SVG symbol library within the scope of IES product specification S-401

Version: 0.3, 24.05.2016, draft

IEEG

Subject

The product specification of Inland ECDIS on the base of S-100, the IHO Universal Hydrographic Data Model, has to include a portrayal catalogue with a symbol library for all regions. The data format which has to be used for the symbols is the Scalable Vector Graphics (SVG) format. SVG is based on Extended Markup Language (XML), allows a vector base description of the symbol graphic, the use of style libraries, additional metadata and has his own local coordinate system.

We have a lot of symbols in all the regions where the inland ECDIS standard is used. For the production and maintenance of the S-401 symbol library an automated work flow is needed. The provision of new standard revisions, inclusive the portrayal library, is the task of the Inland ECDIS Harmonization Group (IEHG).

The work flow for producing and maintaining the S-401 symbol library contains three different sources:

- EXCEL-file of all S-401 symbols,

  with the basic definitions of the symbols and the necessary metadata,

- CAD-file (MicroStation cel-file), with the geometrical construction,

- Style sheet file, with the used line styles and colors.

Out of this source a software tool produces the S-401 symbol library automatically (**S-401 symbol library generator**). This tool was developed within the European project CoRISMa, Sub-Activity 4.2, by the company Geomapping in Hildesheim, Germany.

This document should help for a better understanding and describes the details of the sources and their impacts to the result.

Procedure (work flow)

- **Source documents**
  - **Excel file of all S-401 symbols** (mostly notice marks, beacons, harbour facilities)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
sign	title (acronym	description	size width	ize heigh	origin	origin ok?	absolute from corner left top	publisher	date	format	language	source	version
modified					ctr=center				JJJJ-MM-TT				
Symbols in general													
	BORDER01	check point, border	3,4	4,4	ctr-ctr	?	1.7,2.2	IEHG	2015-07-07	IENC signs, Europe, SVG	en		0.1
	BUNSTA01	bunker station, diesel oil station	3,0	3,6	ctr-ctr	?	1.5,1.8	IEHG	2015-07-08	IENC signs, Europe, SVG	en		0.1
	BUNSTA02	bunker station, water	2,5	4,1	ctr-ctr	?	1.25,2.05	IEHG	2015-07-09	IENC signs, Europe, SVG	en		0.1
	BUNSTA03	bunker station, ballast	3,7	3,1	ctr-ctr		1.85,1.55	IEHG	2015-07-10	IENC signs, Europe, SVG	en		0.1
	CUSTOM01	control point, custom	3,0	3,0	ctr-ctr		1.5,1.5	IEHG	2015-07-11	IENC signs, Europe, SVG	en		0.1
	DISMAR05	distance mark on river axis	1,0	1,0	ctr-ctr		0.5,0.5	IEHG	2015-07-12	IENC signs, Europe, SVG	en		0.1
	HECMTR01	hectometre point, 100m	1,1	1,1	ctr-ctr		0.55,0.55	IEHG	2015-07-13	IENC signs, Europe, SVG	en		0.1
	HECMTR02	hectometre point, 1km	1,5	1,5	ctr-ctr		0.75,0.75	IEHG	2015-07-14	IENC signs, Europe, SVG	en		0.1
	HGWTMK01	high water mark	3,8	6,3	ctr-bottom (ctr of circle)	?	1.9,5.9	IEHG	2015-07-15	IENC signs, Europe, SVG	en		0.1
	LIFEBUOY01	rescue station with life buoy, ring buoy, life ring or life saver	3,3	3,3	ctr-ctr		1.65,1.65	IEHG	2015-07-16	IENC signs, Europe, SVG	en		0.1
	NOTMRK01	notice mark, prohibition	2,4	2,4	ctr-ctr		1.2,1.2	IEHG	2015-07-17	IENC signs, Europe, SVG	en		0.1
	NOTMRK02	notice mark, regulation, restriction	2,4	2,4	ctr-ctr		1.2,1.2	IEHG	2015-07-18	IENC signs, Europe, SVG	en		0.1
	NOTMRK03	notice mark, information, recommendation	2,4	2,4	ctr-ctr		1.2,1.2	IEHG	2015-07-19	IENC signs, Europe, SVG	en		0.1
	NOTMRK04	several notice marks, at least one prohibition mark	2,7	2,7	ctr-ctr		1.35,1.35	IEHG	2015-07-20	IENC signs, Europe, SVG	en		0.1
	NOTMRK05	several notice marks, no prohibition mark, at least one regulation or restriction mark	2,7	2,7	ctr-ctr		1.35,1.35	IEHG	2015-07-21	IENC signs, Europe, SVG	en		0.1
	NOTMRK06	several notice marks, only information and/or recommendation marks	2,7	2,7	ctr-ctr		1.35,1.35	IEHG	2015-07-22	IENC signs, Europe, SVG	en		0.1
	REFDMP01	refuse dump	3,3	4,2	ctr-ctr	?	1.65,2.1	IEHG	2015-07-23	IENC signs, Europe, SVG	en		0.1
	SSENTR01	port entry	2,9	5,7	ctr-bottom (ctr of circle)	?	1.45,5.3	IEHG	2015-07-24	IENC signs, Europe, SVG	en		0.1
	SSLOCK01	signal station, lock	3,3	2,0	ctr-ctr		1.65,1	IEHG	2015-07-25	IENC signs, Europe, SVG	en		0.1
	SSWARS01	signal station, Wahrschau	2,9	5,7	ctr-bottom (ctr of circle)	?	1.45,5.3	IEHG	2015-07-26	IENC signs, Europe, SVG	en		0.1
	TRNBSN01	turning basin	5,0	5,0	ctr-ctr		2.5,2.5	IEHG	2015-07-27	IENC signs, Europe, SVG	en		0.1
	VEHTRF01	vehicle transfer	3,3	4,7	ctr-ctr	?	1.65,2.35	IEHG	2015-07-28	IENC signs, Europe, SVG	en		0.1
	VTCLMK01	vertical clearance mark at bridges	1,3	5,1	ctr-top (ctr of circle)	?	0.65,0.8	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	WTLVGG02	gauge, height of water	1,3	5,1	ctr-bottom (ctr of circle)	?	0.65,4.3	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
Navigational aids													
	BCNSTK03	river beacon, stake – pole	1,4	4,0	ctr-bottom (ctr of circle)	?	0.7,3.6	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	BCNLAT23	river beacon, separation - simplified	1,8	5,4	ctr-bottom	?	0.9,5.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	BOYLAT25	river buoy, fairway separation – simplified	4,5	4,5	ctr-ctr	?	2.25,2.25	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	BOYLAT26	river buoy, obstruction at the right side	2,4	5,4	ctr-bottom	?	1.2,5.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	BOYLAT27	river buoy, obstruction at the left side	2,4	5,4	ctr-bottom	?	1.2,5.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	TOPMA100	beacon top mark, red cone, point down	2,5	2,0	ctr-bottom (beacon - ctr of circle)+4.4		1.25,4.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	TOPMA101	beacon top mark, red boarded cone, point down	2,5	2,0	ctr-bottom (beacon - ctr of circle)+4.4		1.25,4.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	TOPMA102	beacon top mark, green cone, point up	2,5	2,0	ctr-bottom (beacon - ctr of circle)+4.6		1.25,4.6	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	TOPMA103	beacon top mark, green boarded cone, point up	2,5	2,0	ctr-bottom (beacon - ctr of circle)+4.6		1.25,4.6	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1
	TOPMA104	beacon top mark, red boarded cone, point down, green boarded cone, point up, simp	2,3	4,0	ctr-bottom (beacon - ctr of circle)+6.4		1.15,6.4	IEHG	2015-07-29	IENC signs, Europe, SVG	en		0.1

Lines:

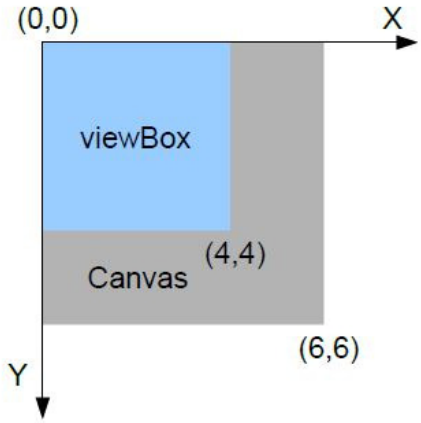
In every line is the decription of one specific symbol. Lines with headlines can be detected automatically and ignored in the SVG symbol creating process.

Columns:

sign:	picture of the SVG symbol
title (acronym):	e.g. NMKINF13; name of symbol and SVG symbol file – also MicroStation model (cell name)
description:	description of the symbolized object
size width:	standard width of symbol (mm) in the IENC
size height:	standard height of symbol (mm) in the IENC
origin:	description of the symbols origin, e.g. ctr-ctr (center, center) = midpoint of the symbol

absolute from corner

left top:	distance (mm) from left-top corner of the symbol, related to the SVG coordinate system:

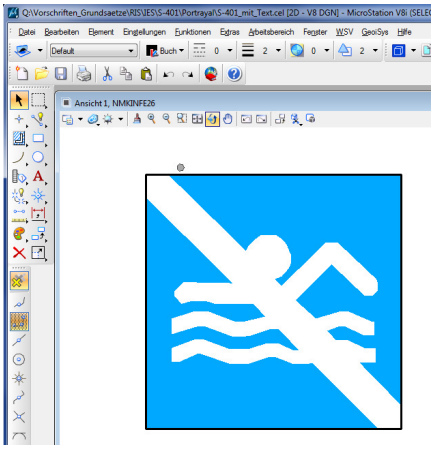


publisher:	publisher of the symbol library (IEHG)
date (JJJJ-MM-TT):	Date of symbol creation or last change
format:	symbol format (mostly SVG) and region (i.e. Europe)
language:	en=English
source:	not used at the moment (standardization group e.g. CEVNI)
version:	x.x

- **MicroStation cell library**

The used Computer Aided Design system (CAD) for the construction of the symbols is Bentley MicroStation V8i. The synonym for a symbol library is in MicroStation a so called “cell library” and stored in a proprietary file format, the MicroStation design file (DGN file). In our case we maintain a “cell library” which contains all S401-symbols, as so called “models”. The title tag of the SVG-symbol is the same as the name of the model in the DGN file.

The S401-Symbols are drawn in MicroStation100 times larger than their defined sizes in the EXCEL-file.



-->

MicroStation cell file cell = symbol

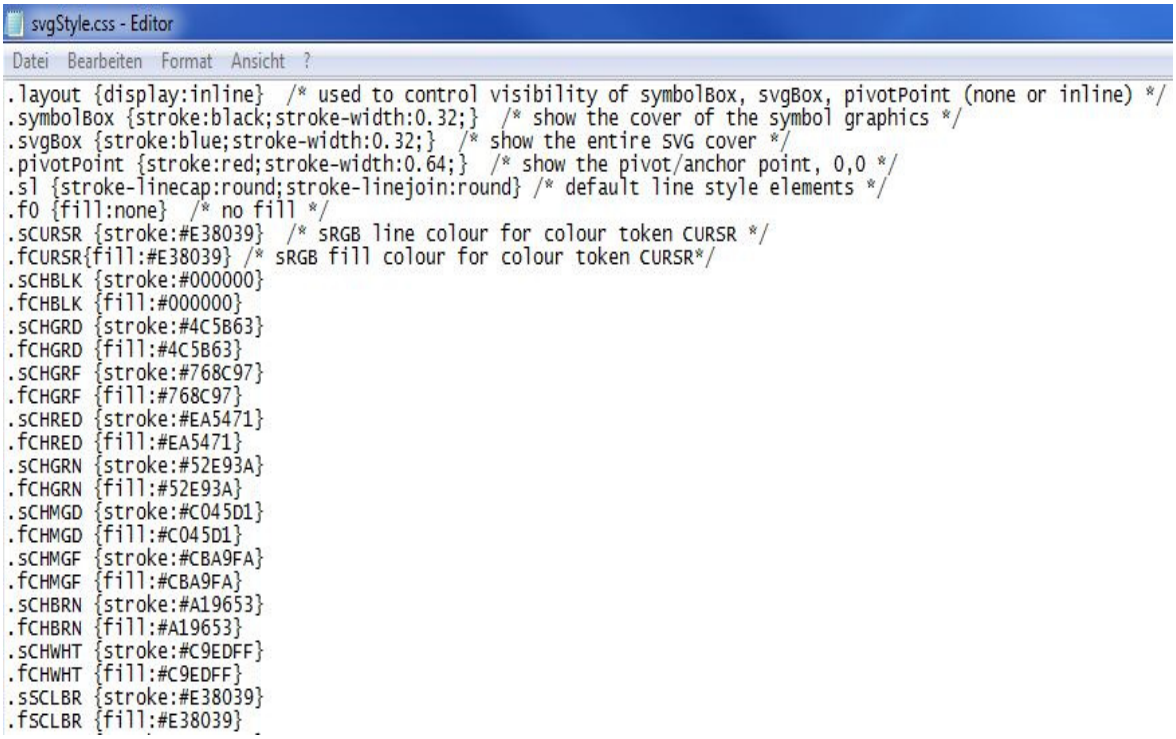
- **SVG style library, used in maritime ECDIS (S-101)**

  S-101 symbols contain no text.
  Tiny profiles, also user by S-101 (of e.g. harbour facilities), permits texts. The definition of fonts, point size etc. is pre-set. The tiny model is descripted in the document: https://www.w3.org/TR/SVGTiny12/

  At inland waterways we use some symbols with integrated text (e.g. NMKREG15A, radiotelephone with channel). The SVG-format allows the integration of text. This task is still unsolved.

  The S-101 SVG style library (provided by CARIS) contains mainly the definitions which are used in the maritime SVG symbol set. We don't access to this library directly, we use it as a template for our own S-401 style library.

  Excerpt of the S-101 SVG style library (CARIS):



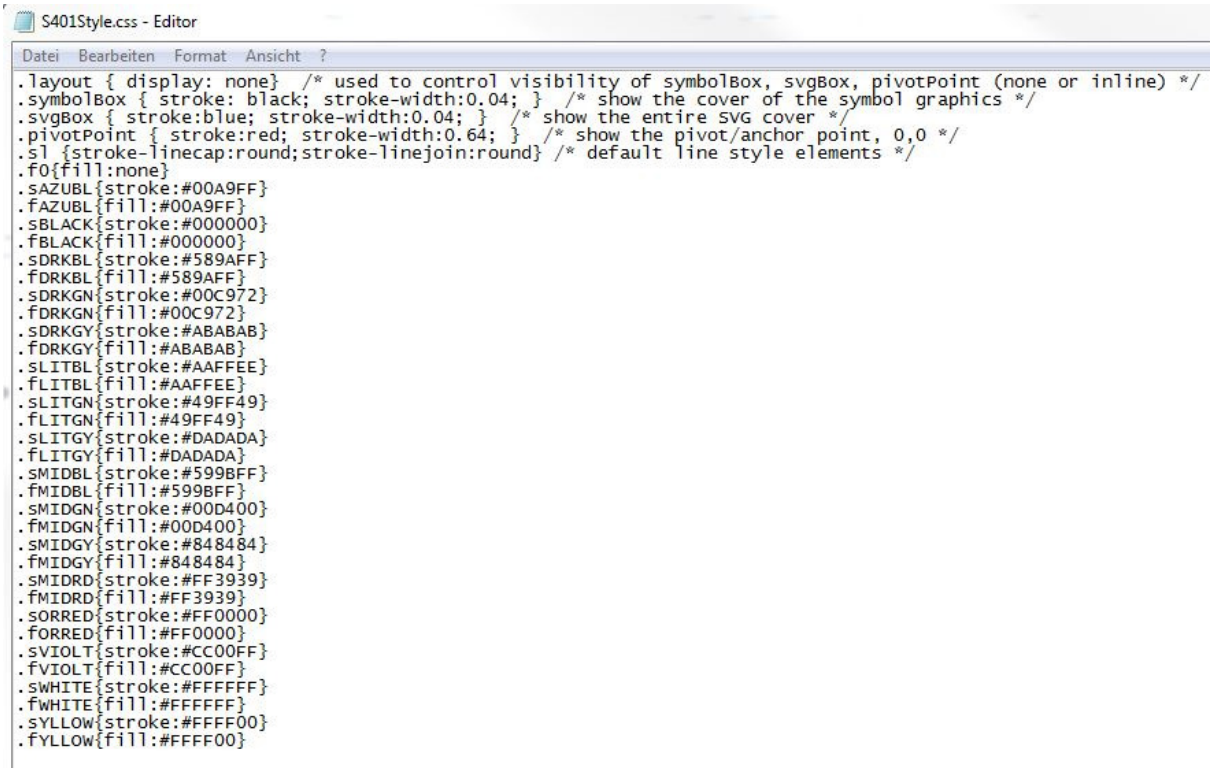
This SVG style library, which is adapted to the maritime solution (S-101), is used as a template for the Inland ECDIS solution.

- **S-401 SVG style library**

  For the symbols in S-401 we defined our own colors. This are defined in an EXCEL-sheet “RGB-values.xls” with Red-Green-Blue (RGB) values”, hexadecimal value, colour name and colour abbreviation.

	A	B	C	D
1	RGB value	hex value	colour	colour abbrev
2	0,169,255	00A9FF	blue	AZUBL
3	0,0,0	000000	black	BLACK
4	88,154,255	589AFF	dark blue	DRKBL
5	0,201,114	00C972	dark green	DRKGN
6	171,171,171	ABABAB	dark gray	DRKGY
7	170,255,238	AAFFEE	light blue	LITBL
8	73,255,73	49FF49	light green	LITGN
9	218,218,218	DADADA	light gray	LITGY
10	89,155,255	599BFF	mid blue	MIDBL
11	0,212,0	00D400	mid green	MIDGN
12	132,132,132	848484	mid gray	MIDGY
13	255,57,57	FF3939	mid red	MIDRD
14	255,0,0	FF0000	orange red	ORRED
15	204,0,255	CC00FF	violet	VIOLT
16	255,255,255	FFFFFF	white	WHITE
17	255,255,0	FFFF00	yellow	YLLOW

During the construction process in MicroStation corresponding colour definitions are used. Finally, the S-401 symbol library generator uses this EXCEL-file as a source and creates out of this the “S401Style.css”, our S-401 SVG style library:


S401Style.css - Editor

Datei Bearbeiten Format Ansicht ?

```
.layout { display: none}  /* used to control visibility of symbolBox, svgBox, pivotPoint (none or inline) */
.symbolBox { stroke: black; stroke-width:0.04; }  /* show the cover of the symbol graphics */
.svgBox { stroke:blue; stroke-width:0.04; }  /* show the entire SVG cover */
.pivotPoint { stroke:red; stroke-width:0.64; }  /* show the pivot/anchor point, 0,0 */
.sl {stroke-linecap:round;stroke-linejoin:round} /* default line style elements */
.f0{fill:none}
.sAZUBL{stroke:#00A9FF}
.fAZUBL{fill:#00A9FF}
.sBLACK{stroke:#000000}
.fBLACK{fill:#000000}
.sDRKBL{stroke:#589AFF}
.fDRKBL{fill:#589AFF}
.sDRKGN{stroke:#00C972}
.fDRKGN{fill:#00C972}
.sDRKGY{stroke:#ABABAB}
.fDRKGY{fill:#ABABAB}
.sLITBL{stroke:#AAFFEE}
.fLITBL{fill:#AAFFEE}
.sLITGN{stroke:#49FF49}
.fLITGN{fill:#49FF49}
.sLITGY{stroke:#DADADA}
.fLITGY{fill:#DADADA}
.sMIDBL{stroke:#599BFF}
.fMIDBL{fill:#599BFF}
.sMIDGN{stroke:#00D400}
.fMIDGN{fill:#00D400}
.sMIDGY{stroke:#848484}
.fMIDGY{fill:#848484}
.sMIDRD{stroke:#FF3939}
.fMIDRD{fill:#FF3939}
.sORRED{stroke:#FF0000}
.fORRED{fill:#FF0000}
.sVIOLT{stroke:#CC00FF}
.fVIOLT{fill:#CC00FF}
.sWHITE{stroke:#FFFFFF}
.fWHITE{fill:#FFFFFF}
.sYLLOW{stroke:#FFFF00}
.fYLLOW{fill:#FFFF00}
```

Explanation:

.f… means a filling color, after the number sign “#” follow the Red-Green-Blue values (RGB) in hexadecimal values (e.g. {fill:#00A9FF} means area filling with azure blue, RGB=0,169,255)

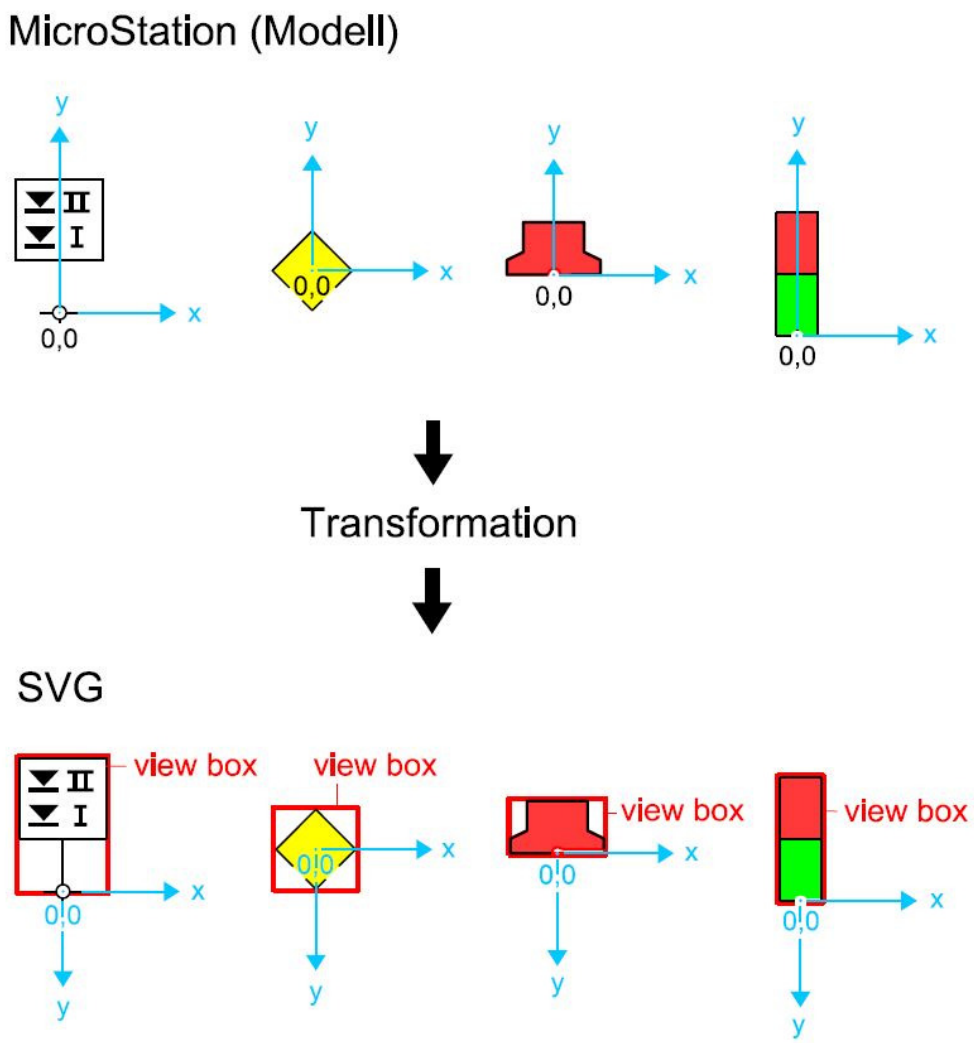
.s… means a stroke color (a color for line drawing):

Stroke width (line width): it is constant defined in our solution:

MicroStation line width:	SVG line width
0.4 mm	
0.8 mm	
1.2 mm	
1.6 mm	
…	

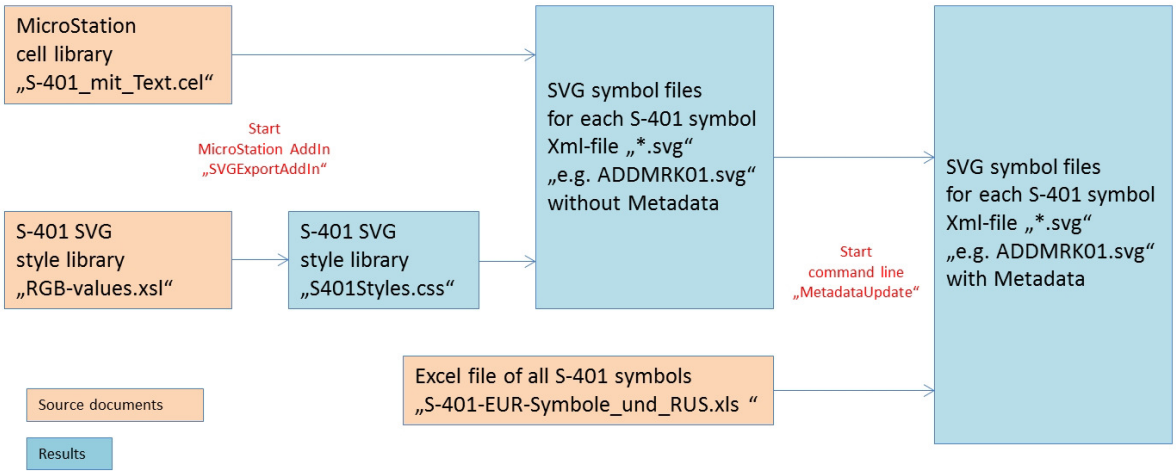
- Coordinate systems

  The origin of the coordinate system in the MicroStation model of the sign will later on used as reference point for placing the SVG symbol.



- **Process description**

  Using the custom SVG export tool (S-401 symbol library generator) all models from MicroStation file will be exported to a user defined folder. The user can also specify a color definition file “RGB-values.xls” for using color names instead of RGB values and for generating the style library (S401Style.css).



- **Results**
  - **SVG symbols**

Example: NMKINF13.svg in graphical form

  - **NMKINF13.svg file in text form (xml):**

```
<?xml version="1.0" encoding="utf-8"?>
<?xml-stylesheet type='text/css' href='S401Style.css'?>
<svg version="1.2" baseProfile="tiny" style="shape-rendering:geometricPrecision; fill-rule:evenodd;" width="7.00mm" hei
  <title>NMKINF13</title>
  <desc>berthing area reserved for vessels other than pushing navigation vessels that are required to carry two blue li
  <metadata>
    <iho:S100SVG xmlns:iho="http://www.iho.int/SVGMetadata">
      <iho:Description iho:publisher="IEHG" iho:creationDate="2015-07-29" iho:source="" iho:format="IENC signs, Europe,
    </iho:S100SVG>
  </metadata>
  <g>
    <polygon class="fAZUBL sBLACK" style="stroke-width:0.04" points="3.50,3.50 -3.50,3.50 -3.50,-3.50 3.50,-3.50 3.50,3
    <polygon class="fWHITE sWHITE" style="stroke-width:0.04" points="2.55,-1.89 -2.57,-1.89 0.00,2.51 2.55,-1.89 " />
    <polygon class="fAZUBL sAZUBL" style="stroke-width:0.04" points="-0.67,0.27 0.68,0.27 0.01,1.37 -0.67,0.27 " />
    <polygon class="fAZUBL sAZUBL" style="stroke-width:0.04" points="-0.67,-1.26 0.68,-1.26 0.01,-0.16 -0.67,-1.26 " />
    <circle class="pivotPoint layout" fill="none" cx="0" cy="0" r="0.2" />
  </g>
</svg>
```

- **Tag-description of SVG symbol files**

version:	version of the SVG data format
width, height:	size width and size height in accordance with the listing in the Excel file *(S-401-EUR-Symbole_und_RUS.xls)*
title:	name of the SVG file at once name of the feature, e.g. NMKINF13
desc:	description of the feature
metadata:	contains publisher, creation date, format/publisher and version in accordance with the listing in the Excel file *(S-401-EUR-Symbole_und_RUS.xls)*
<g>	Here start the graphics - i.e. these columns contain the geometry (in mm).

```
<g>
  <polygon class="fAZUBL sBLACK" style="stroke-width:0.04" points="3.50,3.50 -3.50,3.50 -3.50,-3.50 3.50,-3.50 3.50,3.50 "
  <polygon class="fWHITE sWHITE" style="stroke-width:0.04" points="2.55,-1.89 -2.57,-1.89 0.00,2.51 2.55,-1.89 " />
  <polygon class="fAZUBL sAZUBL" style="stroke-width:0.04" points="-0.67,0.27 0.68,0.27 0.01,1.37 -0.67,0.27 " />
  <polygon class="fAZUBL sAZUBL" style="stroke-width:0.04" points="-0.67,-1.26 0.68,-1.26 0.01,-0.16 -0.67,-1.26 " />
  <circle class="pivotPoint layout" fill="none" cx="0" cy="0" r="0.2" />
</g>
```

style:	
Geometry:	possible geometric forms: polygon, poly line, ellipse/circle, (text)
fill #:	filling (opacity) and colour: hexadecimal value for RGB
class:	alternative to specify individual styles
stroke-width:	a multible of 0.04 mm, as discribed above
points:	coordinates of geometry (e.g. polygon) related to the symbol coordinate system

Open questions

- **The fonts we like to use for texts should be defined. Standard fonts, which are in common use at all systems, should be preferred to save license fees.**
- **In general the handling of text is not yet clear, it has to be harmonized with the use in S-101.**
- **Should the line width change from fix definition to named definitions in the style sheet?**