

BSH Engineering Design Process

M-CAD UNIGRAPHICS, NX

Core Architecture User Guide

NX6

BSH Engineering Design Process User Group

BSH/ITP-DM
Mechanical CAD/NC-CAM/CAE Group



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Preface

Unigraphics NX (NX) is the corporate key system for all CAx applications at BSH. The major areas of use are the R&D and Tooling departments of all various product divisions at BSH throughout the world. Due to the fact that many of the developments of BSH will be engineered and manufactured in a distributed way, it is essential for all international users of the NX system to follow a certain set of rules and methodologies when creating models and drawings.

This document is an abstract of the [BSH NX Core Architecture](#) documentation. It contains those main definitions for the BSH NX end user and BSH supplier participating at the BSH NX supplier program. In order to make this abstract as compact as possible, all setups and definitions “behind the scenes” have been left off. For further information please refer to the core architecture documentation mentioned above.



1 General Design Standards

1.1 Modeling Units

All parts will be modeled and dimensioned in metric units.

1.2 Language in CAD Documents

Language should be English **and** local language. If drawing is distributed in other factories (countries) English is mandatory.

1.3 Dates

All dates will be formatted according to ISO 8601: **CCYY-MM-DD**

CC	century	2-digit number
YY	year	2-digit number
MM	month	2-digit number
DD	day	2-digit number

Example: 2010-05-01 equals May 1, 2010.

1.4 Coordinate Systems

All parts should be modeled near the origin of the absolute coordinate system.

1.5 Datum Objects

1st Datum CSYS only at the absolute coordinate origin (X0Y0Z0). All other datum planes/axis/csyes have to be placed relative to existing geometry (referenced items).

1.6 BSH Layer Standard

The BSH layer standard is absolutely mandatory.

Number	Contents	Category
1	Solid body, final version	BODY
2 - 10	Solids bodies, other parts and bodies	BODY
11 - 40	Sketches	SKETCH
41	Fixed Datums / CSYS	ABSOLUTE_DATUM
42 - 60	Datums	DATUM
61 - 80	Construction and auxiliary geometry	CONSTRUCTION



81 - 85	3D dimensions, text, annotations	ANNOTATION
86	Sheet metal, unfolded part, final version	FLATPATTERN
87 - 90	Sheet metal, other parts	FLATPATTERN
91 - 100	Wave geometry	WAVE
101 - 120	Electric components, data	ELECTRIC
121 - 130	NC auxiliary geometry	CAM
131 - 140	Finite elements, kinematics and other CAE data	CAE
141 - 149	CODIM (Coordinate Dimensioning System)	CODIM
150	Drawing frame and title block, pattern	DRAWING
151 -152	2D annotations (dimensions, notes, etc)	DRAWING
153	BOM balloons	EXPLOSION
154 - 155	BCT Raster elements	BCT_RASTER
156 - 157	BCT Raster construction elements	BCT_RASTER_CONSTRUCTION
158	BCT-Inspector-Balloon visible	BCT_INSPECTOR
159	BCT-Inspector-Balloon invisible	BCT_INSPECTOR_CONSTRUCTI ON
160	Electronic components (EPAK)	BOARD_OUTLINE_LAYER
161	Electronic components (EPAK)	OTHER_OUTLINE_LAYER
162	Electronic components (EPAK)	ROUTE_OUTLINE_LAYER
163	Electronic components (EPAK)	PLACE_OUTLINE_LAYER
164	Electronic components (EPAK)	ROUTE_KEEPOUT_LAYER
165	Electronic components (EPAK)	VIA_KEEPOUT_LAYER
166	Electronic components (EPAK)	PLACE_KEEPOUT_LAYER
167	Electronic components (EPAK)	PGA_LAYER
168	Electronic components (EPAK)	TOPCOMP_LAYER
169	Electronic components (EPAK)	BOTCOMP_LAYER
170 - 180	Manufacturing annotations	
181 - 199	Standard and catalogue parts	CATALOGUE
200	Customer service annotations, German	LNG_DE
201	Customer service annotations, English	LNG_EN
202	Customer service annotations, Spanish	LNG_ES
203	Customer service annotations, French	LNG_FR
204	Customer service annotations, Turkey	LNG_TR
205	Customer service annotations, Portuguese	LNG_PT
206	Customer service annotations, Greek	LNG_EL
207	Customer service annotations, Chinese	LNG_ZH
208 - 247	not in use	
248	Wiring auxiliary geometry	WIRING
249	Wiring Qualification	WIRING
250	not in use	
251 - 255	Reserved for future UG modules	



256	Temporary geometry (like interference), scratch	
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1.7 Line Fonts

Number	Graphical Representation	Name
1	—————	Solid
2	- - - - -	Dashed
3	. - - - -	Centerline
4	. : - - -	2-point
5	. : - - -	3-point
6	. : - - -	4-point
7	. : - - -	Dotted

1.8 Color Definition Files

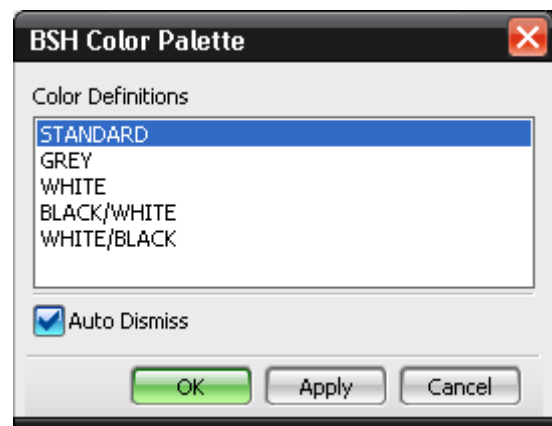
Standard directory for color definition is %UGII_BASE_DIR%\bsh\cdf\. Standard color definition file is standard.cdf (for modeling black background and for drafting black background). There are optional color definition files available for:

- white background (white.cdf)
- grey background (grey.cdf)
- black/white color set (bw.cdf)
- black/white color set (wb.cdf)

Select the color palette icon from the BSH Modeling menu.



The BSH Color Palette window shows up on the screen providing a list of selections. Select one of the five options as described above and select Apply to preview the changes, or OK to make the changes permanent. Repeat the procedure as often as needed. STANDARD is the basic BSH setup.





1.9 Text Fonts and Character Sets

Name	Purpose
bsh_latin	Text with Latin characters
bsh_greek	Text with Greek characters
chinesef	Text with Chinese characters for Customer Service documents
uni_latinext_a	Text with Latin characters for Customer Service documents
uni_greek_a	Text with Greek characters for Customer Service documents

1.10 Reference Sets

The following reference sets are NX standard:

Name	Contents	Purpose
Entire Part	all	default
Empty	nothing	for parts that need not to be seen

The following reference sets are additional reference sets defined for BSH:

Name	Contents	Purpose
BODY	Precise solid	Display fully detailed solid part
FACET	Facetted solid	Quick display of solid part
ORIGIN	CODIM origin symbols	Display CODIM origin symbols

The reference sets "BODY" and "FACET" are automatically created during the save of the part.

1.11 Mass Property Calculation Set-up

The predefined material for mass property calculation within NX is steel. The default values for mass property calculation are as following:

Item	Value
Calculation accuracy	0,01 units
Calculation units	gm/cm ³
Density	7,83064

For other materials the density of a specific part may be changed during the session.



1.12 Seed Part

Seed Part	File Name
BSH Master Model Seed Part	UGII_BASE_DIR/bsh/seed_part/bsh_metric_nx6.prt
DXF/DWG Translator Metric	UGII_BASE_DIR/dxfdwg/dwgnullnx60_mm.prt
DXF/DWG Translator Inches	UGII_BASE_DIR/dxfdwg/dwgnullnx60_in.prt
IGES Translator Metric	UGII_BASE_DIR/iges/igesnullnx60_mm.prt
IGES Translator Inches	UGII_BASE_DIR/iges/igesnullnx60_in.prt
STEP AP214 Metric	UGII_BASE_DIR/step214ug/step214ugnullnx60_mm.prt
STEP AP214 Inches	UGII_BASE_DIR/step214ug/step214ugnullnx60_in.prt
STEP AP203 Metric	UGII_BASE_DIR/step203ug/step203ugnullnx60_mm.prt
STEP AP203 Inches	UGII_BASE_DIR/step203ug/step203ugnullnx60_in.prt
VDA-FS Metric	VDAFS_DIR/null.prt

Seed parts contain:

1. Setup of Customer defaults
2. Standard Datum CSYS
3. Standard Reference Sets
4. Line Font Definition
5. Layer Categories
6. Color Definition
7. Part Attributes
8. Standard Part Expressions
9. RPI Tolerance 0.03

When using NX/Managed mode, the correct seed part will be referenced automatically.



2 Naming Conventions

2.1 File Naming Conventions for Parts and Assemblies

The maximum length for file names is 26 digits plus 4 digits for “.prt”.

File naming convention:

Master parts: **SSSSNNNNNNNNNNN.prt**
Other parts (associated to master part): **SSSSNNNNNNNNNNN_TTCC.prt**

SSSS site id (4 digits) = number generator ID according to BSH standard.
NNNNNNNNNN document number (10 digits)
TT document type
CC counter 01-99

Key	Mnemonic	Meaning
TT	dr	Drawing
	nc	NC part file
	ar	Altrep part file
	sc	Scenario part file

Example: 56001234567890_dr01.prt

2.2 Component Designation

Maximum designation length: 30 characters.

Component names must be in English language only. Use BSH Technology Database.

2.3 Drawing Sheet Names

Only one drawing sheet per drawing part is allowed.

The name of this sheet is always SHT1.

The insertion of only one (1) drawing frame per drawing sheet is allowed. If a component does not fit on to a single drawing frame due to the size or the amount of detail or section views, a new part must be derived from the master model containing the next sheet and drawing frame.

2.4 View Names

Users should just use NX standard functionality; no additional naming conventions have to be observed.



3 Model Creation

3.1 Part Structure

All parts must be created in accordance to the **Master Model Concept** of NX.
Only one geometrical representation might be created within a single NX part file.

3.2 Rules for variants

Variant Cause	Preferred Variant Method
Different shape for drawing and assembly:	BSH NX Part Family and WAVE link to BSH NX Altrep / Deformable parts
Same geometry, same tool set, different SAP material codes:	Same part
Mirrored geometry:	BSH NX Part Family (preferred!) or WAVE BSH NX Assembly
All other differences:	Different parts

3.3 Modeling Accuracy

Tolerance	Value
Maximum allowed deviation between CAD model geometry and nominal dimension of a physical part or drawing:	± 0.001 mm
Maximum gap between the end points of two wire frame elements:	0.001 mm

Setup to support this:

Variable	Value
System tolerance set up for solid bodies and sheet bodies:	0.001 mm
Angle tolerance set up:	0.5



4 Drawing Generation

4.1 Drawing Origin

The origin of a drawing is at the lower left corner, which represents the origin (X0Y0) of the drawing's coordinate system. When inserting the drawing frame, this standard will automatically be maintained without any attention of the user.

4.2 View Projection Method

ISO-Method E is BSH standard (first angle projection method).

ISO-Method A is only allowed for documents from suppliers or existing documents.

The projection method used to create a drawing must be represented in the title block of the drawing frame. Projection method and site logo will be loaded automatically.

4.3 Dimension Parts

All dimensions must match the actual model size within a precision of two decimal digits. Trailing zeroes, however, may not be displayed.



5 Patterns

5.1 General Purpose

A pattern library is available to support drawing generation with elements like drawing frame, title block, and reusable components. Please refer to [BSH NX Pattern Library](#) documentation for more details.

A user interface is provided to automate the process; please refer to chapter [1.2](#) ff of [BSH NX Drawing Generation](#) documentation for further information, how to insert, modify and delete patterns and how to fill in the title block fields.

5.2 Layer Standard for Pattern

The layer to insert a pattern is always 150.

5.3 Drawing Sheet Sizes and Pattern Names

Pattern	Size in mm	R&D pattern name	Tooling pattern name
A4 portrait	297 x 210	GGFRA_A4-PORT	GTFRA_A4-PORT
A4 landscape	210 x 297	GGFRA_A4-LAND	GTFRA_A4-LAND
A3	297 x 420	GGFRA_A3	GTFRA_A3
A2	420 x 594	GGFRA_A2	GTFRA_A2
A1	594 x 841	GGFRA_A1	GTFRA_A1
A0	841 x 1189	GGFRA_A0	GTFRA_A0
A0-1250	841 x 1250	GGFRA_A0-1250	GTFRA_A0-1250
A0-1500	841 x 1500	GGFRA_A0-1500	GTFRA_A0-1500
A0-1750	841 x 1750	GGFRA_A0-1750	GTFRA_A0-1750
A0-2000	841 x 2000	GGFRA_A0-2000	GTFRA_A0-2000
A0-2250	841 x 2250	GGFRA_A0-2250	GTFRA_A0-2250
A0-2500	841 x 2500	GGFRA_A0-2500	GTFRA_A0-2500
A3	297 x 420	GGFRA_E3	
A2	420 x 594	GGFRA_E2	



6 BSH Tools

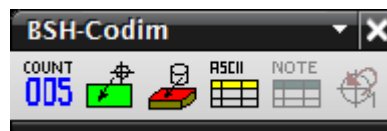
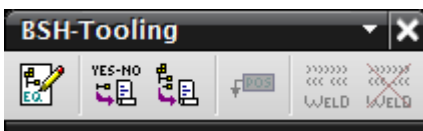
BSH currently has eight different customized toolbars: Modeling, Drafting, Tooling, Codim, Schematics, E/Pak, Professional Plot and Harness-Design.



For more details please refer to [BSH NX Parametric Modeling](#) documentation.



For more details please refer to [BSH NX Drawing Generation](#) documentation.



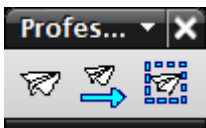
For more details please refer to [BSH NX Tool Design Methods](#) documentation.



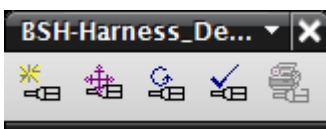
For more details please refer to [BSH NX Schematics](#) documentation.



For more details please refer to [BSH NX E/Pak](#) documentation.



For more details please refer to [Professional Plot for Unigraphics \(PPU\)](#) documentation.



At the moment only used in TRT; for more details please refer to [FTH Harness Design](#)

Other toolbars might be added by 3rd party tools like BCT Inspector, BCT Raster etc.