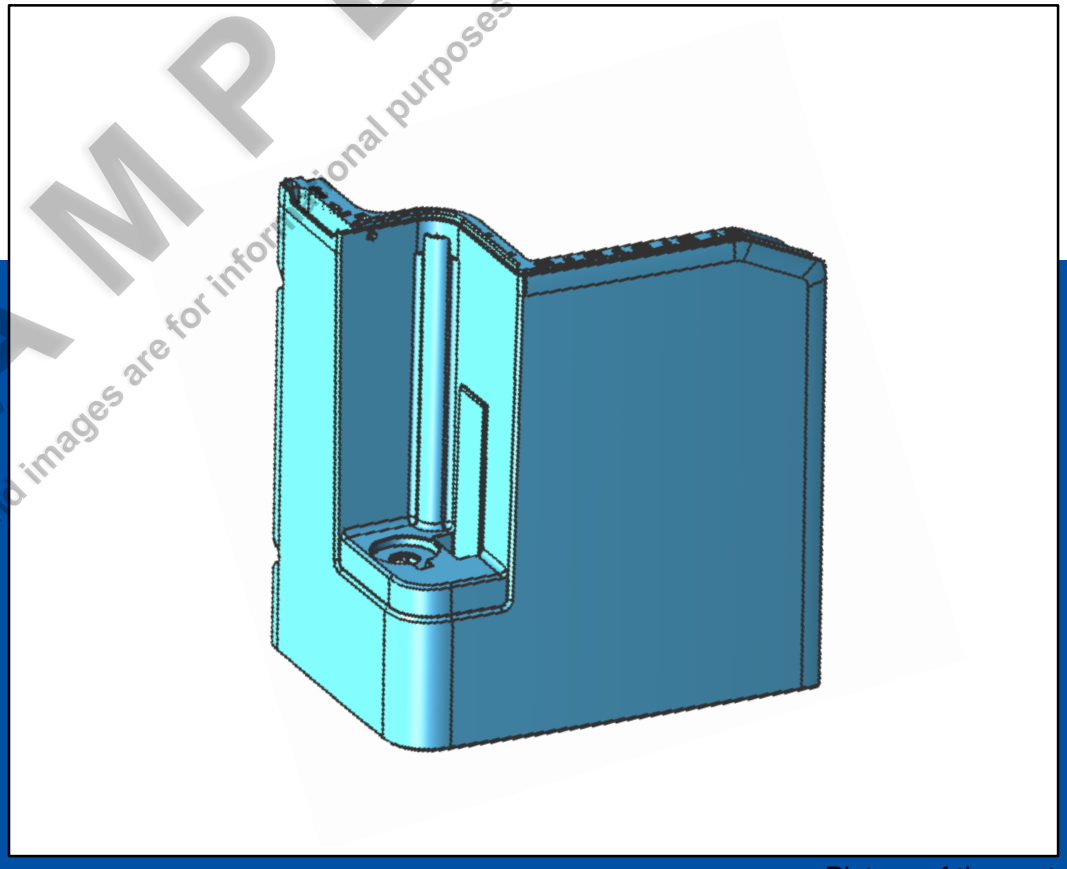
B/S/H/

DFM Report



Picture of the part:

1.1 Project & DFM Information

B/S/H/

Basic Part Data					
Language: Preferred language to fill in the DFM Report is English. Usage of other language is applicable if upfront agreed with BSH					**EN**
End Customer		**BSH**		**Mould BSH Serial No**	**4059953**
Project Name		**TE300**		**Planned Machine (T)**	**500**
Part Name		**L-Housing 30**		**Cavities**	**2**
Part material		**PA Durethan BKV30F 000000**		**Part CQP Clasification** [A, B, C]	**B**
CAD No. / Rev.-Status		**60100000004224**	**B1-T**	**Submission Date**	**27.03.2016**
Contact (s)	**Part**	**Novak**	**Janez Novak, janez.novak@bshg.com , +386 (3) 8311-111**		
	Tool	**Zorec**	**Ivan Zorec, ivan.zorec@bshg.com, +386 (3) 8322-222**		
	Project	**Name3**	**Name, Mail, Telephone**		

Mould Maker Data					
Customer (if not BSH)		**Eurel**		**Basic Tool Dimensions (BHT)**	**296x346x343**
Mould Maker		**Shanghai Weihong**		**Injection system**	**Cold runner system**
Mould Designer (contact1)		**John Doe, Mail, Telephone**		**Injection Moulding Machine Clamping Force** [kN]	**5000kN**
Other Contact (s)		**Name1, Mail1, Telephone1**		**Shot volume with sprue** [cm³] (Foreseen value)	**56,5ccm**
		Name2, Mail2, Telephone2			
DFM Report Responsible (contact2)		**John Doe, Mail, Telephone**		**Submission Date** (Date of last revision sent to BSH)	**28.04.2016**

1.2 Table of contents

	Chapter	Topic	Requested		Done and Confirmed	
			For Quotation	After Tool Order	Supplier Finished [B]	Datum OK Customer Confirmed [A]
1. Project	**1.1**	Project & DFM Information	✓	✓	**Yes**	**Novak, 2016-04-25**
	1.2	Table of contents	✓	✓	**Yes**	**Novak, 2016-04-25**
2. Product Info	**2.1**	Part and tool basic data	✓	✓	**Yes**	**Novak, 2016-04-25**
	2.2	Mould cavity Layout	✓	✓	**Yes**	**Novak, 2016-04-25**
	2.3	Gate Location and Type PROPOSAL	✓	✓	**Yes**	**Novak, 2016-04-25**
3. Parting Lines	**3.1**	Cavity & Core main parting lines definition	✓	✓	**Yes**	**Novak, 2016-04-25**
	3.2	Slider & Lifter core Location and parting line definition	✓	✓	**Yes**	**Novak, 2016-04-25**
	3.3	Ejector pin Location Proposal	✓	✓	**Yes**	**Novak, 2016-04-25**
	3.4	Venting of critical areas	✓	✓	**Yes**	**Novak, 2016-04-25**
4. Draft	**4.1**	Draft Analysis	✓	✓	**Yes**	**Novak, 2016-04-25**
5. Drawing Analysis (2D)	**5.1**	Analysis of Control Dimension, Tolerances, Surface finish,...	✓	✓	**Yes**	**Novak, 2016-04-25**
6. Cooling	**6.1**	Cooling Channel Proposal & cooling of cavity inserts and critical areas	For Quotation not Requested	✓	**Yes**	**Zorec, 2016-04-28**
***7.* Improvement proposals**	**7.1**	Product / Mould Improvement Proposals		✓	**Yes**	**Novak, 2016-04-25**
8. Product Engrave	**8.1**	Cavity No. typ, size and Location		✓	**Yes**	**Novak, 2016-04-25**
	8.2	/		✓	**Yes**	**Novak, 2016-04-25**
	8.3	Adjustable model version sign typ, size and Location		✓	**Yes**	**Novak, 2016-04-25**
9. Mold flow analysis		See separate table of contents			**Yes**	**Zorec, 2016-04-28**
10. Remarks	**10**	Other remarks		✓	**No**	/

CRITERIA: *(CQP Classification A,B,C - see BSH data on pg.1)*

1. ***For A parts:*** → ***Necessary***
2. ***For B and C parts:*** → ***If without cooling process part warps more than are allowable tolerances on drawing then COOL-analysis HAS TO BE PERFORMED***

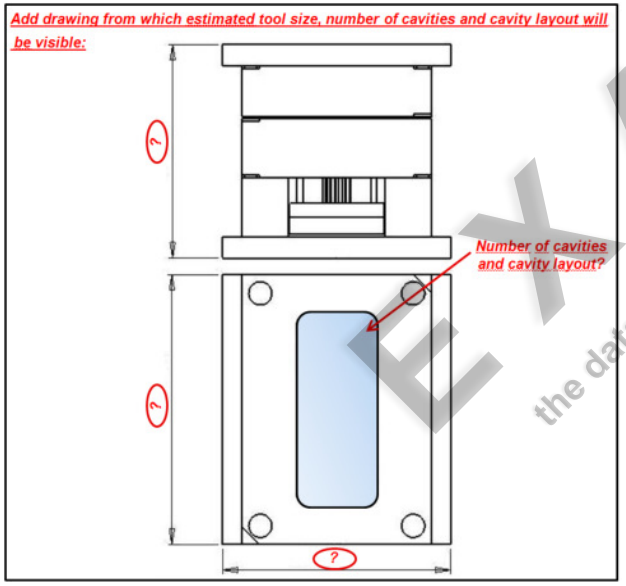
A ... *filled in by BSH*
B ... *filled in by supplier*

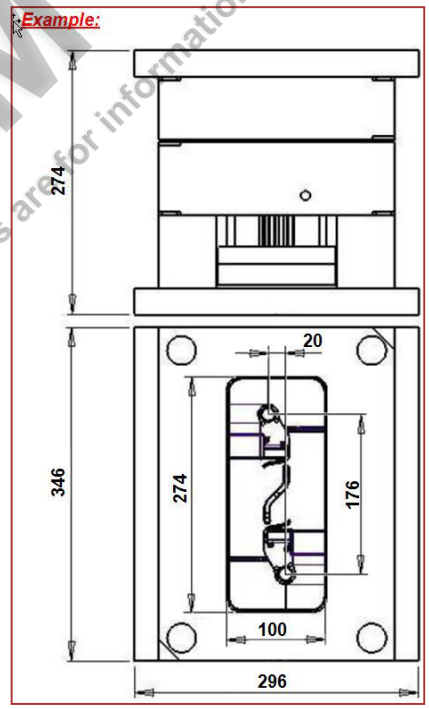
2.1 Part and Tool basic data

Short description of Mold.	**Hot-runner mould**			
Confirmation:	Tool can be used on 1st page planned moulding machine	**DEMAG 500t**	**Cavity Steel**	**1.2343 HRC52-54**
Type of Gate		**Tunnel gate**	**Core Steel**	**1.2343 HRC52-54**
No. of Cavity		**1*1**	**Slider Steel**	**1.2343 HRC52-54**
No. of Injection Points		**1*1**	**Lifter Steel**	**1.2343 HRC52-54**
Estimate Part Weight (g)		**520g**	**Coating of cores and cavities**	**none**
Mold Shrinkage		**1.0052**	**Resin (Color Additiv)**	**ABS+MB**
			Estimated Runner Weight (g)	**---**

2.2 MOULD CAVITY LAYOUT

(sketch can be used here)





On injection moulding tool concept show:

- number of cavities;
- layout of cavity inserts;
- tool orientation on the moulding machine.

Mark upper (Top) side of tool.

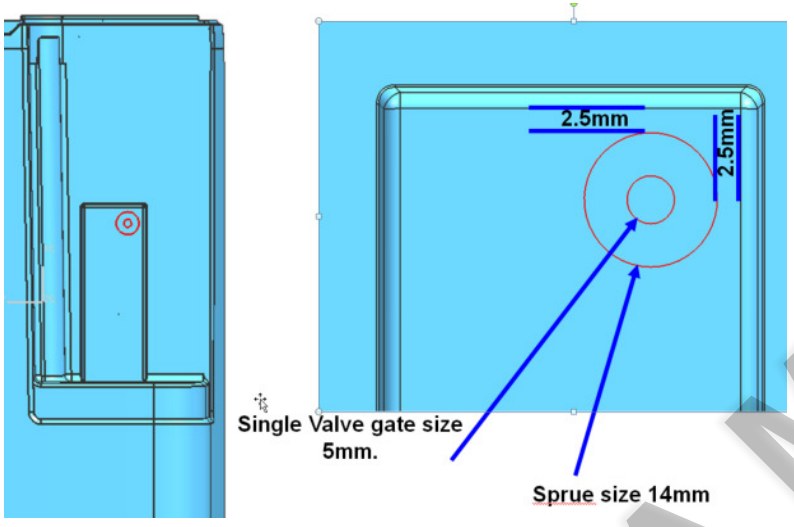
BSH Decision/Comments

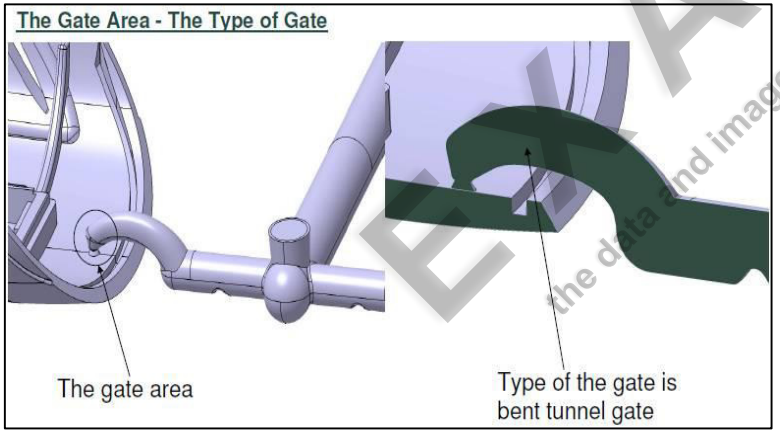
OK / **NOK**
Name,
dd.mm.yy

2.3 Gate location and Type Proposal

B/S/H/

Example:





Describe and show:

- sprue type;
- position of sprue-point;
- size of sprue-point;
- impact of sprue-point on part geometry (calotte, etc.);
- in case of more complex injection system, calculation of pressure-drop through cavity and hot-runner system must be performed. (For TOOL ORDER ONLY!);
- dimension`s of cold runner system (see picture below) (For TOOL ORDER ONLY!).

BSH Decision/Comments
OK / NOK Name, dd.mm.yy

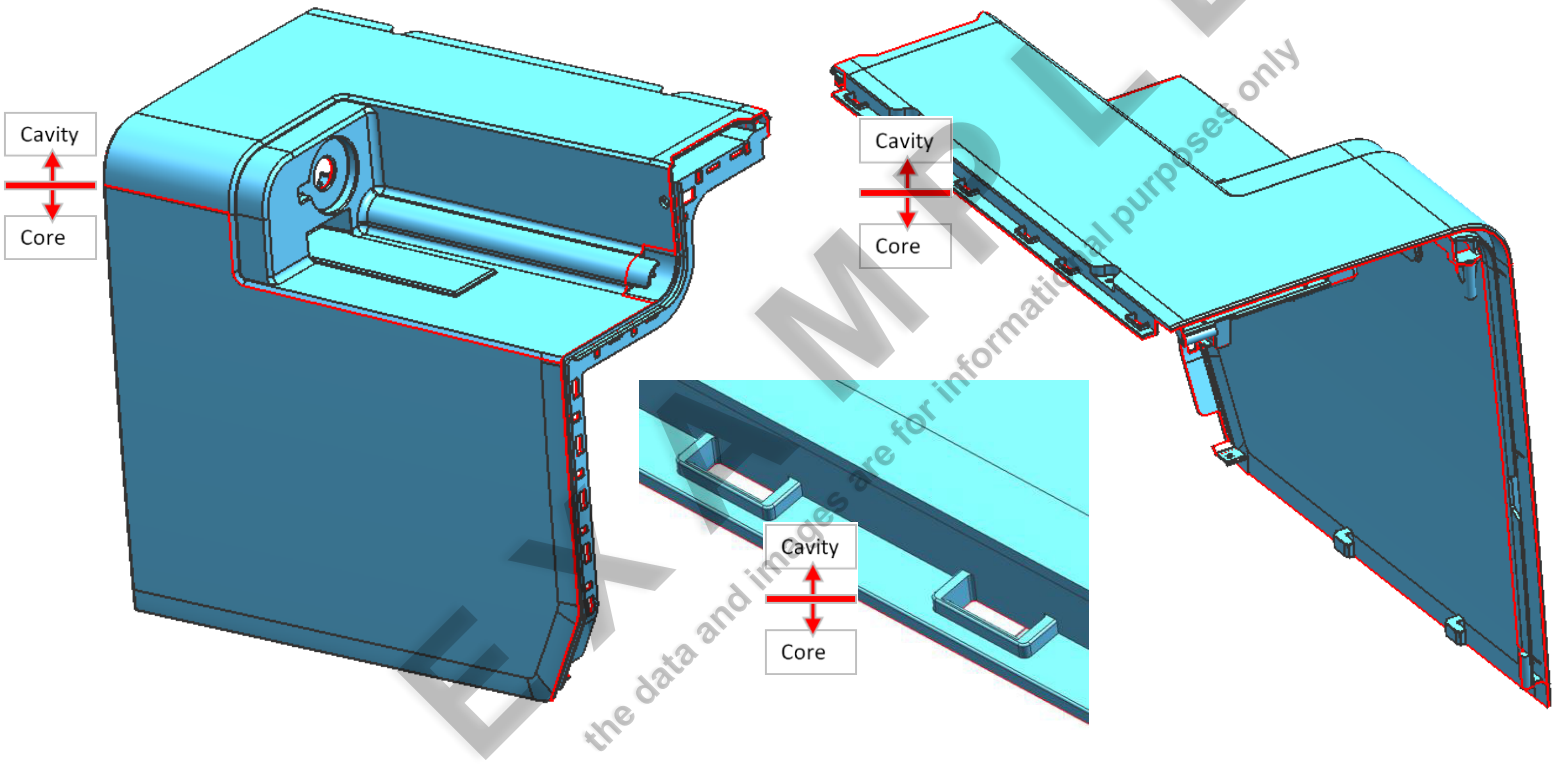
3.1 Cavity & Core main parting lines definition

B/S/H/

Example:

Describe and show:

- main parting lines

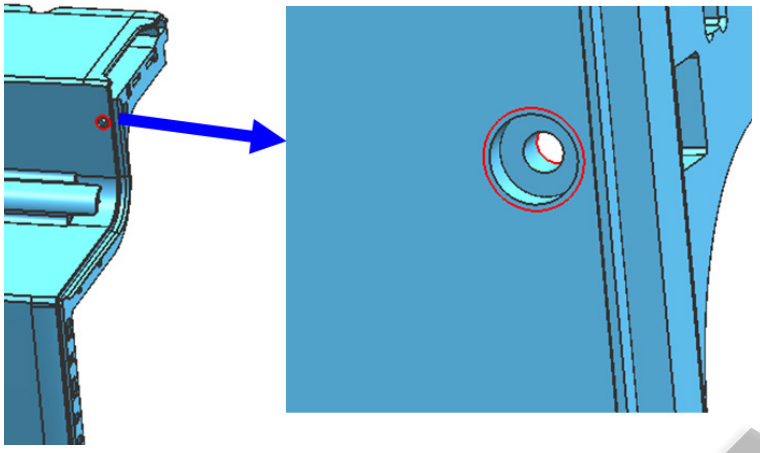


BSH Decision/Comments
OK / NOK Name, dd.mm.yy

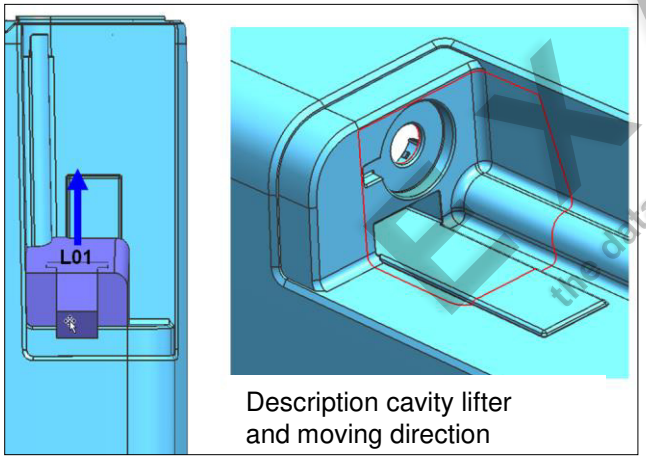
3.2 Slider & Lifter cores Location and parting line definition

B/S/H/

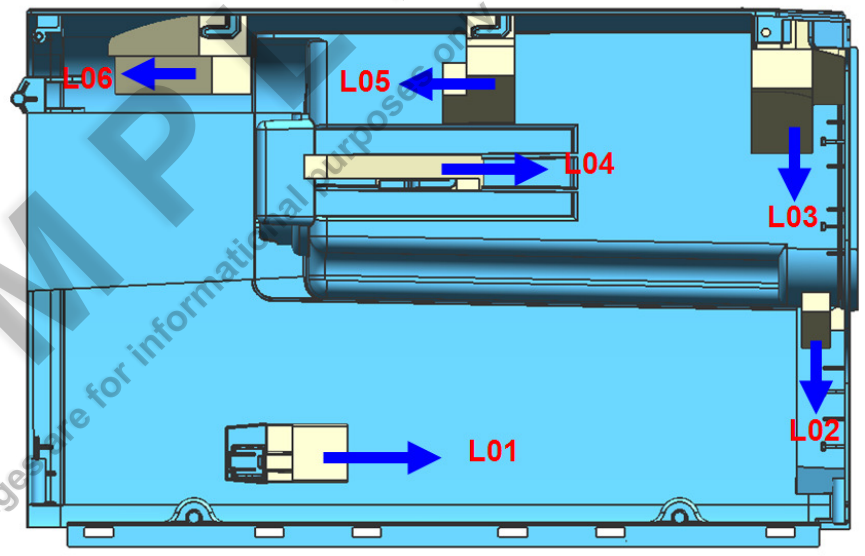
Example:



Description of slider parting line



Description cavity lifter
and moving direction



Description of 6 core lifters and moving direction

Describe and show:

- all slider parting lines;
- show lifters and moving directions.

BSH Decision/Comments

OK / NOK
Name,
dd.mm.yy

3.3 Ejector pin Location Proposal

B/S/H/

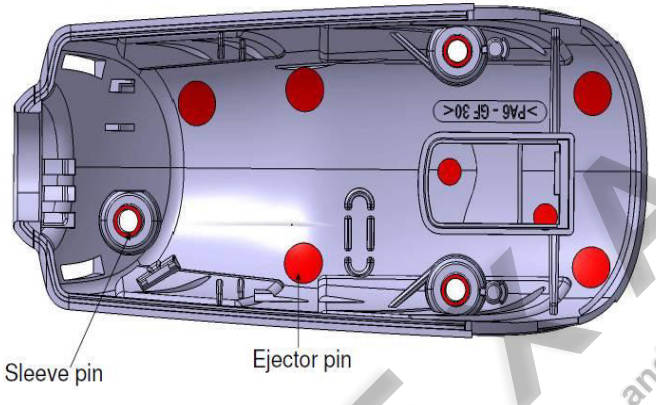
Important: If ejectors are below side cores, they must be mechanical protected and this principle must be shown here.

Describe and show:

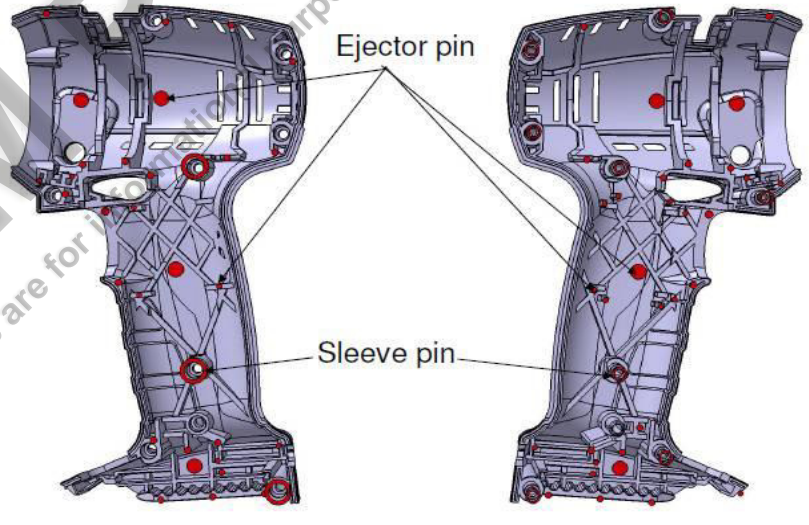
- show position and marks of ejectors and protection of ejectors under side cores

Examples:

The Ejector Area – Type of Ejector



The Ejector Area – Type of Ejector



BSH Decision/Comments
OK / NOK Name, dd.mm.yy

3.4 Venting of critical areas:

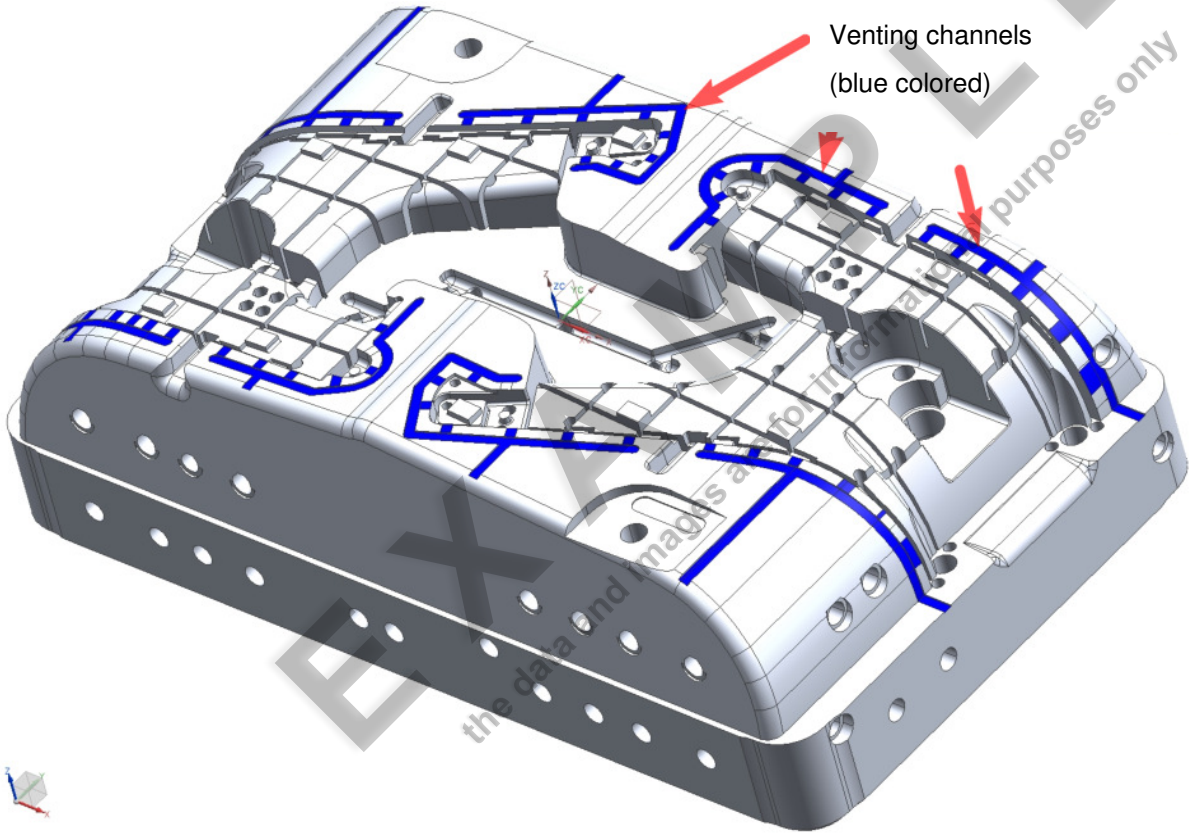
B/S/H/

(for Quotation sketch can be used here)

Show the way of venting critical areas regarding to:

- part geometry;
- analysis of air traps presence;
- filling analysis.

Example:



BSH Decision/Comments
OK / NOK Name, dd.mm.yy

4.1 Draft analysis

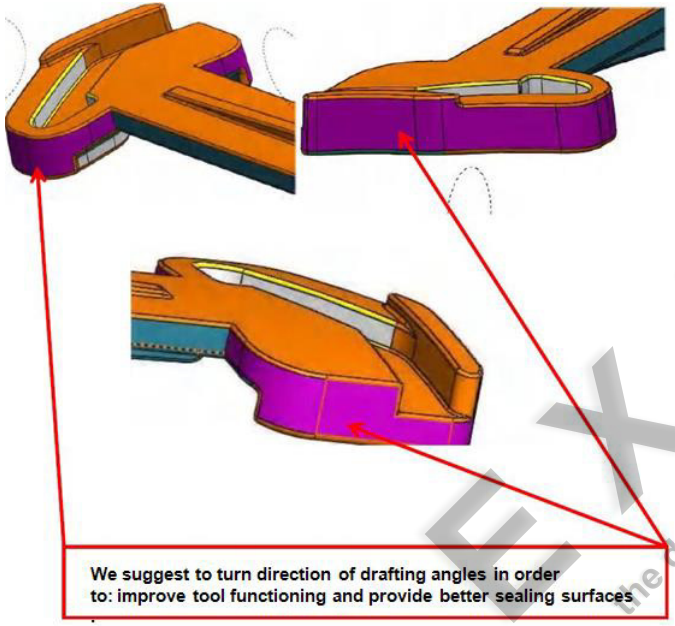
B/S/H/

Show influence of drafting angles on:

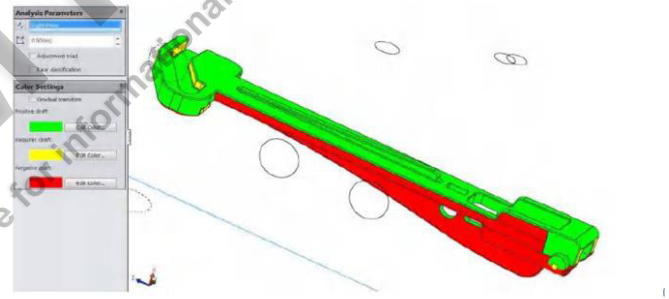
- shape, surface structure and for demolding;
- give potential recommendations for modification of drafting angles on part.

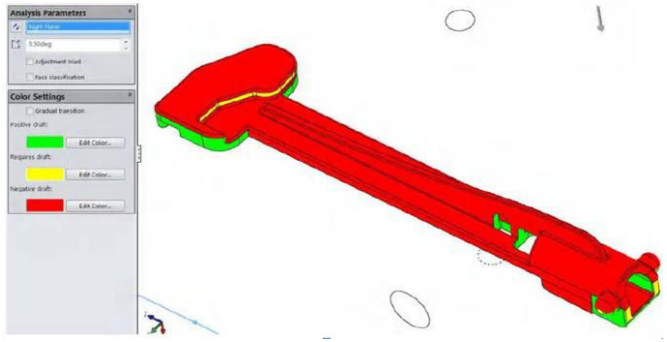
Example:

Recommendation for modification of drafting angles on the part:



Analysis of drafting angles on the part:





BSH Decision/Comments
OK / NOK Name, dd.mm.yy

5.1 Analysis of Control Dimension, Tolerances, Surface finish,…

B/S/H/

If proposal for drawing change exist it must be clarified and confirmed here.

Check 2D drawing characteristics and specially:

- control dimension analysis;
- tolerance analysis;
- how to reach the requirements?
- changeable inserts / separate inserts?!?
- surface finish analysis.

BSH Decision/Comments
OK / NOK Name, dd.mm.yy

6.1 Cooling Channel Proposal & cooling of cavity inserts and critical areas

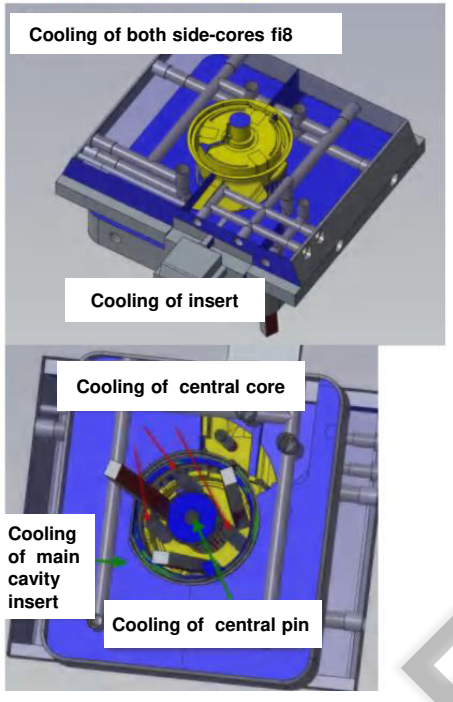
B/S/H/

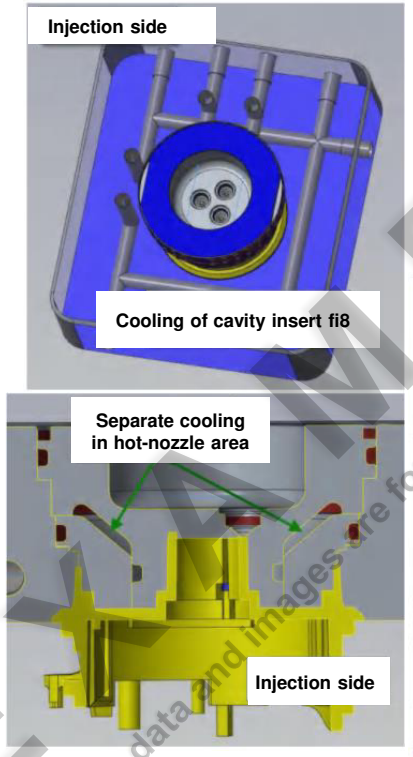
Examples:

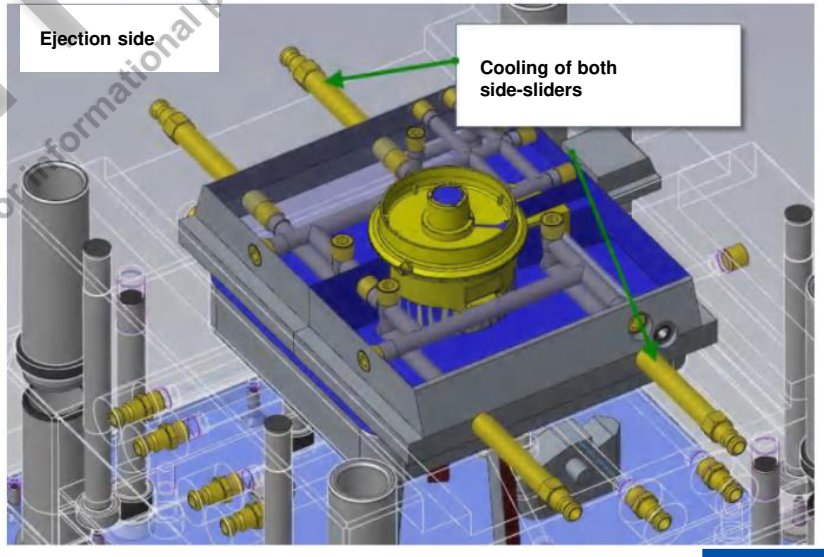
Show implementation of:

- cooling;
- cavity inserts (injection side & ejection side);
- critical areas (baffle plates, spiral core, etc.);
- cooling of hot-runner system;
- tool housing;
- dimension of the cooling system (e.g. diameter, distance, etc.).

Temperiranje / Cooling:







BSH Decision/Comments
OK / NOK Name, dd.mm.yy

7.1 Improvement Proposals

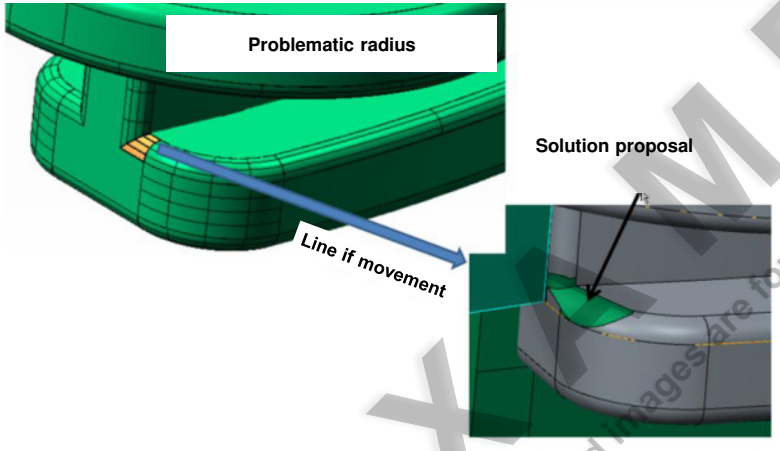
B/S/H/

Describe and show proposals e.g.:

- undercut Improvement Proposal;
- mould Improvement Proposal;
- cavity & Core Draft Angle Improvement Proposal;
- slider & Lifter Draft Angle Improvement Proposal.

Undercut Improvement Proposal_1

Examples:



BSH Decision/Comments
OK / NOK Name, dd.mm.yy

8 Product Engrave, Sign type size and location

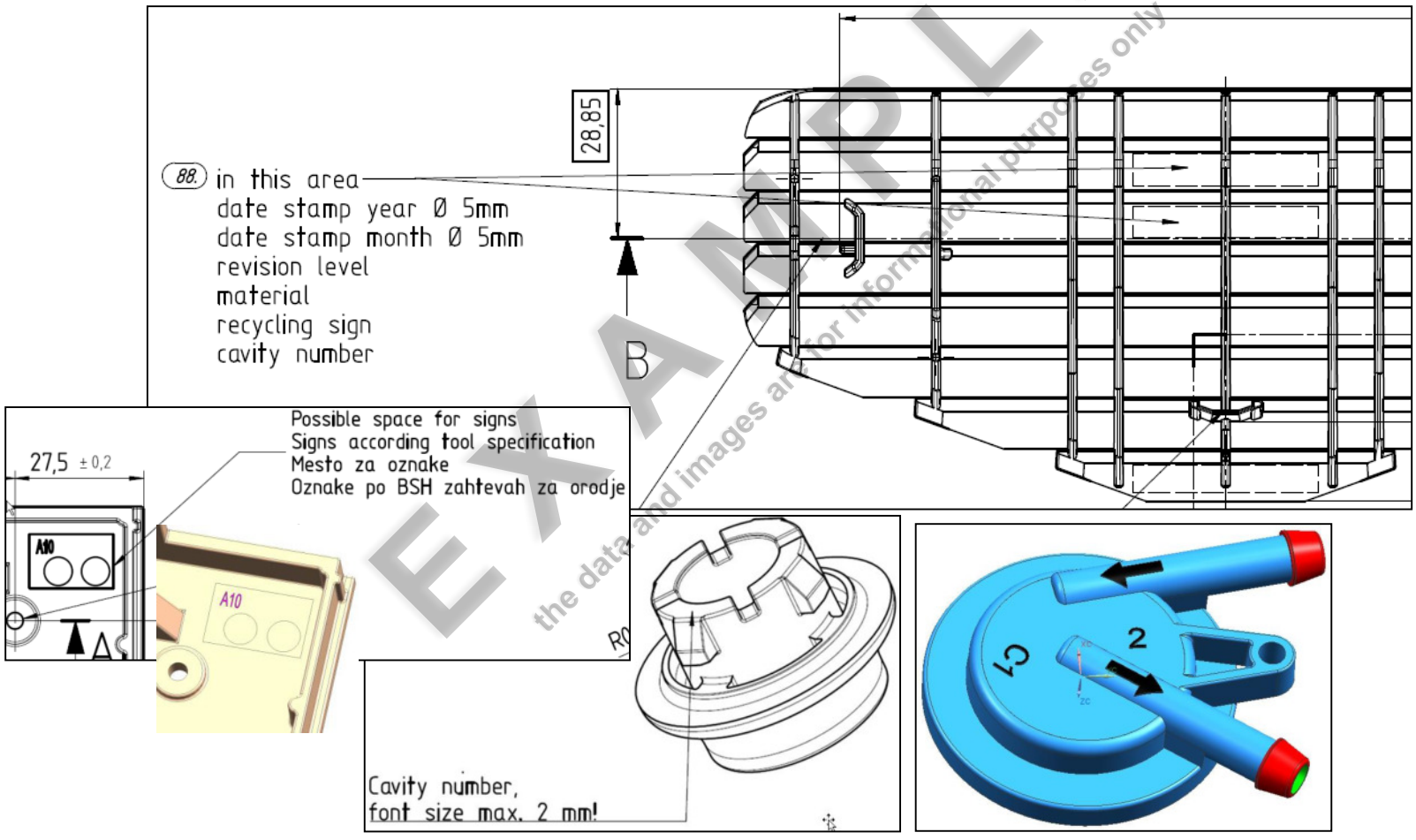
B/S/H/

Confirmation whether proposed place for signs is suitable regarding injection moulding-tool concept. If not, here show proposal for other location.

Check 2D drawing demands:

8.1 cavity no. type, size and location
8.2 adjustable date sign type, size and location
8.3 adjustable model version sign type, size and location

Examples:



BSH Decision/Comments

OK / NOK
Name,
dd.mm.yy

9 Mold flow analysis

B/S/H/

Mold Flow Analysis Report should be a separate report, prepared in detailed and professional manner. See points 9.1÷ 9.8

This file or files must be attached to this DFM Report.

Restriction:

A mesh match percentage of **85%** or higher is acceptable for a Dual Domain Fill+Pack analysis. A percentage of 50% or lower will cause the Fill+Pack analysis to abort. For a Dual Domain Warp analysis, the mesh match percentage should exceed **85%**.

9 Mold flow analysis:

9.1 Input data
9.1.1 mesh (parameter)
9.1.2 material, process parameter (mold, barrel, hot runner temperature, e.g.)
9.2 fill time
9.3 pressure drop
9.4 weld lines
9.5 air traps
9.6 sink marks
9.7 warping
9.8 cool FEM analysis

	File name	Sent: Datum
DFM Report Attachment 1	**DFM_MF_4059953_001. pdf**	**2017-04-26**
DFM Report Attachment 2		
DFM Report Attachment 3		
DFM Report Attachment 4		

BSH Decision/Comments

OK / NOK
Name,
dd.mm.yy

10 OTHER REMARKS [B]

B/S/H/

Fill in other remarks or proposals that are important for achieving manufacturing process as foreseen with the requirements.

BSH Decision/Comments
OK / NOK Name, dd.mm.yy

IMPORTANT NOTE: If there are no remarks to the technical requirements or other related documentation submitted by BSH, it is assumed, that supplier confirms to achieve required product, tool and process specifications.

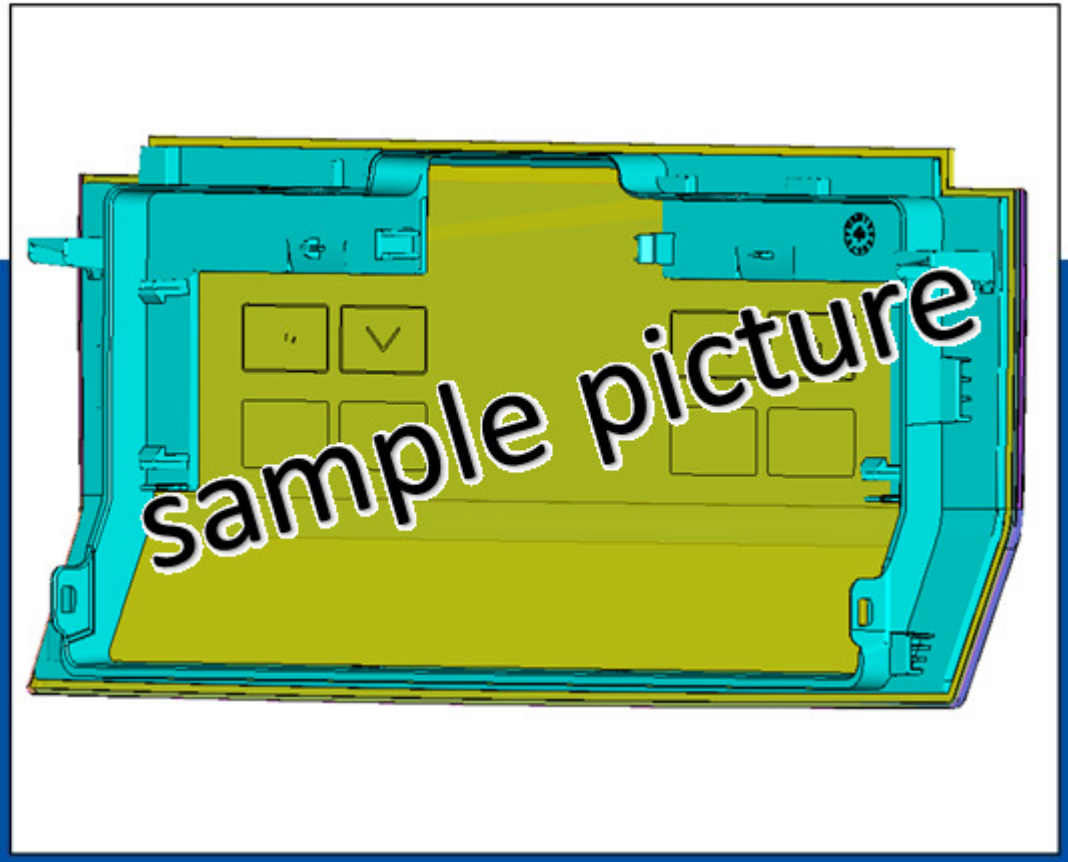
B/S/H/

C1 / 20.04.2021

Moldflow Report

Sample component

In this sample document, sample examples are provided for clarification. This sample document is not filled in for an real component, but rather images of different components and fillings of each field that are independent of each other.



Picture of part:

Document History

B/S/H/

Step A - BSH internal during development, only on the component (optional)
Step B - requested suppliers, on the component with simplified cooling and simplified gate
Step C - selected supplier together with DFM document before start of tool making, component with sprue and tool with concrete CAD tool design
(Step C may have to be repeated for larger tool changes)

Letter of step is the letter of the revision, number of the revision is consecutive and starts at 1 per step/ revision

Revision	Date	Created by	Modification Text
A1	15.02.2019	Mustername	Check of first concept / only at CAD model of part
A2	18.08.2020	Mustername	Check of Status “Quotation” revision of part A4 / injection system is simplified
B1	10.11.2020	Beispilename	Mold Flow with offer / simplified injection- and cooling system
B2	05.01.2021	Beispilename	Update after confirmed adjustments / tool data are simplified
C1	20.04.2021	Beispilename	Mold Flow after Tool Order and before starting tool making / digital tool data are used for Simulation

General Rules

B/S/H/

- **Feasibility Commitment stay valid!** also if results of Moldflow are out of tolerance → **real part must arrive tolerances**
- Language of document is English
- Naming of document is MF SAP Nr. – Revision – Part Name (*example: MF 8001001515 – A1 – Sample Name*)
- Results have to be in SI-Units or typical units, different units after conforming by BSH possible
- Instead of unit “bar” it is possible use unit “MPa” (change must be marked!)
- Deformation and deviations have to be cleaned up of shrinkage/ excluded of shrinkage
- Result pictures must have a readable scale with units
- Variation of simulation must be clearly marked as variation
- Input data stay the same for all results
- If there is not enough space at one page, it is possible to copy template foil of this topic
- STL-file of deformed part after total cooling (to 23 °C) is desirable
- Animation (for example of part filling) can be separate video data otherwise they have to be implemented in Document as video
- Pages which are marked as optional are not necessary , all other skipped foils must be justified (page remains available, reasons for not filling must be given on the foil)
- Add material data sheet in presentation or attach it as separate document (pdf.)
- All information which are attached as separate documents (animations, material data sheet, …) have to be named in presentation (*example: see attached document “material data sheet super plastic.pdf*”)
- In final revision all pages with results and comments have to be implemented
- Pictures and results on foils have to be commented (what does the picture say, evaluation of the result, prevention action)
- Add special features (e.g. cooling inserts, cascade injection, ...) independently on additional foil if they are used
- Possible conspicuous features are to be listed in detail by the supplier in extra transparencies
- Several variants can be simulated, but one variant should be chosen (reason must be explain) and stay constant over simulation → still only one MF document
- "Log-File" (automatically generated simulation protocol) as well as “.mfr file”, “.rsv file” or other result files are desirable
- The responsibility for results and interpretation of results remains with the supplier
- Each step (A, B, C) gets its own document, the individual versions of this document (e.g. A1, A2, A3 ...) are adapted in this one document and modifications are described at page "document history“
- For two component parts the relevant pages must be copied independently
- At the “template page for free design”, the design can be changed as desired (only on these pages)
- Risk assessment should always be filled in, if there is no risk this should be the comment.

not necessary	-
optional	o
necessary	+
as far as possible	(+)

B/S/H/

Content

Result Overview

always to be filled out
(virtual measurements only for Step C)

The chapter "Result Overview" must always be filled in with all results of current step. In Step C, all results of Step B must also be filled in.

The chapter "Result Overview" is a summary of all requested foils of chapter "Simulation Results" (Step B as well as Step C)

From Step C at the latest, all results must be based on a Moldflow (see optional simplification for Step B). Also in the case of simplification for Step B, the results table including risk assessment must be completed

The virtual measurement report is only required for Step C on.

Summary of results

	No influence at part
	Low risk
	Medium risk
	High risk

B/S/H/

For medium and high risk, please note planed prevention action, risks (also if they are named) do not exempt from feasibility commitment and duty to arrive tolerances and requirements at real part.

Page / Information	supplier comment/ result	planed prevention action	rating
Step B and following			
Wall thickness			
Fill Time			
Weld Lines			
Air Traps			
Sink Marks			
Shrinkage			
Warpage/ Deformation (Total)			
Deformation (X-Direction)			
Deformation (Y-Direction)			
Deformation (Z-Direction)			
Step C and following			
Pressure Distribution			
Pressure Analyses			
Pressure at machine nozzle			
Temperature Distribution			
Plastic Core (optional)			
Fibre Orientation (optional)			

Fill in with the values of the simulation (or for the request status also with the experience) and estimate the risk (colour gradation). In case of deviations or a risk, please indicate preventive actions on your own.

BSH remark
Comment
Name / Date

for optional results only

Summary of Optional Supplements

	No influence at part
	Low risk
	Medium risk
	High risk

B/S/H/

For medium and high risk, please note planed prevention action, risks (also if they are named) do not exempt from feasibility commitment and duty to arrive tolerances and requirements at real part.

Page / Information	supplier comment/ result	planed prevention action	rating

BSH remark
Comment Name / Date

Step C

Virtual Measurements

Measurements at virtual final part (STL model of mould flow measured at measurement department) → model have to be *cleaned up of shrinkage, positioning must be done according to reference system. For dimensions out of tolerance or close to tolerance limit (2/3 of tolerance range) prevention action have to be noted. Deviations of virtual measurements do not exempt from feasibility commitment and duty to arrive tolerances at real part.*

Rules for automatic measurement report otherwise use BSH template of Sample inspection report:

In general: Document must be written in English, geometrical tolerances with reference have to noted with "min" and "max" value (see example picture 2).

Necessary information:

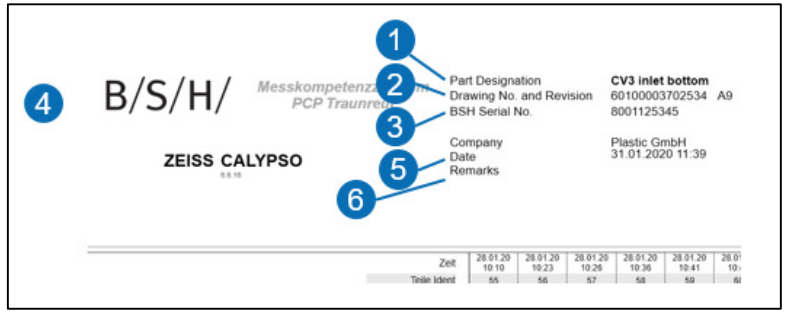
Head of document:

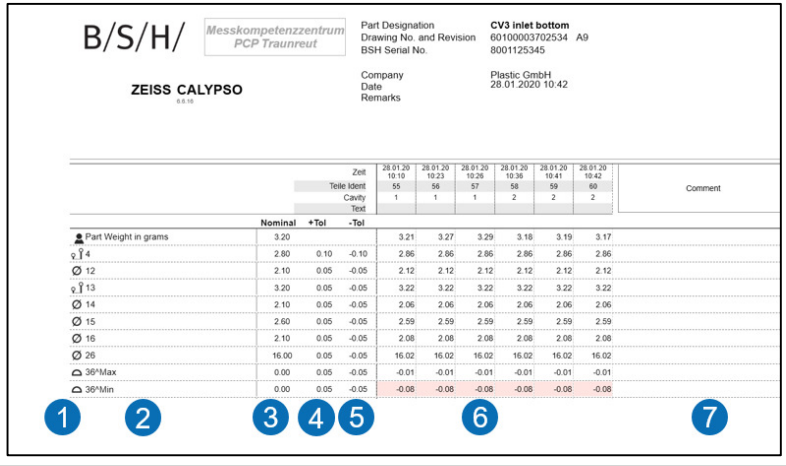
1 part name
2 part number of BSH with revision
3 SAP code of BSH
4 supplier name
5 date
6 place for comments

Measurements:

1 symbol of indication (optional)
2 BCT number of drawing
3 nominal value
4 upper tolerance
5 lower tolerance
6 measurement value, values out of tolerance must be red marked (if more variations are measured, each variation in one column)
(For FFOT samples, three parts per cavity must be measured, each with its own column → see SIR document)
7 place for comments (for example: prevention action)

example pictures:





Step C

B/S/H/

Virtual Measurements

Expected measurements at final part → cleaned up of shrinkage.

sample picture e.g. BSH SIR

Quality department Decision Comment:

- [ ] Release
- [ ] No Release
- [ ] Limited Release until Date

Responsible: Dept.:

Test results Cavity / Formnest 1 of 1 | Part weight (measured): / Teile-Gewicht: 58,3 g

Item-No.: Drawing Field:	Nominal value	Upper allowed deviation	Lower allowed deviation	Additional Information	Actual value (Supplier)		Act 1
1. / C7	---			8x	see subnumbers; with the snappers of positioningsystem A at top side, start with marked feature and count clockwise direction		
1.1. / C7	0	0,3	0	[Profile Line	0,3	A-A] max dev... Answer ... 31.05.2021: the play is reduced ... there is no loss of function and no safety risk, the assembly is still possible, only	0,18		
1.2. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,12		
1.3. / C7	0	0,3	0	[Profile Line	0,3	A-A] max dev -0,19	0,15		
1.4. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,14		
1.5. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,24		
1.6. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,28		
1.7. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,22		
1.8. / C7	0	0,3	0	[Profile Line	0,3	A-A]	0,25		
2. / D6	---			4x compleat ear geometry including cut out	see subnumbers; count in this view from left to right		
2.1. / D6	0	0,4	0	[Profile Surface	0,4]	0,23		
2.2. / D6	0	0,4	0	[Profile Surface	0,4]	0,26		

BSH remark

Comment

Name / Date

General information

always to be filled out

Input values of the simulation / basis data of the Moldflow

In the special case "Fill in on the basis of experience" (see results of Step B/ Status Quotation), the fields are to be filled in as far as possible.

The material data / material parameters of the material used for simulation must be entered in this document. If this material differs from the one indicated on the drawing, a justification must be given.

General Information

B/S/H/

Screenshots of the input mask for Basic data of simulation is sufficient if all information are readable.
If a replacement material is used, a justification for the chosen material shall be given.

* *only for 2K-Parts*
** *only for Step C*

Part					
Part name	Sample component			CQP Classification	B
Drawing Nr & Revision	60100003200754	A8		SAP Code	8001001515
Supplier					
address Adress of supplier	Sample Plastic Company Polymere Street 007 08150 Thermoplastic-Town Country			Moldflow done by *(insofar as supplier does not make Moldflow at there own)*	Address of Moldflow Company if not done by supplier
contact Contact person of supplier	Mr. Mustermann E-Mail@Mustermann.com Tel: 0815 007 4711			Moldflow software & version	Autodesk Moldflow Insight 2019.02
Basic data of simulation					
Planned machine	ABURG Brack die Maschine			Clamping force [KN]	3.500
Number of cavities	1+1			Injection pressure [bar]	1.200 (PMMA) / 1.600 (ABS)
Material component 1	PMMA			Volume injection unit 1 [cm³]	555
Material component 2 *	ABS			Volume injection unit 2 [cm³] *	115
Tool temperature during filling	90°C			Mesh size	0,8 mm
Tool temperature during cooling	50°C			Mesh quality	98 %
Middle plane		shell body (DD)		3D mesh X	Number of mesh elements (part)	1.500.000
Cooling BEM		Cooling FEM	X		Number of mesh elements (mold) **	1.200.000

Material Processing Parameters

B/S/H/

Screenshots of the input mask are sufficient if all information are readable.
If a replacement material is used, a justification for the chosen material shall be given.

** optional, if possible please specify*

Material Description & Material Database									
Material Name	ALCOM AWL 109/15 WT1217-11LB					Material Family	ABS / PC		
Test Date *	10.10.1910	Last Modification *	11.11.2011			Material Structure	Amorphous		
Material Data Completeness Indicator *	Gold	X	Silver		Bronze	Fillers	15 % Light reflection glass particles		
Processing Parameters									
Mold Temperature [°C]	90					Maximum Shear Stress [N/mm²]	0,4		
Mold Temperature range [°C]	min.	80	max.	100		Maximum Shear Rate [1/s]	50.000		
Melt Temperature [°C]	260					Transition Temperature [°C]	187		
Melt Temperature Range [°C]	min.	250	max.	270		Density Melt [g/cm³]	1,318	Density Solid [g/cm³]	1,563
Mechanical Properties									
Elastic Modulus Parallel [N/mm²]	9714,5					Thermal Expansion coefficient Parallel [1/°C]	$2{,}25 * 10^{-5}$		
Elastic Modulus Perpendicular [N/mm²]	5542,3					Thermal Expansion coefficient Perpendicular [1/°C]	$5{,}09 * 10^{-5}$		
Poissons Ratio Parallel	0,417					Yield strain [%] *	3,1		
Poissons Ratio Perpendicular	0,417					Breaking stress [N/mm²] *	56,4		
Shrinkage									
Observed Shrinkage Parallel [%]	min.	0,224	max.	0,330		Observed Nominal Shrinkage Parallel [%]	0,259		
Observed Shrinkage Perpendicular [%]	min.	1,507	max.	2,194		Observed Nominal Shrinkage Perpendicular [%]	1,849		
Replacement Material (only if correct material is not available for Moldflow)									
Explanatory Comment	e.g. material with identical or comparable properties - in any case with risk assessment								
Used theoretical Models									
Shrinkage model *						Fiber orientation model *			

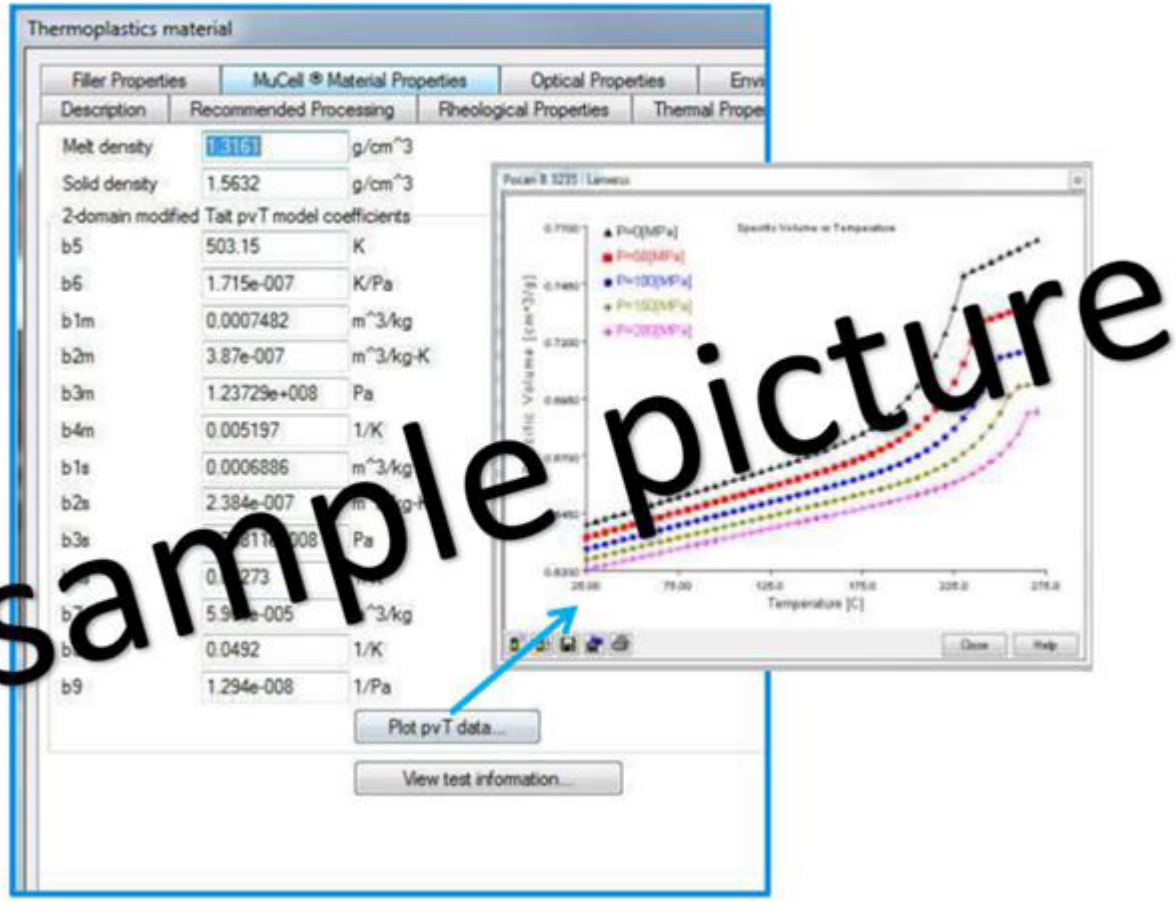
Material data sheet or Material data set

Placeholder for material data sheet if the template foil is not filled out

Material data sheet

pvT-Diagram

Estimated Part Weight [g]	153,5	Estimated Melt-Cushion-Volume [cm³]	115,2

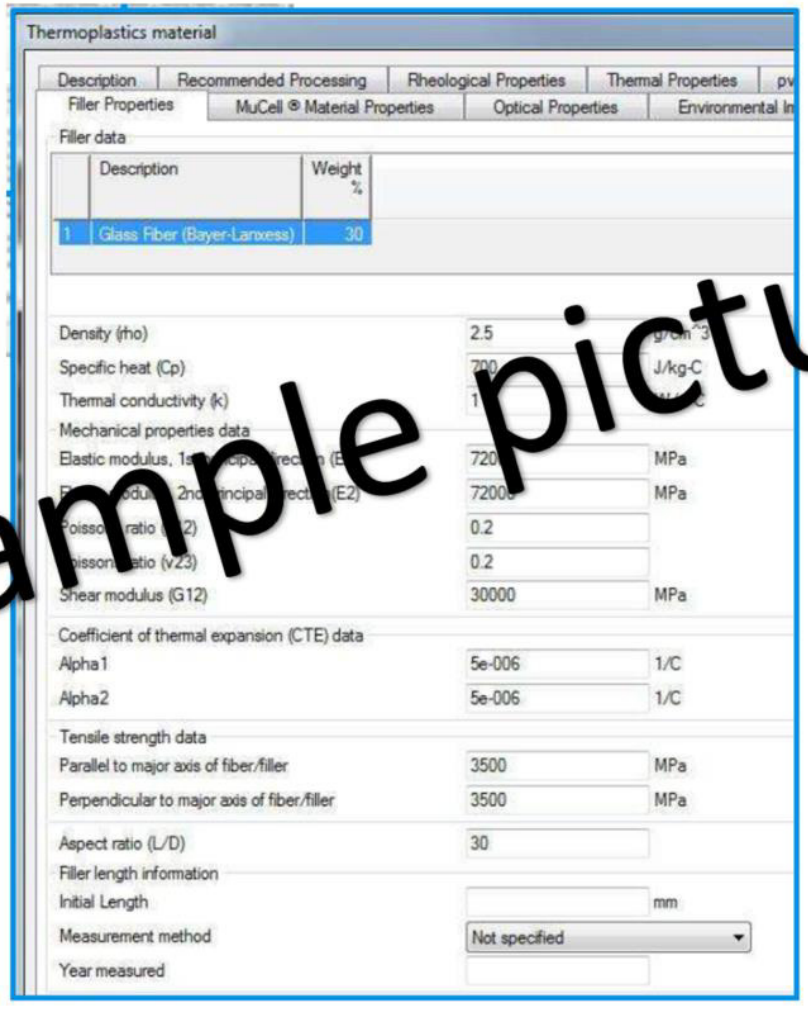


(only in case fillers are used)

B/S/H/

Filler information

data comparable to page "Material Processing Parameters"



Simulation Results

Step B and following (Status: “Quotation”)

Optional simplification for simple parts (option excluded for components with CQP-A level):

It is sufficient to fill in the comment fields of step B for submission of the offer. For example, if supplier can assess risk based on his experience without simulation. An independent comment on each point/ page is necessary. Comments must be clearly marked on which data basis (e.g. experience) they are basing.

Summary results table with estimated risk must be filled in completely, even if the pages are only filled with comments (without doing Moldflow simulation, based on experience).

This simplification is only valid for Step B (Status: “Quotation”), in Step C (Status: “Tool Order”) all required pages have to be filled in with Moldflow results, also the pages "Step B and following".

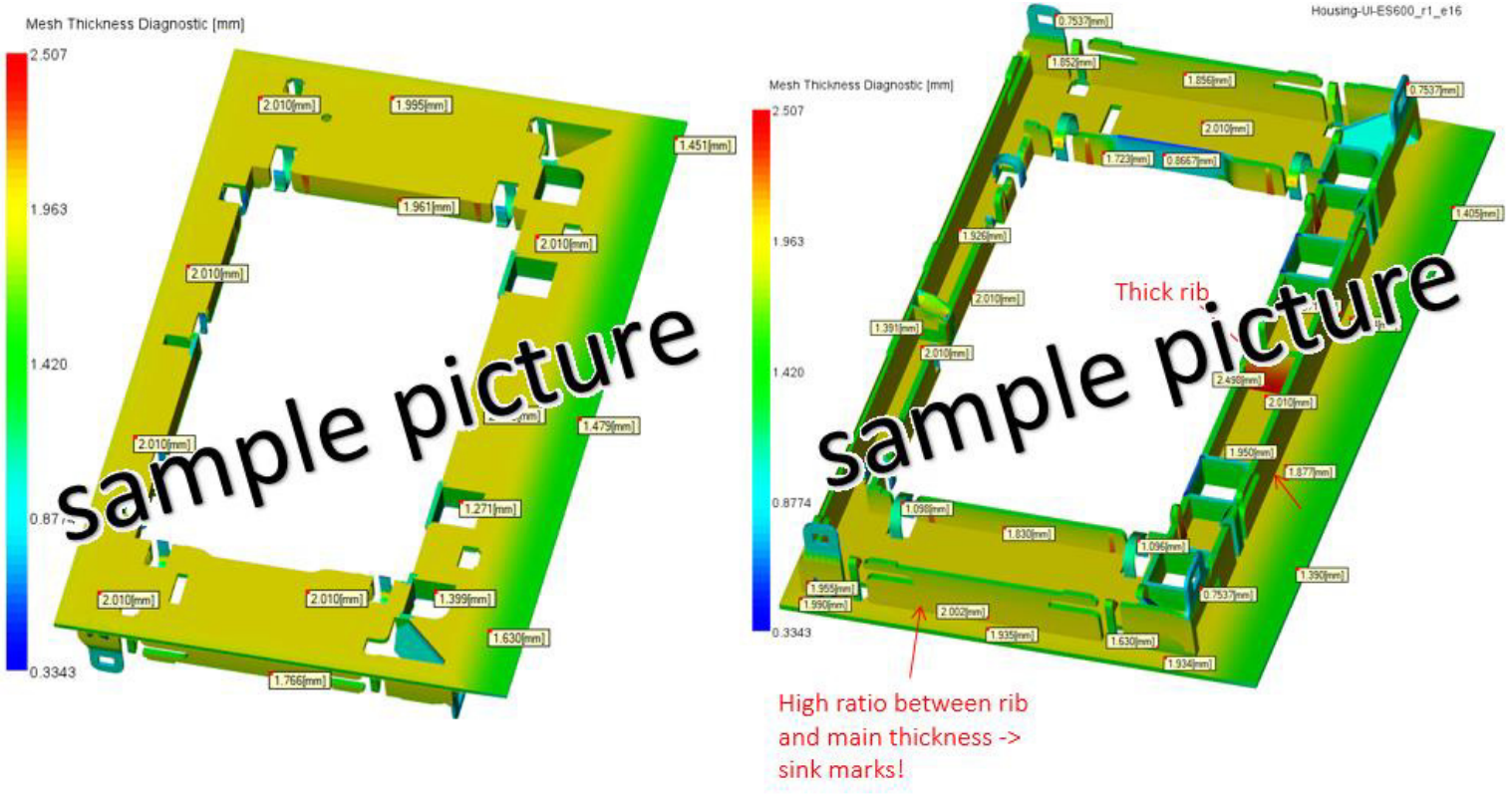
Wall thickness analyse

B/S/H/

If more detailed descriptions are needed, these can be made on the mesh quality slide.

** Is the geometry meshed fine enough, represented well by the wall thickness distribution (radii, ribs, mesh accuracy, ...)*

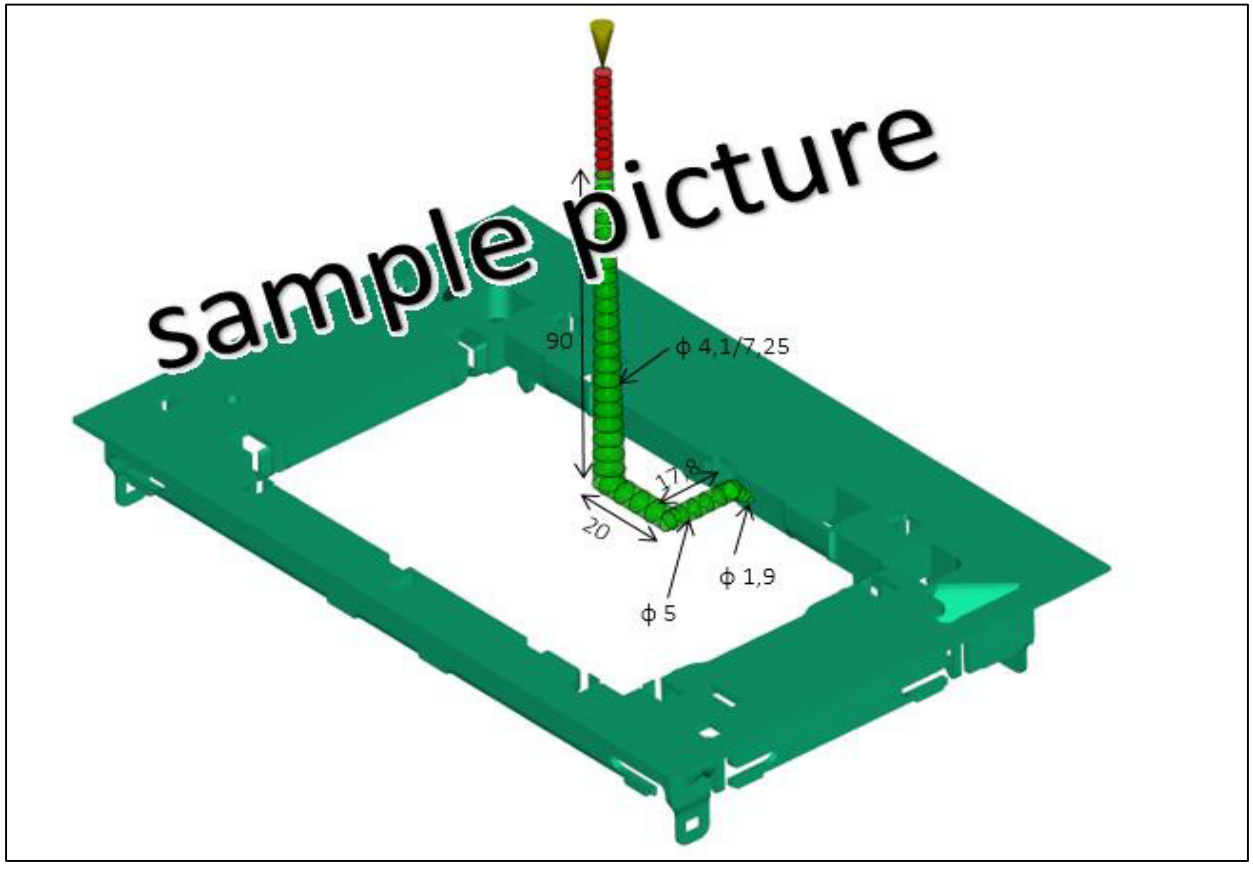
Minimal wall thickness [mm]	0,87	Maximal wall thickness [mm]	2,48	Geometry plausibility check *	done
Comment (influence for simulation and results)	See comment at picture	it is possible to insert the comment in the picture or in this field			



Injection System

For Step B a simplified version is sufficient

Type of System	Hotrunner, Valve gate	Dimension of gate [mm]	∅ 1,9
Number of gate points	1		



Cooling System

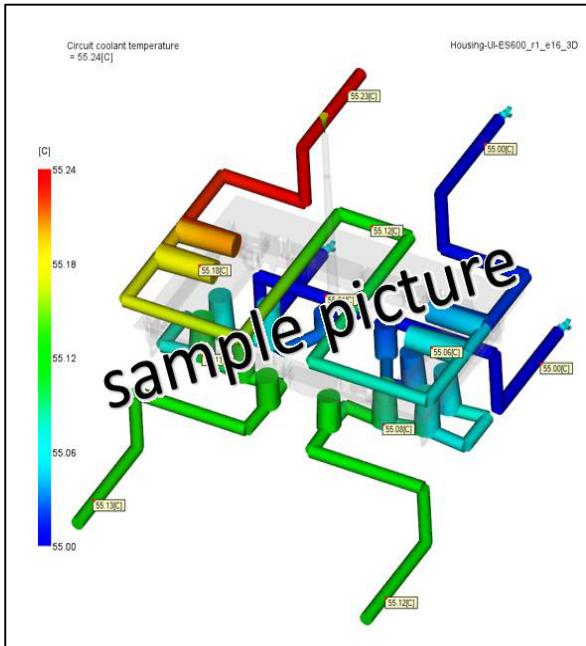
For Step B a simplified version is sufficient

B/S/H/

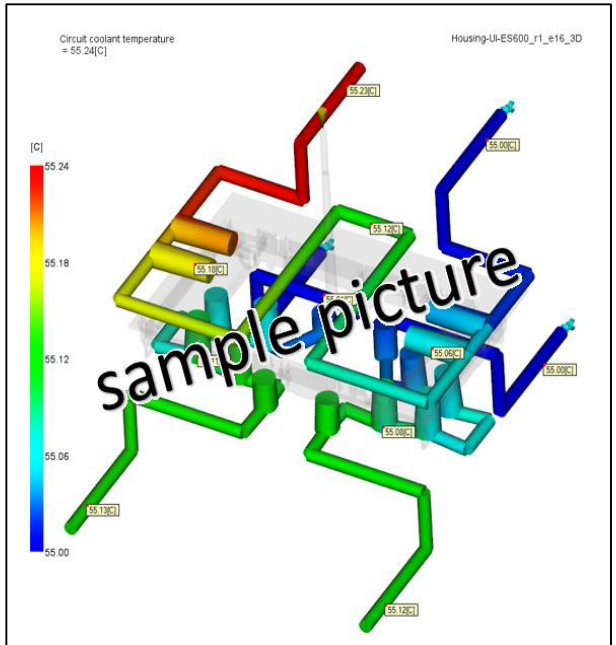
** Range of result values*

Cooling medium	Water, oil, …	Dimension of cooling [mm] *	∅ 5,4 mm Maximal length: 995 mm
Tool steel			

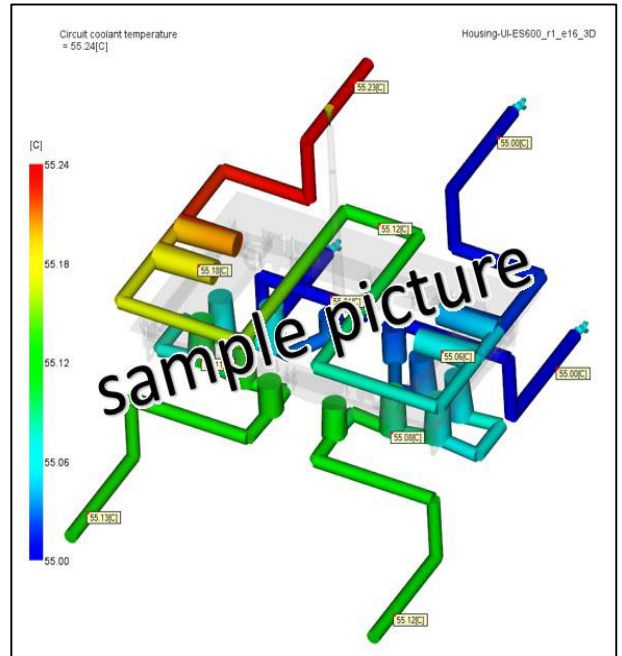
Temperature [°C] *	55,0 – 55,2	Pressure [bar] *	1,8 – 3,0	Reynolds number *	8.500 – 12.400



Estimated temperature in cooling system



Estimated pressure in cooling system



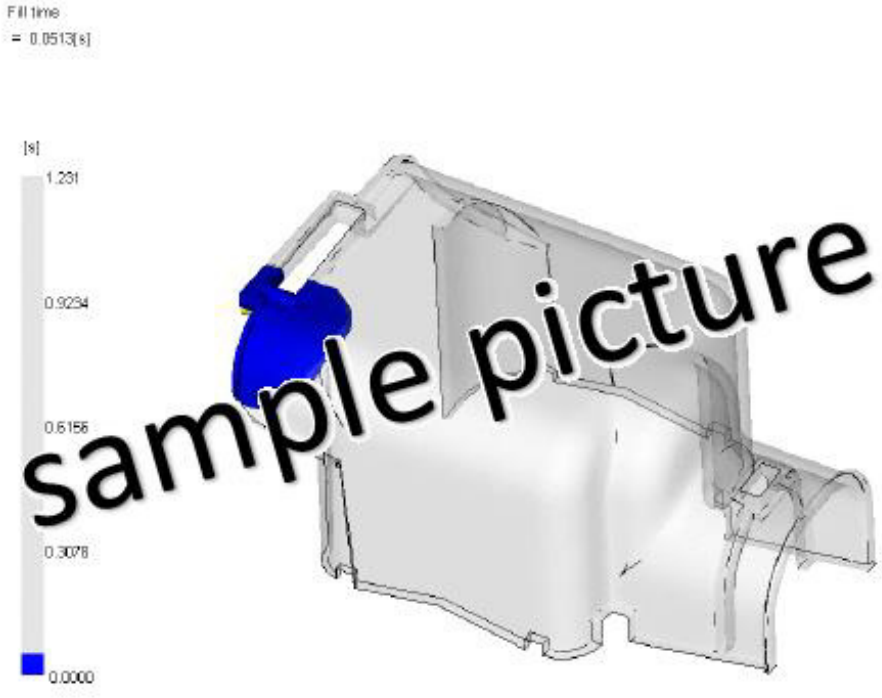
Estimated fluid flow behaviour in cooling system

Fill Time Animation

In case of inaccuracies at the seal off point, please give more details at the foil "Plastic Core"

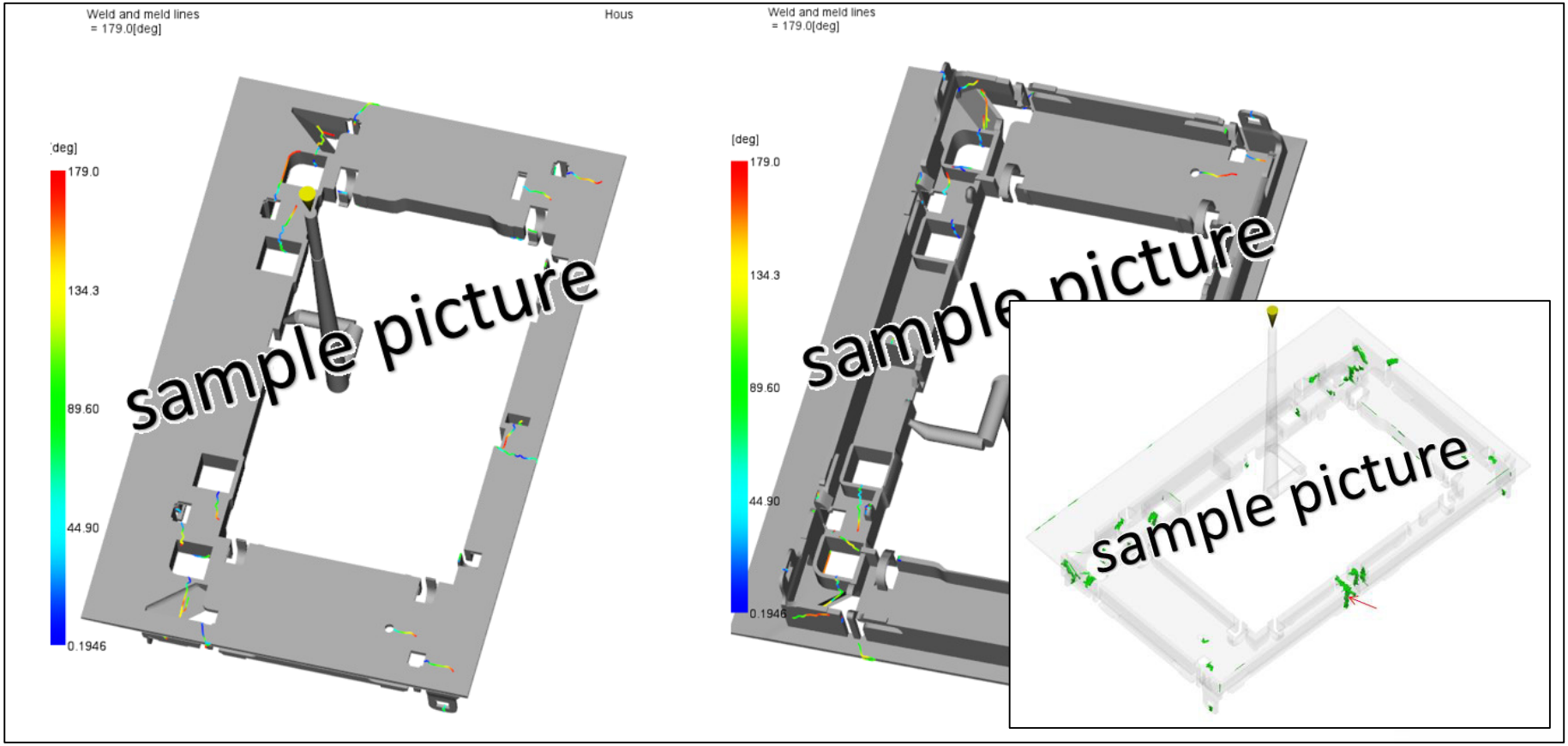
** Range of result values, details on page "plastic core"*

Fill Time [s]	5,28		switchover point [s] [%]	4,98	98
Seal off time [s] (part* / gate)	21,1	22,0	Ejection time [s]	33,5	
Comment / Risk	no significant risk, the part is sealed before the connection freezes				



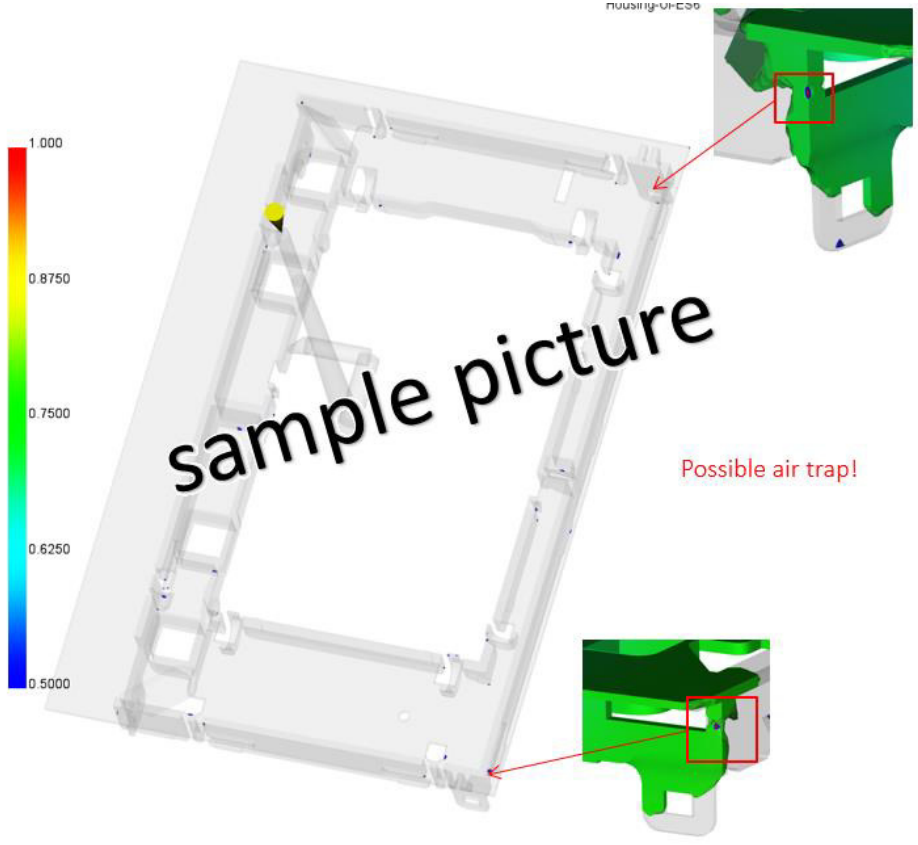
Weld Lines

Temperature at time of contact [°C]	89,1 – 178,3	Pressure at time of contact [bar]	758
Time between weld line seam formation and start of packing pressure [s]			1,2
Risk assessment by the supplier (visually, strength problems, ...)	the most critical is the weld line at the top in the middle, see separate picture. In general, the risk can be considered low, the temperature and pressure are high enough and the time until the holding pressure sets in is short. Venting positions will be placed at main weld line areas to prevent air traps.		



Air Traps

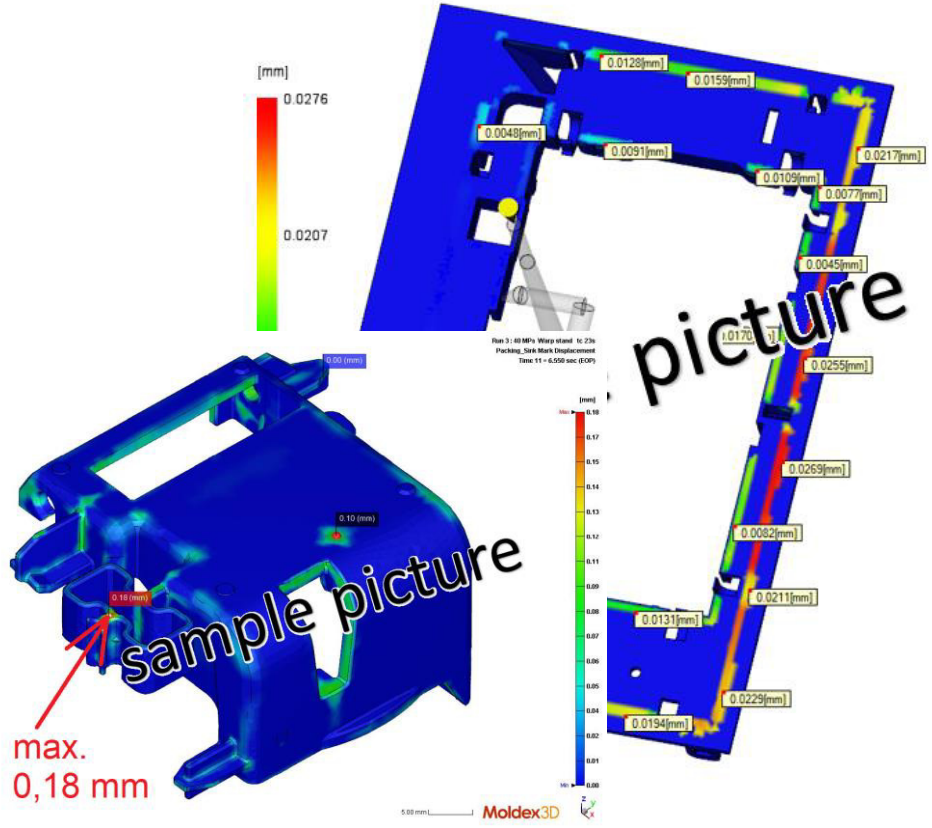
Risk assessment and preventive actions:	no significant risk, venting positions will be placed at areas of air traps to prevent problems like burn marks.

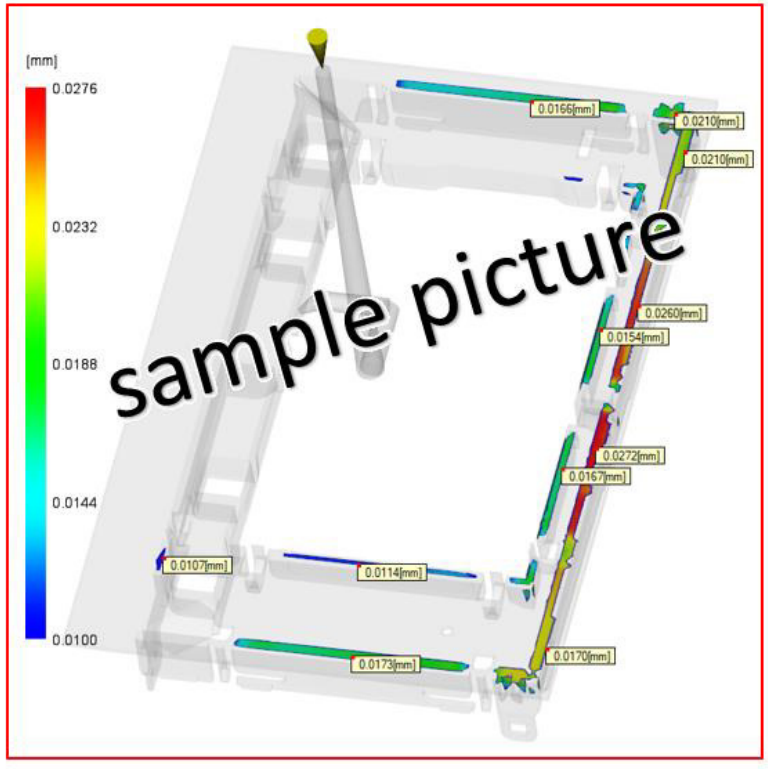


Sink Marks

B/S/H/

Maximal sink mark [mm]	0,18	Range of sink marks [mm]	0,05 – 0,18
Comment / Risk	low risk, the point of sink mark will occur neither on a visible surface nor on a functional surface. The sink mark is unavoidable due to the wall thickness and defined at drawing.		

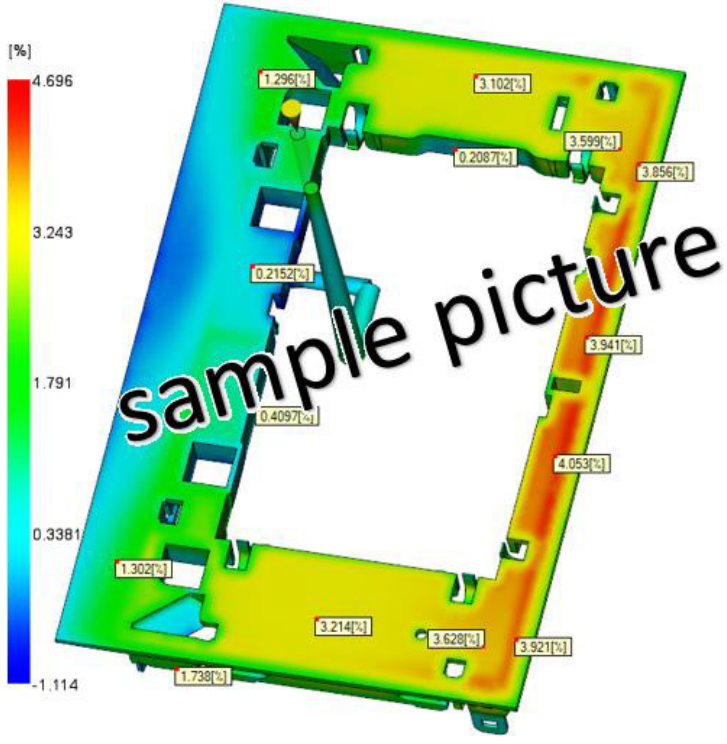


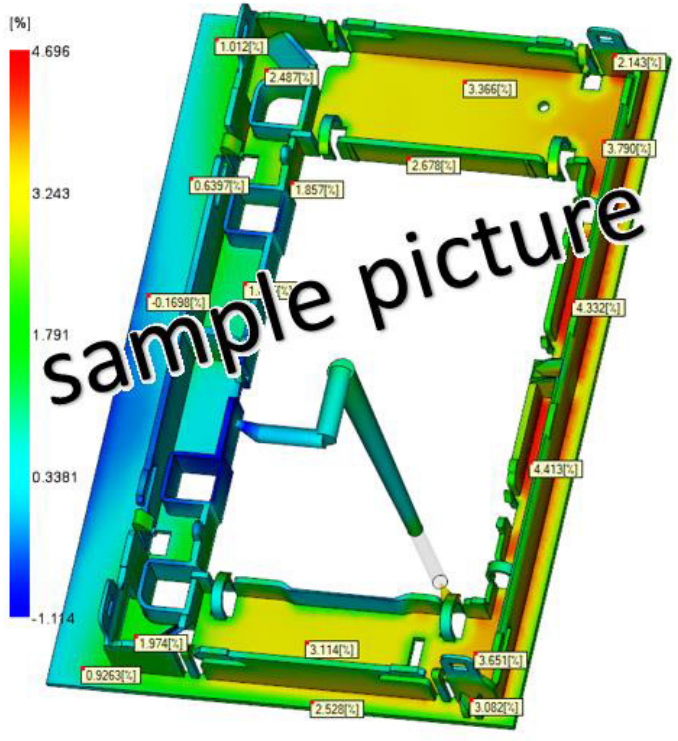


Shrinkage after cooling

Averaged volume shrinkage // Areas with shrinkage of 10 % or more must be clearly marked

Minimal shrinkage [%]	0,12	Cooling time [s]	60
Maximal shrinkage [%]	2,15	Comment/ Risk	

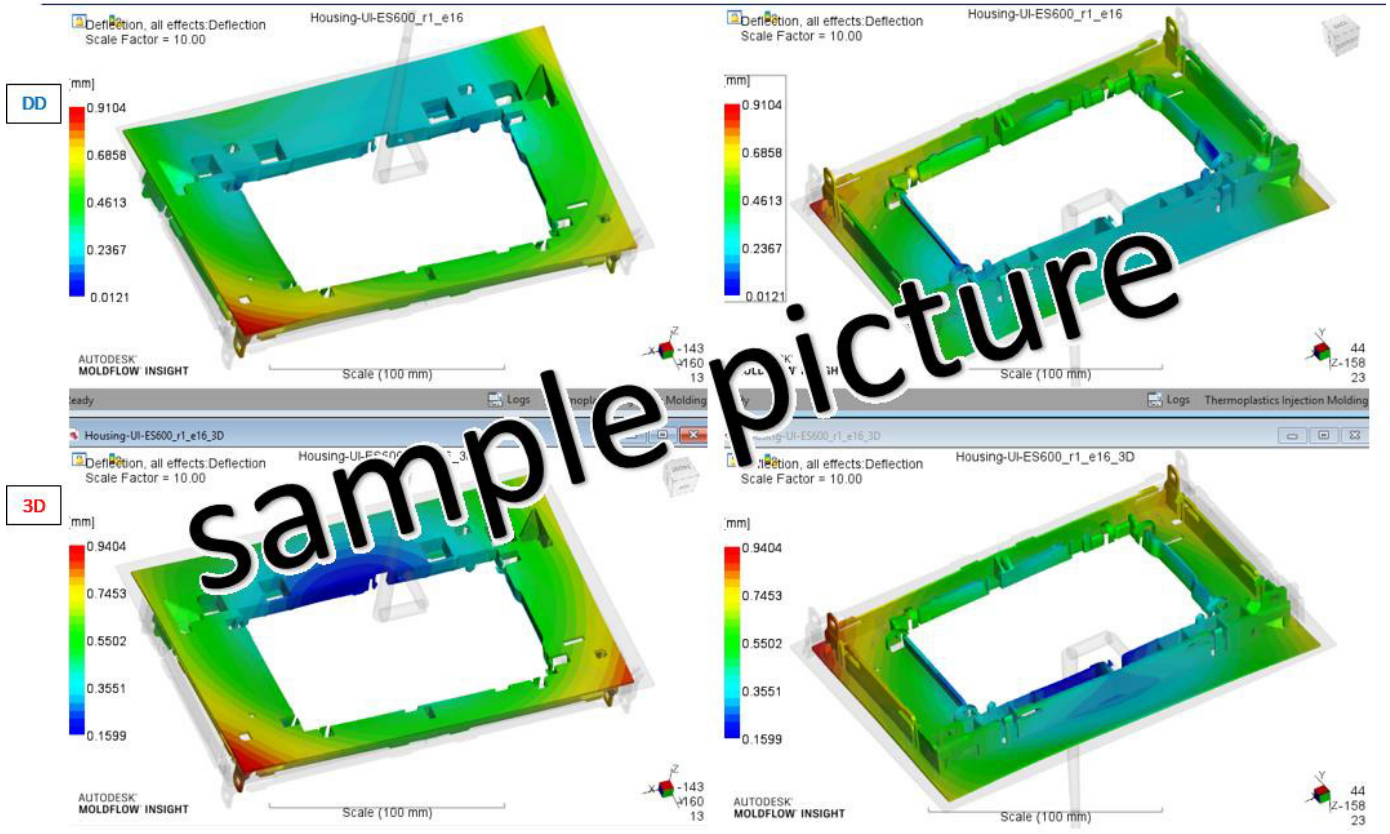




Deformation after cooling (total)

Warpage, cleaned up of shrinkage/ excluded of shrinkage → at final part

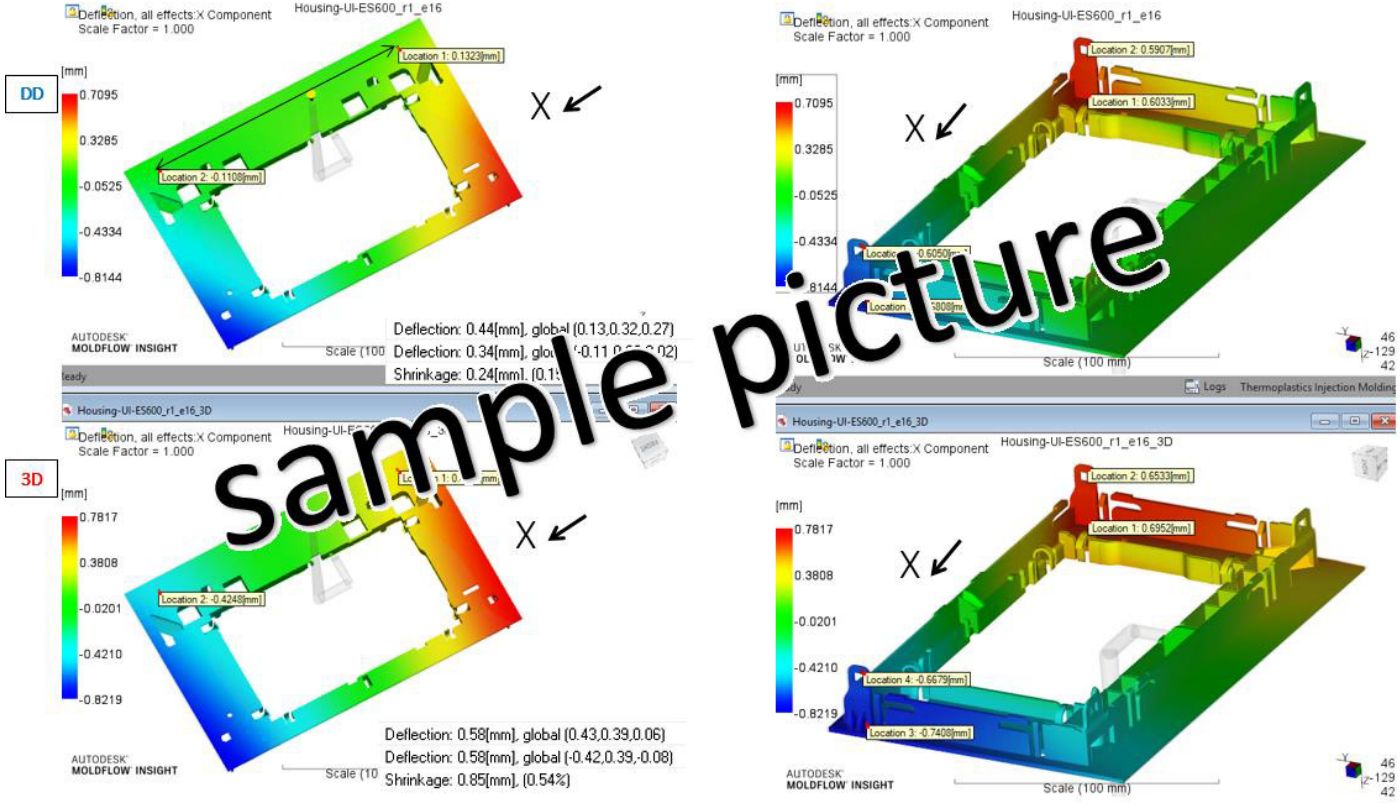
Maximal deformation [mm]	1,15	Cooling time [s]	60
Shrinkage compensation factor [%]		Part temperature	23 °C
Comment / Risk	No risk, deformation is held in the mould and taken into account		



X-Deformation after cooling

cleaned up of shrinkage/ excluded of shrinkage → at final part

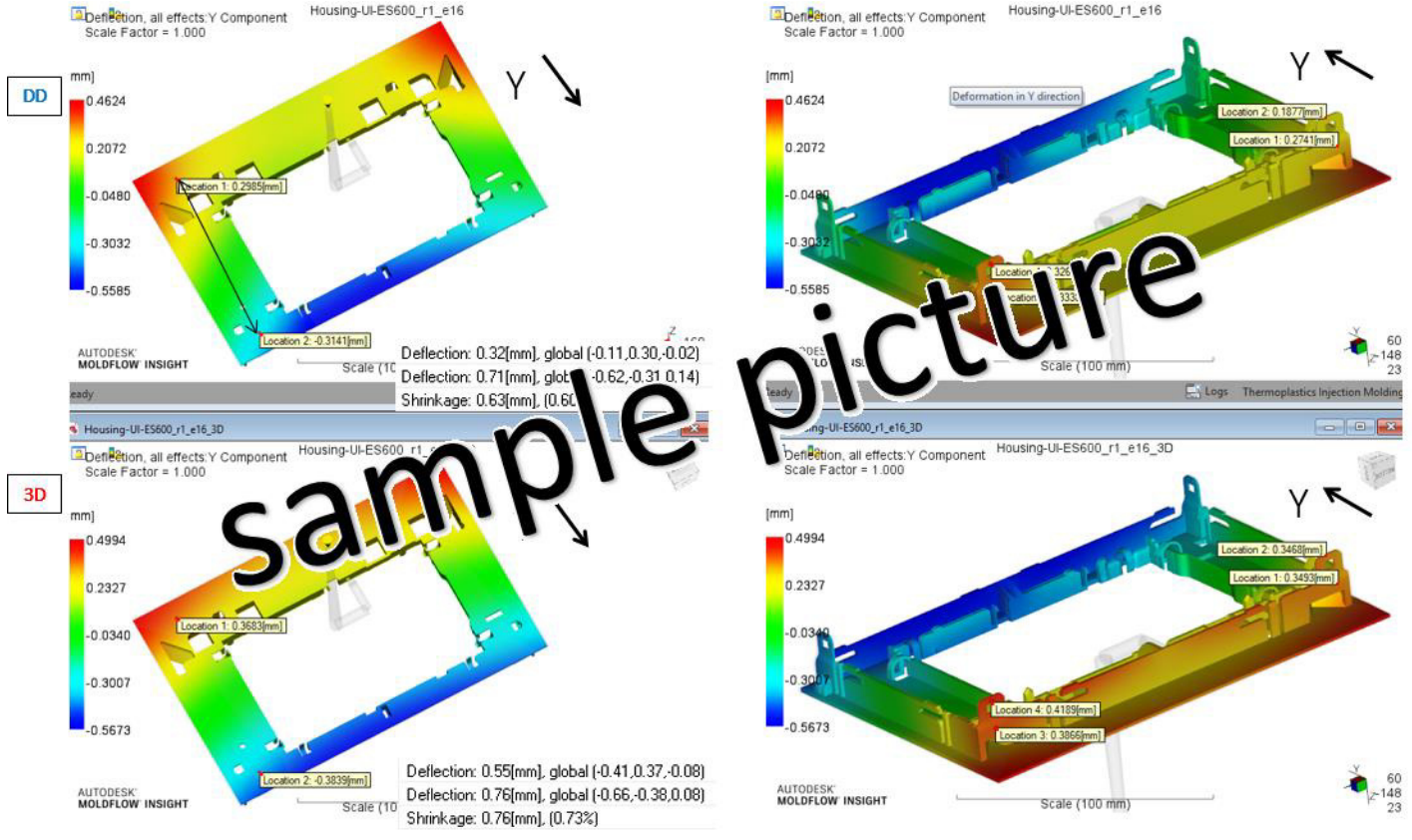
Maximal deformation [mm]	0,74	Cooling time [s]	60
Shrinkage compensation factor [%]		Part temperature	23 °C
Comment / Risk	The deformation in the X-direction is not particularly noticeable		



Y-Deformation after cooling

cleaned up of shrinkage/ excluded of shrinkage → at final part

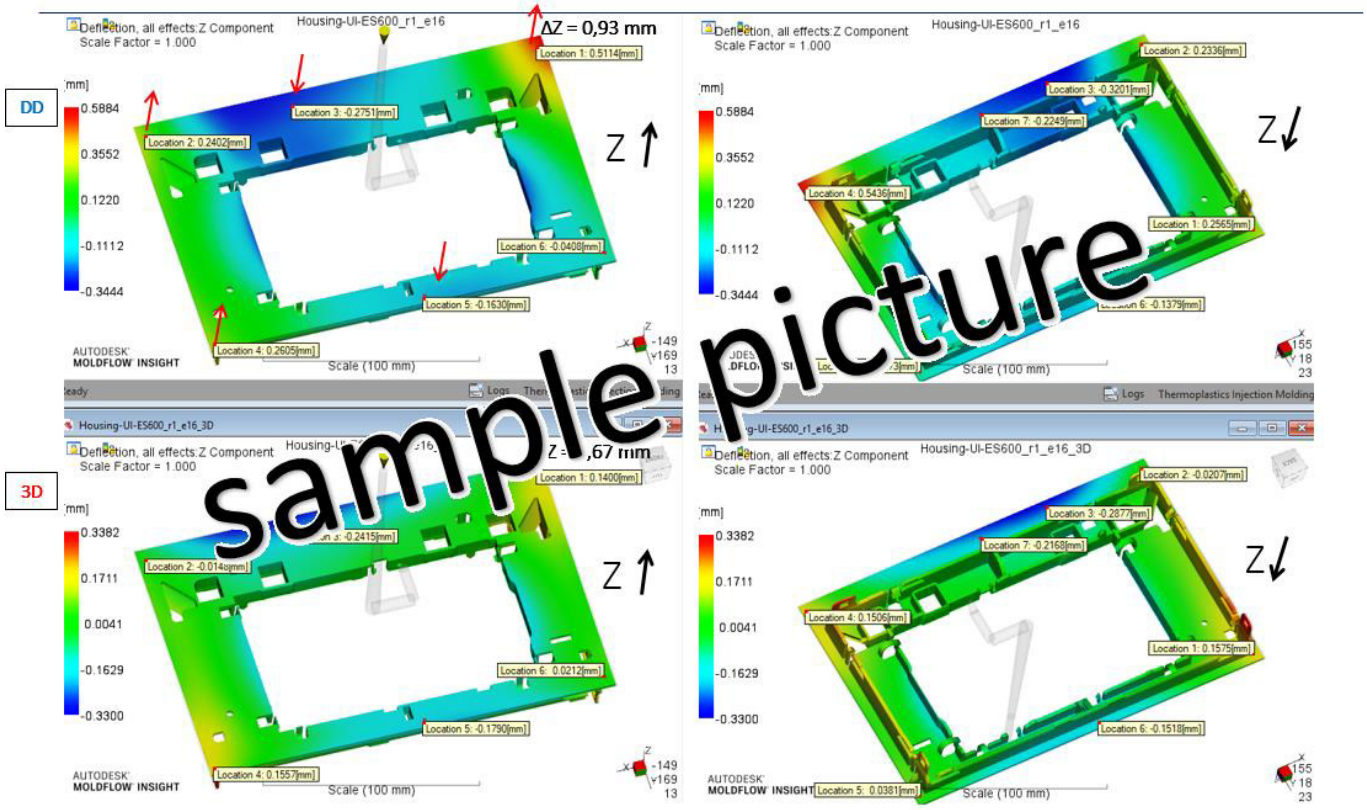
Maximal deformation [mm]	0,41	Cooling time [s]	60
Shrinkage compensation factor [%]		Part temperature	23 °C
Comment / Risk	The deformation in the Y-direction is not particularly noticeable		



Z-Deformation after cooling

cleaned up of shrinkage/ excluded of shrinkage → at final part

Maximal deformation [mm]	0,93	Cooling time [s]	60
Shrinkage compensation factor [%]		Part temperature	23 °C
Comment / Risk	The deformation in the Z-direction is not particularly noticeable		



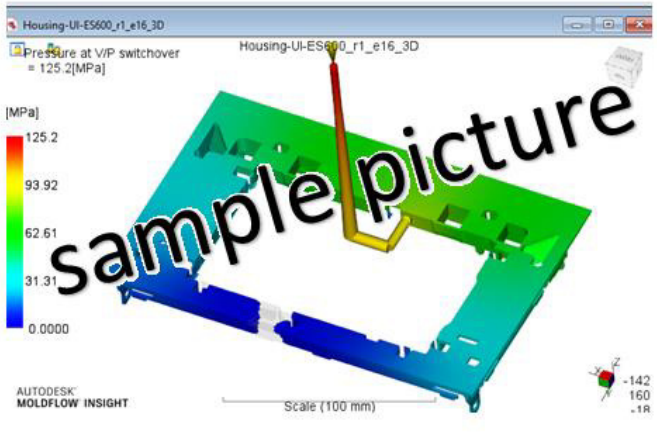
Simulation Results

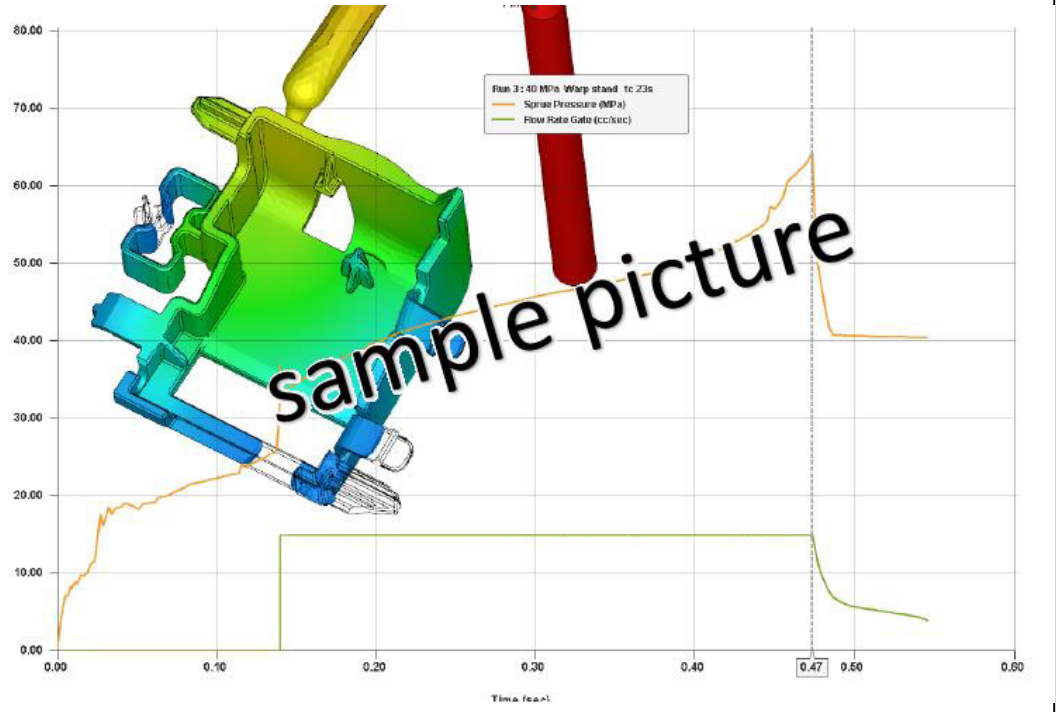
Step C (Status: “Tool Order”)

Pressure Distribution at switchover point

B/S/H/

switchover point [%]	98	Range of pressure at switchover point [bar]	25 - 1250
Comment / Risk	At switchover point a balanced pressure distribution is arrived. The pressure capacity of the molding machine is be higher.		



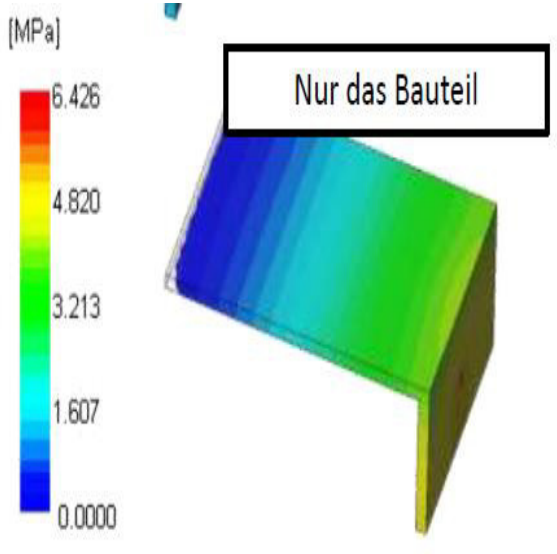


Pressure Analyses

B/S/H/

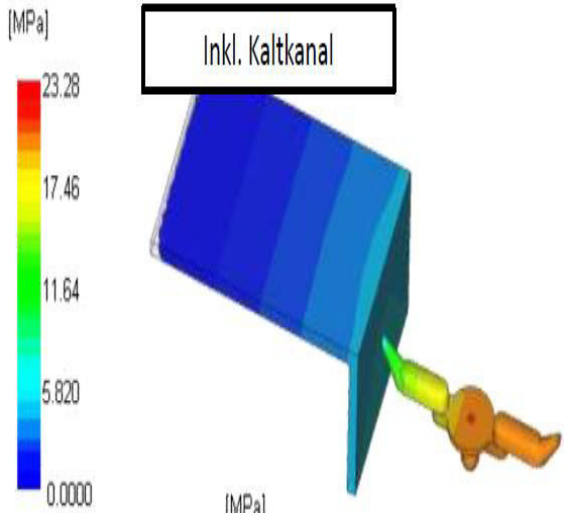
Statement	

Maximal pressure [bar]	643



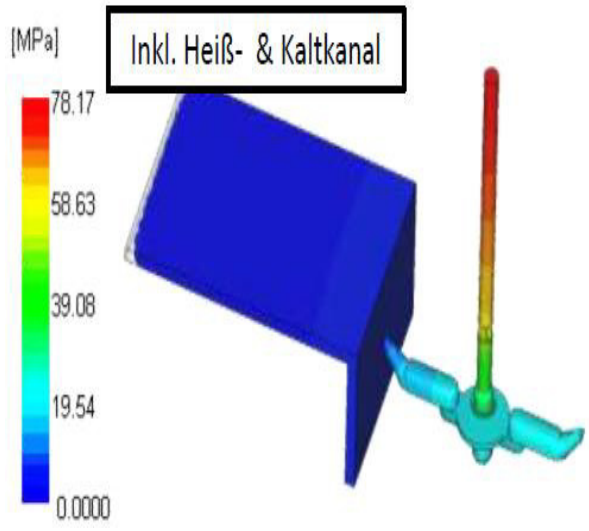
Picture of pressure only at part

Maximal pressure [bar]	2328



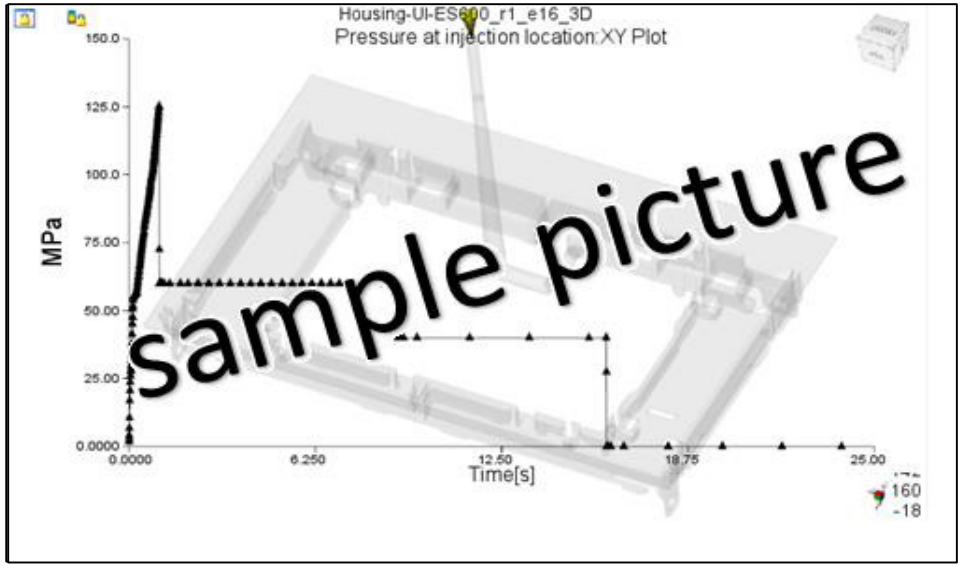
Picture of pressure at part and cold runner

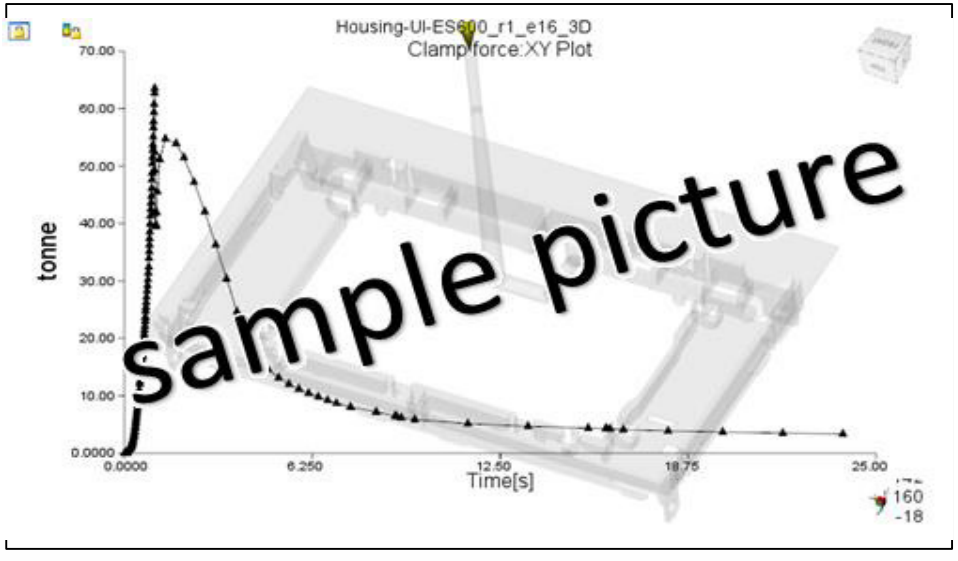
Maximal pressure [bar]	7817



Picture of pressure at part, cold runner and hot runner

Pressure at machine nozzle





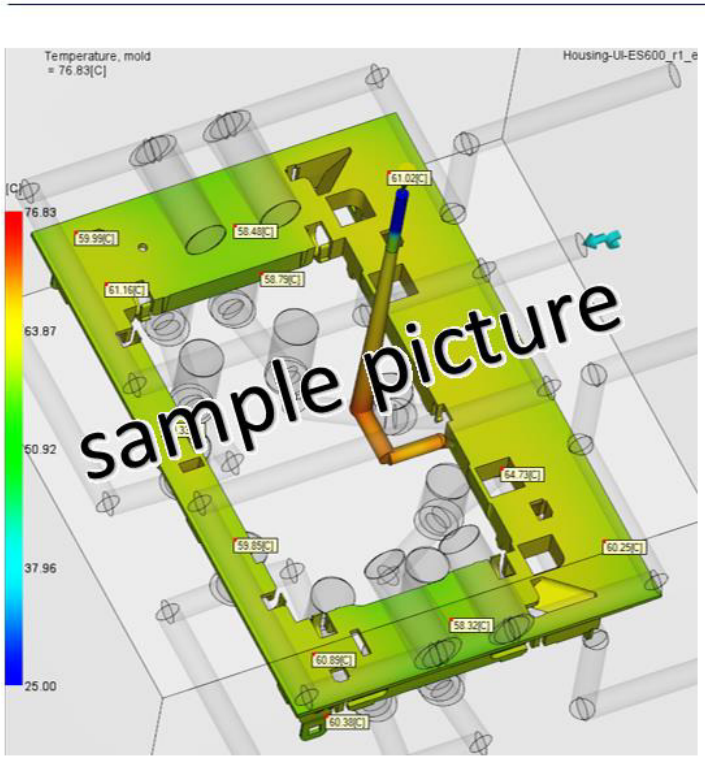
Maximal pressure [bar]	1.252
Level of packing pressure [bar]	615
Time till packing pressure [s]	7,4
Time of packing pressure [s]	8,2
Maximal clamp force [KN]	550
Machine size [KN]	650

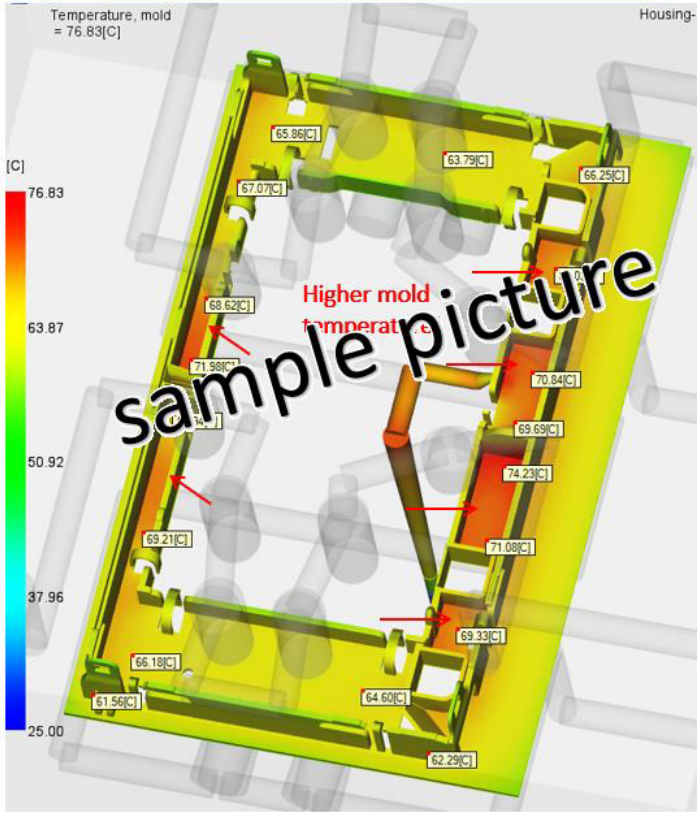
Comment	no imbalance in the filling process is recognisable. The pressure capacity of molding machine is higher holding pressure is defined. The maximum applied clamp force is less than 80 % of the machine limit

Temperature Distribution

Averaged component temperature at end of cycle

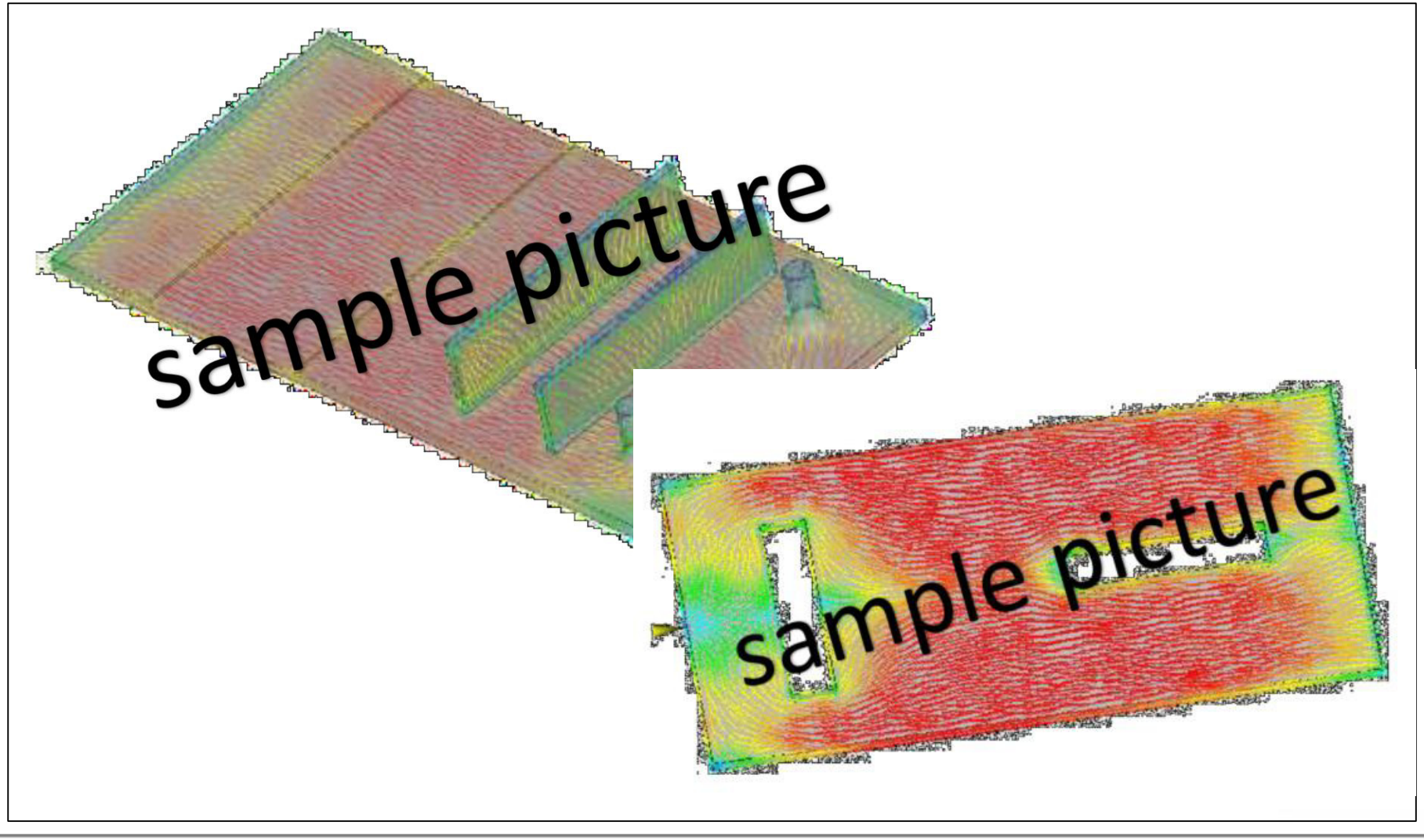
Minimal temperature [°C]	55,3	Maximal temperature [°C]	74,2
Comment / Risk	The areas with higher temperature are observed in more detail. The risk is classified as low.		





(only in case fillers are used)

Fibre Orientation



B/S/H/

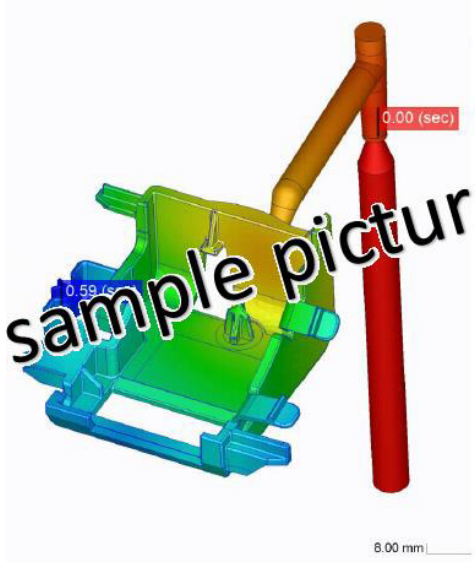
Optional Supplements

Optional independent of step

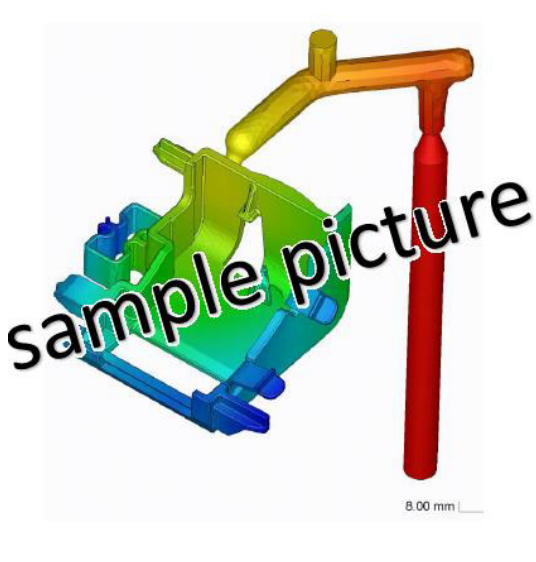
Variation of Injection System

B/S/H/

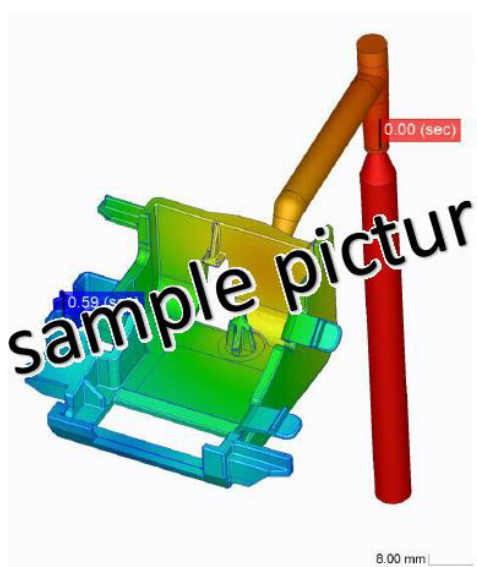
The injection point is chosen because it gives better results in MoldFlow terms of dimensional accuracy.



Chosen concept



Variation 1



Variation 2 …

Animation of the velocity vectors

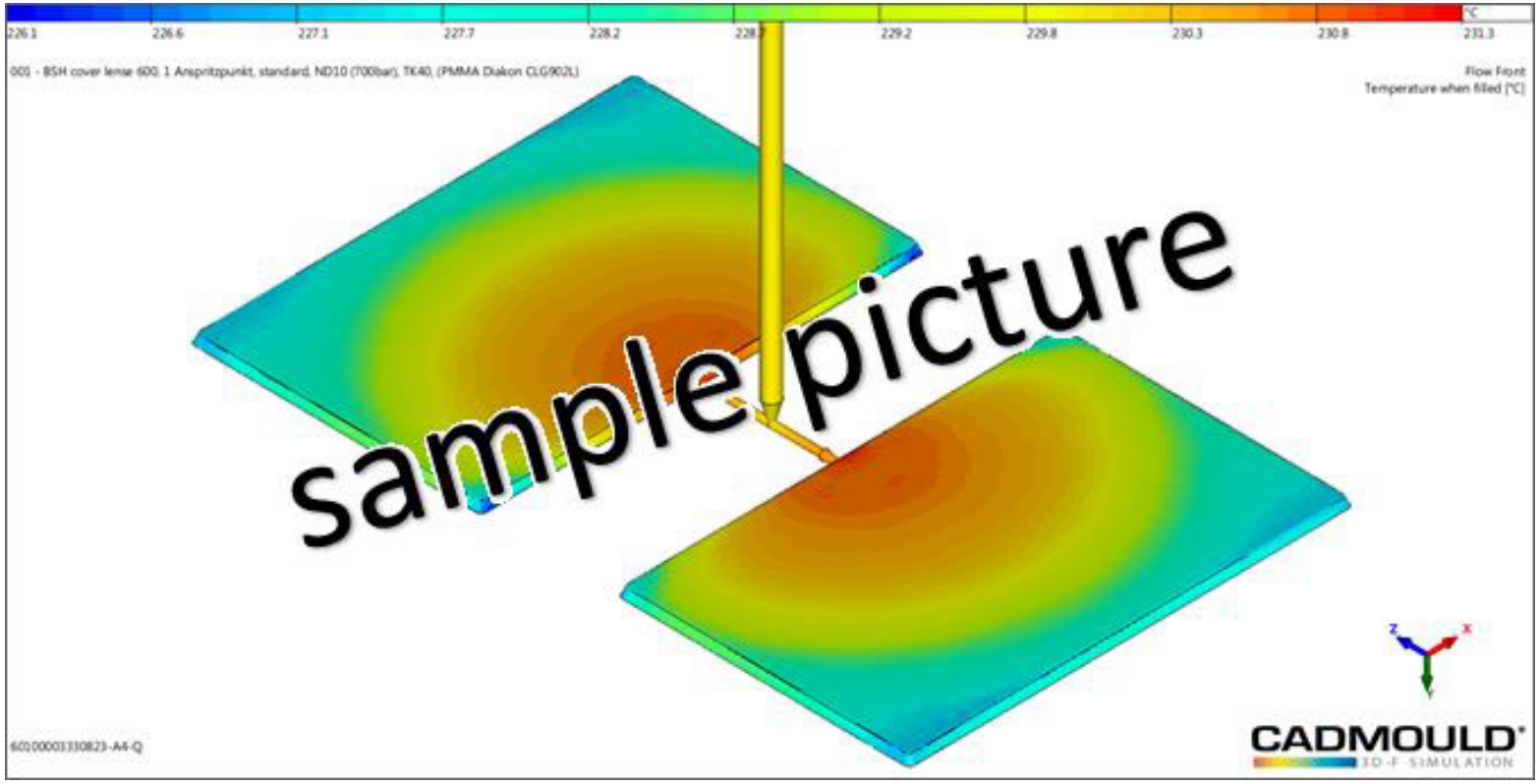
only if there are abnormalities

Animation of the velocity vectors

Flow Front Temperature

B/S/H/

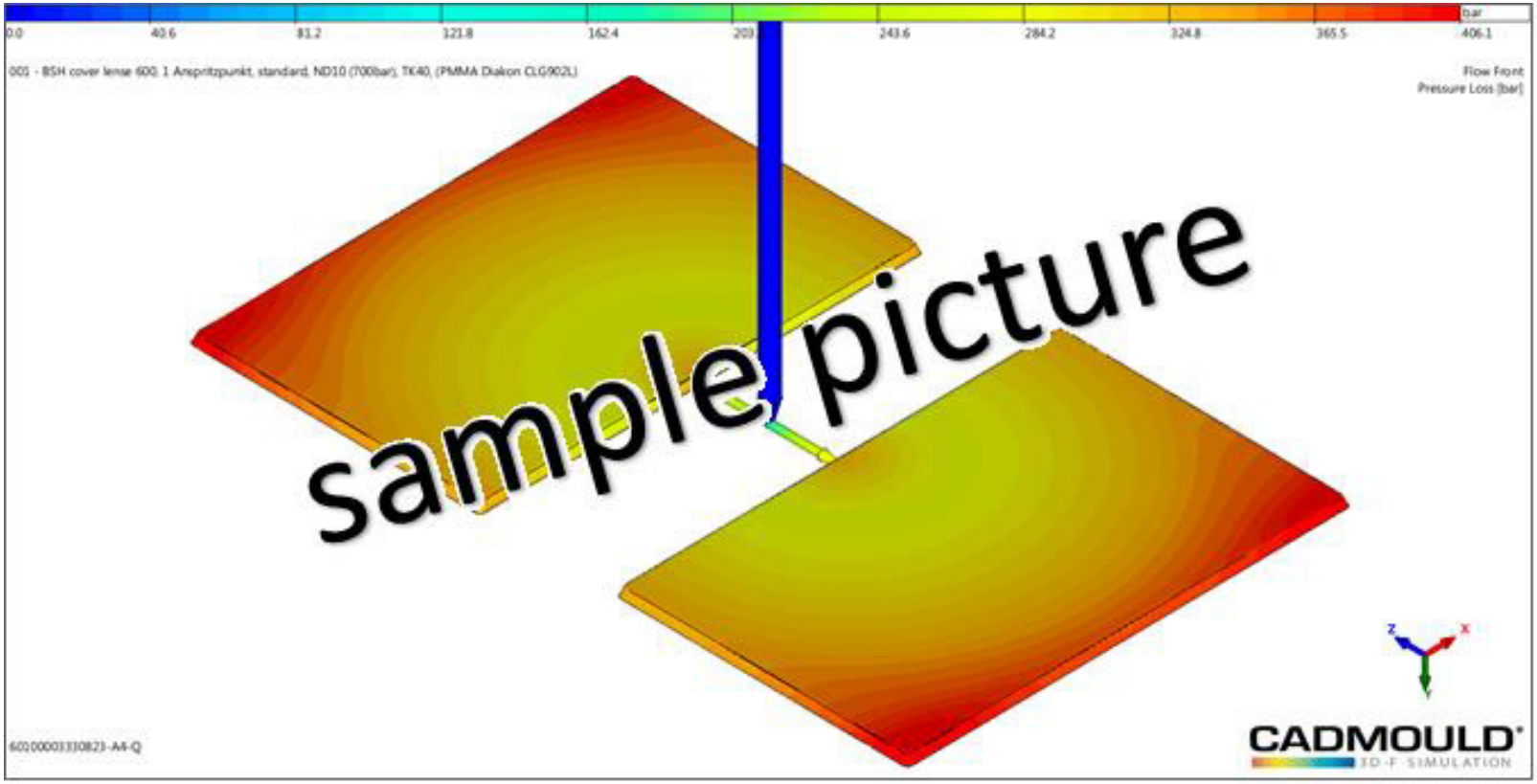
Minimal flow front temperature [°C]	226,1	Maximal flow front temperature [°C]	233,5
Maximal temperature decrease [°C]		Maximal temperature increase [°C]	
Comment / Risk	The flow rate is optimized, no critical significantly decreases or increase of flow front temperature.		



Holding Pressure Distribution

B/S/H/

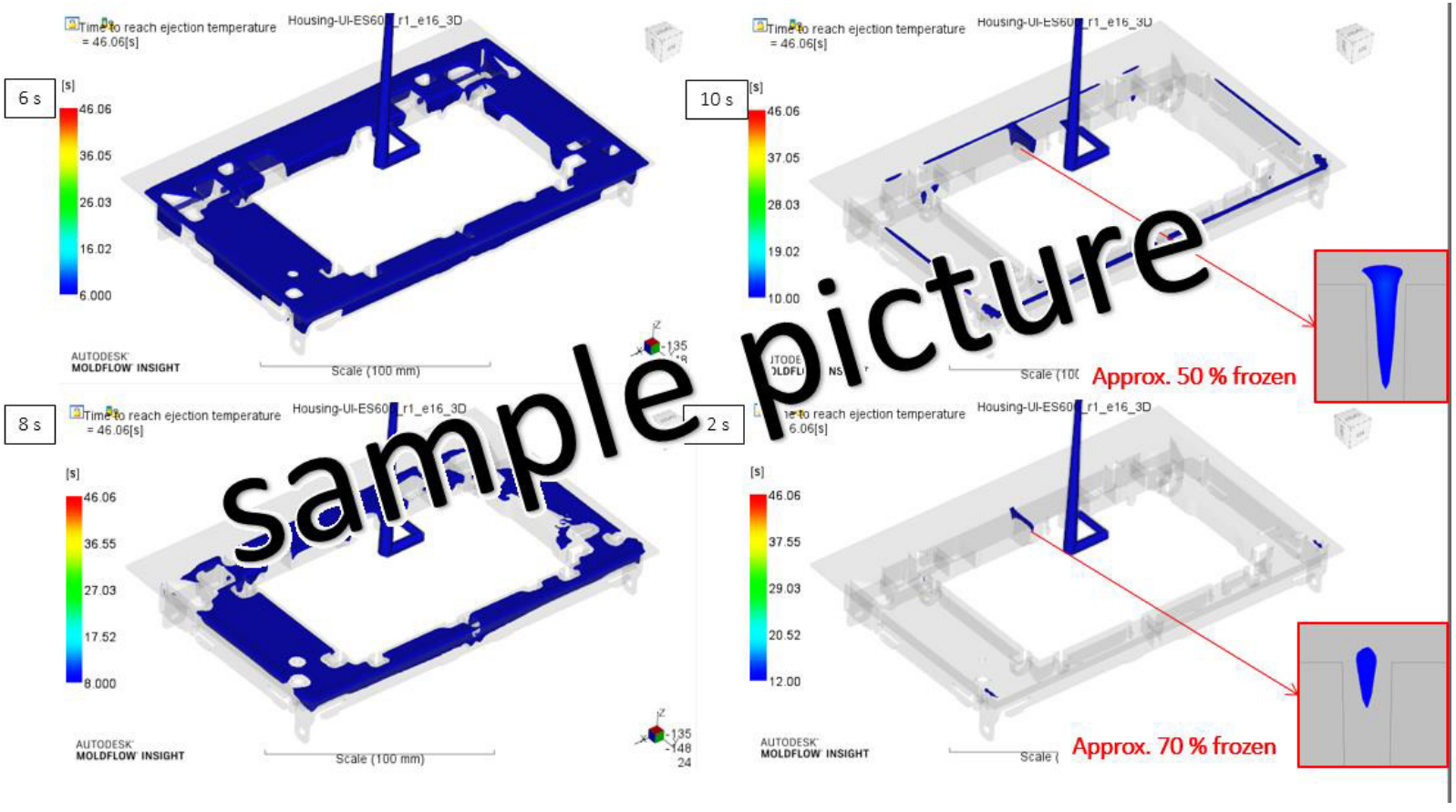
Minimal pressure [bar]	240,8	Maximal pressure [bar]	406,1
Packing pressure [bar]		Packing pressure time [s]	8
Comment / Risk	No critical anomalies		



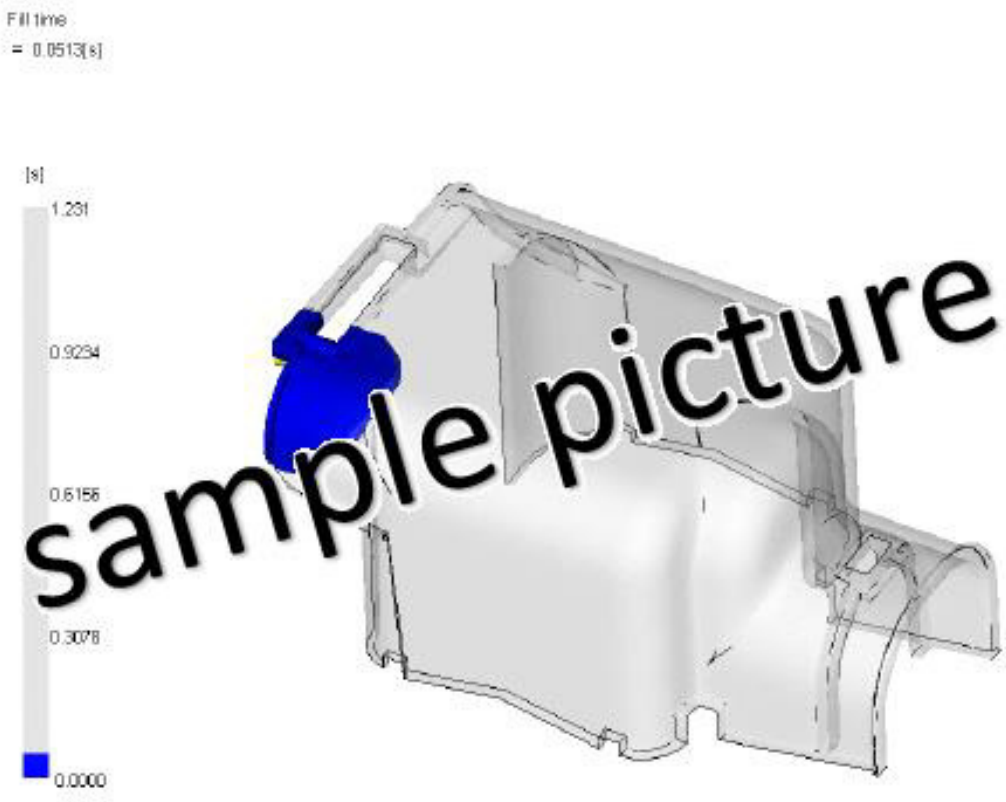
Plastic Core Distribution during cooling

B/S/H/

Maximal temperature at ejection [°C]	37,47	Cooling time till ejection [s]	12
Comment / Risk			



Plastic Core during cooling animation



Shear Rate / Temperature

B/S/H/

Maximal shear rate [1/s]		Max temperature [°C]	
Comment / Risk			

Area of max. Shear Rate

Area of max. Temperature

Mesh Quality

B/S/H/

Maximal element size [mm]		Minimal element size [mm]		Average element size [mm]	
Comment					

Picture of Mesh elements at Part

Reversible model

Reversible model

Suggestions of optimisations
Variation of material to arrive better flatness

B/S/H/

Maximal deformation in Z-Direction	0,66 mm	With actual material deformation in Z-Direction	0,93 mm
Best results with variation M2 (material proposal: PC+ABS Anjacom PC/ABS 055/80-GF10)			

BSH remark
Comment
Name / Date

Variation of material to arrive better results

B/S/H/

Template page for free design to present suggestions

BSH remark
Comment Name / Date

Additional Results

Template page for free design
Place for results that supplier usually considers, but which are not required and therefore have no separate template page.
Please enter a descriptive comment
