

Gislaved Gummi Quality Handbook[®] for Customers

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1 Scope

The objective of Gislaved Quality Handbook for Customers (GQHC) is to give a description of the activities Gislaved Gummi AB is expected to do in order to provide the customer with high product quality. GQHC is based on current ISO standards and general customer requirements. All other conditions are handled according to current general agreement and the general conditions of sales.

2 Mixing Control

All compound batches, intended for manufacturing of gaskets, are controlled according to table 1.

Table 1. Quality assurance schedule for mixing

Type of control	Method	Frequency
Mooney viscosity (MU)	ISO 289-1:2015	20% or 1 batch per order
Rheological properties	Rheometer MDR	100%
Density (g/cm ³)	ISO 2781:2018	100%
Hardness (IRHD)	ISO 48-2:2018	100%

All other tests on compounds are optional and have to be agreed separately.

3 Initial Sample Directions

Initial samples for at least one material from each mould are included in the mould price (renovation price). Other materials are to be approved based on technical agreement. Gislaved Gummi AB delivers five (5) samples for NBR and EPDM and two (2) for all other materials:

- Production of new moulds.
- Renovation or modification of an existing mould.

You will always receive at least two (2) pcs from each cavity. Please see table below for the number of gaskets that will be sent to you when you order initial samples:

No of cavities	NBR	EPDM	CR	FKM	Q	HNBR	FEPM
1	5	5	2	2	2	2	2
2	3+2	3+2	2+2	2+2	2+2	2+2	2+2
3	2+2+2	2+2+2	2+2+2	2+2+2	2+2+2	2+2+2	2+2+2
4	2+2+2+2	2+2+2+2	2+2+2+2	2+2+2+2	2+2+2+2	2+2+2+2	2+2+2+2

A customer approval of the initial sample is required before any serial delivery may take place. If the purchaser puts a serial order without making any written objection as to previously supplied delivery samples, the purchaser shall be deemed to have approved such samples, as stated in the general conditions of sales.

- Initial samples shall be manufactured according to normal production conditions.
- Drawing number and issue shall be reported in the Initial Samples document.
- Dimensional tolerances are reported in the Initial sample document.
- Initial samples shall be marked according to drawings or other agreements with the customer.
- The hardness and compression set shall be reported in the Initial Samples document.
- Initial samples will also be sent when a material is changed. The number and type of gaskets needed has to be agreed on from case to case.

4 Tolerances

Dimensions and other properties on rubber gaskets can be measured at the earliest 30 minutes after completing the curing. Dimensional tolerances follow ISO 3302-1:2014 unless other tolerances are agreed upon on drawings or other steering documents between Gislaved Gummi and the customer. All dimensions must be measured at standard laboratory temperature, 23±2°C according to ISO-23529:2017. Deviations from this might have large impact on length from thermal expansion.

4.1 ISO 3302-1:2014

The following text is found in ISO 3302-1:2014, chapter 5.1 General.

“The dimensional tolerances stated in this part of ISO 3302 may be wider than those used in some other engineering practice. The following considerations apply.

a) All rubber shows some shrinkage when cooled after moulding, and allowance for this is made in the mould design. The amount of shrinkage is dependent on the rubber type and the mix used, but also varies from batch to batch of the same mix. Products made from some silicone rubbers, fluorocarbon elastomers and other special-purpose elastomers are subject to larger shrinkages; therefore tolerance classes M1 and M2 (see 5.2) are very difficult to obtain with these rubbers.”

Table 2. From Table 1 - Tolerances for moulding from ISO 3302-1:2014, chapter 5.4

Dimensions in millimetres (unless indicated otherwise)

Nominal dimension		Class M1		Class M2		Class M3		Class M4
Above	up to and including	F ±	C ±	F ±	C ±	F ±	C ±	F and C ±
0	4,0	0,08	0,10	0,10	0,15	0,25	0,40	0,50
4,0	6,3	0,10	0,12	0,15	0,20			
6,3	10	0,10	0,15	0,20	0,20	0,30	0,50	0,70
10	16	0,15	0,20	0,20	0,25	0,40	0,60	0,80
16	25	0,20	0,20	0,25	0,35	0,50	0,80	1,00
25	40	0,20	0,25	0,35	0,40	0,60	1,00	1,30
40	63	0,25	0,35	0,40	0,50	0,80	1,30	1,60
63	100	0,35	0,40	0,50	0,70	1,00	1,60	2,00
100	160	0,40	0,50	0,70	0,80	1,30	2,00	2,50
160	—	0,3 %	0,4 %	0,5 %	0,7 %	0,8 %	1,3 %	1,5 %

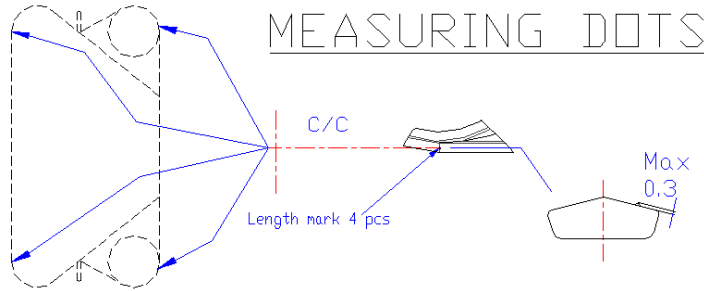
Only class M1 (precision moulded products) and M2 (High quality mouldings) are used for plate heat exchanger gaskets.

4.2 Length Tolerances

The length measurement (c/c) are not affected by deforming influences like flash thickness or lateral displacement of different mould parts and therefore follow tolerance (F), fixed dimensions.

Gaskets in NBR, EPDM, CR and HNBR follow class M1 fixed dimensions (F), which means that gaskets with c/c longer than 160 mm will have a tolerance width of ± 0.3 %. All other gasket materials follow class M2 fixed dimensions which means a tolerance width of ± 0.5 %.

Picture 1. Typical location of measuring dots used for length measurements



4.3 Thickness Tolerance

Thickness dimensions can be altered by variations in flash thickness or lateral displacement of different mould parts and will therefore follow tolerance (C), closure dimensions.

Gaskets with a c/c shorter than 1 m follows class M1 closure dimension (C) for thickness. All other gaskets follow class M2 closure dimensions (C) unless other tolerances are agreed upon on drawings or other steering documents between Gislaved Gummi and the customer.

4.4 Flash Tolerance

The flash shall follow Class X2 for “critical parts of gaskets, i.e. liquid exposed parts” and X3 for all other parts as listed in Table 2 in ISO 3302-1:2014 Amendment 1: Classification system for flash unless other tolerances are agreed upon on drawings or other steering documents between Gislaved Gummi and the customer. See Table 3.

Table 3. Classes of flash from Table 2 in ISO 3302-1:2014 Amendment 1

Class	Maximum height of flash mm	Description
X0	0	No flash *
X1	0.1	Precision flash
X2	0.5	Accurate flash
X3	1	Normal flash
X4	2	Rough flash
X5	No limit	Non-critical

* Class X0 can only apply to those surfaces of an article which do not have parting lines.

4.5 Crookedness (Distortion)

Crookedness is difficult to measure and will always be a question of judgement.

4.6 Contamination

Contamination from foreign objects is not allowed.

4.7 Surface Defects

Defects on the sealing surface of the gasket are not allowed according to Gislaved Gummi AB internal quality instructions. The marking dot is not regarded as a surface defect. This is valid if nothing else is agreed upon with the customer.

Defects outside of the dotted lines are allowed with a maximum height/depth of 0.3 mm. Repeated surface defects, e.g. from mould damage are not allowed unless an exemption is received from the customer.

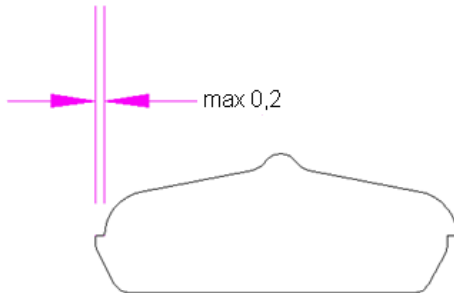
Picture 2. Dotted lines indicate the sealing surface of the gaskets



4.8 Mould Displacement

Mould displacement is allowed with a maximum of 0.2 mm as described in picture 3.

Picture 3. Maximum allowed mould displacement



Cavity off set max 0,2.

5 Identification of Mould and Gasket

All moulds have a stamped four (4) digits mould number to identify the mould with an extra digit for the cavity according to the type xxxx or Mxxxx. This mould number will also be found on the gasket.

The gaskets shall have a colour code for identification of material type. This colour code is according to customer specifications or, if this is not available, according to Gislaved Gummi standard. The position of the colour code depends on the design of the gasket and/or agreement with the customer but will in most cases be located close to the quarter mark and mould no, i.e. at a place with no influence of the gasket performance.

Gislaved Gummi AB aim to have the logo in every mould if nothing else is agreed with the customer.

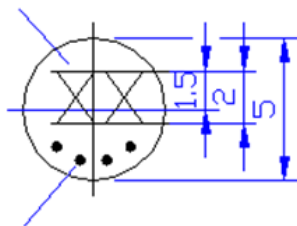
Picture 4. The Gislaved Gummi AB logo



All moulds will have a year and quarter mark for easier traceability unless other date markings are agreed upon on drawings or other steering documents between Gislaved Gummi and the customer.

Picture 5. Year and quarter mark

Two last figures of the year



One punch mark for every quarter of the year

Mould number, Gislaved Gummi logotype and other markings related to Gislaved Gummi AB will be removed from the mould in case of external transfer.

Customer specific markings, such as logo and item number can be added on customer request.

6 Delivery Control

6.1 Definition of Batch

One batch embraces the number of gaskets, from a uniform gasket batch, present in the oven during the same post curing cycle.

6.2 Test Frequency

Test frequency is determined in proportion to a uniform gasket batch and/or number of gaskets, present in the oven during the same post curing cycle or per delivery lot, sees point 6.3, 6.4, 6.5 and 6.6 below.

6.3 Compression Set

Gasket samples are taken out from each batch, independent of batch size. One gasket from each uniform gasket batch, plus one more gasket for every 300 gaskets in a uniform-gasket batch, if the batch exceeds 300 gaskets.

6.4 Hardness

Gasket samples are taken out from each batch, independent of batch size. One gasket from each uniform gasket batch, plus one additional gasket for every 300 gaskets in a uniform-gasket batch, if the batch exceeds 300 gaskets. The standard unit for the hardness measurements are IRHD-N.

6.5 Length Measurement

If <50 lot size 1 gasket per delivery lot is measured to determine length (c/c). If >50 then 3 per delivery is measured. However, it is preferred also to have a plate for control of fit in plate.

6.6 Thickness

If <50 lot size 1 gasket per delivery lot is measured to determine thickness. If >50 then 3 per delivery is measured.

6.7 How to Measure

Dependent on different contact surfaces the specific surface pressure might vary from one gasket type to another. Thus, it is important to keep the total force applied at a constant level when measuring the dimensions. However, due to differences in thickness and width (shape factor) of different gasket items, it is likely to expect some differences in values between these items even if tests have been carried out on the same temperature, time and materials. For all measurements it is important that the sample or gasket always is relaxed (free from external force).

6.8 Gaskets for Nuclear Industry

All requirements for delivery of gaskets intended for nuclear industry are to be decided in special agreement with the customer.

6.9 Result

The results will be available upon request. It can be supplied in form of an electronic delivery inspection report.

7 Packaging

The packing is made in either a cardboard container including plastic bags, EUR pallets with maximum four collars separated by wooden spacers or domestic equivalents. Gaskets produced in NBR, IIR and CR are always packed in a plastic bag. The storage time might be severely affected if these bags are broken.

Great care is taken to pack the gaskets with least amount of stress, i.e. they are folded/ twisted the least possible way.

Each packaging will contain test result for hardness and compression set tested at delivery control unless otherwise is agreed upon with the customer. On every bundle there is a bundle label. On the label it is stated the Production Batch No. The number is used for traceability of the gaskets.

8 Storage

The customer warehouse must be suitable for rubber gasket storage: The gaskets must be protected against ozone, sunlight, ultraviolet light, heat and dust, and may not be stored near welding equipment and electrical motors.

The gaskets must be stored according to FIFO (First In First Out) principle.

The gaskets are manufactured and packed so that a minimum storage time for all gaskets is 36 months from delivery date. If stored correctly, in an unbroken original packaging, the gaskets will meet all specified requirements within the minimum storage time. Gaskets in NBR, IIR and CR are packed in plastic bags and must not be removed as there is a risk for ozone cracks.

9 Mould Maintenance

Gislaved Gummi AB is responsible for preventive mould maintenance to avoid unexpected break-down and poor quality. This includes repair and change of worn out guide pins and bush rings. Gislaved Gummi AB is also responsible for any handling mistakes that may damage the moulds.

All other maintenance (including worn moulds) or changes are on the customer behalf and will not be executed unless agreed in writing.

Any other agreements regarding mould maintenance has to be documented in writing.

10 Measurement Methods

10.1 Hardness – ISO 48-2:2018

Hardness is tested twice, at the mixing control of the gasket compound and at the delivery control of the complete gaskets, according to section 2 and 6 in this document.

The hardness is always measured in IRHD-N (IRHD Normal method) according to ISO 48-2:2018. The test piece is prepared according to ISO 23529 when tested in the mixing control. The actual gasket profile is tested at delivery control and, thus, the test piece deviates from ISO 48-2:2018. Gaskets thinner than three (3) mm are measured with IRHD-M (micro). The hardness is then measured on the cross section.

10.2 Compression Set – ISO 815-1:2014

Compression set follows ISO 815-1:2014 with the exception of the test piece. Furthermore, the number of test pieces is two (2) instead of three (3).

Compression set at delivery control is done to verify the production process and is therefore always tested on different gasket items. The shape factor of the gasket is very important and must be considered carefully when evaluating the test result from compression set measurements. The duration of this test is always 22–24 hours unless otherwise is agreed upon in writing.

The compression is 25 ± 2 %.

Compression set reported in e.g. technical data sheets is done on typical standard gasket piece.

10.3 Length Measurements

A fixed steel ruler (with mm scale) shall be used for length measurements. The length is measured between marked positions. All moulds have to be modified with measuring dots according to well defined distances settled in the drawing complete with applicable tolerances. Gislaved Gummi has the freedom to do this mould marking by own initiative. Dimensions could also be verified by fit in plate if a pressed plate is available. All dimensions must be measured at standard laboratory temperature, 23 ± 2 °C according to ISO-23529:2017. Deviations from this might have large impact on length from thermal expansion.

10.4 Thickness Measurements

Test Instrument for thickness dimension shall be in conformity with item 3.2.1.1 in ISO 3302-1:2014. For correlations it is important to use same force (load) and foot size. This means that instruments such as sliding calipers may not be used.

The thickness shall be measured on a predefined number of measuring points according to length of gasket (c/c):

- < 1200 mm 10 locations
- ≥ 1200 mm 14 locations

11 Claims

11.1 General

Claims on products from Gislaved Gummi AB will be accepted only if they do not comply with specifications or standards. All claimed products shall always be returned to Gislaved Gummi AB, unless otherwise agreed. The exact terms are stated in the general conditions of sales.

11.2 Customer Complaint Report

A complaint report shall be sent to Gislaved Gummi AB, customer service by the customer together with the claimed parts unless otherwise is agreed. The address is gasket@gislavedgummi.com

The complaint report shall contain the following:

- Customer reference.
- Item number and description.
- PO specific information.
- Cause of rejection.
- Costs claimed.
- Information when Gislaved Gummi will receive the claimed parts.
- Batch number (control number).
- Mould number.

11.3 Actions

An acknowledgement of receipt and a date for scheduling of short-term actions will be sent to the customer within 24 hours after receiving the customer claim report.

A claim can be accepted either by agreement with the customer or after investigation by Gislaved Gummi AB. A credit note will be sent as quickly as possible after acceptance.

11.3.1 Short-Term Actions

Short term actions should include the following:

- Replacement/complement for the faulty delivery.
- Temporary changes in production.
- Check of stock.
- Follow up on next delivery, etc.

11.3.2 Long-Term Actions

Gislaved Gummi AB will send a non-conformity report with corrective actions to the customer within 20 working days or two weeks after receiving the claimed goods.

12 Deviation From This Document

All deviations from this document shall be registered for each customer as a supplement to the general conditions of sales.