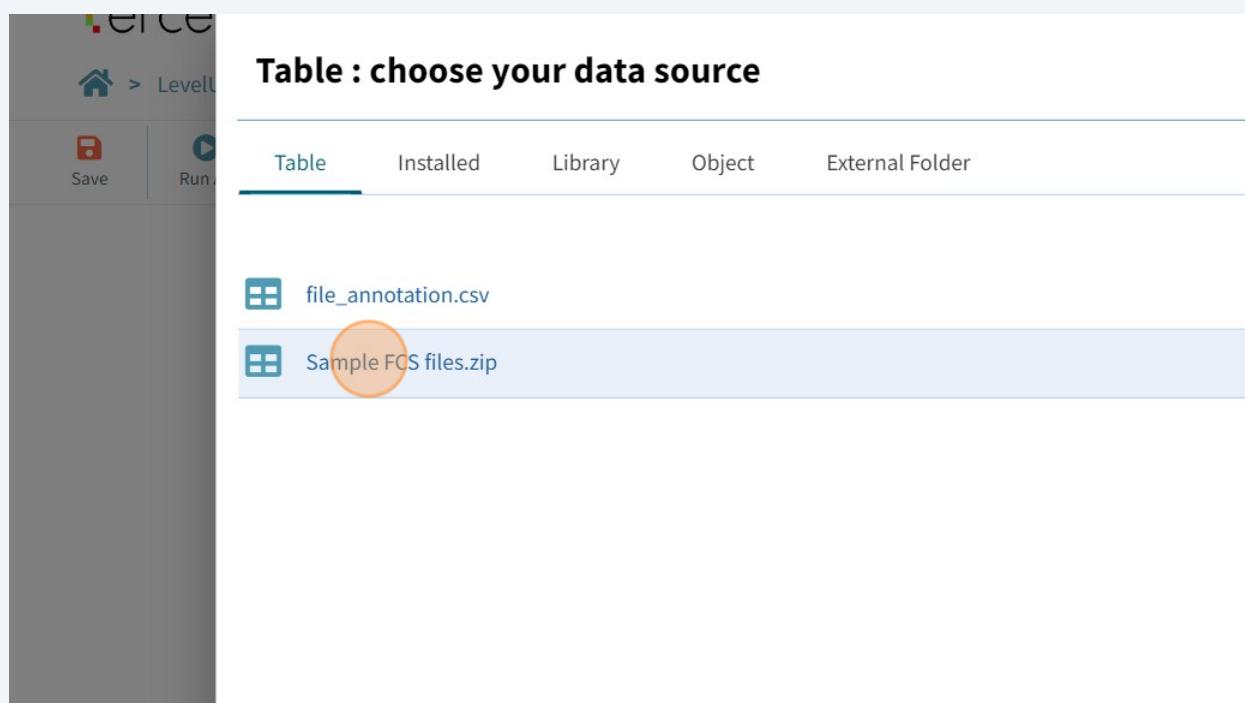
6 Click the Global toolbar to add the data tables



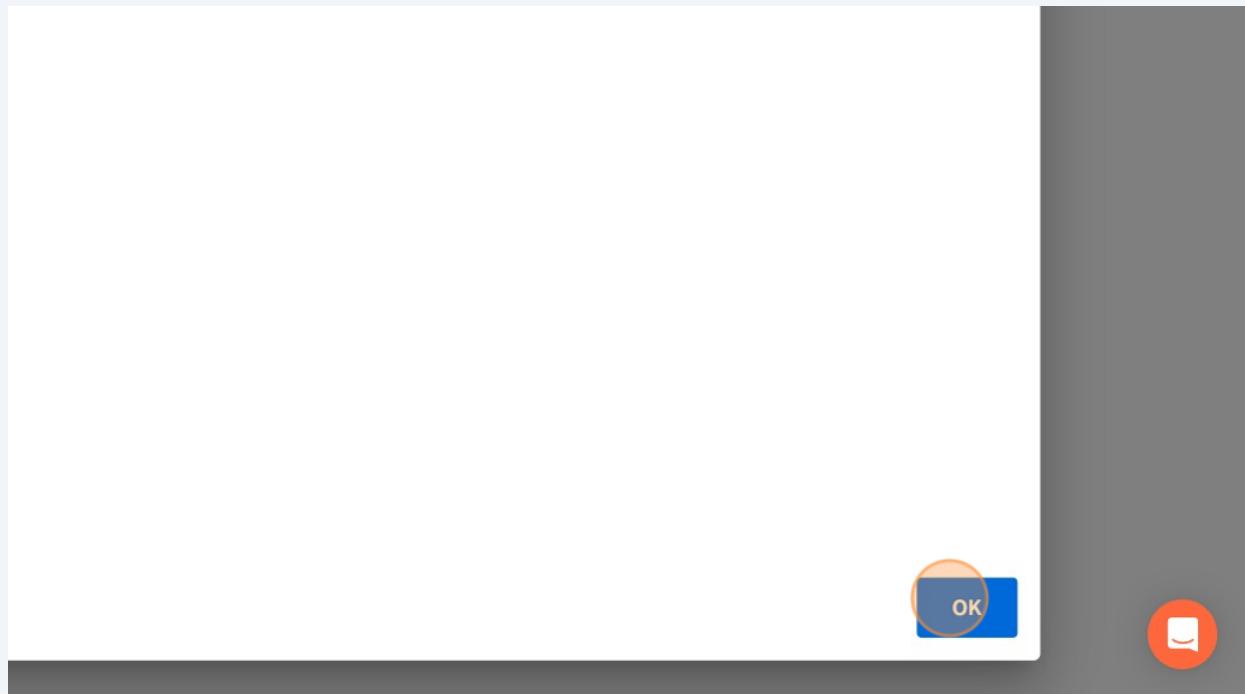
7 Click "Table"



8 Click "Sample FCS files.zip"



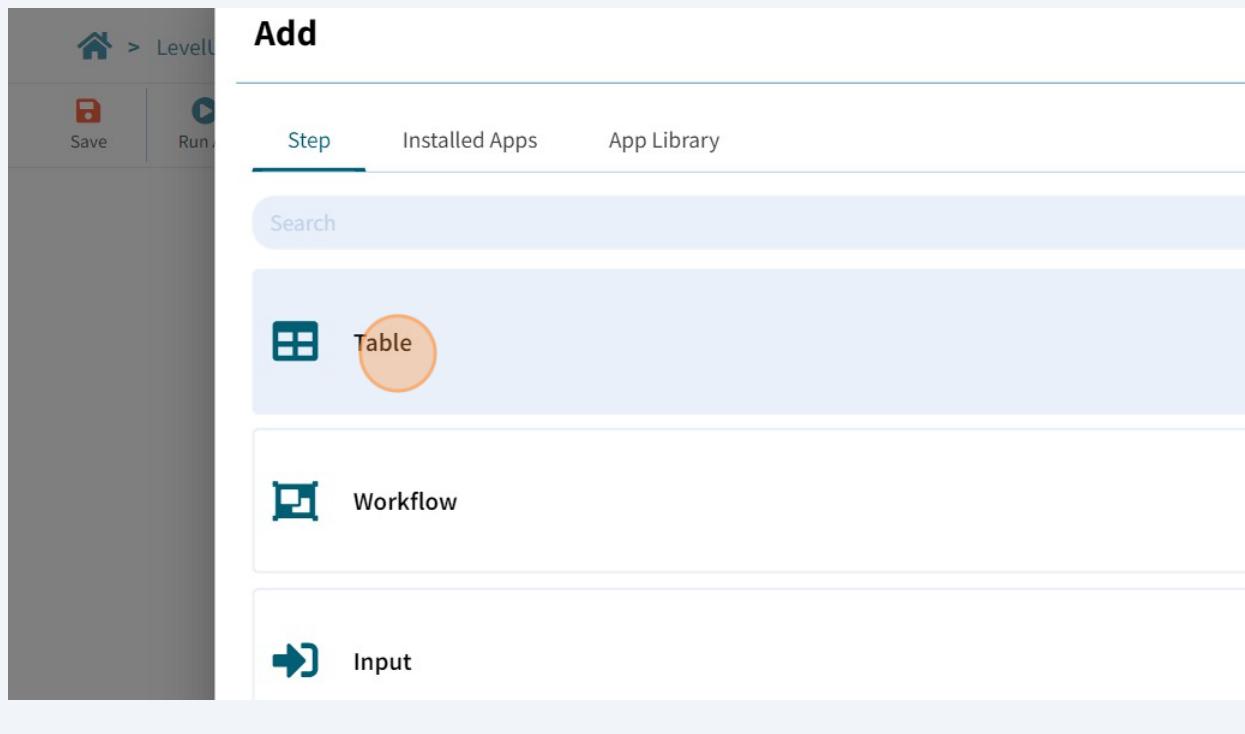
9 Click "OK"



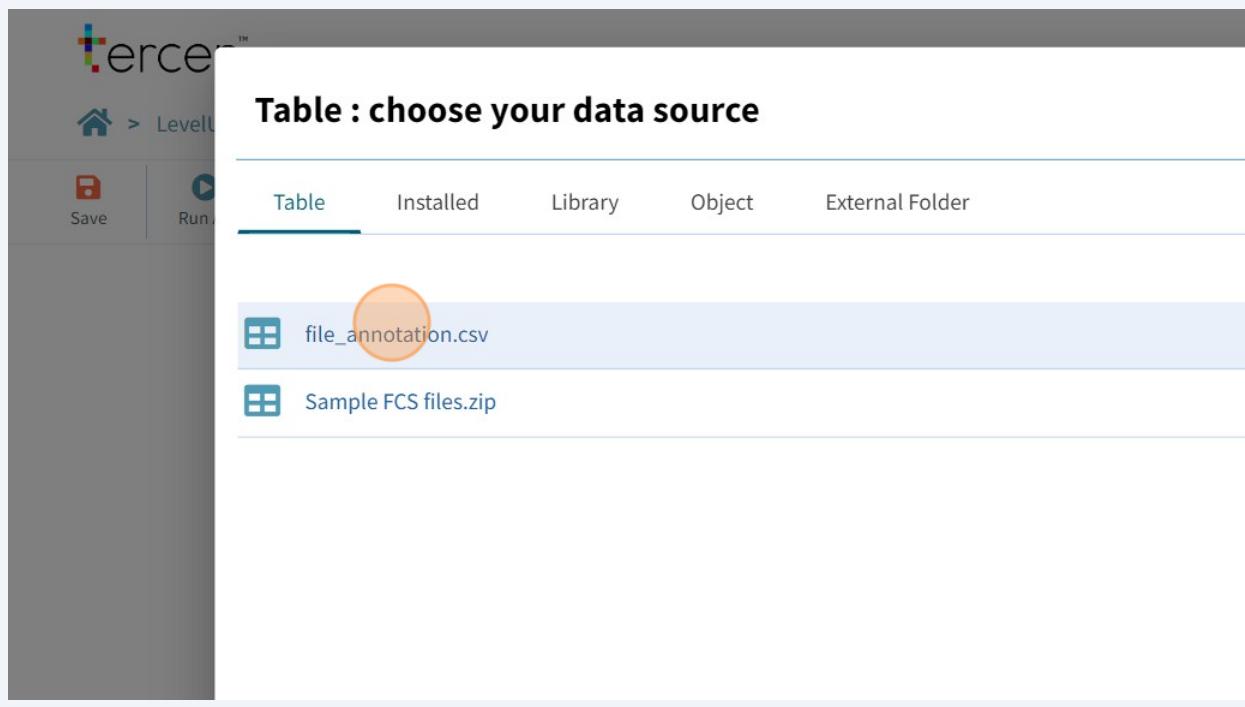
10 Repeat the process for the annotation file.

A screenshot of the tercen software interface. At the top, the navigation bar shows: Home > LevelUpWorkshopsTeam > Workshop II - Martin > Join Example. Below the navigation are several buttons: Save (red), Run All (blue play icon), Reset (green recycling icon), Add Step (light green button with a plus sign, highlighted with an orange circle), and Clone (blue square icon). A large "Add Step" button is centered below these. In the main workspace, a file named "Sample FCS files.zip" is listed in a small box with a blue folder icon.

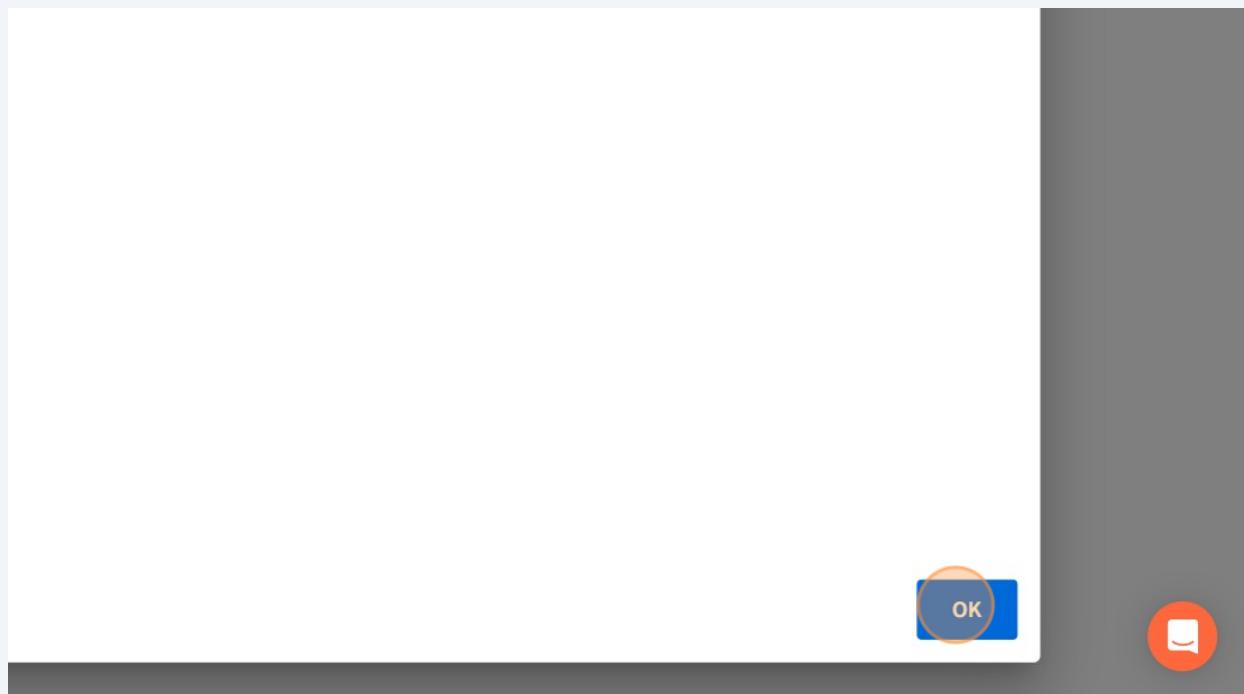
11 Click "Table"



12 Click "file_annotation.csv"



13 Click "OK"



14 Lets note some things about our data.

Click the Sample FCS files.zip Table

Select **Edit** from the toolbar

A screenshot of the Tercen software interface. At the top, there is a navigation bar with icons for Home, Save, Run All, Reset, Add Step, and Close. Below the navigation bar is a toolbar with several icons: a blue square (Save), a play button (Run All), a recycling symbol (Reset), a plus sign (Add Step), a blue square with a white plus sign (Close), a circular arrow (Recycle), a pencil (Edit), a person icon, a trash can, a clipboard, and a plus sign. The "Edit" icon is highlighted with a red circle. Below the toolbar, there are two file thumbnails: "Sample FCS files.zip" and "file_annotation.csv". The "Edit" icon is also highlighted on the toolbar above these files.

15 Click "Table 2"

The screenshot shows the Tercen software interface. At the top, there is a navigation bar with a home icon, followed by the path: LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > Sample FCS files.zip. Below the navigation, there are two tabs: "Table 1" and "Table 2", with "Table 2" highlighted and circled in orange. A status message "Columns / Rows: 16 / 495319" is displayed. Below the tabs are four buttons: "1" (selected), "Previous", "Next", and "Download". The main area displays a table with the following columns and data:

#	FSC-A (numeric)	FSC-H (numeric)	SSC-A (numeric)	AARD-A (numeric)	APC-H7-A (numeric)	Ax488-A (numeric)	Ax647-A (numeric)	Ax700-A (numeric)	PE-A (numeric)
1	33391.44	32856.0	13424.25	222.0	82.84	36.75	58.52	19.0	343.44
2	134460.0	119544.0	34686.0	186.75	229.52	62.25	81.32	714.4	830.16

16 Tercen is tracking the **filename** of the FCS data.

The screenshot shows the Tercen software interface. At the top, there is a navigation bar with a home icon, followed by the path: LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > Sample FCS files.zip. Below the navigation, there are two tabs: "Table 1" and "Table 2", with "Table 2" highlighted. A status message "Columns / Rows: 2 / 495319" is displayed. Below the tabs are four buttons: "1" (selected), "Previous", "Next", and "Download". The main area displays a table with the following columns and data:

event_id (int32)	filename (character)
1	LD1_NS+NS_A01_exp.fcs
2	LD1_NS+NS_A01_exp.fcs
3	LD1_NS+NS_A01_exp.fcs
4	LD1_NS+NS_A01_exp.fcs
5	LD1_NS+NS_A01_exp.fcs
6	LD1_NS+NS_A01_exp.fcs

17 Click "Join Example"

rcen™

LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > Sample FCS files.zip

Table 2

Rows: 2 / 495319

Previous Next Download

event_id	filename
(int32)	(character)
1	LD1_NS+NS_A01_exp.fcs
2	LD1_NS+NS_A01_exp.fcs

18 Click on the **file_annotation.csv** table and select Edit.

Search Tercen

opsTeam > Workshop II - Martin > Join Example

Reset Add Step Clone

Edit

Sample FCS files.zip

file_annotation.csv

19 The annotation file lists its information by **filename**.

Columns / Rows:		2 / 2	
1	Previous	Next	Download
#	filename		Condition
	(character)		(character)
1	LD1_NS+NS_A01_exp.fcs		Control
2	LD1_PI+PI_D01_exp.fcs		Treatment

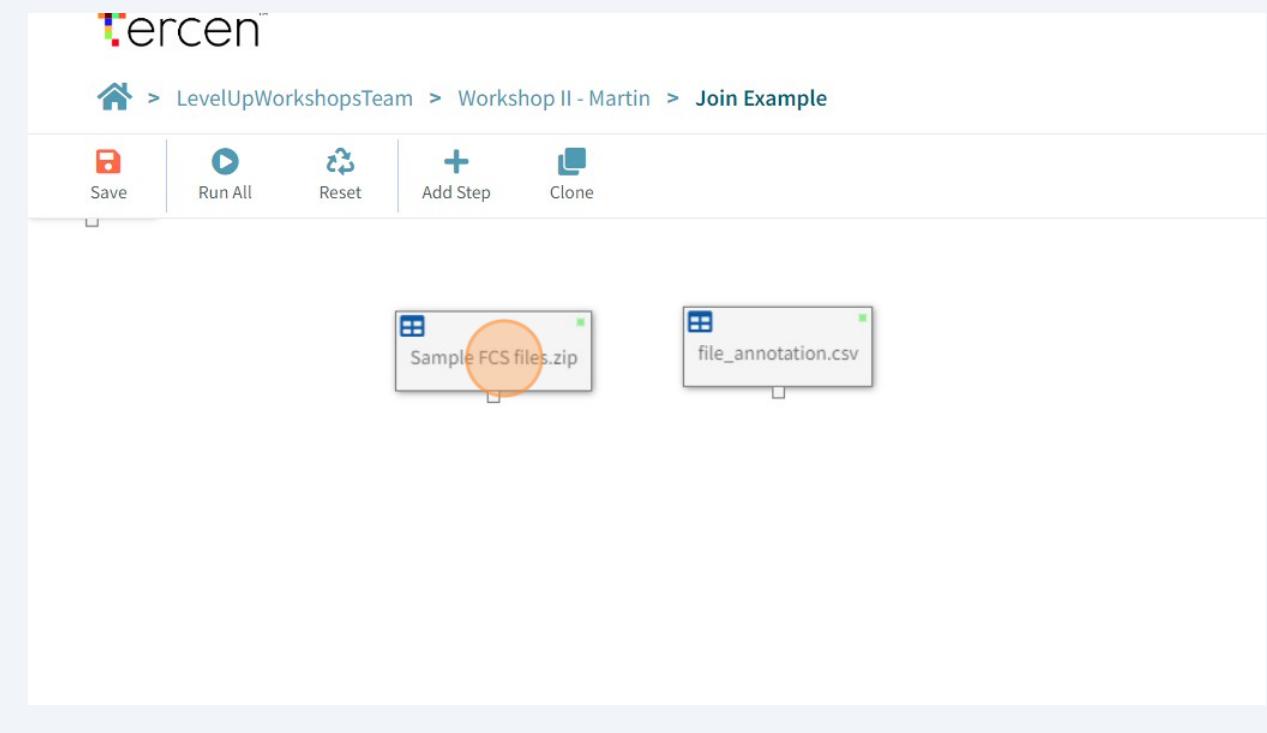
20 Return to the **Join Example** workflow.

ercen™	
> LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > file_annotation.csv	
/ Rows:	2 / 2
	Previous
	Next
	Download
filename	
(character)	
LD1_NS+NS_A01_exp.fcs	
LD1_PI+PI_D01_exp.fcs	

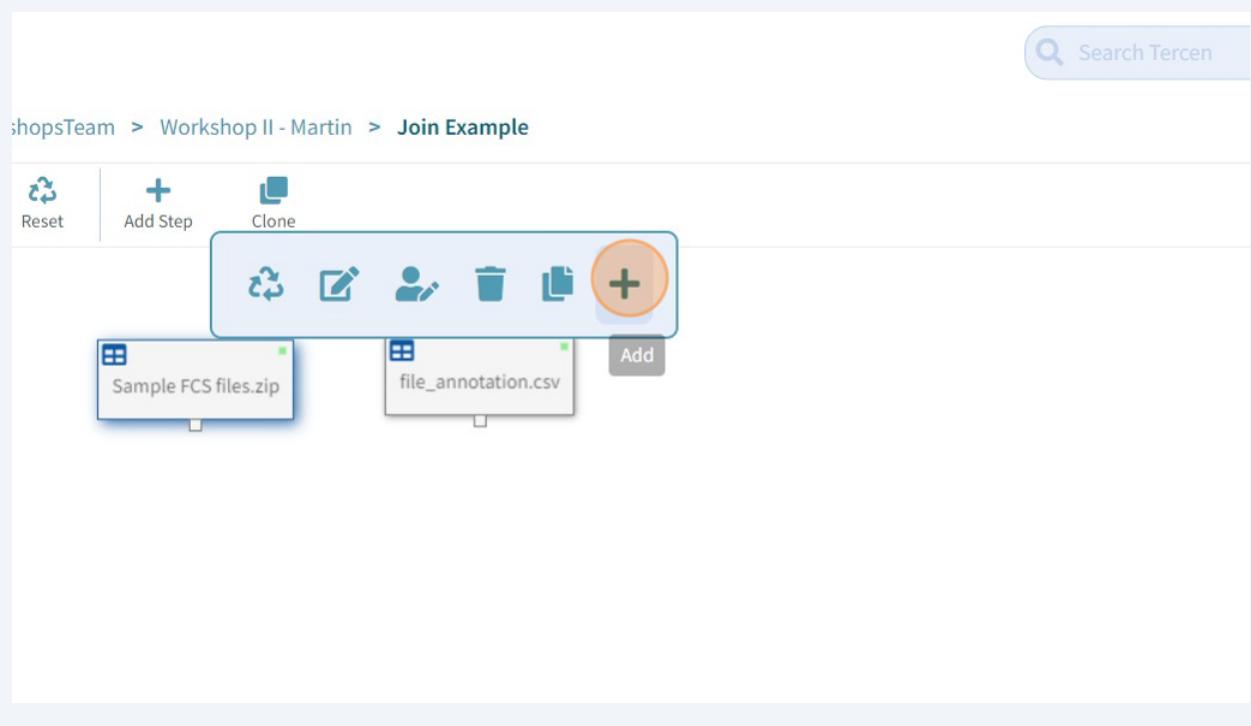
21 We will add a Join Step to the FCS Table.

and then link it to the annotation table.

Click Sample FCS files.zip to bring up the local toolbar.



22 Click Add.



23 Select Join (left Table).

The screenshot shows a list of data steps. The first three are standard, while the fourth and fifth are specifically for joins. The fourth item, 'Join leftTable', is highlighted with an orange circle around its icon and name.

- Data step** `data`
Perform computation on user defined projection
- Multi data step** `data`
Perform computation on user defined projection
- Join** `leftTable`
Join two data sets
- Join** `rightTable`
Join two data sets
- Gather** `table`
Convert data from a wide format to a long format

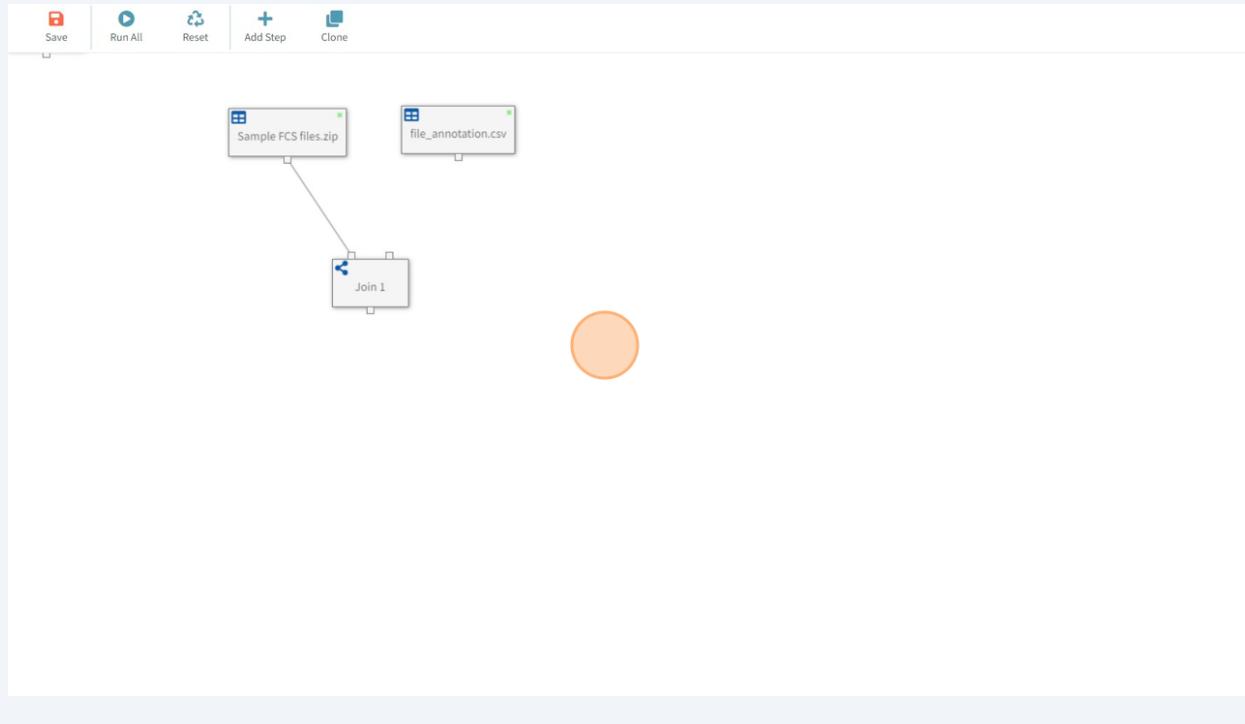


There are different types of Join which you can learn in advanced lessons. Use Join (Left) for now and ask your instructor if you need to know more.

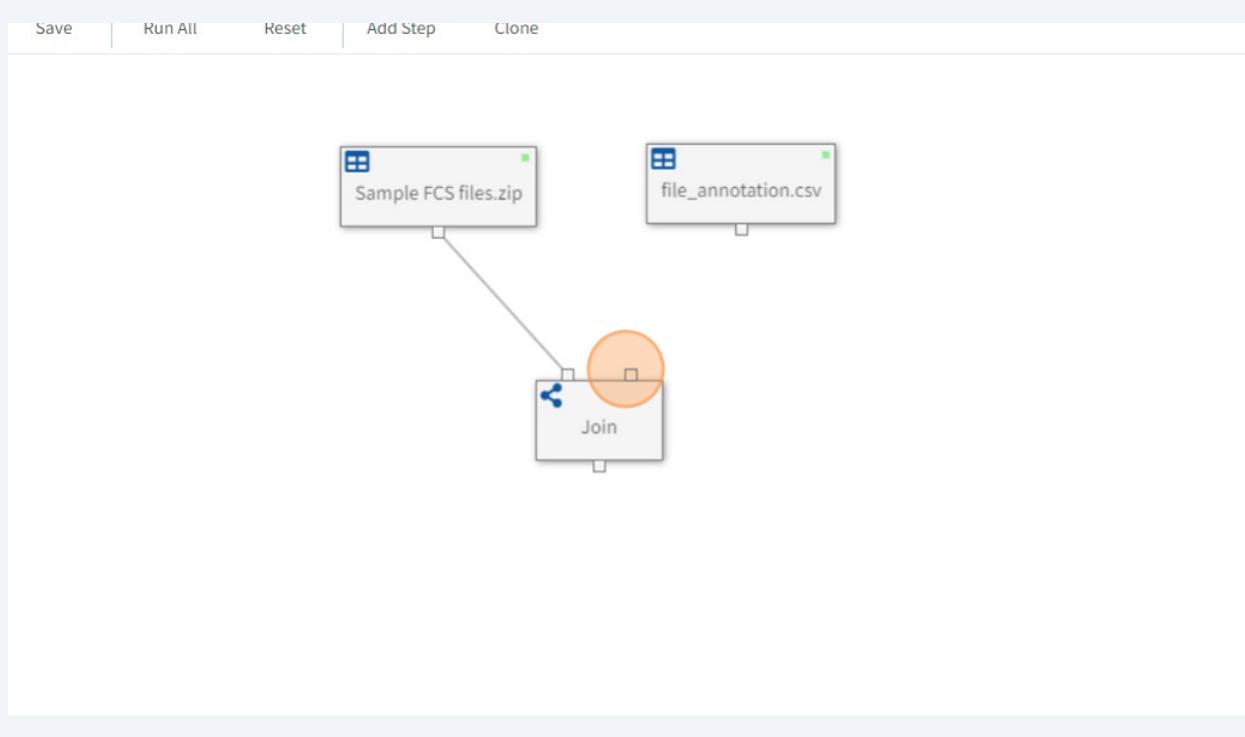
24 A Join Step is added to teh workflow canvas.

It is linked to the FCS table.

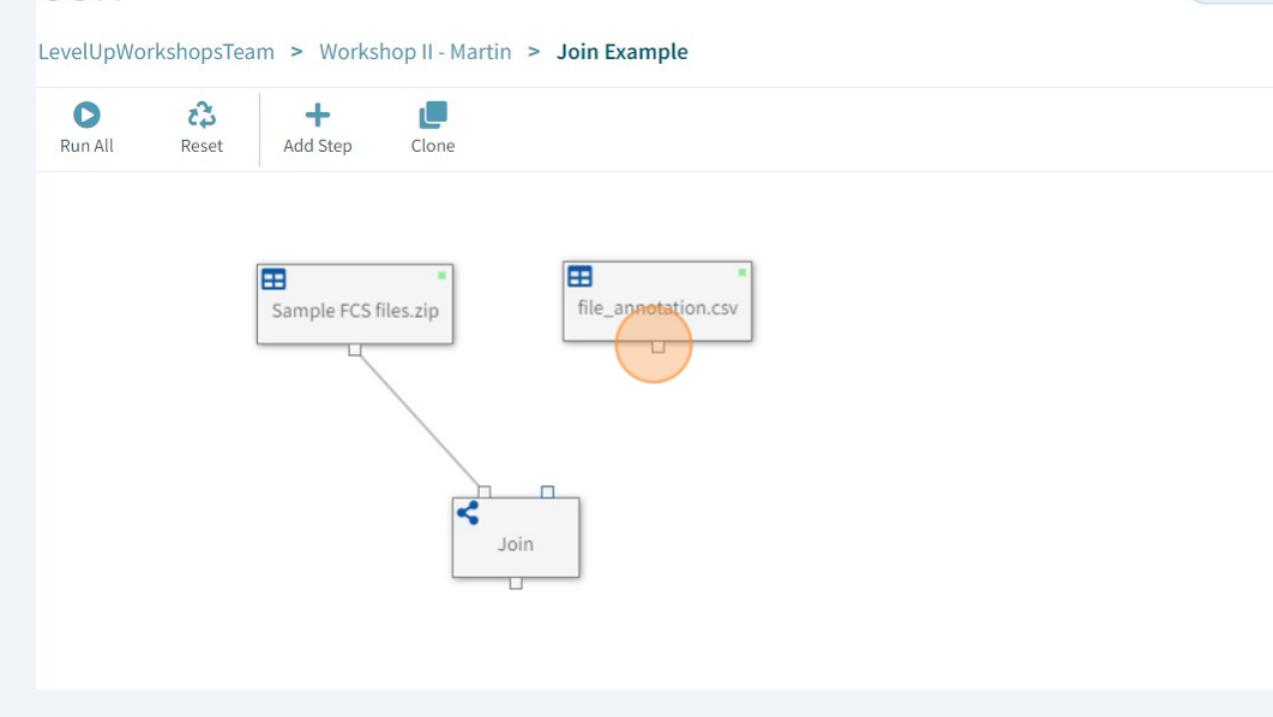
Click the white space to clear the local toolbar.



25 To make the link click the free **node** on the top of the Join Step

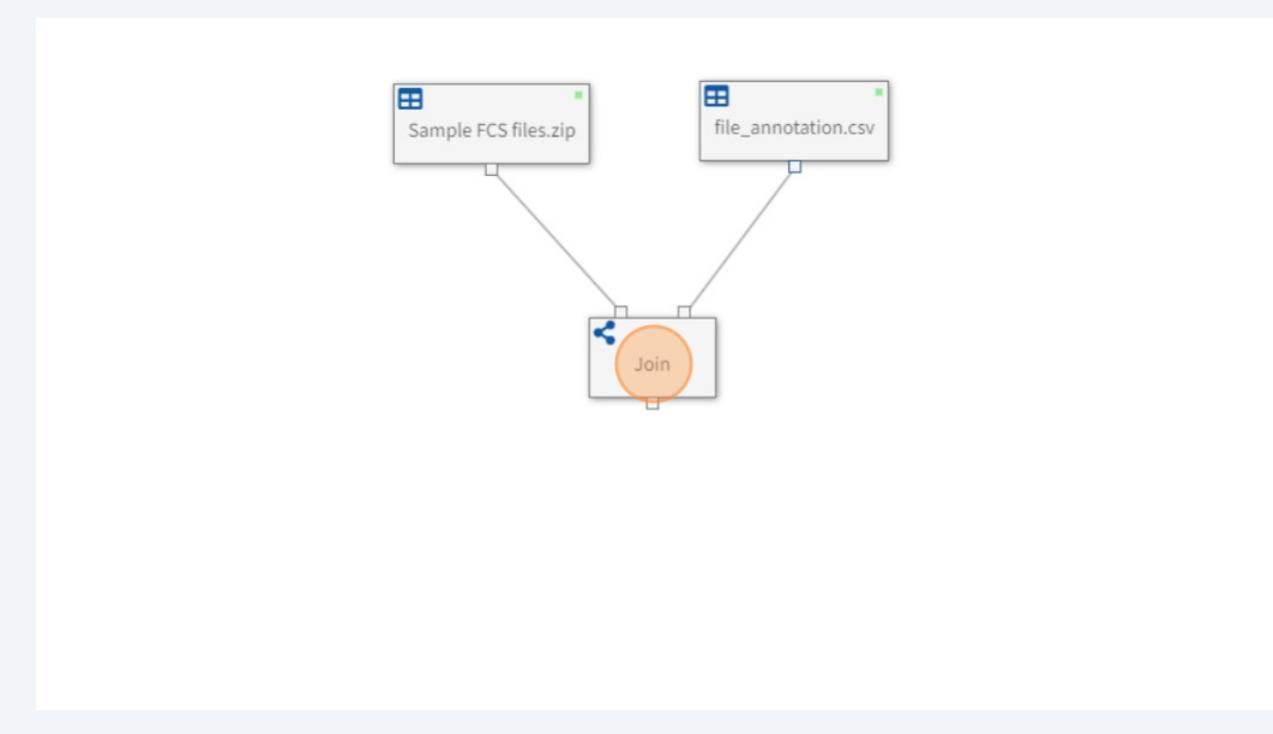


26 Now click the free node at the bottom of the annotation step.



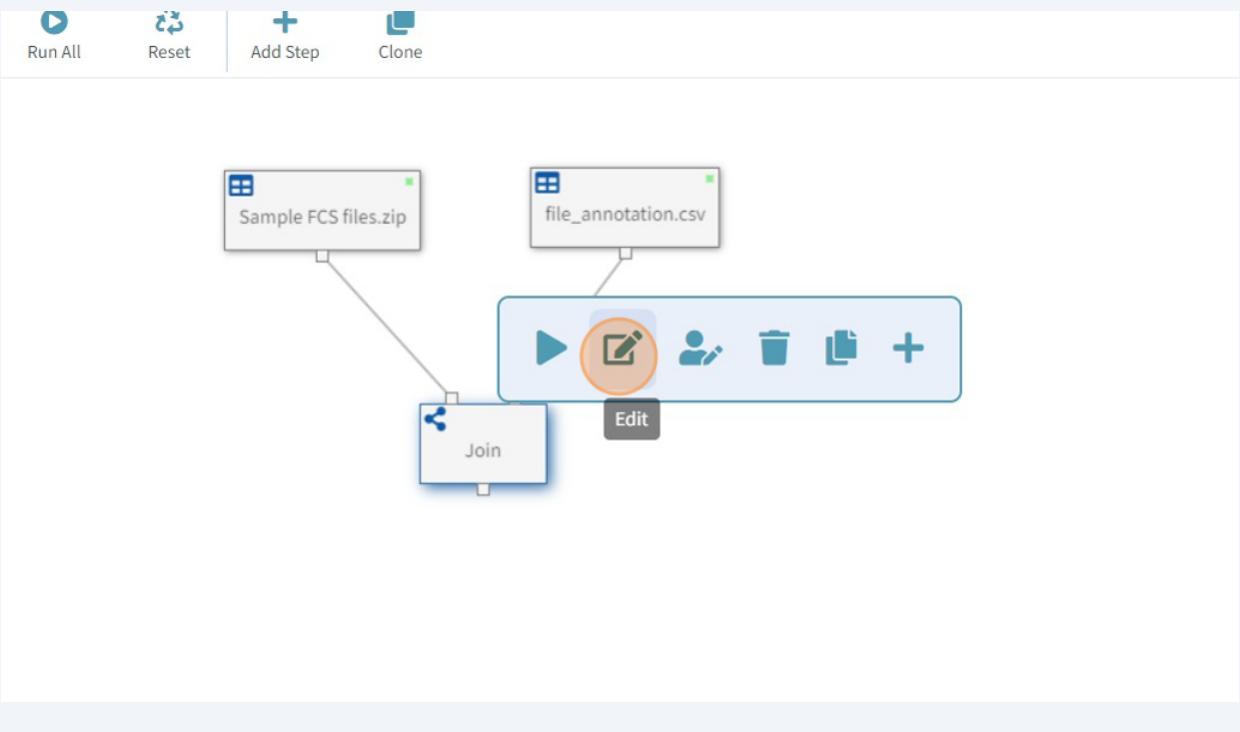
27 Now the Join is linking the two data tables.

It's time to set the **Key** to combine them.



28 Click the Join step to bring up the local toolbar.

Select **Edit** to open it.



29 You will see the two tables side by side.

The factors of each Table are listed.

We know the annotation file is structured to match the file name.

This is the **key** for these two tables.

Namespace
js0

Join keys

Select all Select all

<input type="checkbox"/> FSC-A (numeric)	<input type="checkbox"/> filename (character)
<input type="checkbox"/> FSC-H (numeric)	<input type="checkbox"/> Condition (character)
<input type="checkbox"/> SSC-A (numeric)	<input type="checkbox"/> rowId (numeric)
<input type="checkbox"/> AARD-A (numeric)	<input type="checkbox"/> tableId (character)
<input type="checkbox"/> APC-H7-A (numeric)	
<input type="checkbox"/> Ax488-A (numeric)	
<input type="checkbox"/> Ax647-A (numeric)	
<input type="checkbox"/> Ax700-A (numeric)	
<input type="checkbox"/> PE-A (numeric)	
<input type="checkbox"/> PE-Cy5-A (numeric)	
<input type="checkbox"/> PE-Cy7-A (numeric)	
<input type="checkbox"/> PE-TxRed-A (numeric)	
<input type="checkbox"/> PacBlue-A (numeric)	
<input type="checkbox"/> Time (numeric)	
<input type="checkbox"/> fileId (numeric)	
<input type="checkbox"/> event_id (numeric)	
<input type="checkbox"/> filename (character)	

30 Select Filename from the FCS list

- PE-A (numeric)
- PE-Cy5-A (numeric)
- PE-Cy7-A (numeric)
- PE-TxRed-A (numeric)
- PacBlue-A (numeric)
- Time (numeric)
- fileId (numeric)
- event_id (numeric)
- filename (character)

Back

31 And select filename from the Annotation list.

ce

] all

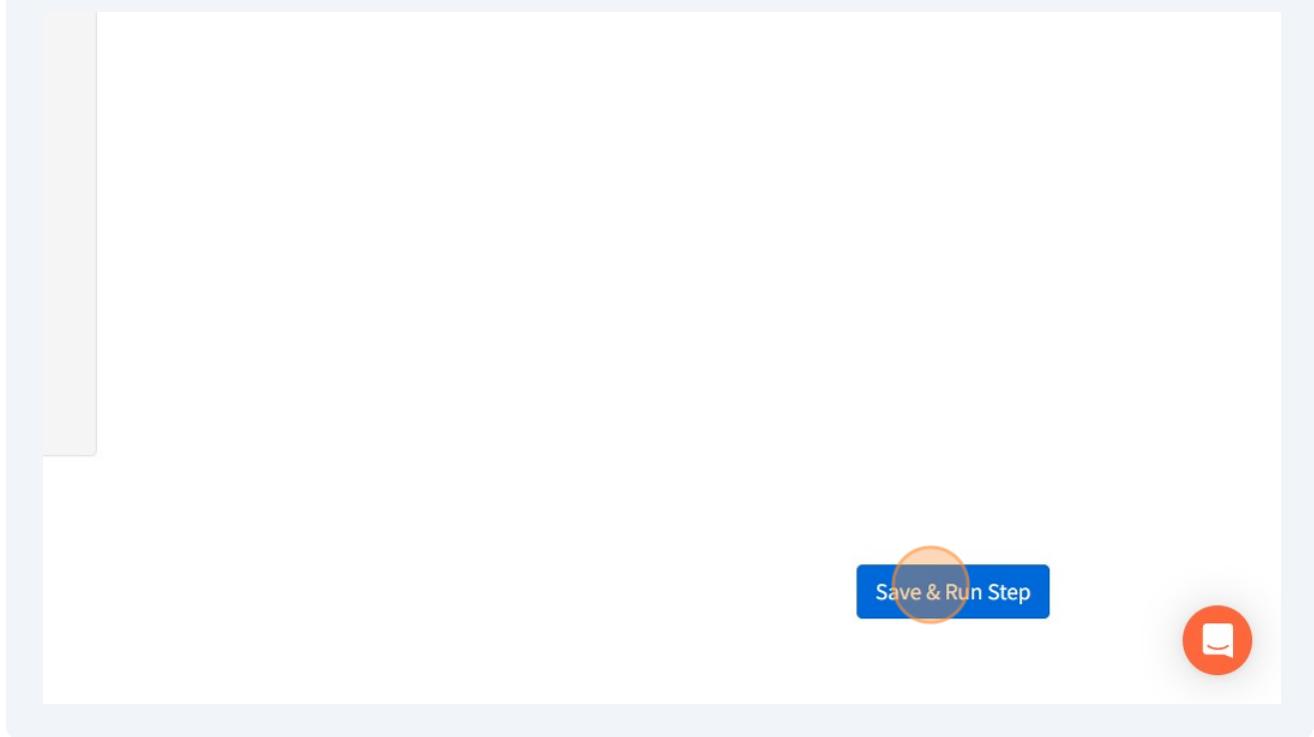
Select all

- :A (numeric)
- :H (numeric)
- :A (numeric)
- :D-A (numeric)
- :H7-A (numeric)
- 88-A (numeric)
- 47-A (numeric)
- 00-A (numeric)

- filename (character)
- Condition (character)
- rowId (numeric)
- tableId (character)

32 Click "Save & Run Step"

Now the **Join** is made



33 Return to the "Join Example" workflow.

A screenshot of a "Join Example" workflow configuration screen. At the top left, the word "ercen™" is visible. In the top right corner, there is a search bar with a magnifying glass icon and a small dropdown menu icon. Below the header, a breadcrumb navigation path shows the current location: "LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > Join". The main area contains several configuration sections. One section is titled "Namespace" with a input field containing "js0". Another section is titled "Join keys" with a "[filename]" placeholder and a "Select all" checkbox. To the right of these, there is another "Join keys" section with a "[filename]" placeholder and a "Select all" checkbox. Below these sections are two lists of checkboxes. The left list includes "FSC-A (numeric)", "FSC-H (numeric)", "SSC-A (numeric)", "AARD-A (numeric)", and "APC-H7-A (numeric)". The right list includes "filename (character)" (which is checked), "Condition (character)", "rowId (numeric)", and "tableId (character)".



Files can be complicated and have many similar names possible to make a mistake picking a join. Joins don't work if they don't have data they can match from both tables.

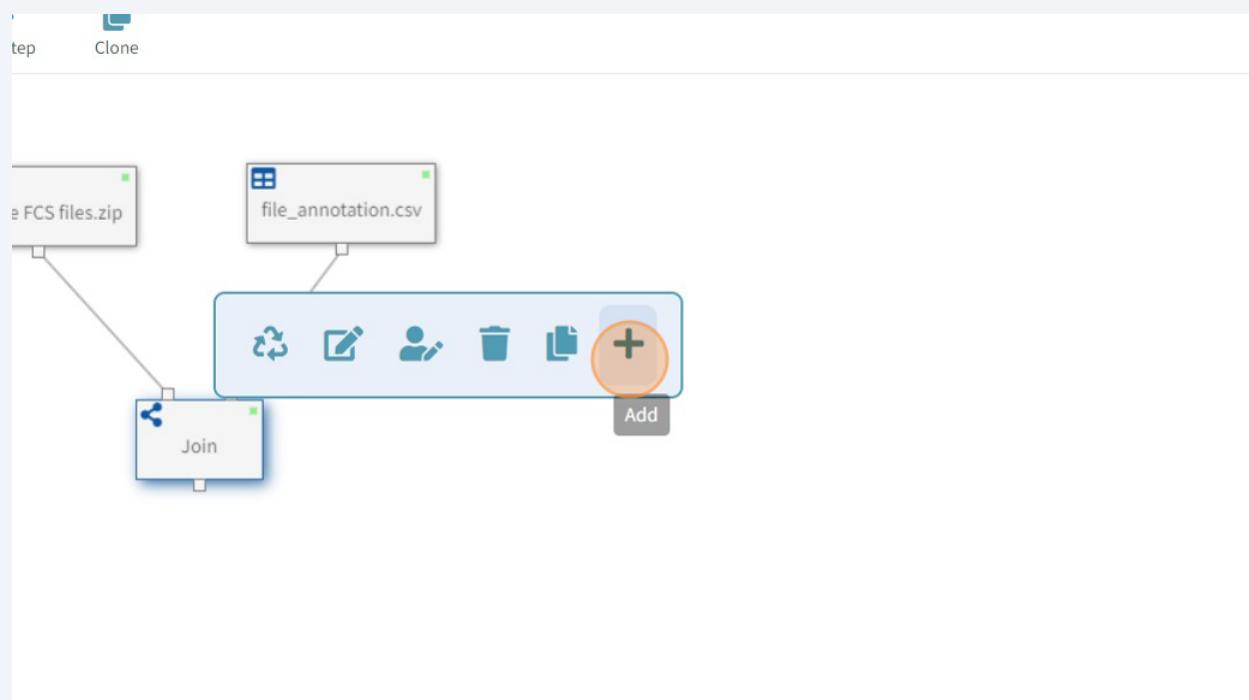
34

Files can be complicated and have many similar factor names. It's possible to make a mistake picking a join. Joins don't work if they don't have data they can match from both tables.

We can add data step to check if the Join is good.

Click the Join step

Select Add from the local toolbar.



35 Choose Data Step

The screenshot shows the 'Add' screen with the 'Step' tab selected. The 'Data step' operator is highlighted with an orange circle. Other operators shown are 'Multi data step' and 'Join'. The 'Data step' operator is described as 'Perform computation on user defined projection'.

36 Make a projection of our Join using the crosstab Rows.

The screenshot shows the 'Crosstab' operator configuration screen. The 'Factors' tab is selected. A dropdown menu is open, showing 'Sample FCS files.zip'. Below the dropdown, there is a list of variables: js0.filename, js0.Condition, js0.rowId, and js0.tableId. An orange circle highlights the dropdown arrow.

37 Drag **filename** from Sample FCS files.zip to **Row**

The screenshot shows a list of factors on the left and a 'Join' section on the right. The 'filename' factor is highlighted with an orange circle. The 'Join' section contains a list of factors: js0.filename, js0.Condition, js0.rowId, and js0.tableId. Below the 'Join' section is a status bar with dimensions: Width: 330px (8.73cm) | Height: 280px (7.41cm) | dpi: 96.

- PE-Cy5-A
- PE-Cy7-A
- PE-TxRed-A
- PacBlue-A
- Time
- fileId
- event_id
- filename

Join

- js0.filename
- js0.Condition
- js0.rowId
- js0.tableId

Width: 330px (8.73cm) | Height: 280px (7.41cm) | dpi: 96

38 Drag **js0.filename** from the **Join** factors also to **Row**

You can drag the crosstab lines to adjust the grid.

The screenshot shows a list of factors on the left and a 'Join' section on the right. The 'js0.filename' factor is highlighted with an orange circle. The 'Join' section contains a list of factors: js0.filename, js0.Condition, js0.rowId, and js0.tableId. To the right is a crosstab grid with one column labeled 'LD1_PI+PLD01_ex'. Below the 'Join' section is a status bar with dimensions: Width: 410px (10.85cm) | Height: 530px (14.02cm) | dpi: 96.

- PE-Cy5-A
- PE-Cy7-A
- PE-TxRed-A
- PacBlue-A
- Time
- fileId
- event_id
- filename

Join

- js0.filename
- js0.Condition
- js0.rowId
- js0.tableId

LD1_PI+PLD01_ex

Width: 410px (10.85cm) | Height: 530px (14.02cm) | dpi: 96

39

We have a projection of what the filename "is" on the original file compared to the filename factor created by the Join Step based on matching the **key** we chose for it.

If an incorrect key was chosen there would be no match and then the **js0.filename** factor would be empty.

This is an easy way to verify if the Join is working.

Save the step.

The screenshot shows the Tercen software interface with the following details:

- Header:** Tercen™, Search Tercen
- Breadcrumbs:** Home > LevelUpWorkshopsTeam > Workshop II - Martin > Join Example > Data step
- Toolbar:** Save, Add Operator, Crosstab, Tables, Layer 1, Point, 4, Transform..., Filters, Colors, Labels, Error Bar.
- Left Panel:** Factors, Environment, Settings. Under Factors, there is a search bar and a list of factors:
 - SSC-A
 - AARD-A
 - APC-H7-A
 - Ax488-A
 - Ax647-A
 - Ax700-A
- Table:** filename | js0.filename
- Rows:**
 - LD1_NS+NS_A01_exp.fcs | LD1_NS+NS_A01_exp.fcs
 - LD1_PI+PI_D01_exp.fcs | LD1_PI+PI_D01_exp.fcs

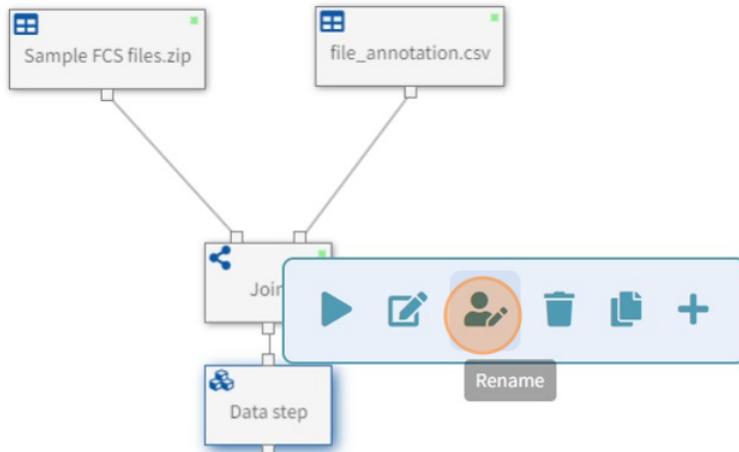
40

Return to the **Join Example** workflow

The screenshot shows the Tercen software interface with the following details:

- Header:** Tercen™, Search Tercen
- Breadcrumbs:** > LevelUpWorkshopsTeam > Workshop II - Martin > **Join Example** > Data step
- Toolbar:** Add Operator, Crosstab, Tables, Layer 1, Point, 4, Transform..., Filters, Colors, Labels, Error Bar.
- Left Panel:** Environment, Settings. Under Environment, there is a search bar and a list of factors:
 - A
 - RD-A
 - C-H7-A
 - 88-A
 - 47-A
- Table:** filename | js0.filename
- Rows:**
 - LD1_NS+NS_A01_exp.fcs | LD1_NS+NS_A01_exp.fcs
 - LD1_PI+PI_D01_exp.fcs | LD1_PI+PI_D01_exp.fcs

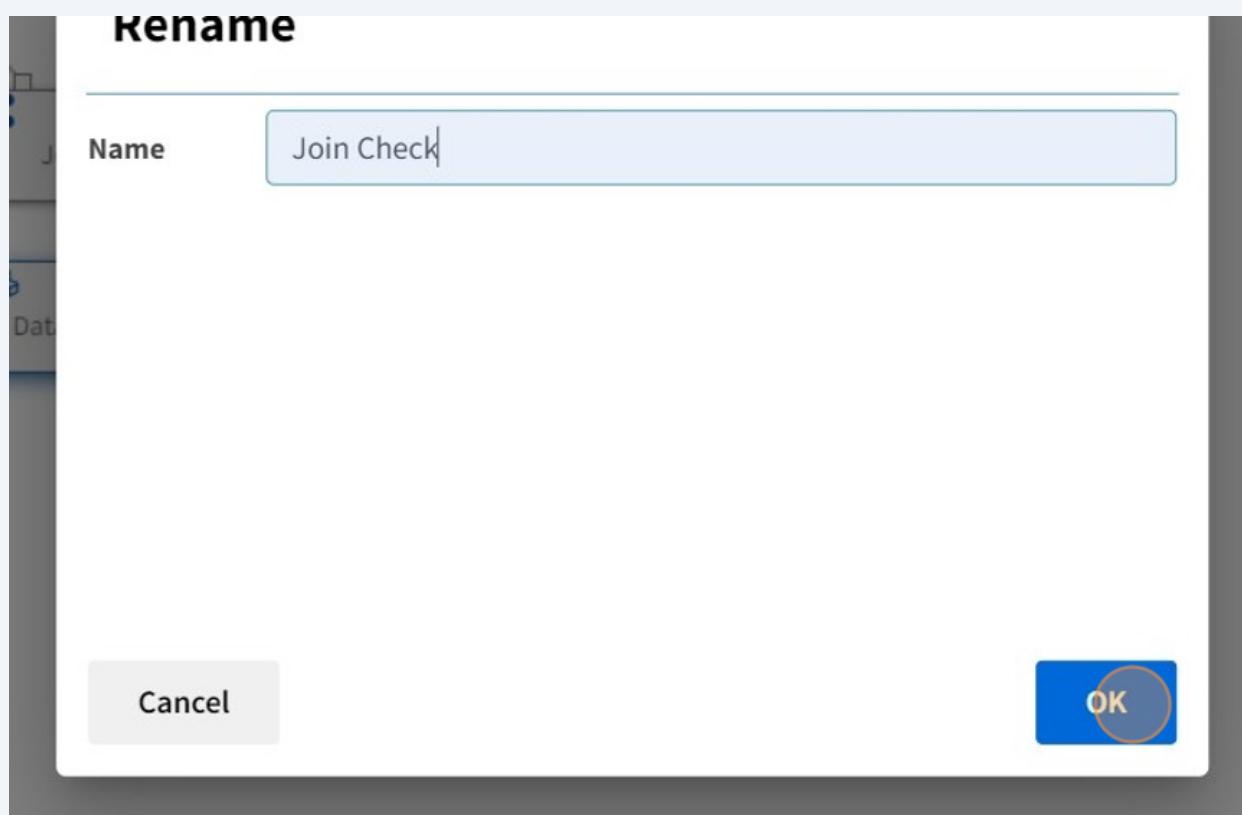
41 Click Rename.



42

Rename the step to "Join Check"

Click "OK"

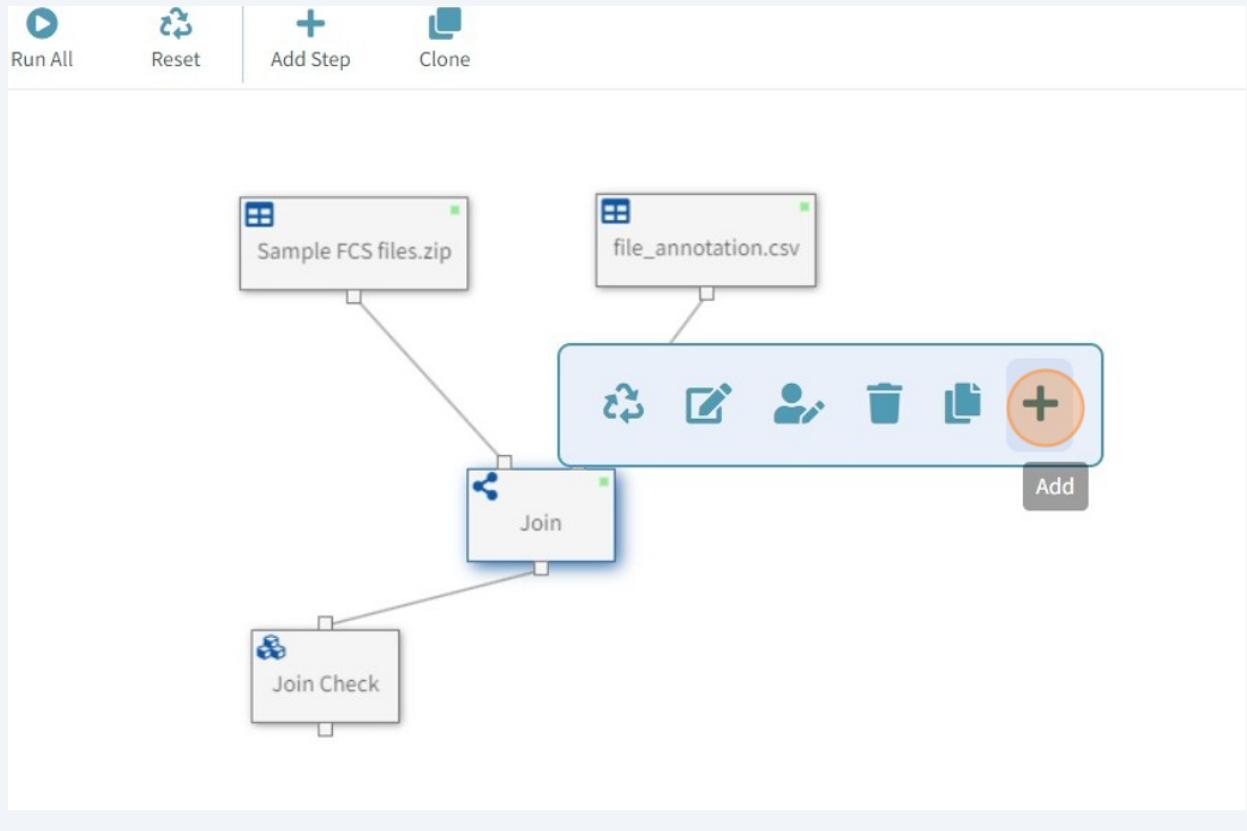


43

Now projections and calculations can be made using both data files at the same time.

Click the Join Step

Select Add from the local toolbar.



44 Add a Data Step.

The screenshot shows a software interface for adding a step. At the top, there are tabs: 'Step' (which is selected), 'Operator', 'Operator Library', 'Installed Apps', and 'App Library'. Below the tabs is a search bar with the placeholder 'Search'. There are three main items listed:

- Data step** data
Perform computation on user defined projection
- Multi data step** data
Perform computation on user defined projection
- Join** leftTable
Join two data sets

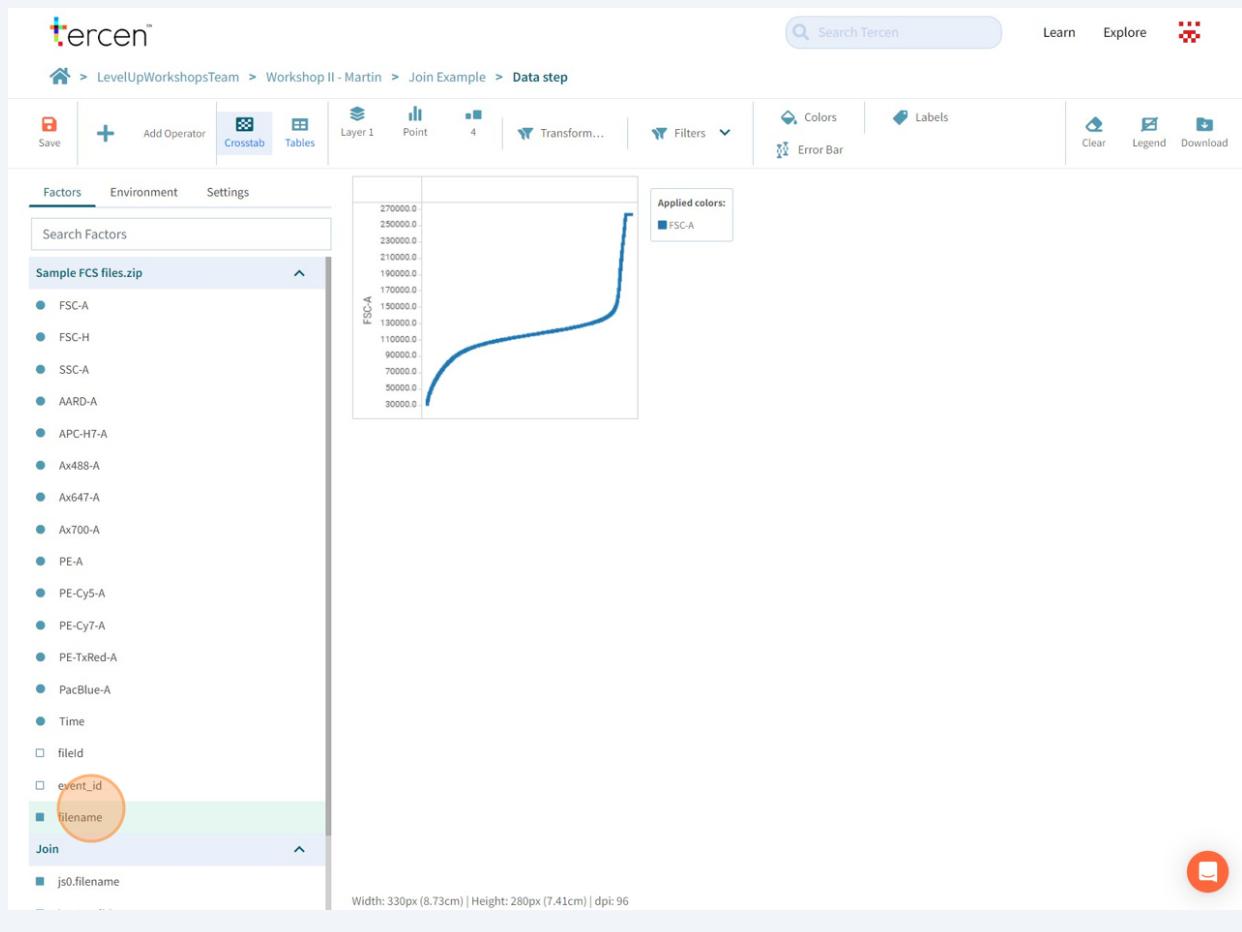
45 From the **Sample FCS files.zip** factors

Drag FSC-A channel to the Y-Axis

The screenshot shows a software interface for selecting factors. At the top, there are several buttons: 'Save', '+ Add Operator', 'Crosstab' (which is selected), 'Tables', 'Layer 1', 'Point', '4', 'Transform...', and 'Filters'. Below these are tabs: 'Factors' (selected), 'Environment', and 'Settings'. A search bar labeled 'Search Factors' is present. A list of factors from the file 'Sample FCS files.zip' is shown:

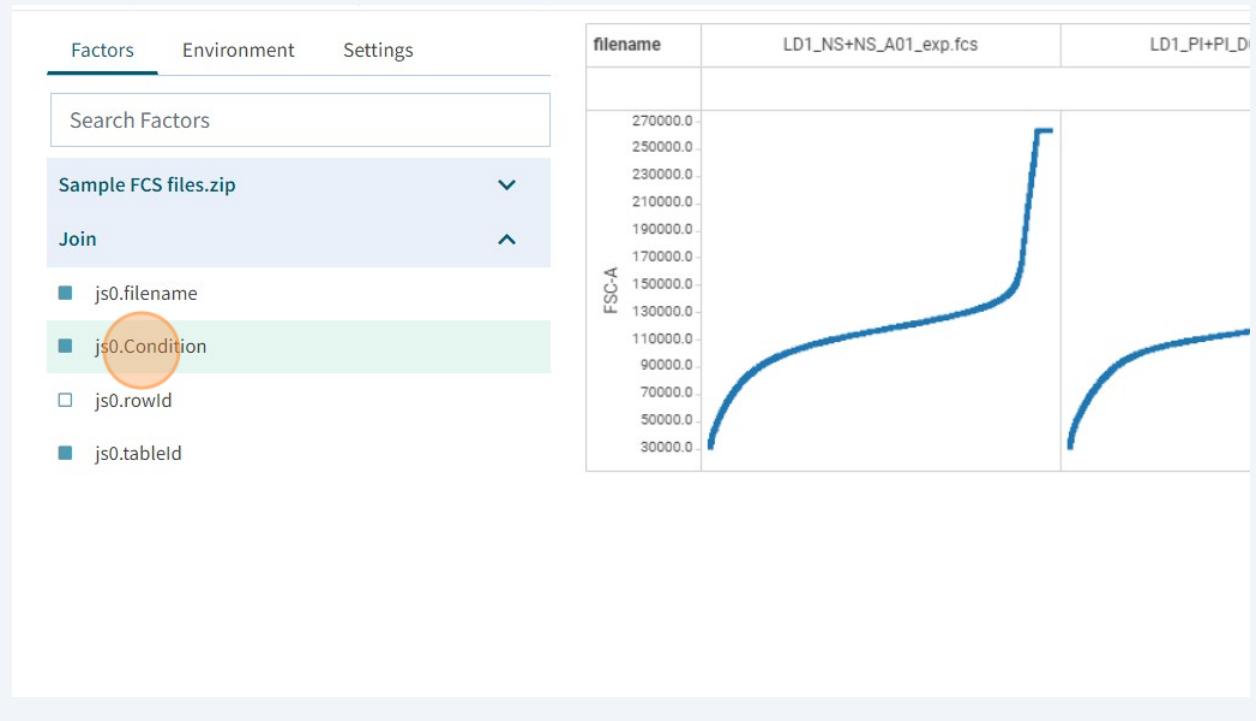
- FSC-A
- FSC-H
- SSC-A
- AARD-A
- APC-H7-A
- Ax488-A
- Ax647-A

46 Drag filename to the Column



47 From the **Join** factors

Drag js0.Condition also to **Column**

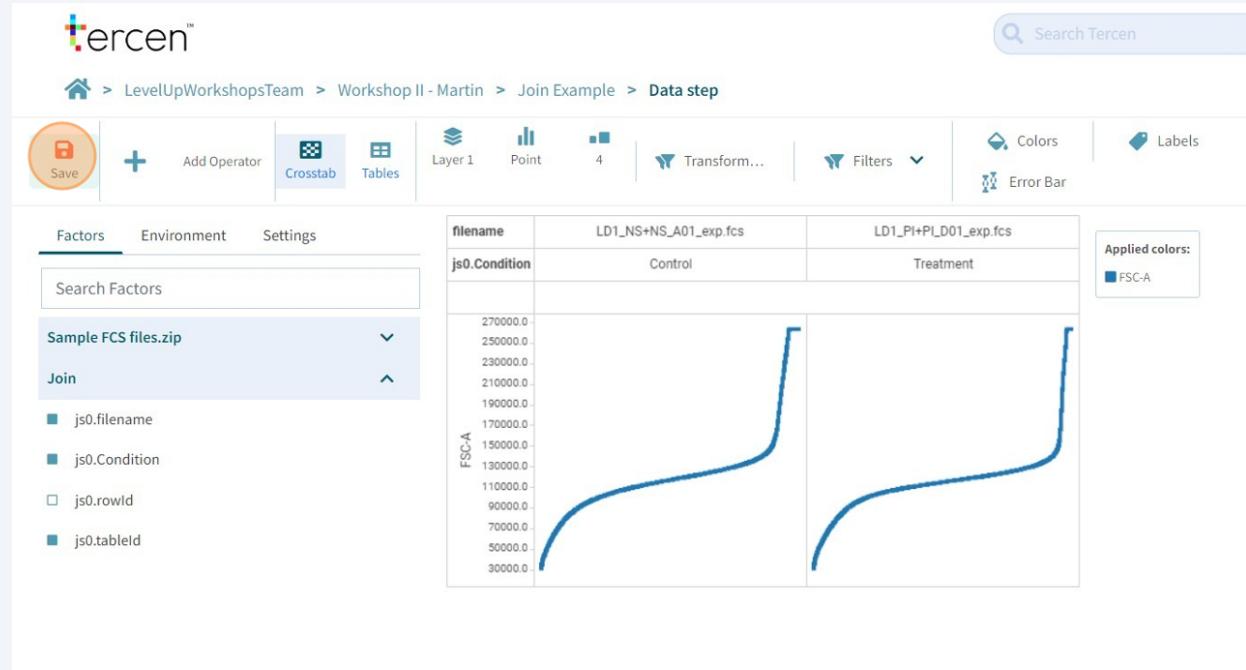


48

This is a simple projection that shows which file is from the control group and which file is from the treatment group.

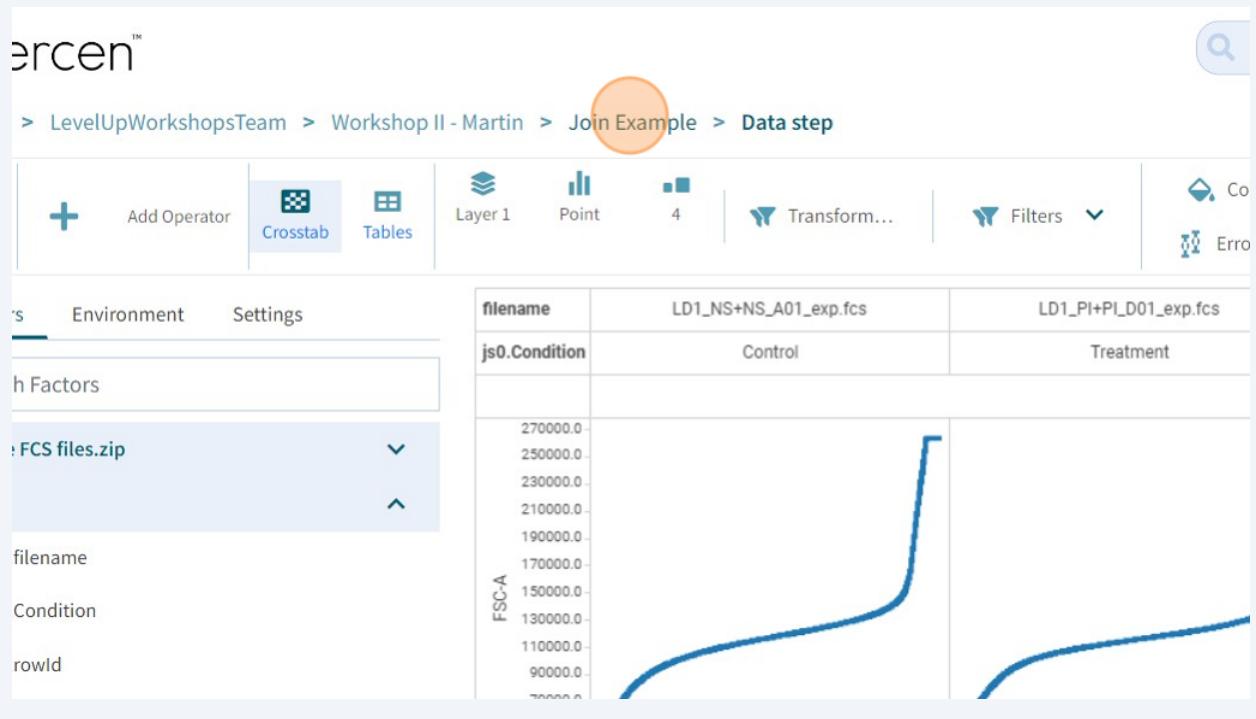
It shows how the FCS files can be enriched by the meta-data that comes from the annotation file.

Click "Save"



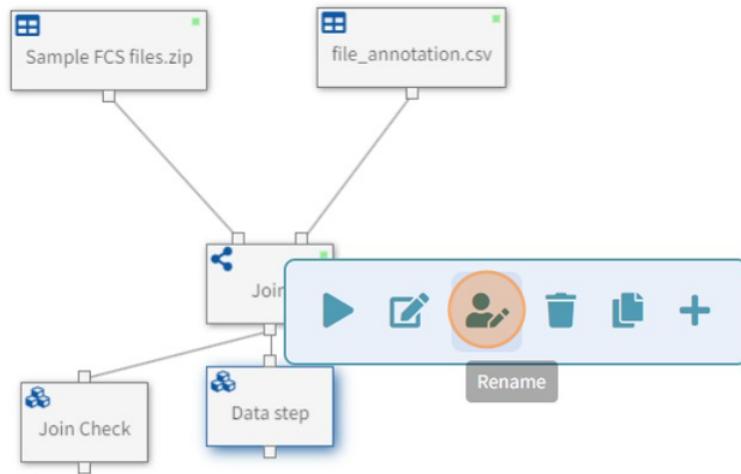
49

Return to the workflow canvas.

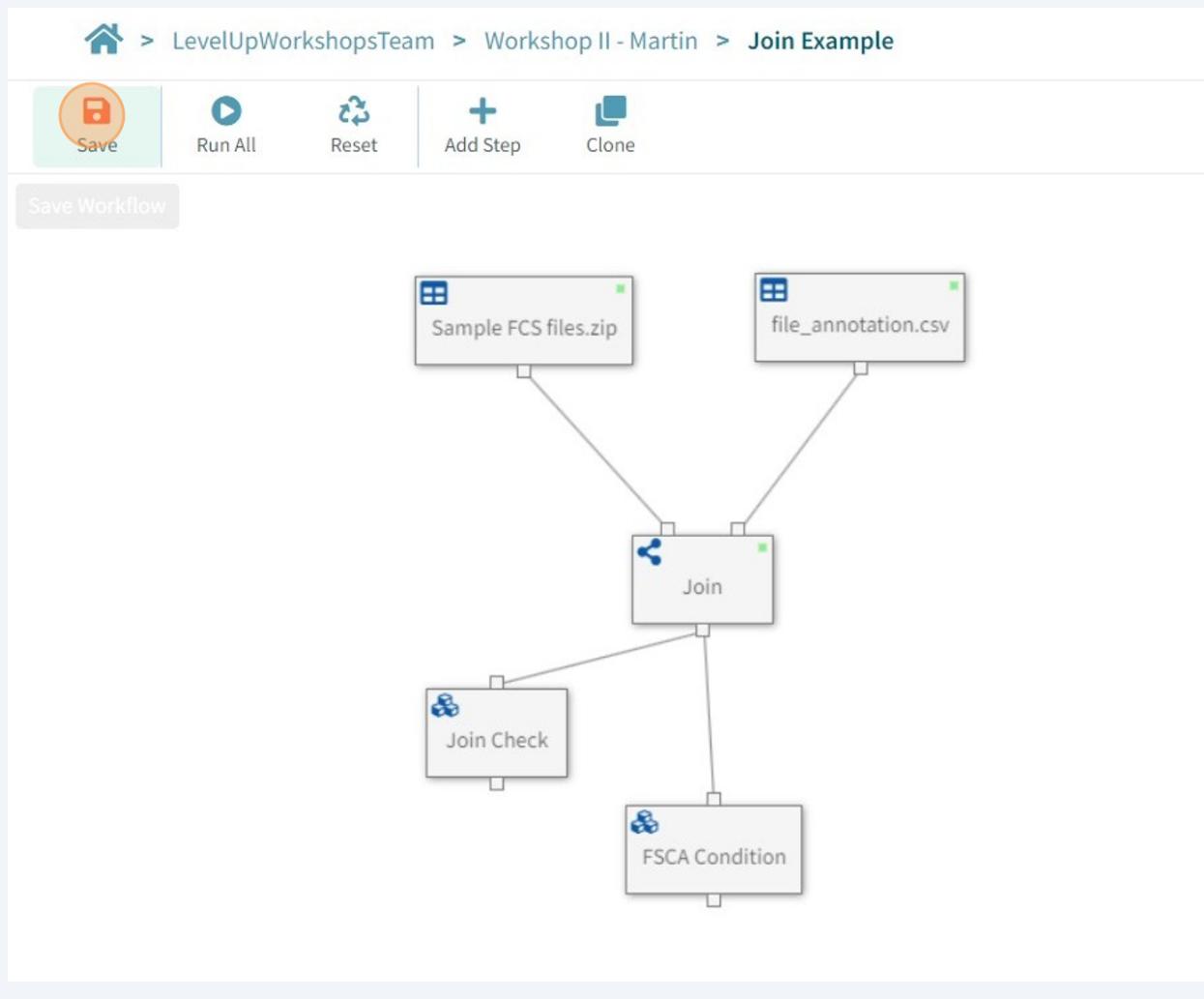


50 Rename the step "FSC-A Condition"

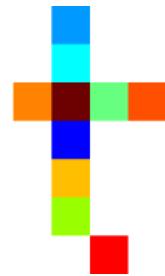
Press OK when done.



51 Don't forget to Save your workflow.



0203 - Gather Channels



In this lesson we will use the **Gather Step** in Tercen to convert FCS files from wide data to long data.

1 Gather Concept:

FCS files are **wide** data yet the majority of the algorithms designed for Flow Cytometry analysis require data to be submitted in **long** format.

Because of this we recommend to convert all Flow Cytometry data to long format when doing an analysis.

Apart from this using long data gives advantages to making graphs because the **Variables** and **Measurements** become bundled together and can be projected as a group.

Tercen converts wide data to long data using the **Gather Step**.

2 This is a representation of the FCS file uploaded to Tercen.

It is **wide** data with multiple channels per eventid

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
filename	field	event_id	Time	FSC-A	FSC-H	SSC-A	AARD-A	APC-H7-A	Ax488-A	Ax647-A	Ax700-A	PE-A	PE-Cy5-A	PE-Cy7-A	PE-TxRed-A	PacBlue-A	
LD1_NS+NS_A01_exp.fcs	1	1	0	33391.44141	32856	13424.25	222	82.83999634	36.75	58.52000046	19	343.4400024	1053.359985	152.639994	1412.640015	86.25	
LD1_NS+NS_A01_exp.fcs	1	2	0	134460.119544	34686	186.75	229.5200043	62.25	81.3199996	714.3999634	830.1600342	1810.080078	470.8800049	3285.360107	135		
LD1_NS+NS_A01_exp.fcs	1	3	0	106458.4844	94119	33408.75	168	709.8399658	63	177.0800018	2197.91992	786.960022	2070	562.3200073	3129.120117	147	
LD1_NS+NS_A01_exp.fcs	1	4	0	133750.0781	115251	49335.75	294	225.7200012	84	88.9199817	697.6799927	1060.560059	1977.120117	406.8000183	3620.160156	148.5	
LD1_NS+NS_A01_exp.fcs	1	5	0	111611.5234	98348	40650.75	934.5	538.0800171	84	231.0399933	1402.199951	81.3600061	814.3200073	352.0800171	7.92000076	4303.5	
LD1_NS+NS_A01_exp.fcs	1	6	0	76180.32031	63698	35274	233.25	649.7999878	57.75	139.8399963	1744.199951	937.4400065	2206.800049	538.5599976	3810.240234	193.5	
LD1_NS+NS_A01_exp.fcs	1	7	0	132429.6094	118017	33083.25	159	37.23999786	87.75	235.5999908	137.5599976	4190.400039	2003.040039	367.200122	1602.720093	94.5	
LD1_NS+NS_A01_exp.fcs	1	8	0	133997.0469	118019	39651	206.25	259.1600037	50.25	133	869.4400024	719.2800293	1912.320068	532.8000488	2726.640137	107.25	
LD1_NS+NS_A01_exp.fcs	1	9	0	135452.8909	118054	47211	268.5	250.8000031	97.5	106.4000015	813.200012	688.3200073	1490.400024	330.480011	2809.440186	178.5	
LD1_NS+NS_A01_exp.fcs	1	10	0	105161.7656	91274	35323.5	198.75	699.9599609	70.5	283.480011	2054.280029	818.6400146	2839.680176	815.7600098	3277.440186	175.5	
LD1_NS+NS_A01_exp.fcs	1	11	0	103033.4453	88970	37875.75	1464.75	482.600061	51.75	117.0400009	1078.439941	122.400015	179.280014	259.2000122	56.88000107	7278	
LD1_NS+NS_A01_exp.fcs	1	12	0	90181.44531	78958	26774.25	206.25	479.5599976	75.75	209	1654.52002	954.7200317	2947.680176	627.8400269	3892.320068	129.75	
LD1_NS+NS_A01_exp.fcs	1	13	0	116452.0859	101871	44421.75	261	104.1199951	96	363.2799988	141.3600006	5275.44043	2414.880127	398.8800049	1933.920044	282.75	
LD1_NS+NS_A01_exp.fcs	1	14	0	84451.67969	76406	43479	683.5	186.9599915	114.75	313.1199951	361.7600098	7665.120117	2774.160156	491.0400085	2916.720215	1904.25	
LD1_NS+NS_A01_exp.fcs	1	15	0	123223.6875	108639	34420.5	143.25	5250.080078	47.25	205.199969	162.6399994	32.40000153	652.3200073	2045.520142	51.84000397	171.75	
LD1_NS+NS_A01_exp.fcs	1	16	0	111121.2031	98643	37588.5	222	5254.640137	57.75	344.2799988	274.3599854	41.04000092	1232.640015	2139.840088	43.20000076	39.75	
LD1_NS+NS_A01_exp.fcs	1	17	0	105023.5234	92723	53018.25	1170	78.27999878	84.75	428.6399841	187.7200112	5839.92041	2895.120117	370.0800171	2161.440186	5570.25	
LD1_NS+NS_A01_exp.fcs	1	18	0	111785.0469	97271	28725	186	468.1600037	93.75	186.1999969	1333.040039	977.0400391	3038.400146	586.0800171	3975.840088	128.25	
LD1_NS+NS_A01_exp.fcs	1	19	0	111591.3672	98857	28660.5	180	4792.560059	44.25	178.5999908	199.8800049	54.00000381	851.7600098	2170.800049	33.84000015	78	
LD1_NS+NS_A01_exp.fcs	1	20	0	118860.4844	101179	52255.5	384	10082.91992	116.25	274.3599854	446.1199951	84.24000549	494.6400146	4230	79.9200058	168.75	
LD1_NS+NS_A01_exp.fcs	1	21	0	116443.4453	102050	31998	195.75	582.1599731	69	150.4799957	1792.079956	977.7600098	2289.600098	583.9200439	3836.160156	154.5	
LD1_NS+NS_A01_exp.fcs	1	22	0	105983.2813	94913	30786.75	777	959.1199951	171.75	164.1600037	2531.560059	1257.1199958	3349.440186	792.000061	5209.200195	306	
LD1_NS+NS_A01_exp.fcs	1	23	0	120579.125	104987	44034	237.75	175.5599976	107.25	524.3999634	242.4400024	7536.960449	4627.439941	545.7600098	2887.200195	144	
LD1_NS+NS_A01_exp.fcs	1	24	0	117517.6875	101270	36508.5	243.75	369.3599854	100.5	120.0800018	1155.959961	986.4000244	2430	626.4000244	4407.120117	225	
LD1_NS+NS_A01_exp.fcs	1	25	0	118657.4453	104070	34915.5	172.5	235.5599908	77.25	49.3999771	727.3200073	922.3200073	2172.960205	433.4400024	4096.080078	138.75	

3

This illustrates what happens to a single row of the the data when a **Gather** is performed.

The diagram illustrates the 'Gather' operation on an FCS file. The top part shows a wide table with many columns (A-Q) and one row. The bottom part shows the same data after the Gather operation, transformed into a long table with fewer columns (A-E) and many rows. A callout box labeled "TWO NEW FACTORS CREATED" points to the new "VARIABLE" and "VALUE" columns.

filename	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
LD1_NS+NS_A01_exp.fcs		fileid	event_id	Time	FSC-A	FSC-H	SSC-A	AARD-A	APC-H7-A	Ax488-A	Ax647-A	Ax700-A	PE-A	PE-Cy5-A	PE-Cy7-A	PE-TxRed-A	PacBlue
LD1_NS+NS_A01_exp.fcs	1	1	0	33391.44141	32856	13424.25	222	82.83999634	36.75	58.52000046	19	343.4400024	1053.359985	152.6399994	1412.640015	86	

filename	fileid	event_id	Time	VARIABLE	VALUE
LD1_NS+NS_A01_exp.fcs	1	1	0	FSC-A	33391.44141
LD1_NS+NS_A01_exp.fcs	1	1	0	FSC-H	32856
LD1_NS+NS_A01_exp.fcs	1	1	0	SSC-A	13424.25
LD1_NS+NS_A01_exp.fcs	1	1	0	AARD-A	222
LD1_NS+NS_A01_exp.fcs	1	1	0	APC-H7-A	82.83999634
LD1_NS+NS_A01_exp.fcs	1	1	0	Ax488-A	36.75
LD1_NS+NS_A01_exp.fcs	1	1	0	Ax647-A	58.52000046
LD1_NS+NS_A01_exp.fcs	1	1	0	Ax700-A	19
LD1_NS+NS_A01_exp.fcs	1	1	0	PE-A	343.4400024
LD1_NS+NS_A01_exp.fcs	1	1	0	PE-Cy5-A	1053.359985
LD1_NS+NS_A01_exp.fcs	1	1	0	PE-Cy7-A	152.6399994
LD1_NS+NS_A01_exp.fcs	1	1	0	PE-TxRed-A	1412.640015
LD1_NS+NS_A01_exp.fcs	1	1	0	PacBlue-A	86.25

4

The Measurements (blue) are moved to one per row

The Channel Names (green) are lined up with their relevant measurement.

Two new Group names (purple) are created. VARIABLE for the group of Channel Names and VALUE for the group of measurements.

The parts of the Observation that are not being grouped (like filename) keep their column name and are repeated one for each row.

This process happens for every Observation in the FCS file until there is one **long** table with one measurement per row.

5 Click "Workshop II - Martin"

The screenshot shows the Tercen software interface. At the top, there is a navigation bar with the Tercen logo and a search bar labeled "Search Tercen". Below the navigation bar, the breadcrumb path shows "Home > LevelUpWorkshopsTeam > Workshop II - Martin". A large orange circle highlights the project name "Workshop II - Martin" in the breadcrumb path. The main content area is titled "LevelUpWorkshopsTeam". It has two tabs: "Project" (which is selected) and "Activities". Below the tabs, the project title "Workshop II - Martin" is displayed with a lock icon. A message "No description provided." follows. There are several action buttons: "New data set", "New workflow" (which is highlighted with an orange circle), "New file", "Upload file", "Upload workflow", and "Project settings". A blue header bar displays a notification from "MartinE" about an updated workflow named "Gather Example". The file list under "Gather Example" includes "Sample FCS files.zip", "README.md", "Join Example", "file_annotation.csv", and "Example Files".

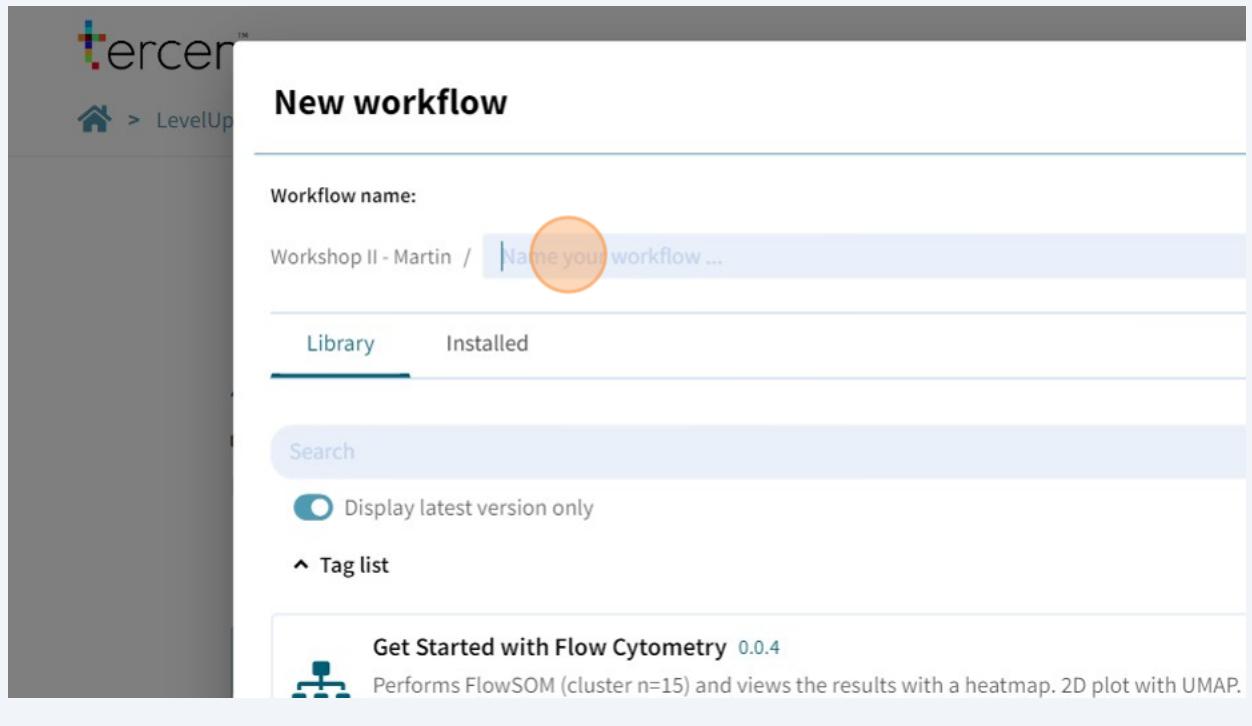
6 Click "New workflow"

The screenshot shows the Tercen software interface, similar to the previous one but with a different focus. The "New workflow" button in the toolbar is highlighted with an orange circle. The rest of the interface is identical to the previous screenshot, including the navigation bar, breadcrumb path, project title, and file list.

7 Name your workflow

Gather Example

Click OK when done



8 From the Global toolbar

Click "Add Step"

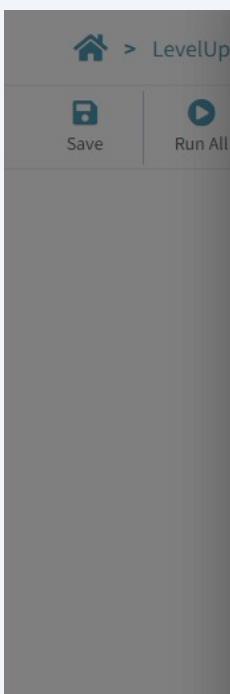


Home > LevelUpWorkshopsTeam > Workshop II - Martin > Gather Example



Add Step

9 Choose Table



Add

Step

Installed Apps

App Library

Search



Table



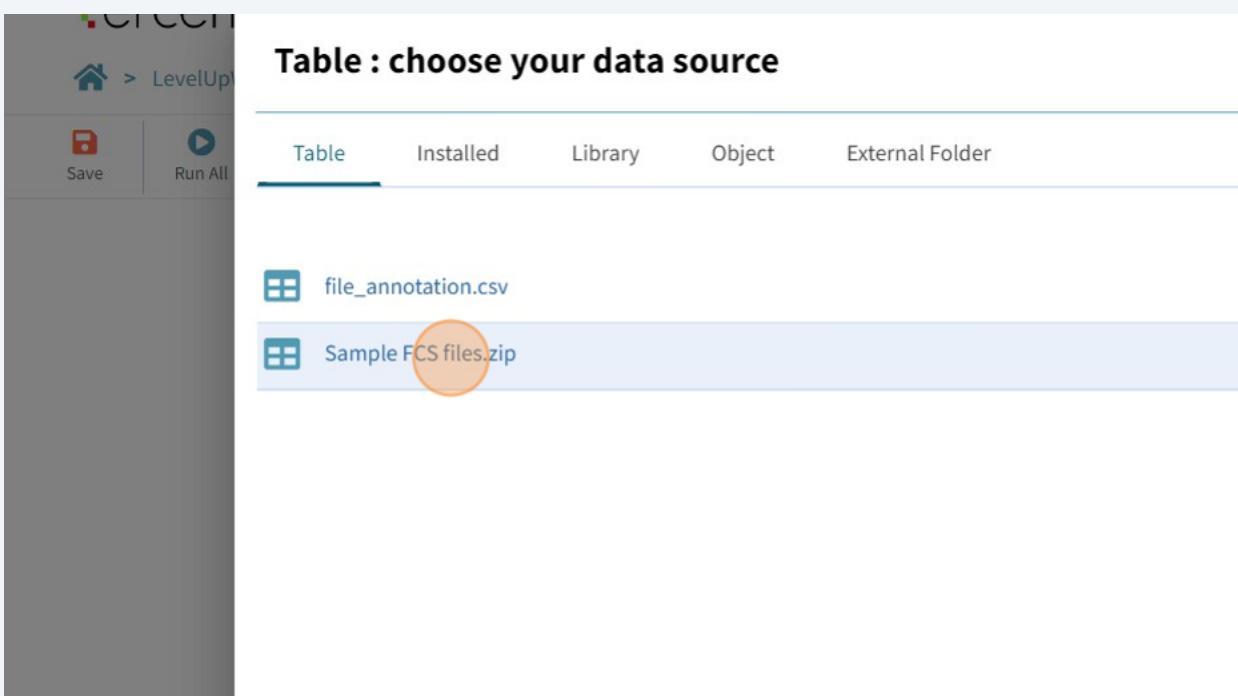
Workflow



Input

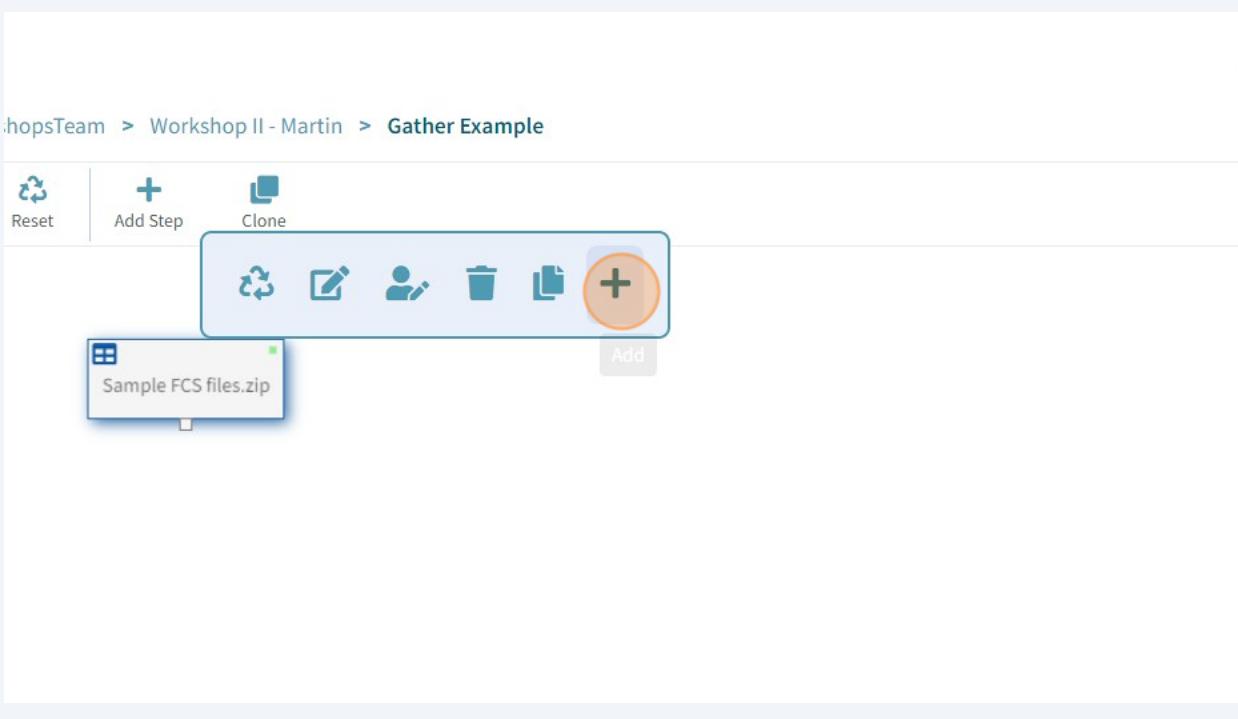
- 10** Add the **Sample FCS files.zip** table to the workflow

Click Ok

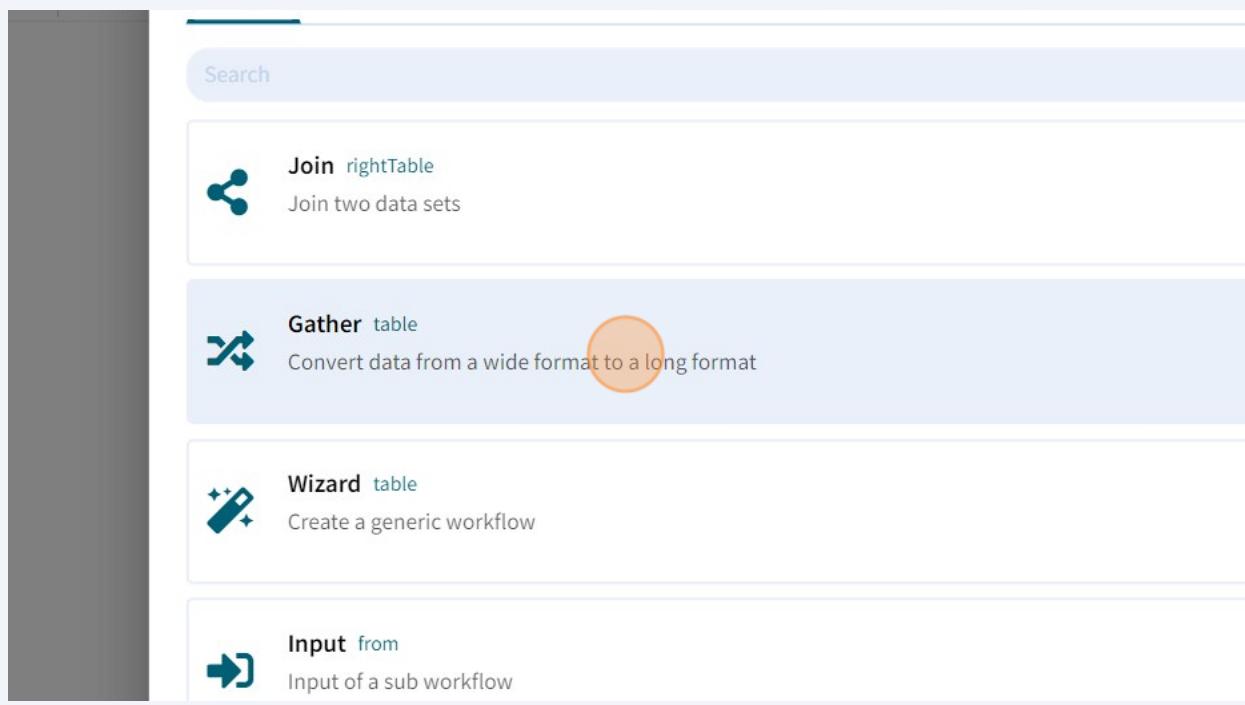


- 11** Click the Data table to bring up the local toolbar.

Select Add

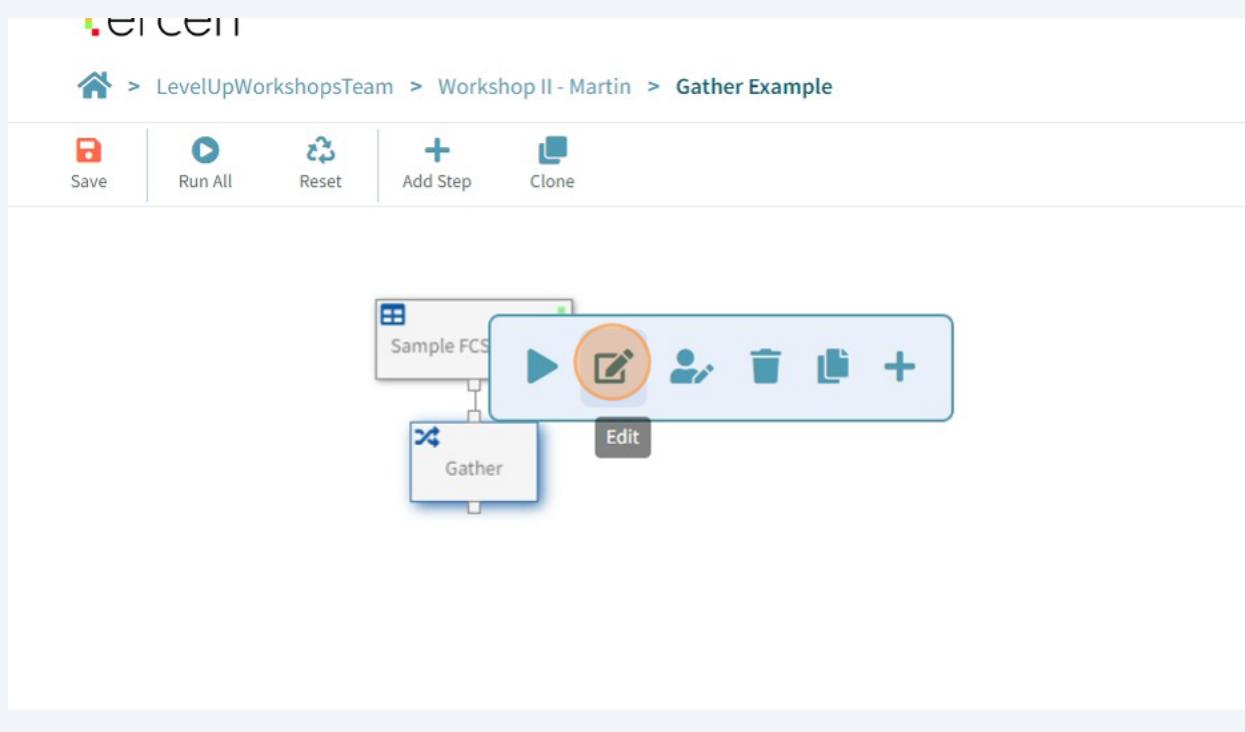


12 Choose **Gather** from the list



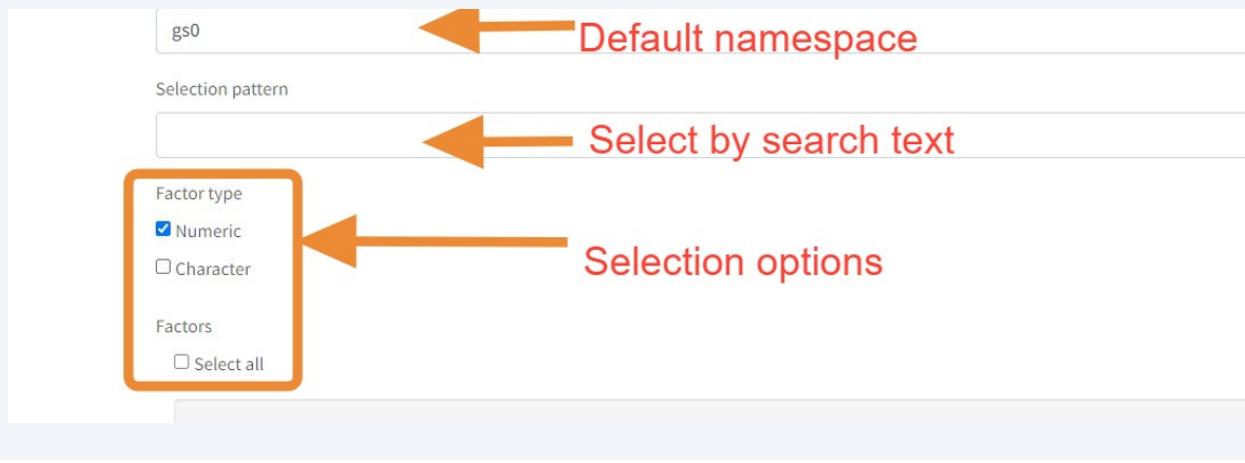
13 Now we will set up the Gather

Click the Gather step and select **Edit**

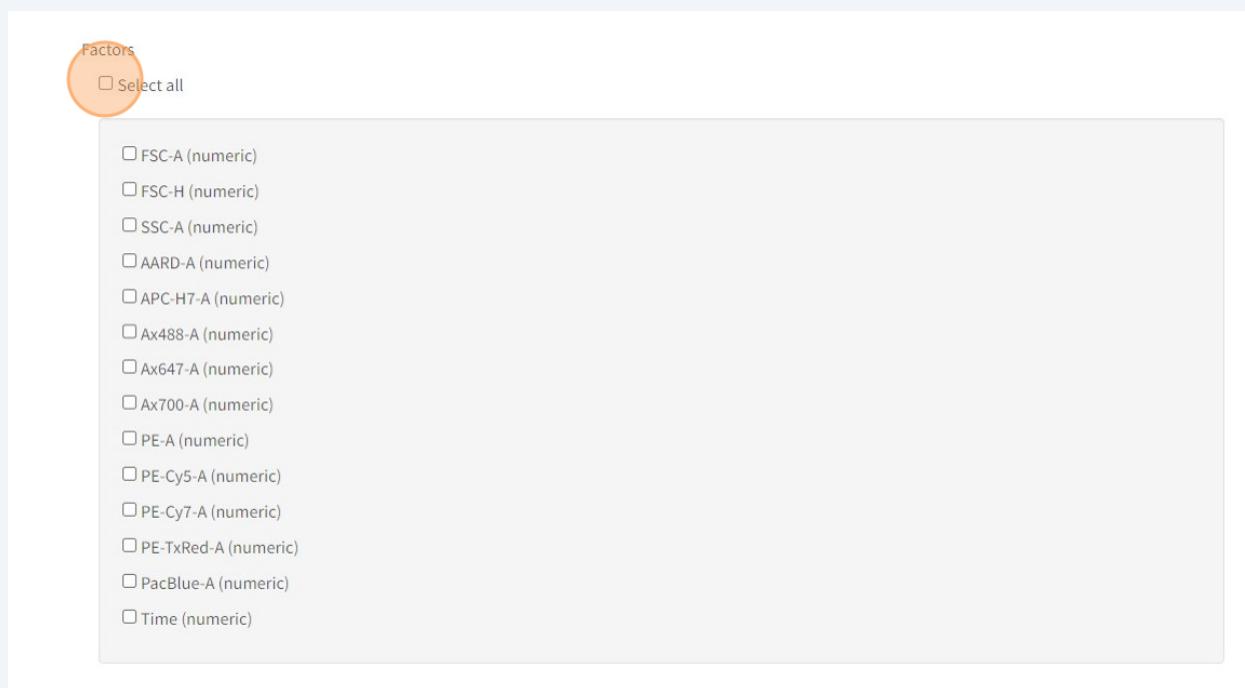


14 Some advanced selection options are available but we will skip them for now.

(Ask your instructor if you think you need them)



15 Click the "Select all" field.



16 You can exclude Channels you are not interested in analysing.

For example deselect **Time**

- APC-H7-A (numeric)
- Ax488-A (numeric)
- Ax647-A (numeric)
- Ax700-A (numeric)
- PE-A (numeric)
- PE-Cy5-A (numeric)
- PE-Cy7-A (numeric)
- PE-TxRed-A (numeric)
- PacBlue-A (numeric)
- Time (numeric)

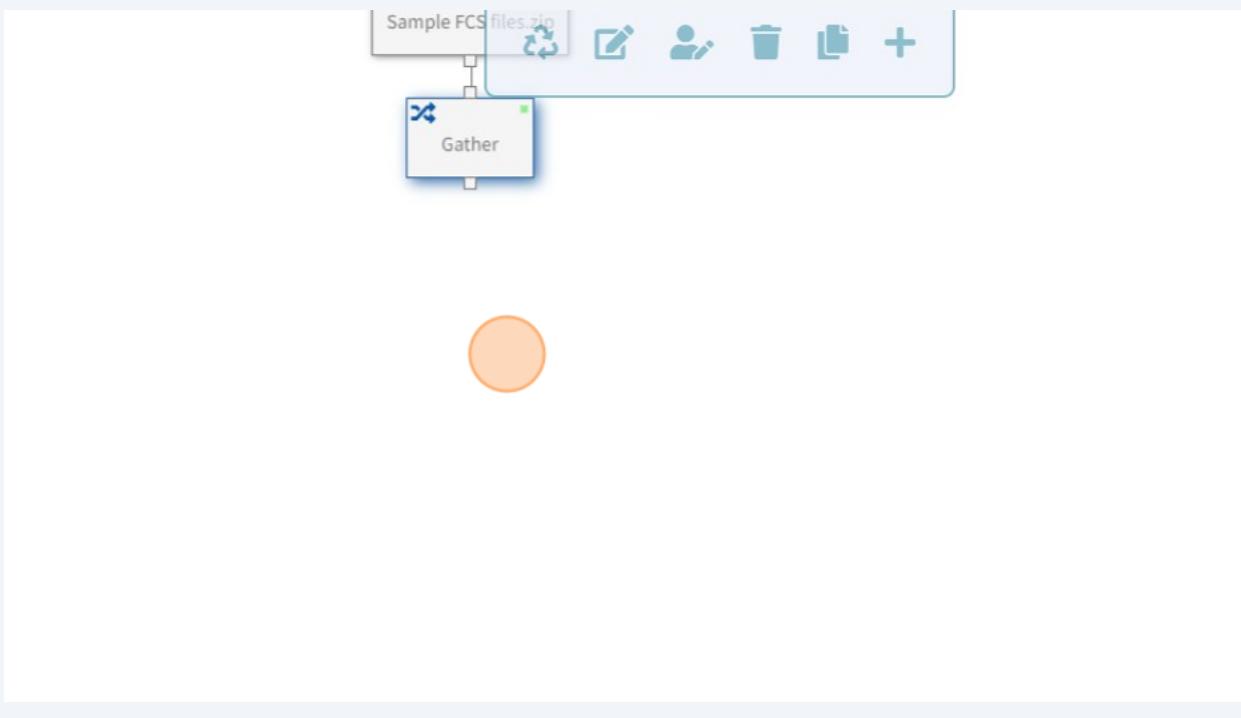
Back

17 Press **Save & Run Step**

Save & Run Step

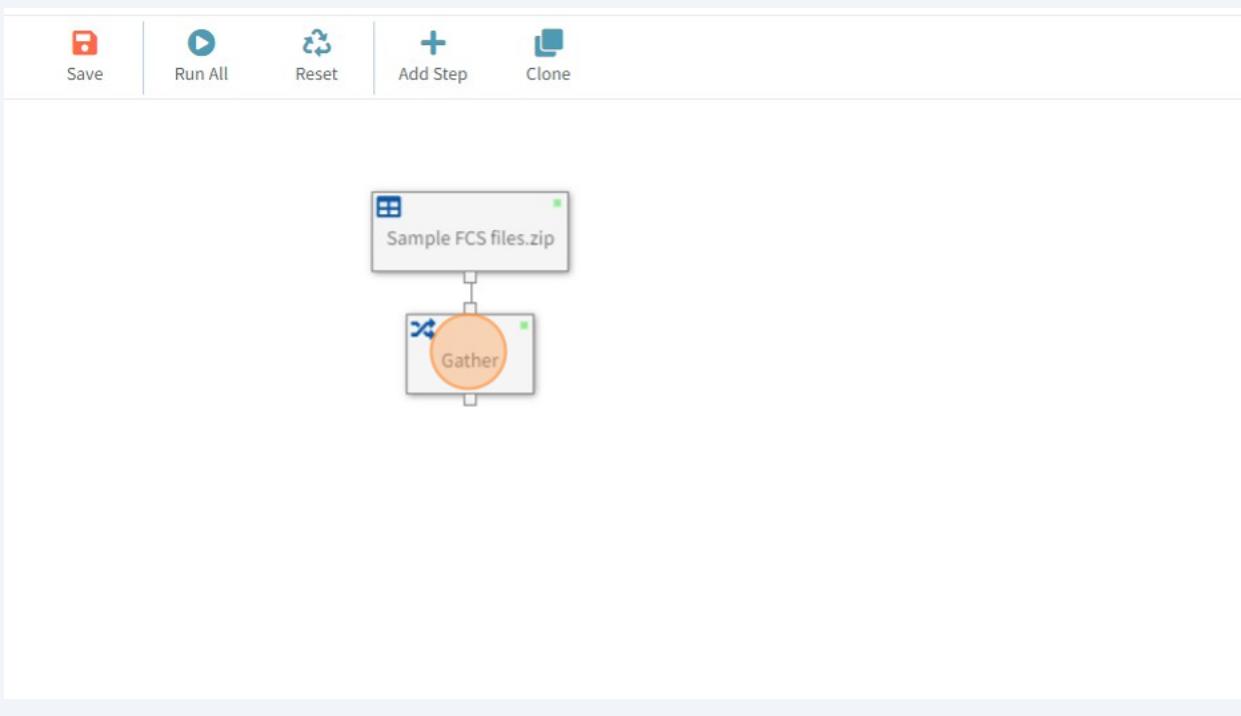


18 Click here.



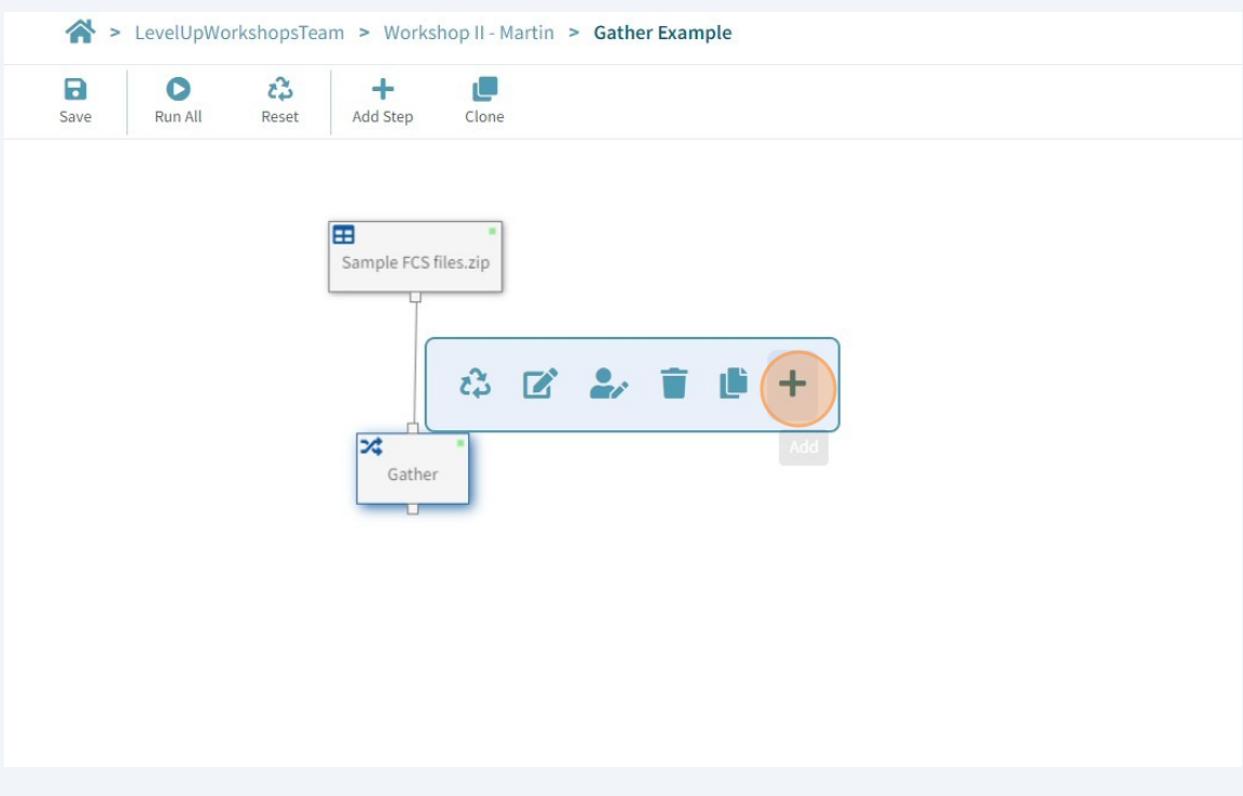
19 The Gather is complete.

It is ready to submit long data to any downstream algorithms (such as FlowSOM).



20 Let's look at how gathered Factors can be used for making graphs.

Select the Gather Step and press Add



21 Add a Data Step

The screenshot shows the "Add" dialog box. At the top left, there is a "Save" button and a "Run All" button. The title of the dialog is "Add". Below the title, there are five tabs: "Step" (which is selected and highlighted in blue), "Operator", "Operator Library", "Installed Apps", and "App Library". A search bar is located below the tabs. The main content area displays three data step options:

- Data step data**: Description: Perform computation on user defined projection. This option is highlighted with an orange circle.
- Multi data step data**: Description: Perform computation on user defined projection.
- Join leftTable**: Description: Join two data sets.

22 Open the FCS file Factor list

The screenshot shows a software interface for managing data steps. At the top, there's a navigation bar with icons for Save, Add Operator, Crosstab (which is selected), Tables, Layer 1, Point, and a dropdown for Transform... and Filters. Below the navigation bar, there are three tabs: Factors (selected), Environment, and Settings. A search bar labeled "Search Factors" is present. Under the Factors tab, a list shows "Sample FCS files.zip" and "Gather". The "Gather" item has a dropdown arrow icon to its right, which is highlighted with an orange circle. Below the list, there are two items: "gs0.value" (preceded by a blue circle) and "gs0.variable" (preceded by a blue square). To the right of the list is a large, empty grid table.

23 See it is configured like the theoretical example at the start of the lesson.

The repeating data from the observation is listed under the Sample FCS files.zip

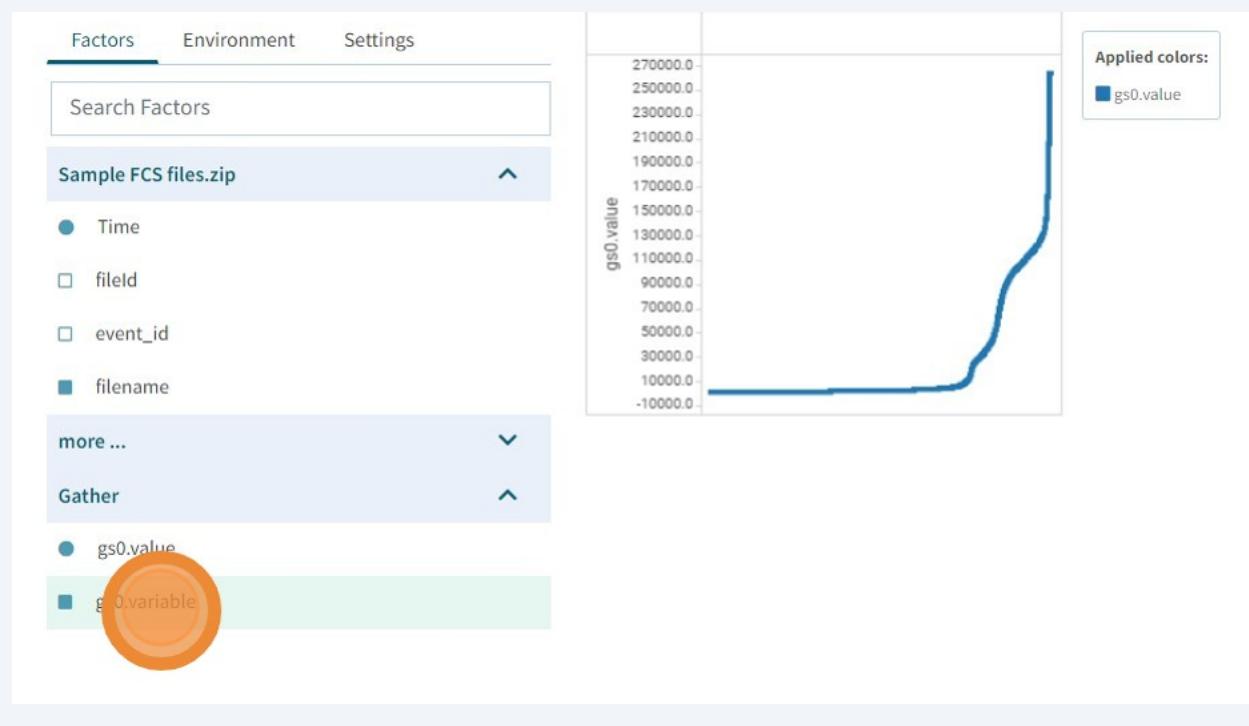
And the Two new factors (containing the groups) are listed under the Gather.

Drag **gs0.value** to the **Y-Axis**.

The screenshot shows a software interface with a top navigation bar featuring 'Factors', 'Environment', and 'Settings'. The 'Factors' tab is active. Below the navigation, there is a search bar labeled 'Search Factors'. A dropdown menu is open, showing 'Sample FCS files.zip' at the top, followed by several items: 'Time' (selected, indicated by a blue dot), 'fileId', 'event_id', and 'filename'. Below this is a 'more ...' section. Another dropdown menu is open, labeled 'Gather', showing 'gs0.value' (selected, indicated by a blue dot) and 'gs0.variable'. The 'gs0.value' item is highlighted with a large orange circle.

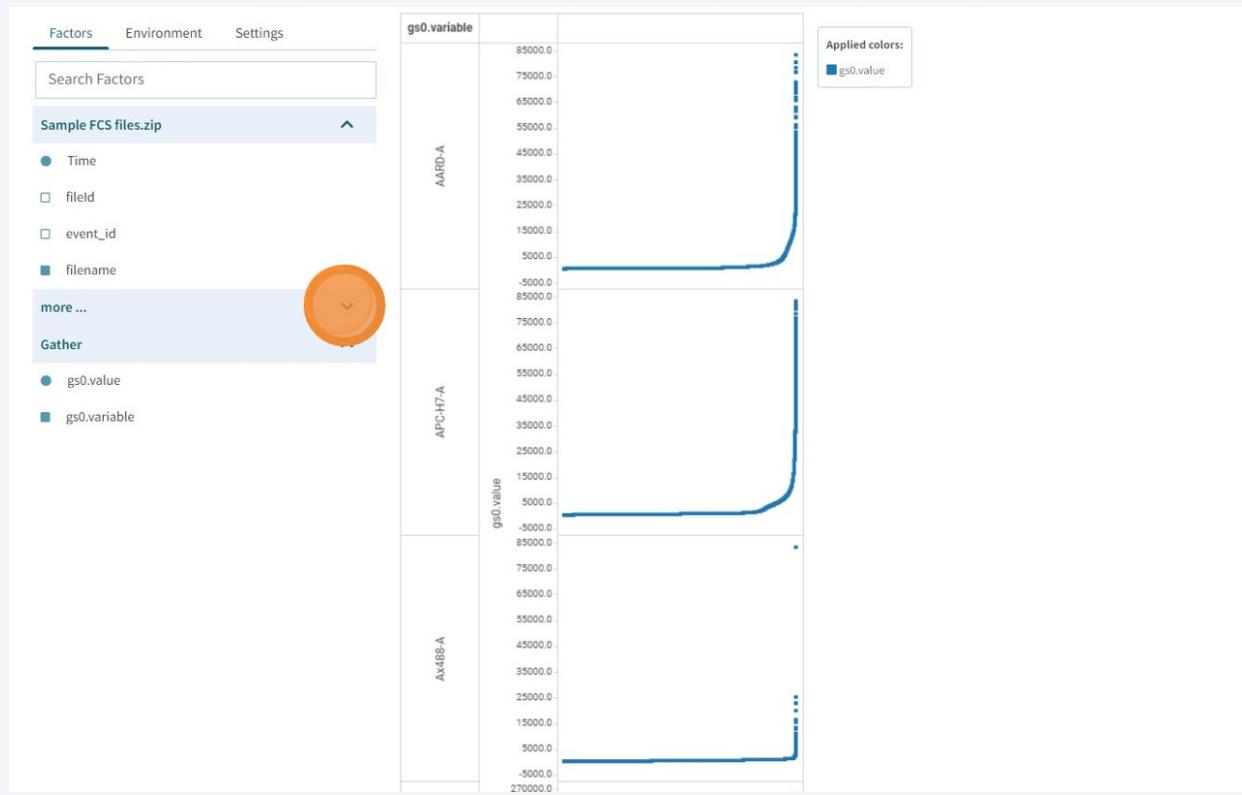
24 Every channel measurement is plotted together.

Drag **gs0.variable** to **Row**



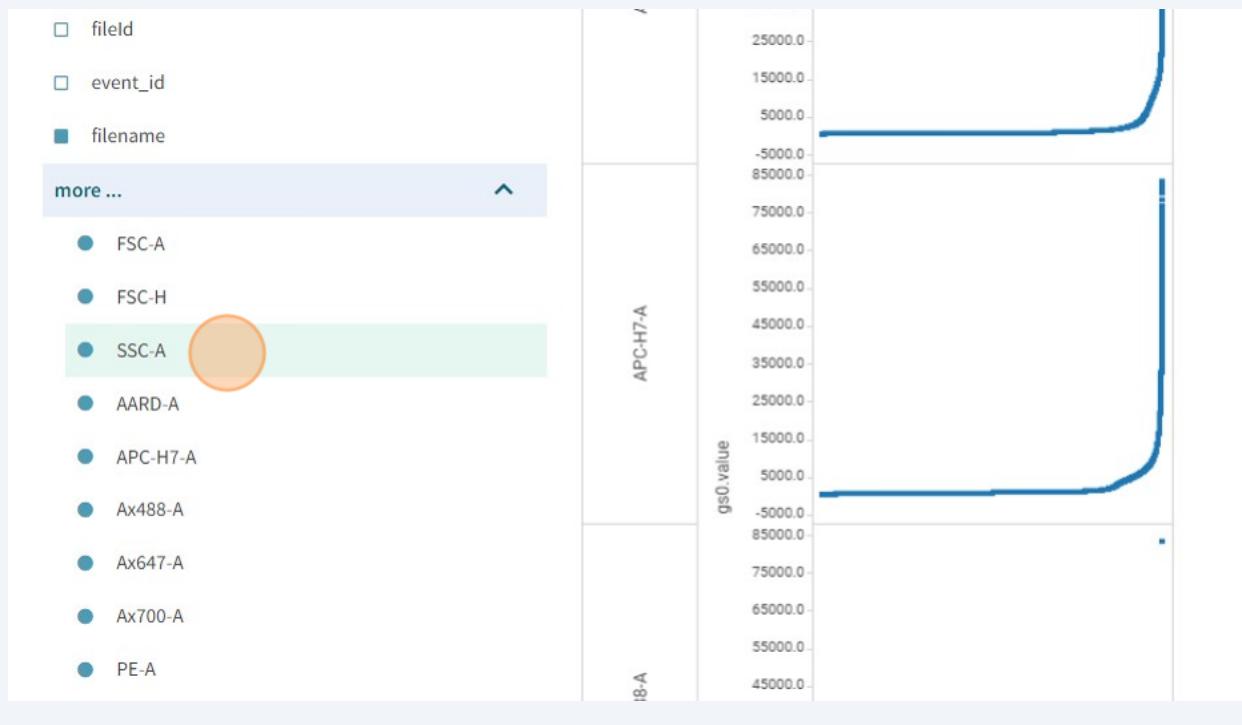
25 Now there is a separate row for each channel.

We can make multi-variate plots.

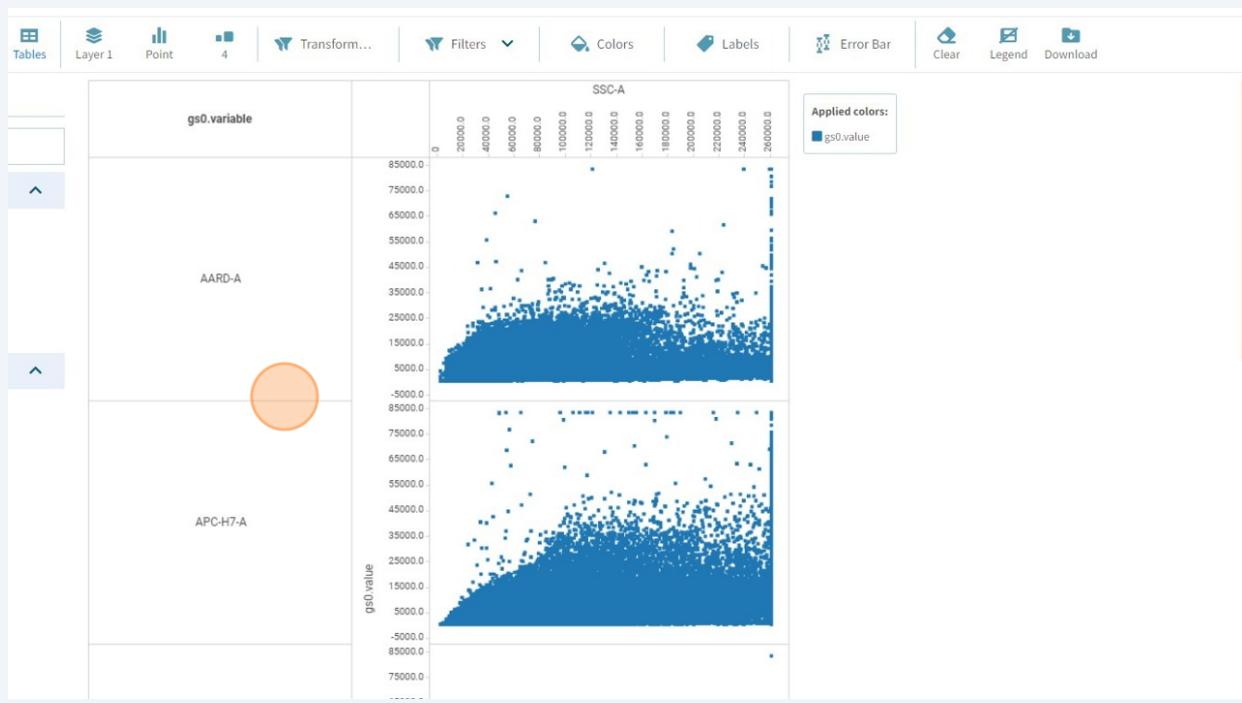


26 Drag SSC-A to X-Axis

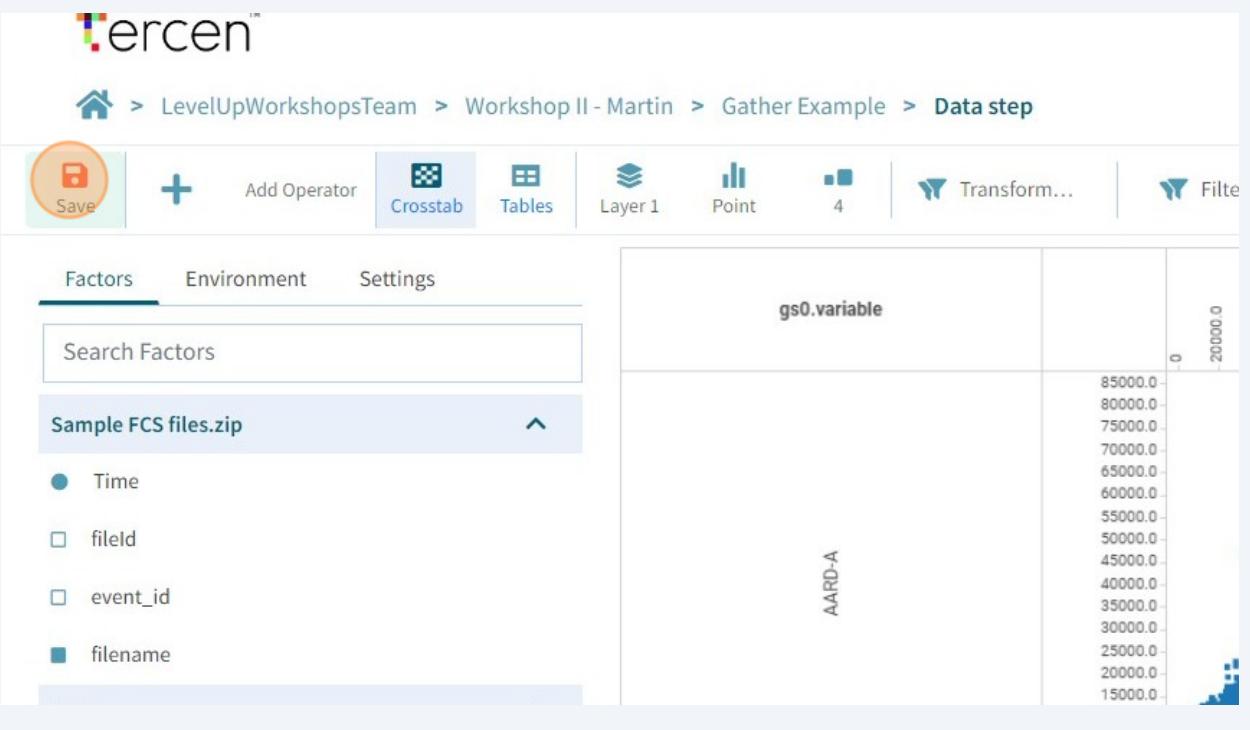
Adjust your graph by dragging the black lines.



27 Tercen will build a bi-variate plot for each of the channels against the one you have selected.

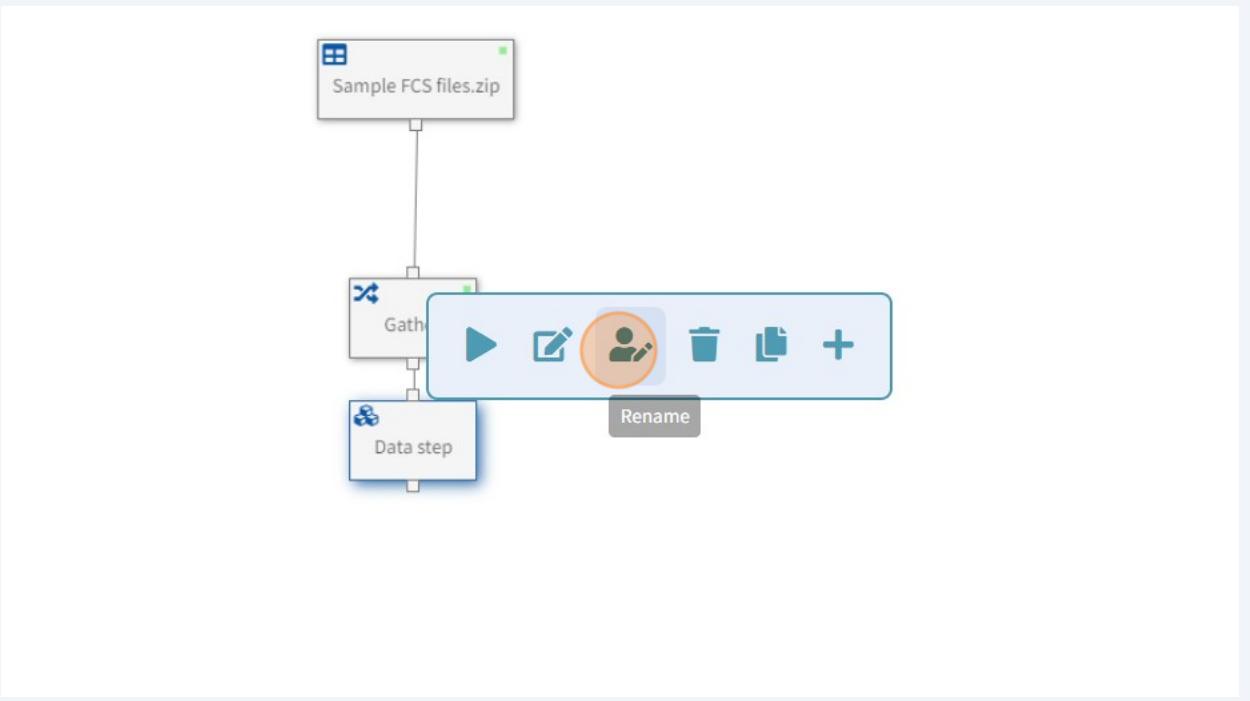


28 Don't forget to save you workflow.

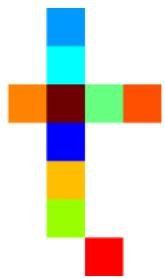


29 Rename your data step.

All Channels vs SSC-A

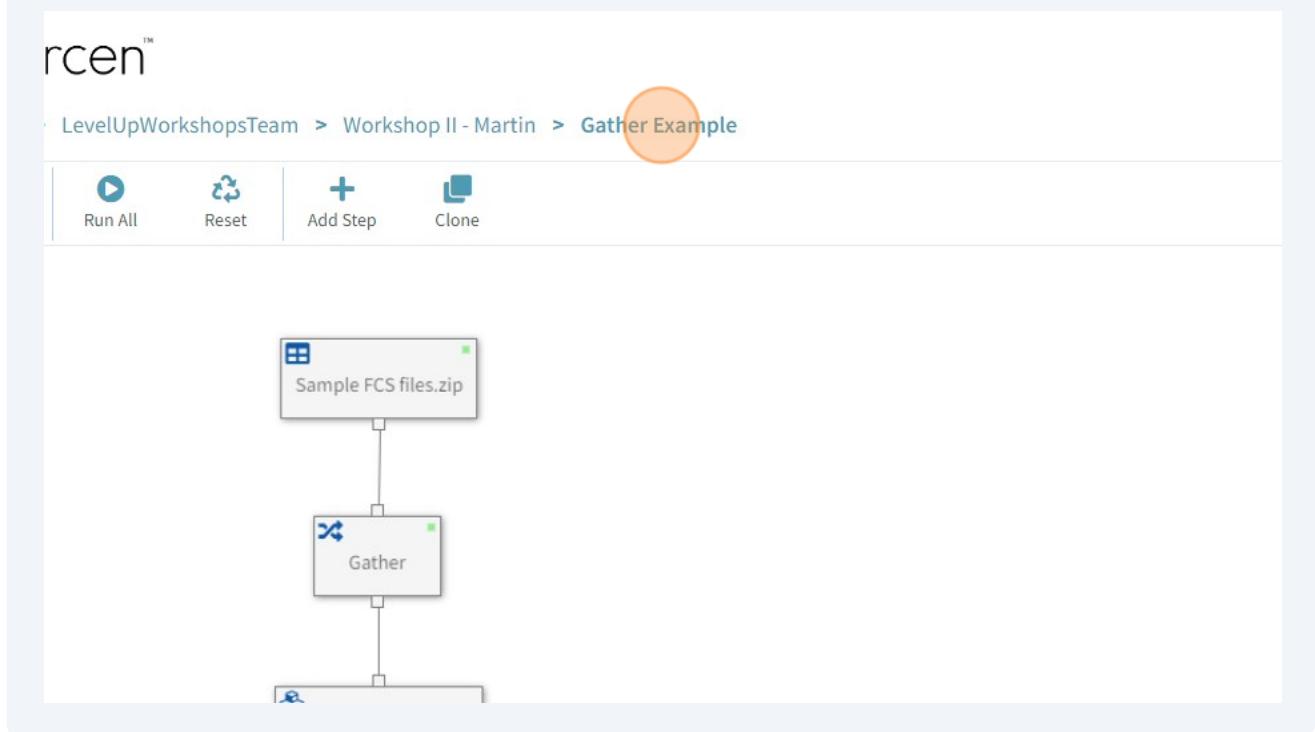


0204 - Filter Channels and Values



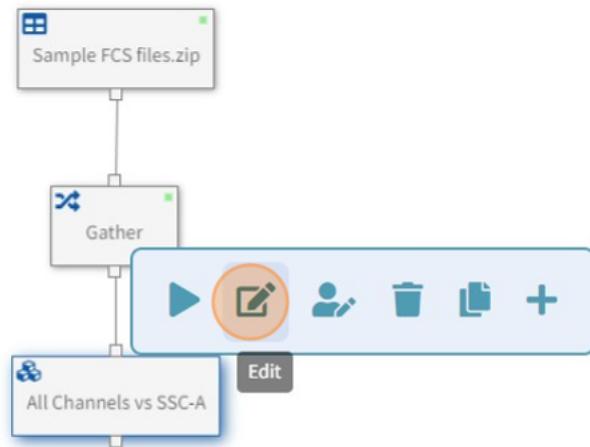
Filters are a way to sub-select the data in a crosstab projection. Filters use "Boolean Logic" which is based around the idea that all values are either true or false and by asking enough true/false questions you can get to any data point.

- 1 Starting from the Gather Example workflow.



2 Click All Channels vs SSC-A

Select **Edit**



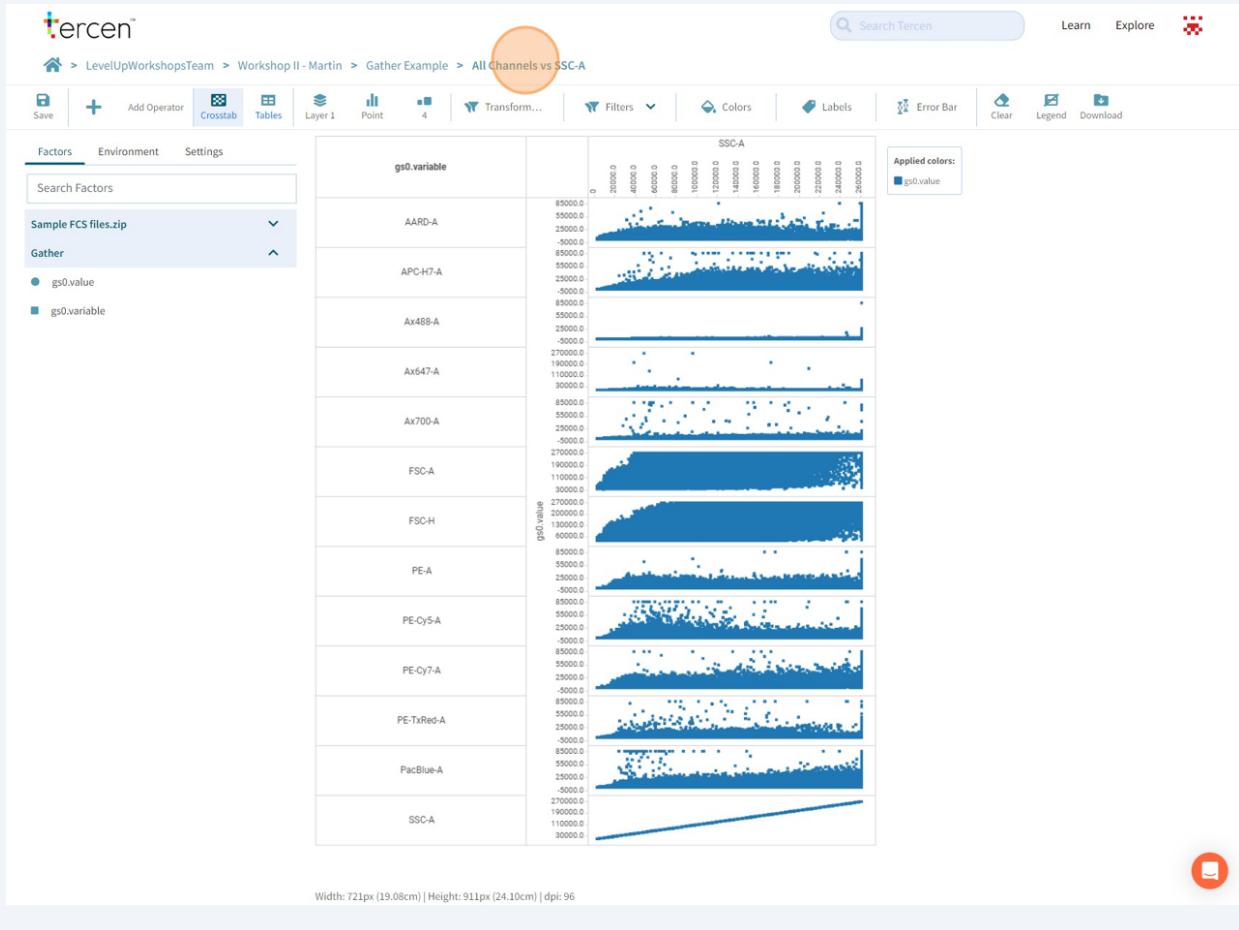
3

Filters are a way of narrowing down the data which is displayed in the crosstab grid (and sent to an operator for calculation).

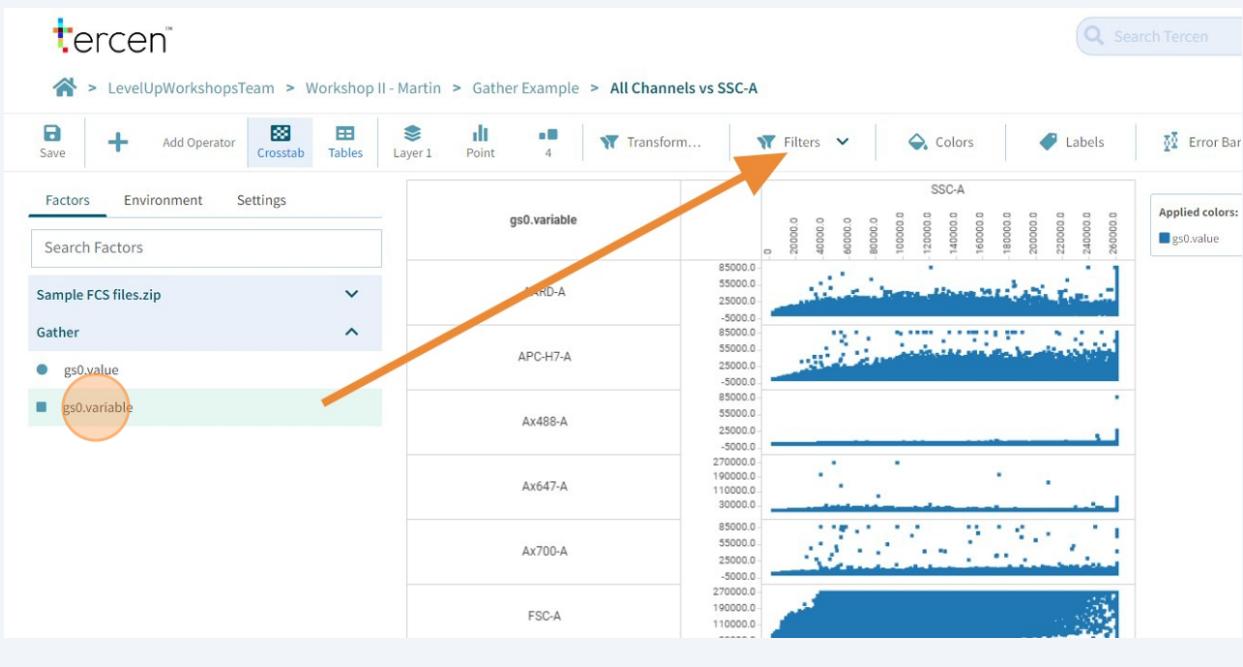
We made this projection after the Gather step. It is a comparison of channels against the Side Scatter channel.

Note the bottom block is not a useful comparison SSC-A against SSC-A

We can use a filter to remove it.

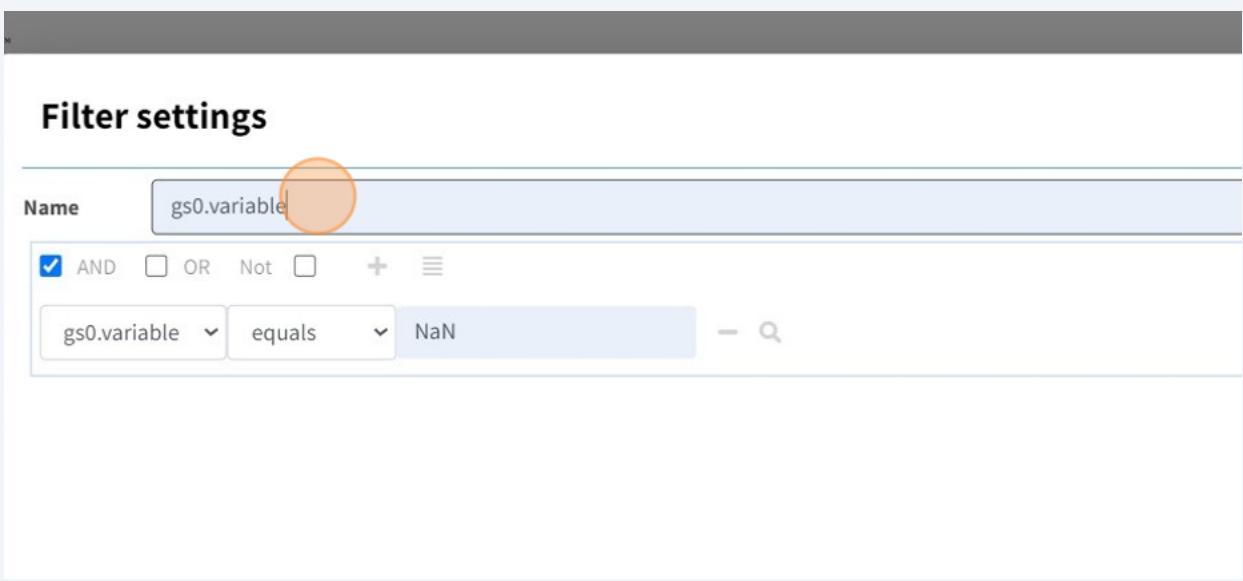


- 4 Drag **gs0.variable** and drop it on the **Filter** zone.



- 5 The Filter Settings box will open

Change the name to "Exclude Channels"



6 Filters are a list of rules built up in the table of settings.

Each rule has three parts.

1. The Factor it is based on
2. A logic for the rule to use
3. A piece of data to define the rule.

To remove the SSC-A channel we will build a rule as follows.

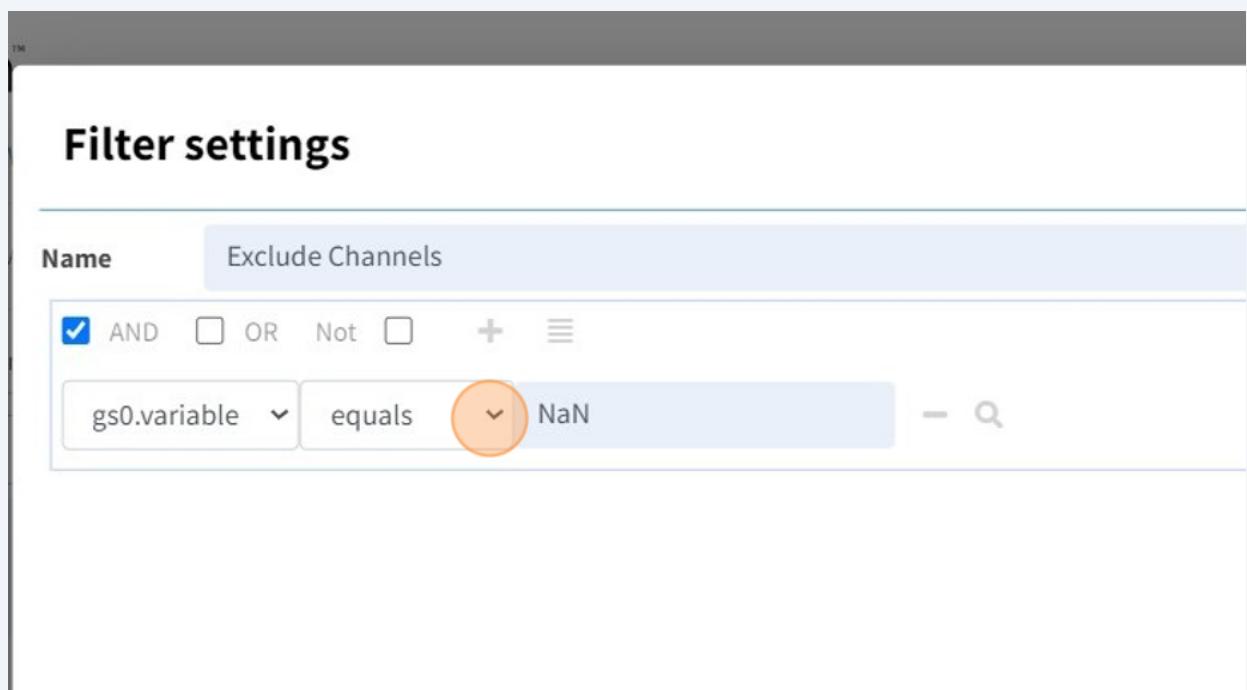
1. gs0.variable (Factor)
2. is not equal to (logic)
3. SSC-A (definition)



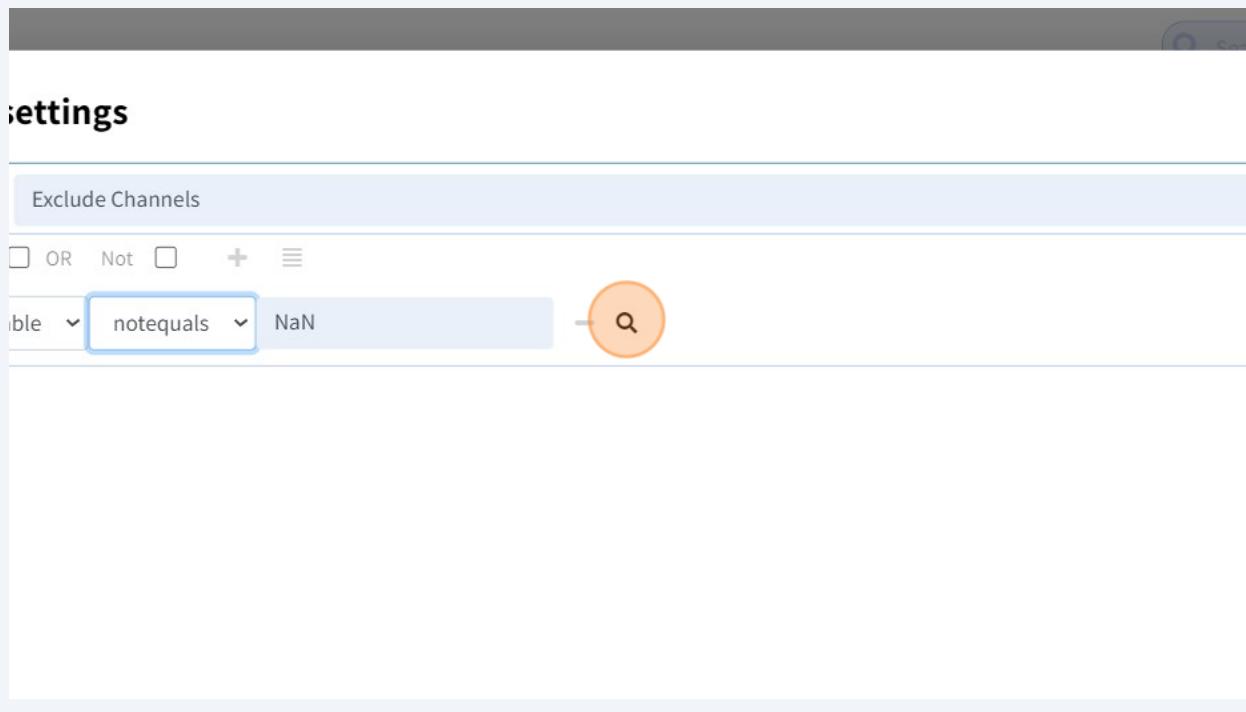
7 Since the Factor is already set by default

Click the logic section.

Change to **notequals**

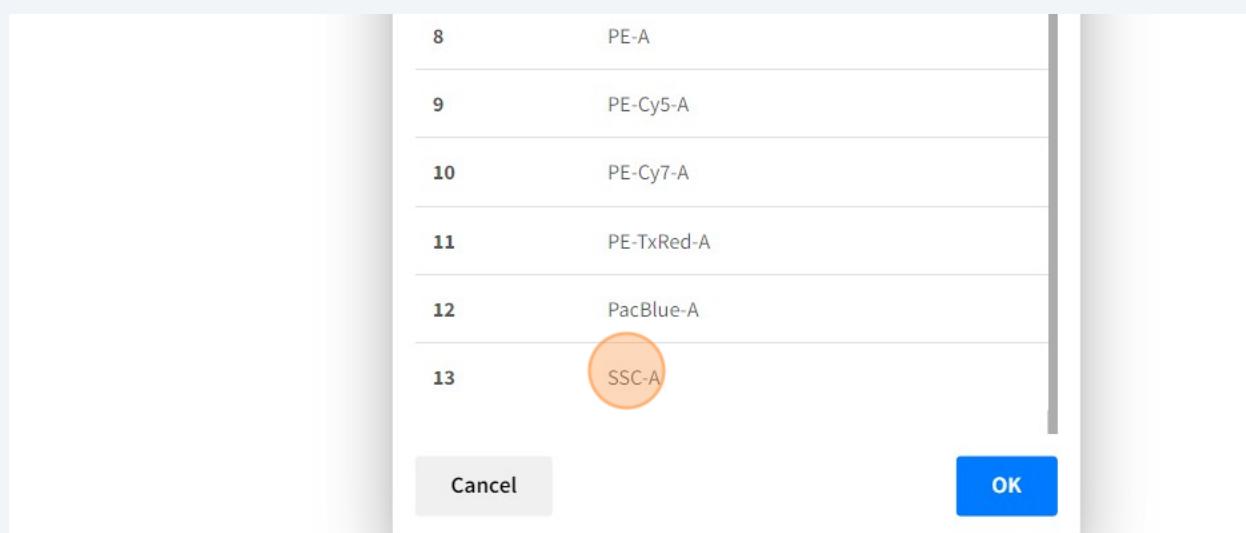


- 8 Click the Search button

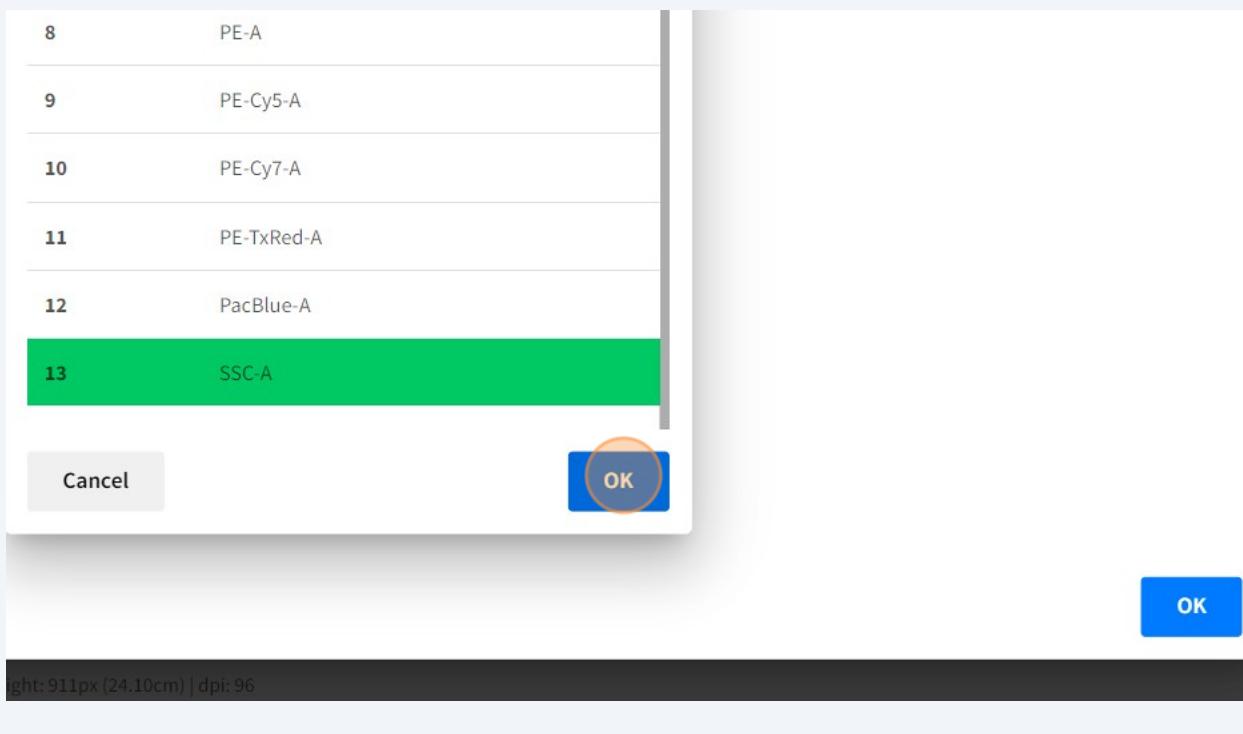


- 9 Tercen will list out all of the data in that factor (gs0.variable)

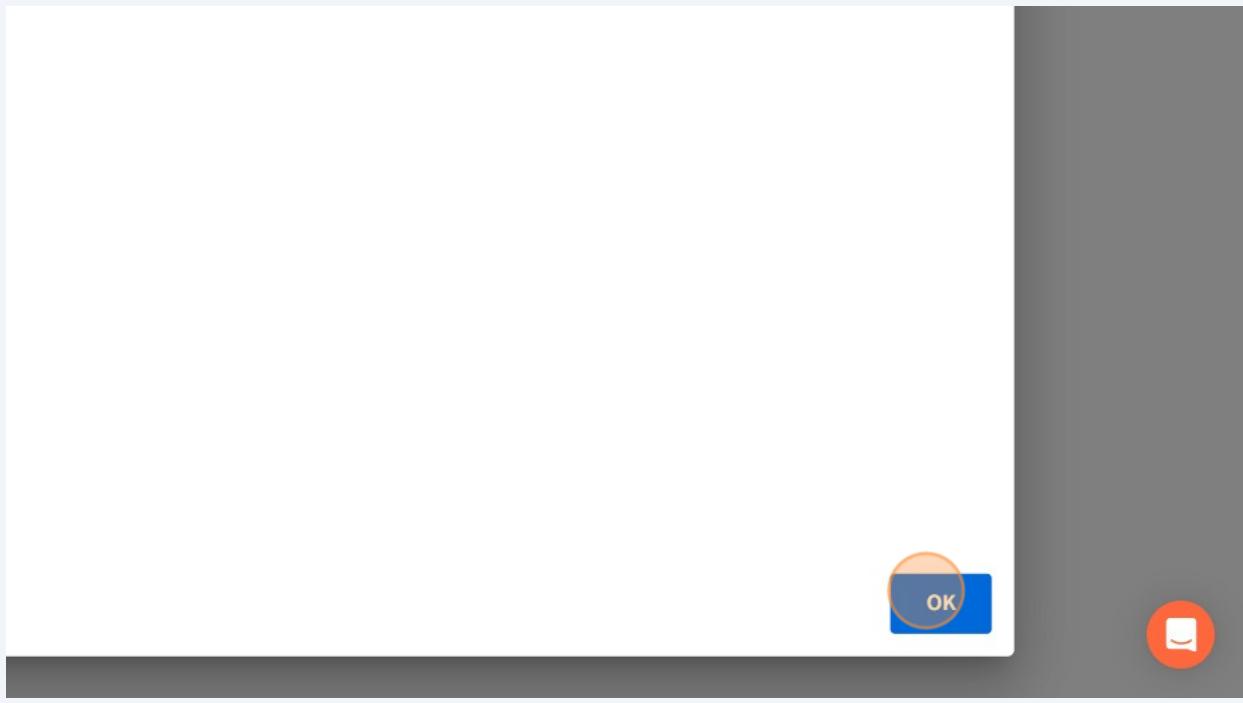
Click "SSC-A"



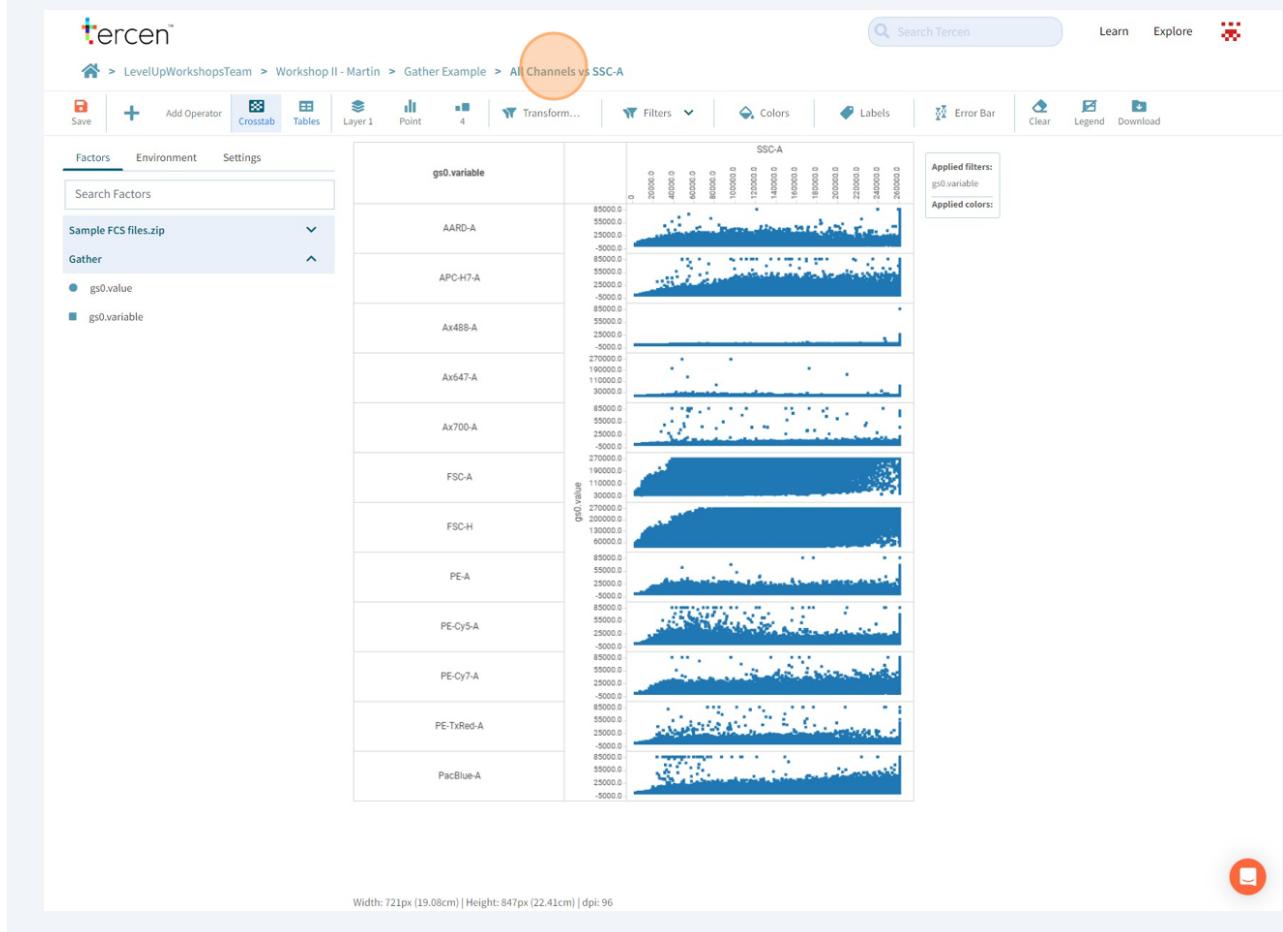
10 Click "OK"



11 Click "OK" again to apply the filter.



12 See that SSC-A has been removed from the projection.

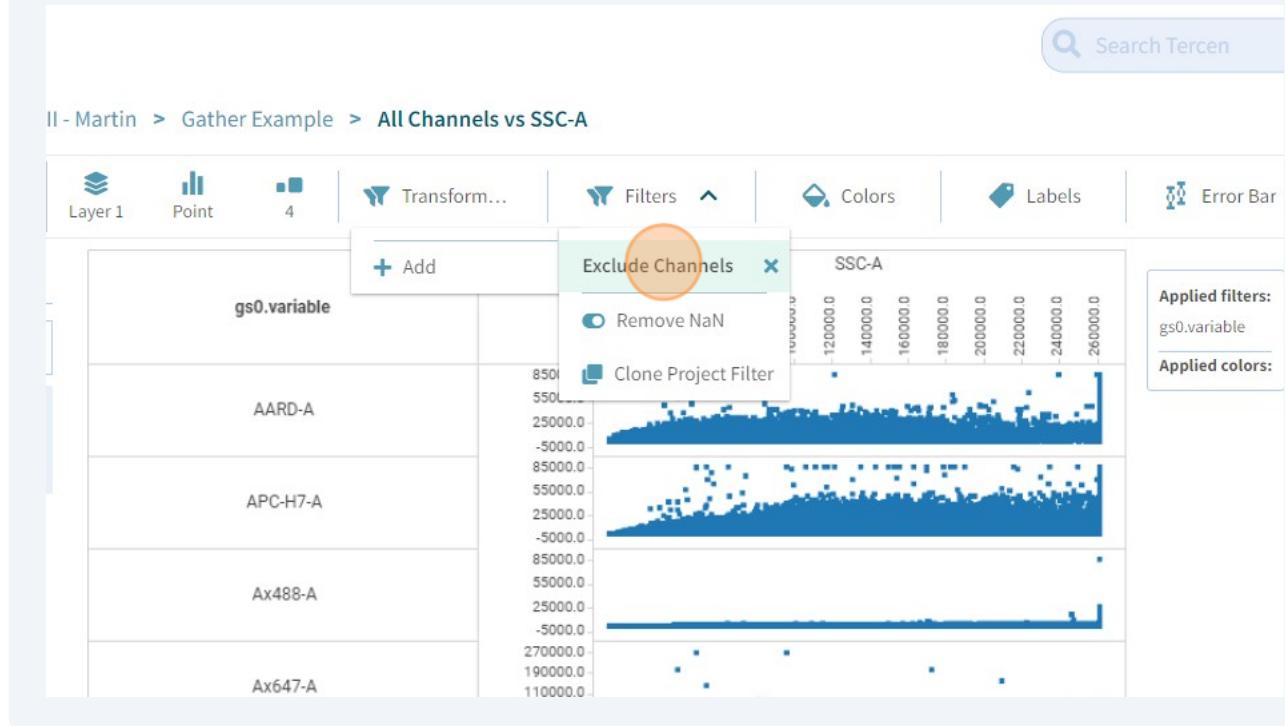


13 Filters can be modified after they are created.

Click the Chevron in the Filters icon to bring up the list

The "Exclude Channels" filter is there.

Click it to bring the setting back.



14

Rules can be added and removed from the filter using the Plus and Minus buttons.

Let's make new rules to remove the other scatter channels from our graph.

Press the + plus icon to add a new rule.

The screenshot shows the Tercen software interface with the 'Factors' tab selected. On the left, there is a sidebar with a 'Save' button, a '+' icon, a 'Sample FCS files.zip' link, and a 'Gather' section containing two items: 'gs0.value' and 'gs0.variable'. The main area is titled 'Filter settings' and contains a table with columns 'Name' and 'Exclude Channels'. The first row has 'AND' checked under 'Name' and 'not equals' under 'Exclude Channels'. A red circle highlights the '+' button in the top right corner of the filter row. Below this, there is a search bar with the text 'SSC-A'.

- 15** As an exercise follow the steps above to remove all the Forward Scatter channels.

Remember the logic is

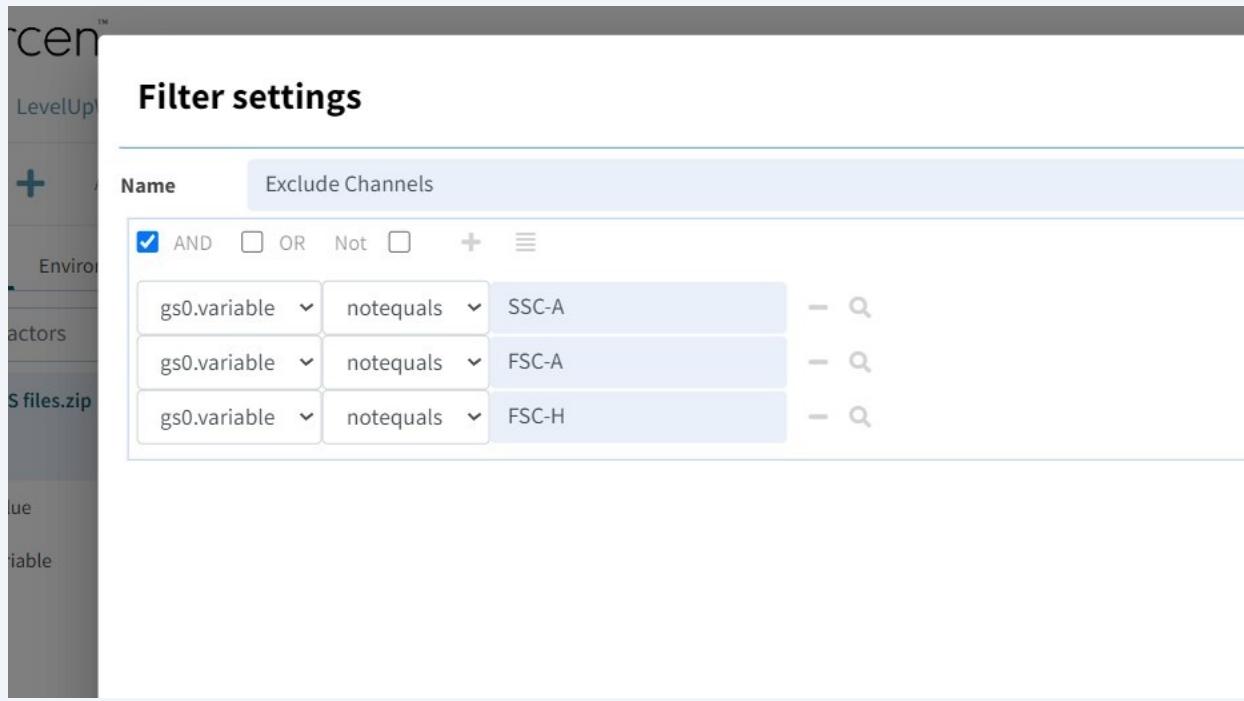
1. Factor
2. Logic
3. Definition

The screenshot shows the Tercen software interface with the title "Filter settings". The left sidebar has "Factors" selected. The main area displays two filter conditions:

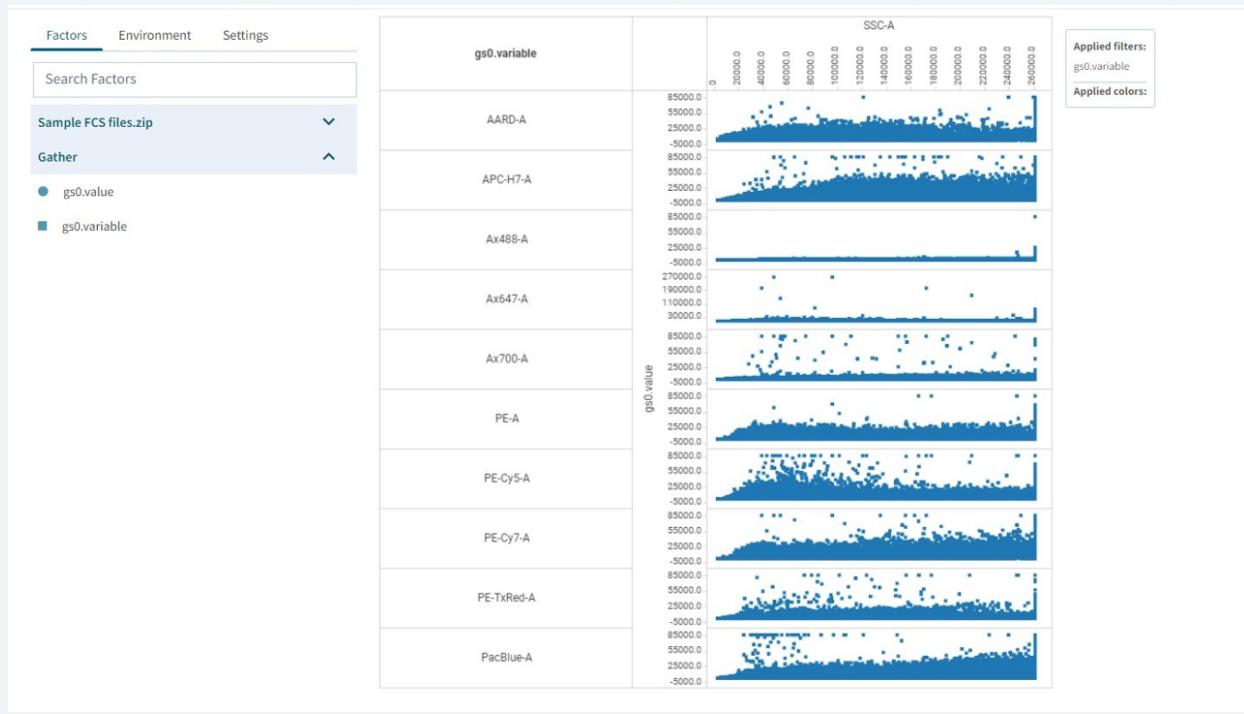
- Top condition: **gs0.variable** notequals **SSC-A**
- Bottom condition: **gs0.value** equals **NaN**

The dropdown menu for the bottom condition's variable, "gs0.value", is highlighted with an orange circle.

16 When you have made a filter that looks like this press OK.



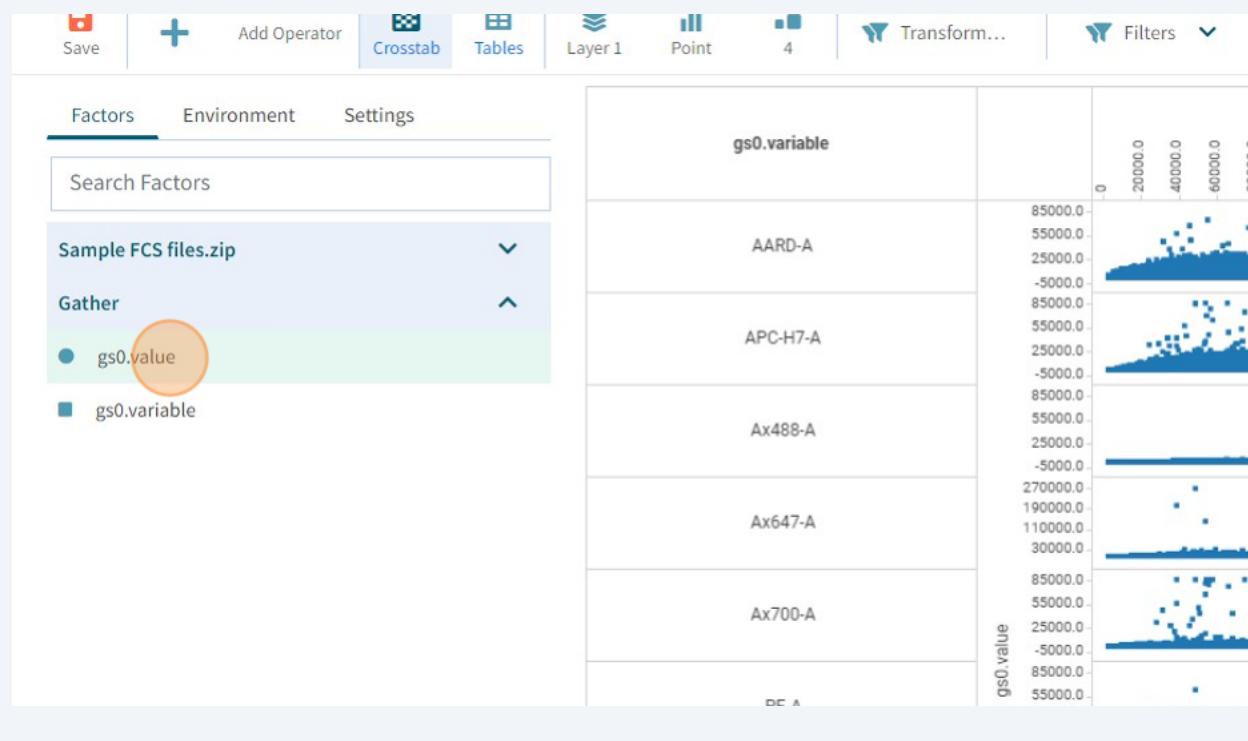
17 Now the forward scatter and side scatter channels are removed.



18

Filters can also be build using numbers and Tercen can apply multiple filters to the same set of data.

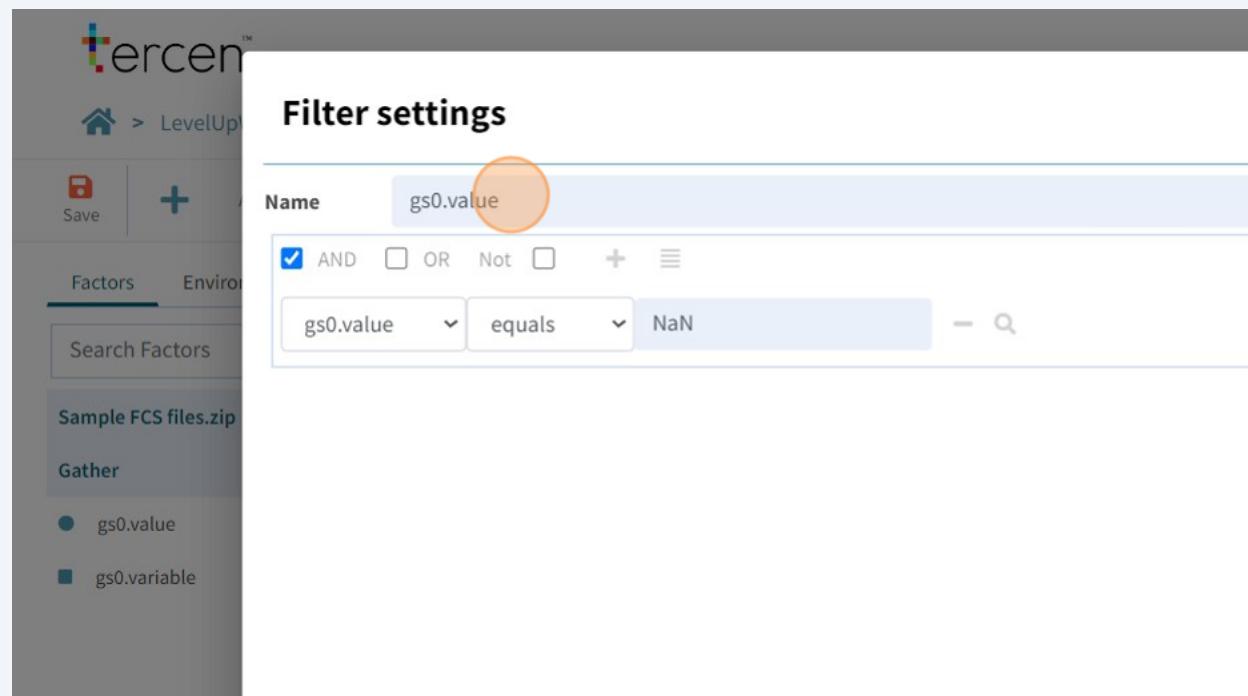
Drag "gs0.value" to Filter.



19

A new Filter will be created.

Names this one "Upper & Lower Bound"



20 Using the same rules logic lets set up a numerical filter.

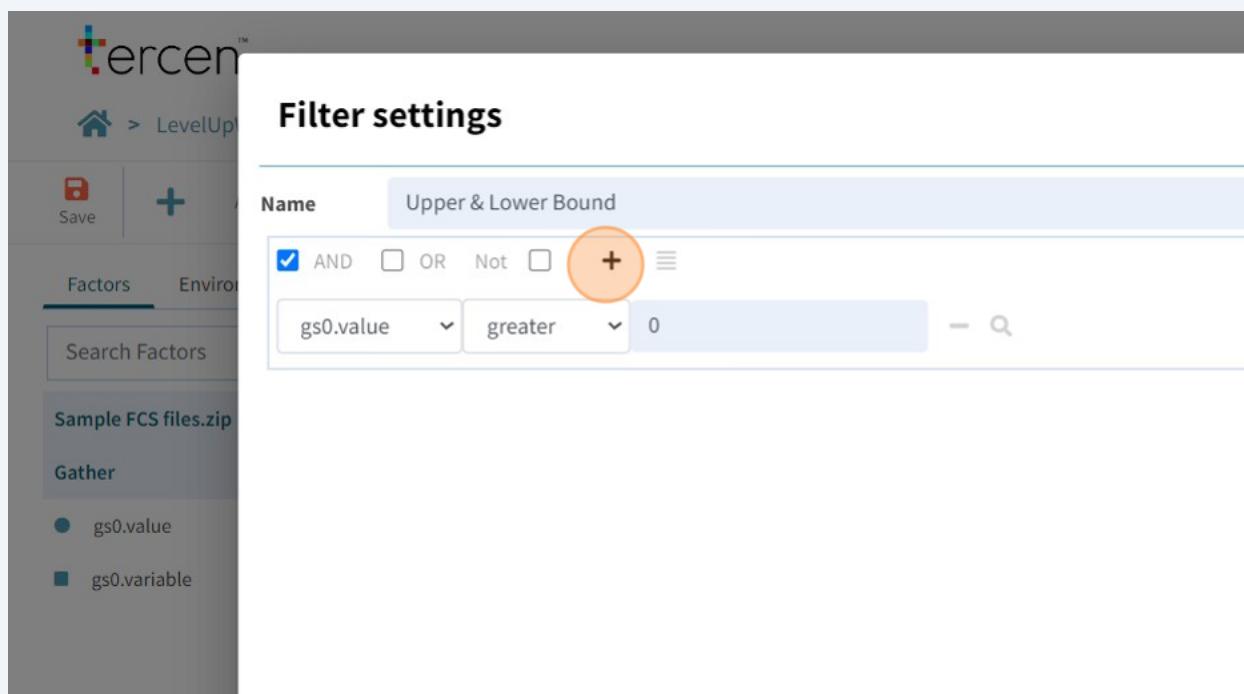
Set the first rule to be

1. gs0.value
2. greater than
3. 0

If you know the definition you need it can be typed into the text box instead of using the search function.

(Though the search function will search for numbers if you need it)

Press Plus to add a second rule.



21 Set this rule to be

1. gs0.value
2. less than
3. 10000

Click "OK"

Filter settings

Name

Upper & Lower Bound



AND



OR

Not



gs0.value



greater



0



gs0.value



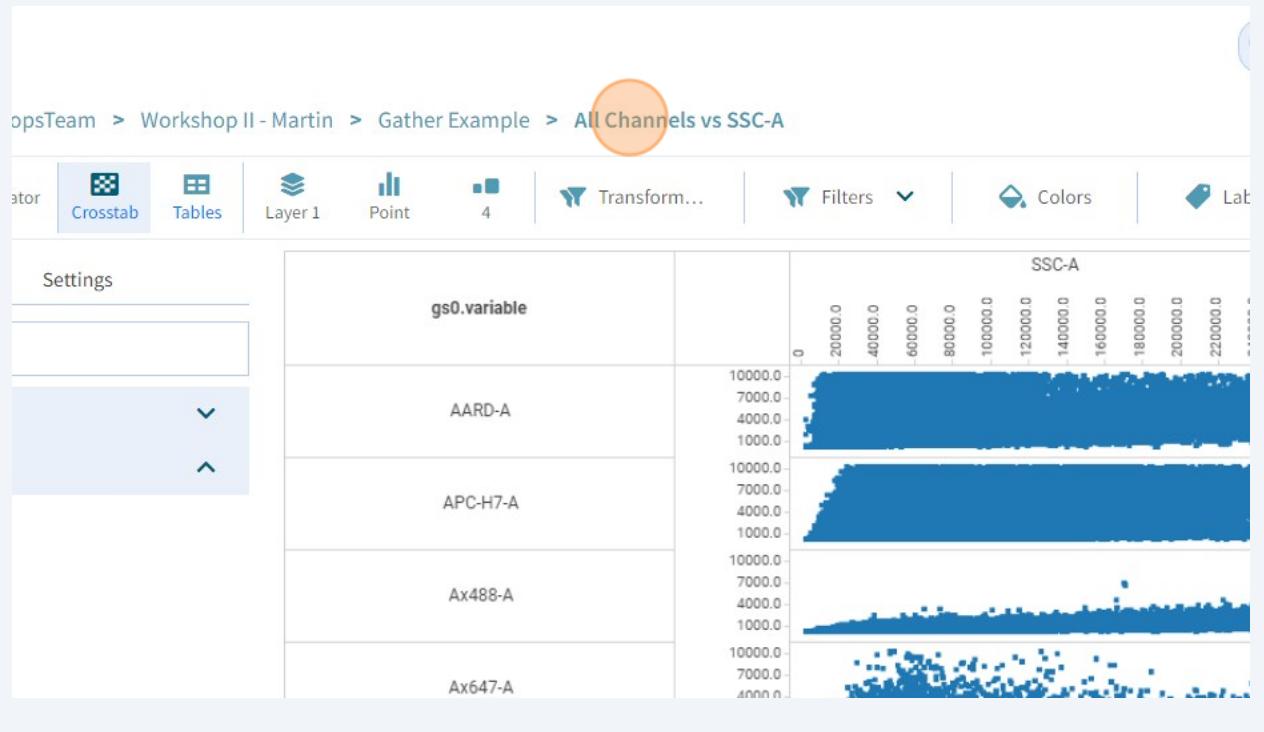
less



10000



22 Click "All Channels vs SSC-A"

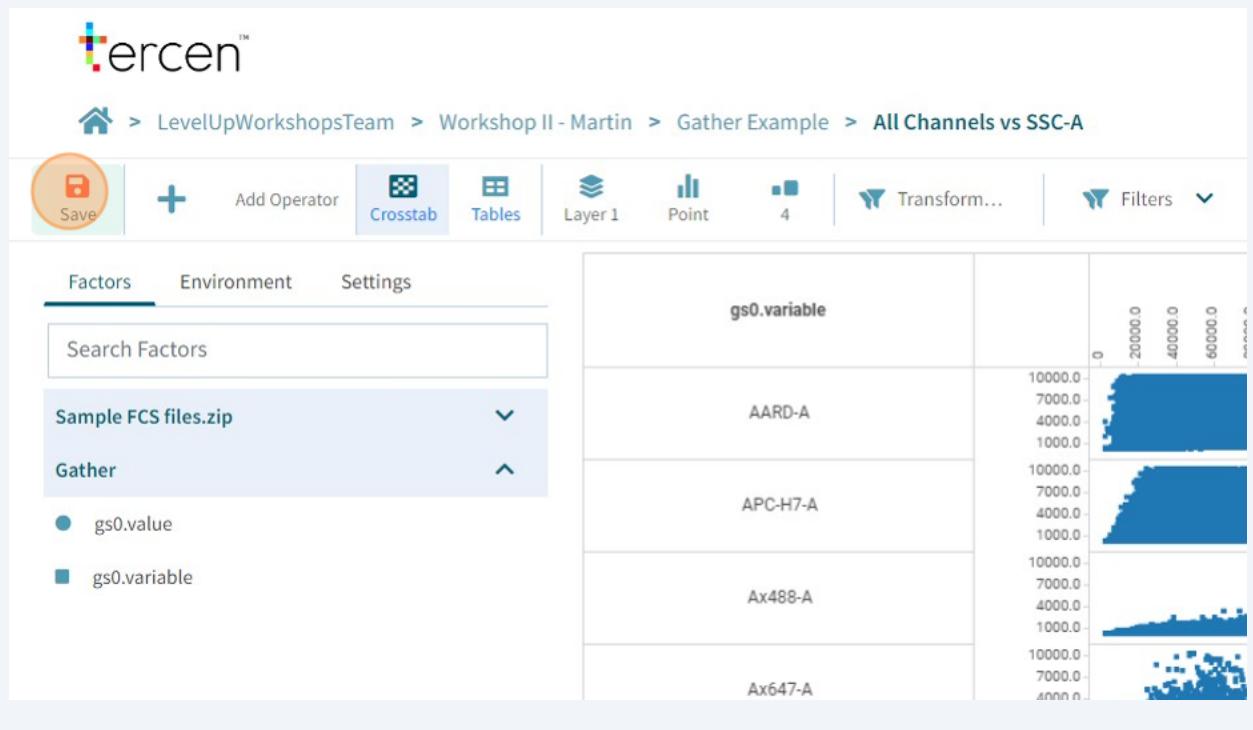


Filters apply their rules from the Top down.

The top rule is applied first and then the next one, and so on, down the list.

The rules at the top DO affect the rules that come after them.

23 Save your workflow.



This lesson shows you the basics that are used in 80% of cases but complicated filters can be created in Tercen.

Ask your instructor for more information if you feel you need to make advanced filters..