Li-SAFE methodology: User manual

Lithium-ion Battery Safety Methodology

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1.0

Revision	Date	Description of the modification	Author
0.1	01/09/2014	First draft	Suzanne Van Poppel
0.2	02/09/2014	Version after first internal revision	Suzanne Van Poppel
1.0	23/09/2014	Final version for the first SW-release	Suzanne Van Poppel

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1. Introduction

This user manual gives information on the use of the Li-SAFE methodology.

2. Login Page

- Open http://193.104.8.63 in a web browser
- The login screens appears
- Use login info to enter the portal
- The 'Home Page' opens

Figure 1: Login page

3. Home Page

The home page consists out 3 parts:

1. General introduction to the Li-SAFE portal

2. Left side menu give a list of functionalities:
   - 2.1 Search menu
   - 2.2 Link to the home interface
   - 2.3 Link to the top level interface
   - 2.4 Scaling parameters
   - 2.5 Query interface
   - 2.6 Table of the standard comparison
   - 2.7 Overview of the general information of the standards
   - 2.8 Glossary
   - 2.9 List with symbols and abbreviations
   - 2.10 Feedback function

   These function are explained in detail in the following chapters

3. Tree-view of all the process of the battery lifecycle. By clicking on the process its information page opens

The version of the portal is indicated at the bottom of the page

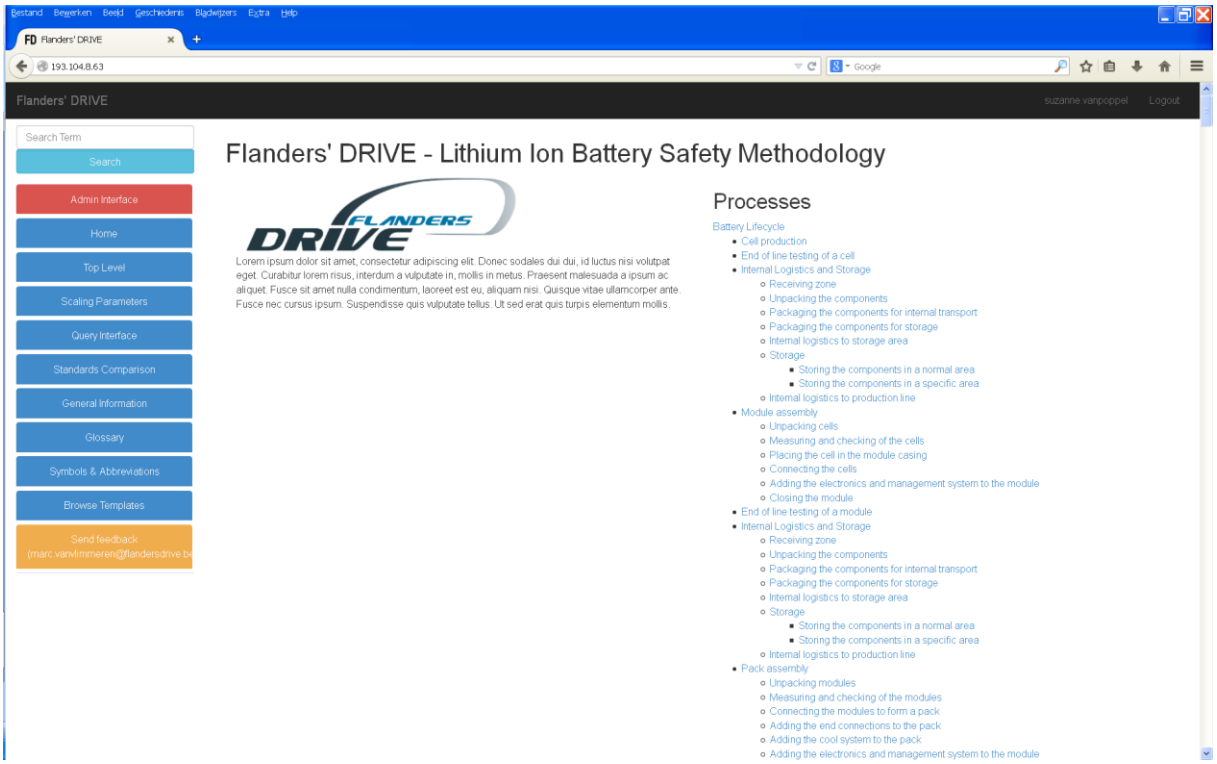

Figure 2: Li-SAFE home page

4. Navigation through the Li-safe Battery lifecycle

The Li-SAFE portal gives for each process in the battery lifecycle relevant safety information from the standards, recommendations, materials and components. Two options are available to navigate through the lifecycle:

- Navigation via the graphs
- Navigation via the list of processes

4.1 Navigation via the graphs

4.1.1 Top level graph

The top level graph can be opened via the 'left side menu'. This graph gives the complete lifecycle. The lifecycle exists of

- Sub flows (rectangles with a dashed line)
- Steps (rectangles with solid lines)
- Decision: red arrow indicates the 'no' path, green arrow the 'yes' path

As an example the following figure gives a part of the complete life cycle

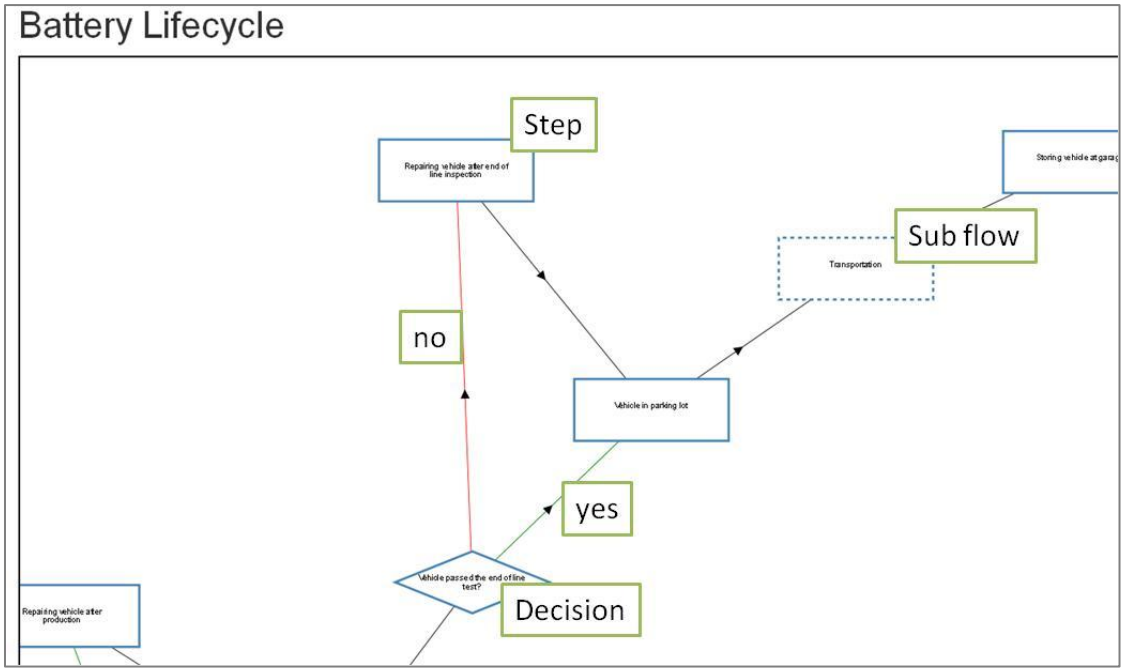

Figure 3: Part of the lifecycle graph with examples of a sub flow, a step and a decision

By clicking on a sub flow or step, the corresponding information page of the sub flow or step opens.

In the graph it is possible to:

- Zoom in and out:
  - Place pointer on the block on the lifecycle where you want to zoom in and out
  - Scroll with the 'mouse wheel' to zoom
- Drag the figure in various directions:
  - Place pointer on a block in the lifecycle
  - Click an hold left mouse button
  - Move the mouse to move the graph

4.1.2 Sub flow graph

For each sub flow a graphical representation is given in its information page. Just like the top level flow, a sub flow can exist of sub flows, steps and decision. These elements are represented in the same way as in the top level graph.

By clicking on a sub flow or step, the corresponding information page of the sub flow or step opens. The graph has the same zooming and dragging functionalities

4.2 Navigation via list of processes

At the right side of the home interface a list of the processes is given. By clicking on the step or sub flow, the corresponding information page opens.

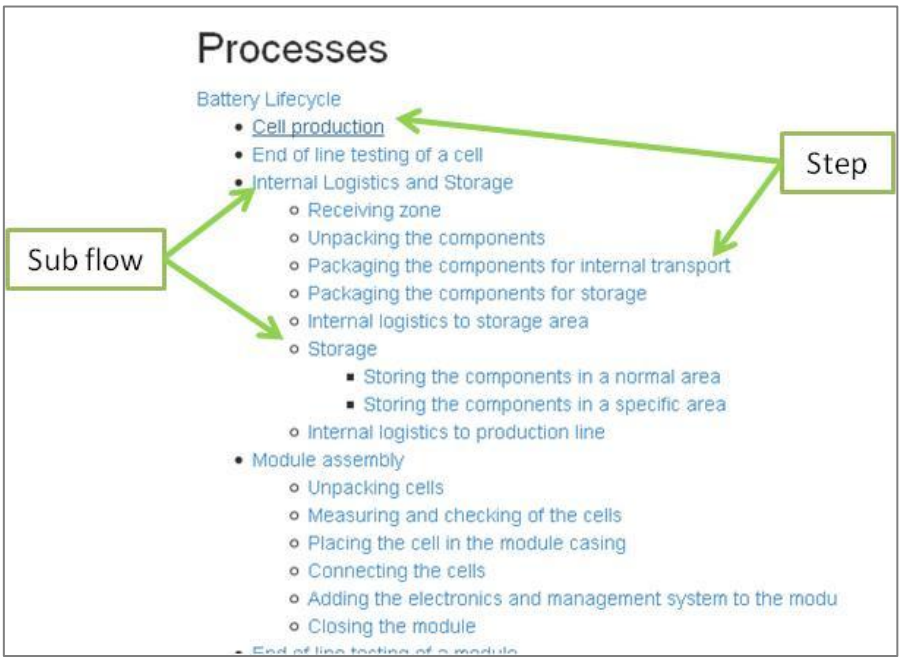

Figure 4: Part of the list of processes in the Home-interface

5. Flow and step interfaces

5.1 Flow interface

The flow interface consists of the following parts:

1. Description: the description gives detailed information of the flow, the purpose and scope and the structure of the process
2. List of information clauses which are valid for the process. The list of these clauses is divided into 5 parts:
   - Requirements
   - Recommendations
   - Materials
   - Components
   - Test Laboratories

   Figure 5 gives an example of a flow interface with only requirements clauses.
3. Graphical representation of the flow.

In the flow interface the 'Export to excel'-function is available (orange button below the description). This function allows the user to export the list of information to an excel file. The information of each of the five parts is stored in a separate excel-sheet.

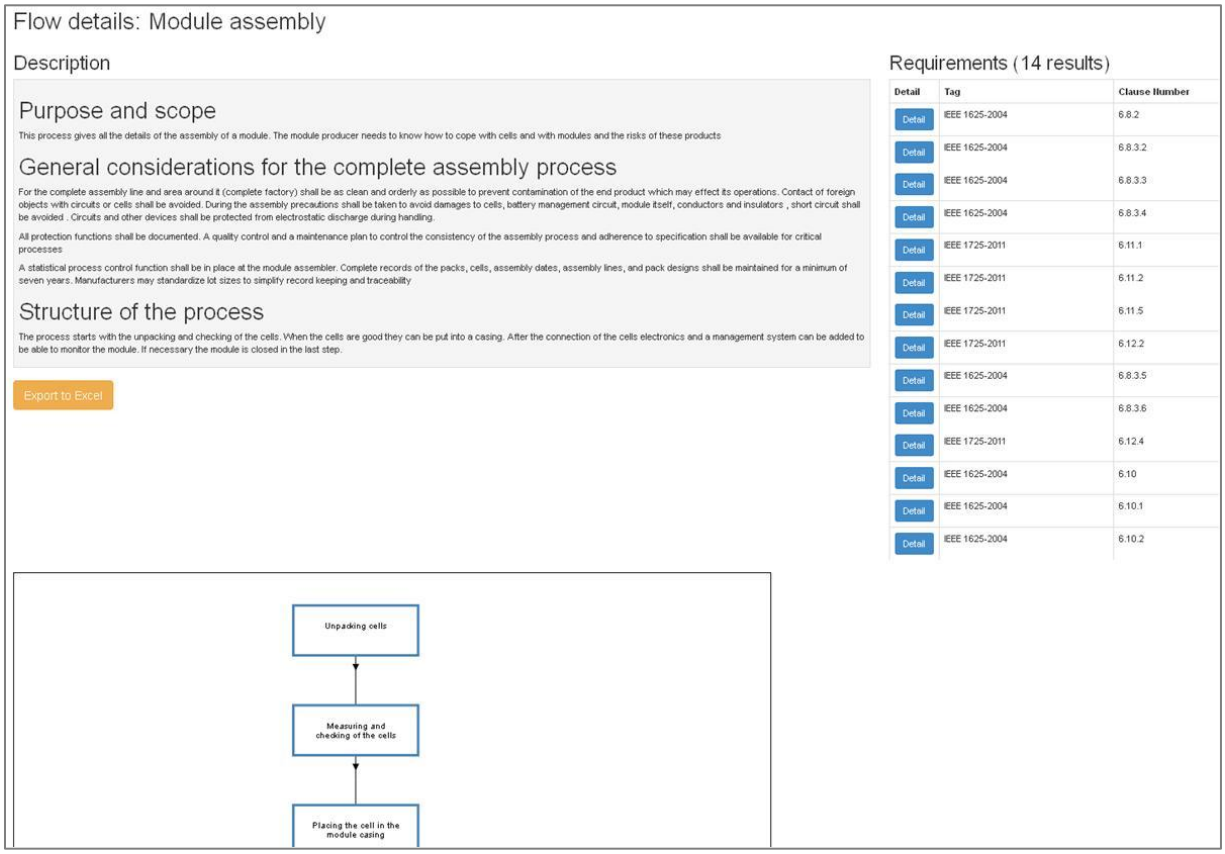

Figure 5: example of a flow interface

5.2 Step description

The step interface consists of the following parts:

1. Description: the description gives detailed information on the process step
2. List of information clauses which are valid for the process. The list of these clauses is divided into 5 parts:
   - Requirements
   - Recommendations
   - Materials
   - Components
   - Test Laboratories
3. If applicable the following information can be added:
   - Work products and templates which can be used in the process step (eg. Vehicle user manual can be work product from the Vehicle Design and Development process)
   - The roles and responsibilities for the process step can be defined. The following roles can be used:
     - Responsible (R)
     - Accountable (A)
     - Consulted (C)
     - Informed (I)

In the step interface the 'Export to excel'-function is available (orange button below the description). This function allows the user to export the list of information to an excel file. The information of each of the five parts is stored in a separate excel-sheet.

6. Scaling

One of the main assets of the platform is the possibility to scale the safety-related information with respect to the following parameters:

- Product type: cell, module, pack, vehicle, damaged cell, damaged module, damaged pack
- Application type: automotive, bicycle, portable application, ...
- Activity: assembling, packing, labelling, …
- Process: cell production, module assembly, storage, transportation, …
- Region: Europe, US, international, Japan, …
- Standard body: ISO, IEEE, IEC, …
- Standard: scaling on specific standard for which info is available in the portal

The scaling has influence on:

- **The graphs**: steps, decisions and flows for containing information which is not applicable for the selected scaling parameters will be greyed out and it is not possible to click on these elements.
  Figure 6 gives a part of the top level scaled to product type cell or damaged cell. Almost all processes on module level are scaled out except those in which cells are still handled separately. All processes on 'Cell level' are still 'active'. The greying out is also implemented in the sub flow graphs.
  Figure 7 gives as an example the flow 'Module assembly' in which in the first steps cells are handled. The steps in which only modules occure, are scaled out.

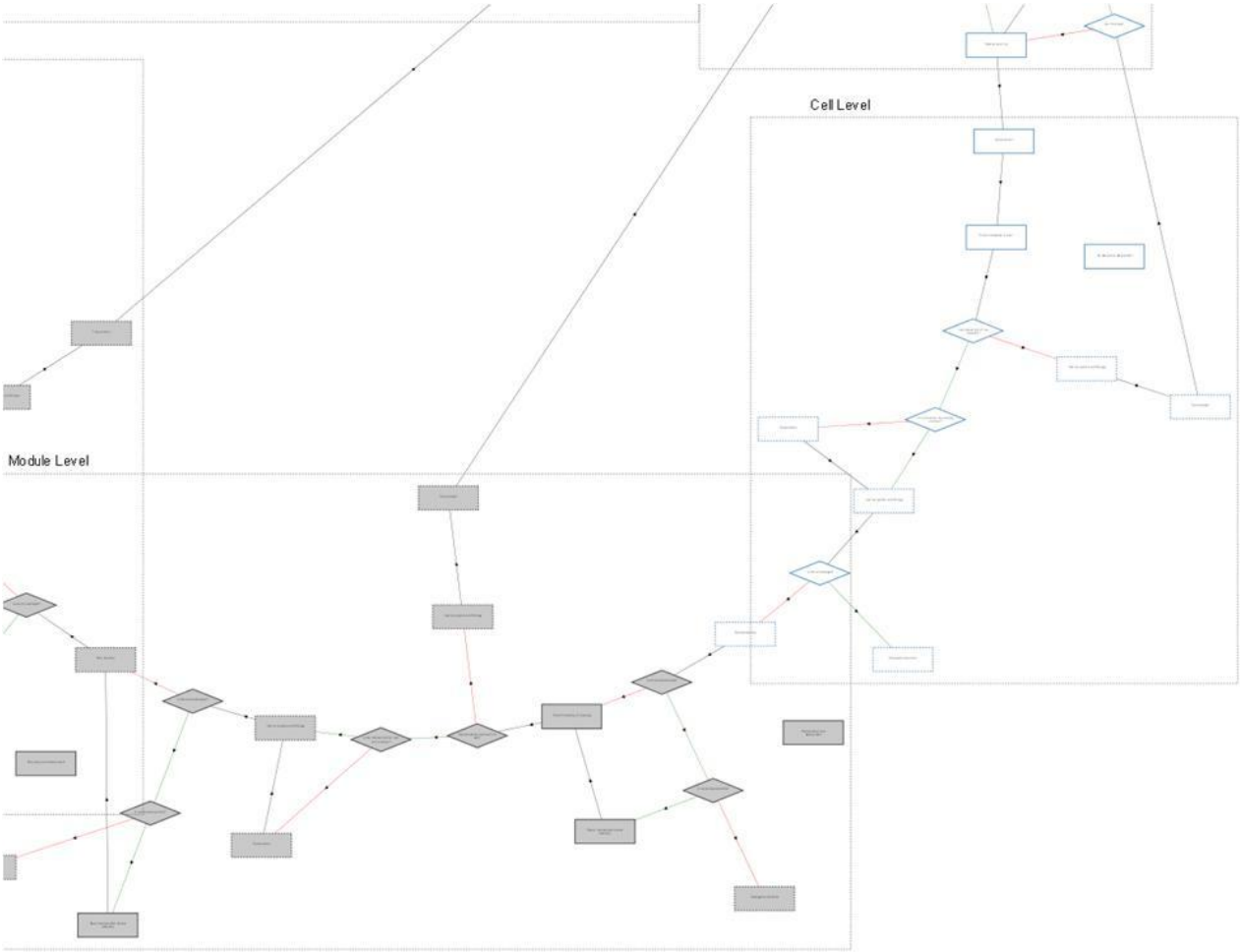

Figure 6: Part of the top level flow scaled on 'prodType = cell or damaged cell'

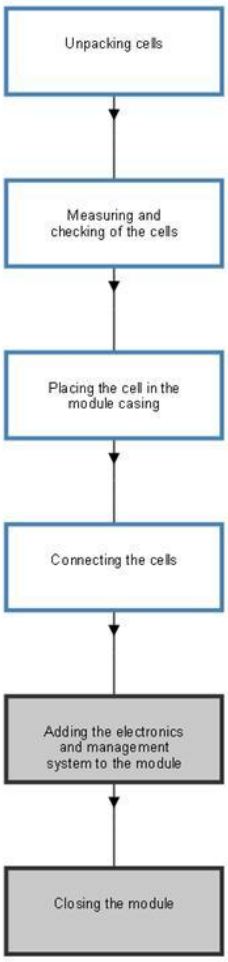

Figure 7: Flow 'Module assembly' scaled on prodType = cell

- The **list of information clauses** in the flow and step interface: only those clauses for which the scaling parameters are valid will be shown.
- The **description** of the process: parts of the description which are not valid for the scaling parameters will be removed.

  Example: Step 'Connecting the cells'
  Figure 8 gives as example the step 'Connecting the cell' scaled on product type cell. The top of the figure gives the not scaled content of the steps with the requirements and recommendations. The second part shows how this information is scaled. The requirements are concerning modules so they are scaled out and description which gives information on handling modules after the cells are connected is removed.

- **Exporting function**: only the scaled set of information will be exported to excel
- **Search and query function** will only use the scaled set of information
- **Standard comparison table** will be scaled down. If scaled on 'cell', only those standards which are applicable on cells will be shown.

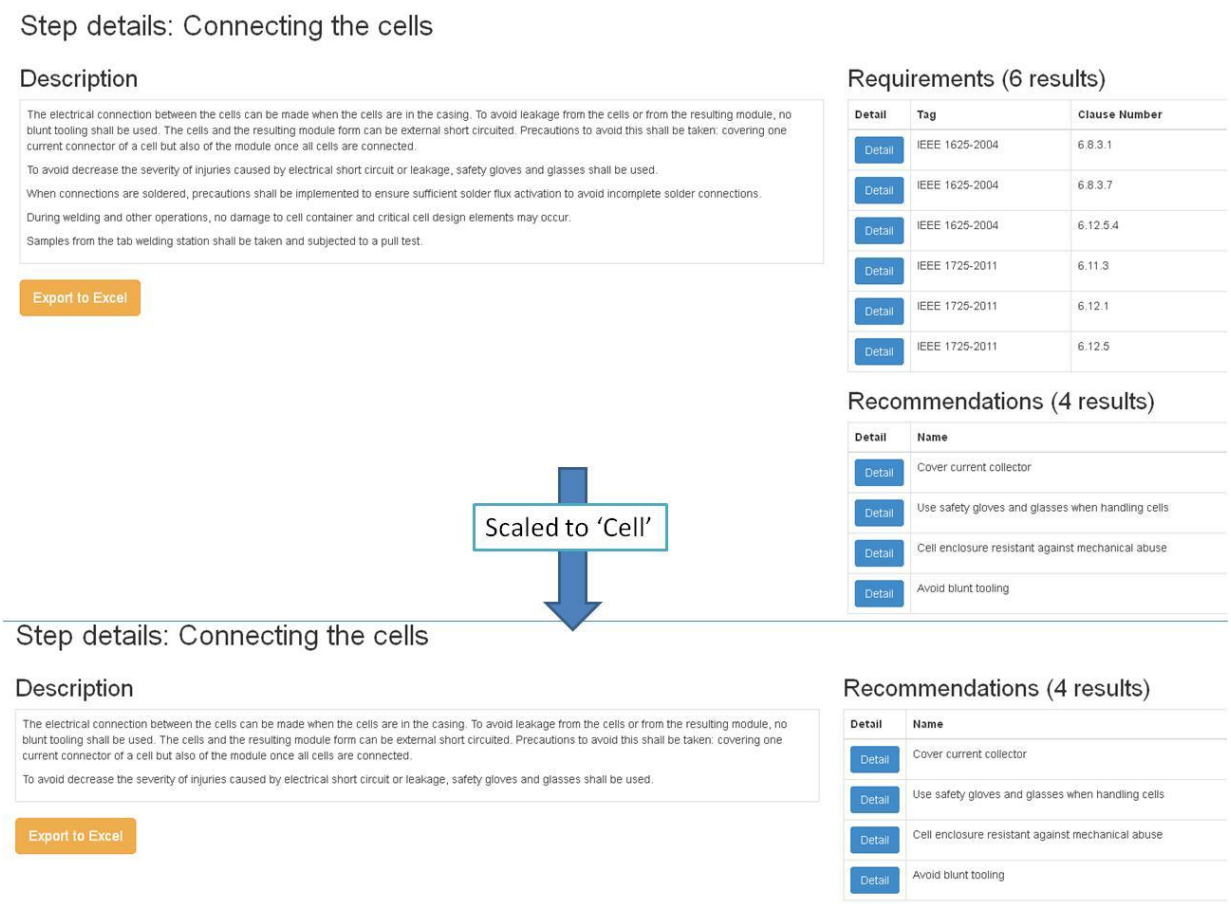

Figure 8: Example of scaling of description and list of clauses

7. Functionalities in ‘Left side menu’

This chapter describes the functions in the ‘Left side menu’

7.1 Search

Search functionality which search in the content of the 5 information clauses, steps and flows. The search functionality doesn’t search in the database of the glossary, symbols and abbreviations lists and also not in the document (work products or guidelines. The results are grouped per type and are exportable to excel.
The results are affected by the scaling parameters

7.2 Admin interface

Note: this button is only available for users with administrator privileges
Via this link, the administrator can open the administrator interface. In this interface the admin can:

- Add or delete user
- Add new information clauses
- Define new flows and steps
- Add content to the description of the flows and steps

7.3 Add note

The ‘Add note’-button appears when a step or flow interface is opened. The function allows the user to add notes to a step or a flow, to edit the note and to remove it.

- Adding a note: when clicking on the ‘Add note’-button, a text field appears with ‘Note content’.

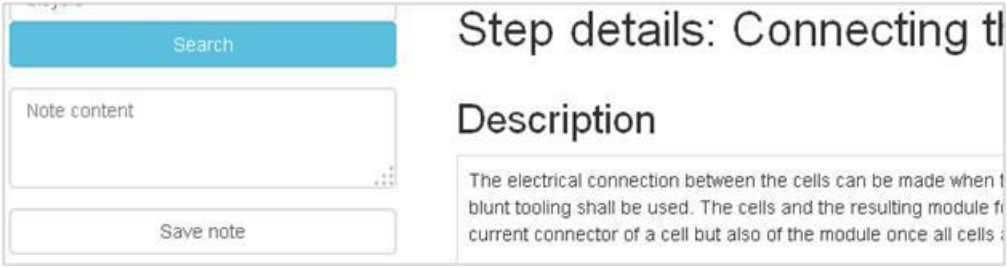

Figure 9: text field to add a note

- The user can type a note in the field and this note can be saved via the ‘Save note’-button.

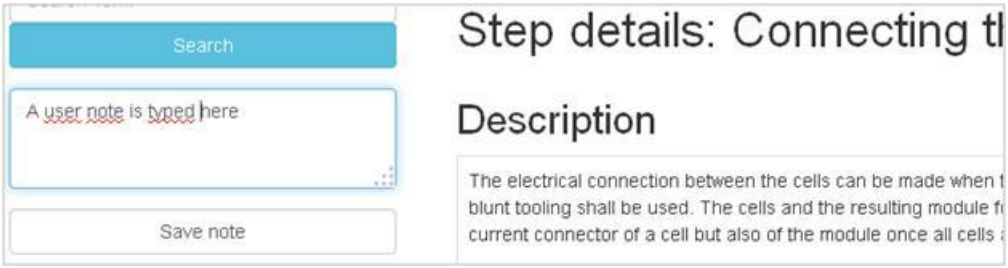

Figure 10: Adding and saving a note

- When the user reopens the step or flow, the note will be displayed directly and not the ‘Add note’-button
- To remove the note, the user needs to delete the text and press ‘Save note’. The note is deleted and the text field will be replaced by the ‘Add note’-button

Notes are only viewable by the user who has made them.

7.4 Home

Link to go to the home page.

7.5 Top level

Link to go to the top level flow

7.6 Scaling parameters

This is the function in which the users can select the scaling parameters. For each scaling parameter a list with possible values is given. The values for the parameters can be selected, deselected as follows

- The user can select a value by 'left-clicking' on the wanted value.
- Multiple values can be selected by 'Ctrl + left-clicking' on the wanted values
- Values can be removed by 'Ctrl + left clicking' on the already selected values
- The new set of values (selected or deselected) need to be saved by clicking the 'Save' button at the end of the page
- All selected values can be removed by clicking the 'Reset button at the end of the page. This results in a none scaled process.

Some notes:

- If no scaling values are selected, the portal is not scaled and all information is available
- It is possible to scale only on 1 scaling parameters. Information which doesn't have a value for that parameter will still be shown.
  Example:
  The portal is scaled to Region = US, materials don't have a parameter 'region'. They will not be scaled out.

7.7 Query interface

The query page is another type of search page in which the user can look for requirements concerning the same topics. The user can select the standard, the requirement type, requirement sub type, test type and clause type. The possible values for these query parameters depend on the scaling and the selected values of the previous query parameters.

7.8 Standard comparison

The standard comparison gives an overview of all tests and standards described in the portal. For each type of test it indicates which standards give a procedure for this test type. Figure 11 shows a part of this table. The columns give the standards and the rows the tests.

Flanders' DRIVE - Standards Comparison

Test Type	ISO 12405	ISO 6469	IEC 62660	IEC 60068	IEC 62281	IEC 62133	SAE J2464	SAE J1798	SAE J2380	SAE J2929	NEN-EN 15194	UL s1642	UL s2054	UL 2580	IEEE 1625	IEEE 1725	JIS C 8714	UN Regulation No. 100	UN Manual of Tests and Criteria
Dewing (temperature change)	X									X									
Temperature cycling	X		X		X		X			X		X	X	X				X	X
Vibration	X		X	X	X				X	X		X	X	X	X			X	X
Shock	X	X	X		X		X			X		X	X	X				X	X
External short circuit	X	X	X		X	X	X			X	X	X	X	X	X	X	X	X	X
Abnormal charge	X		X		X	X	X			X		X	X	X		X	X	X	X
Insulation resistance		X												X				X	

Figure 11: Part of the comparison table

When the user clicks on a standard name the general information is shown for this standard. This information gives the scope, the normative references and the general requirements of the standard. When the user clicks on the test type, all clauses of all the standards considering this test type are listed. The user can also click on a specific test-standard combination. This gives directly the list of clauses from the selected standard for the specific test.

The comparison table is influenced by the scaling parameters. It only gives those standards which are valid for the chosen set of parameters.

7.9 General information

For every standard a general information page is made. This gives information on the scope, the normative references and the general requirements of the standard. The list gives the titles of all standards. By clicking on the detail-button, the page with the general information opens.

7.10 Glossary

Link to the glossary list. By clicking on the detail button next to the term, the glossary for that term from the different standards is given.

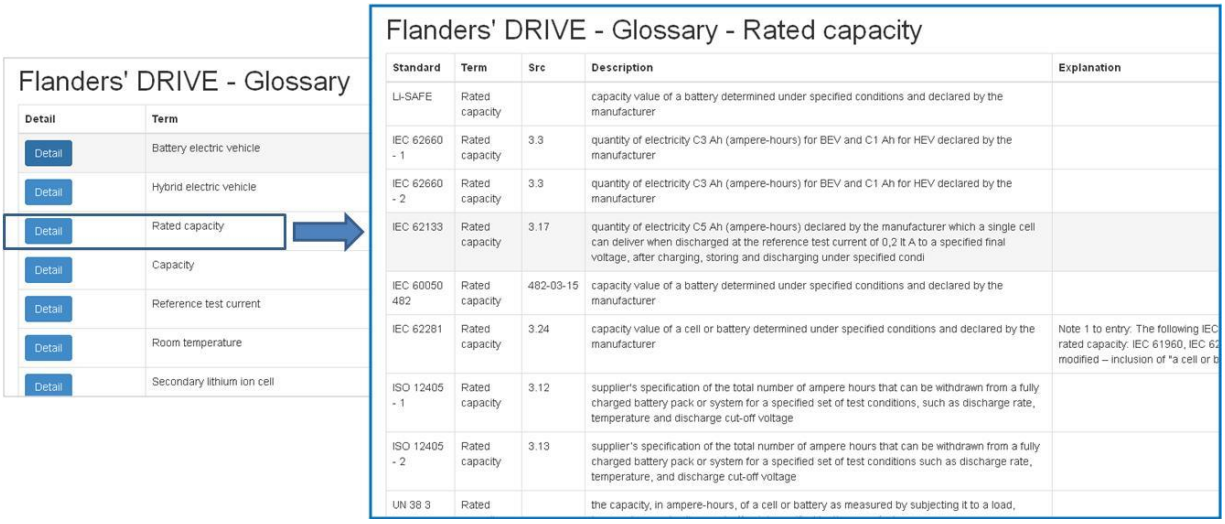

Figure 12: Glossary list and example of description list for 'Rated capacity'

7.11 Symbols and abbreviations

Link to the list of symbols and abbreviations. By clicking on the detail button next to the symbol or abbreviations, information of the standards on the selected symbol or abbreviation is given.

7.12 Browse templates

A link to an interface which gives a complete overview of the work products, templates and guidelines. Every document is downloadable.

7.13 Send feedback

When the user encounters problems or bugs, this feedback can be given via a mail to the administrator. By clicking on the feedback button, an email opens automatically in which the information can be filled in.