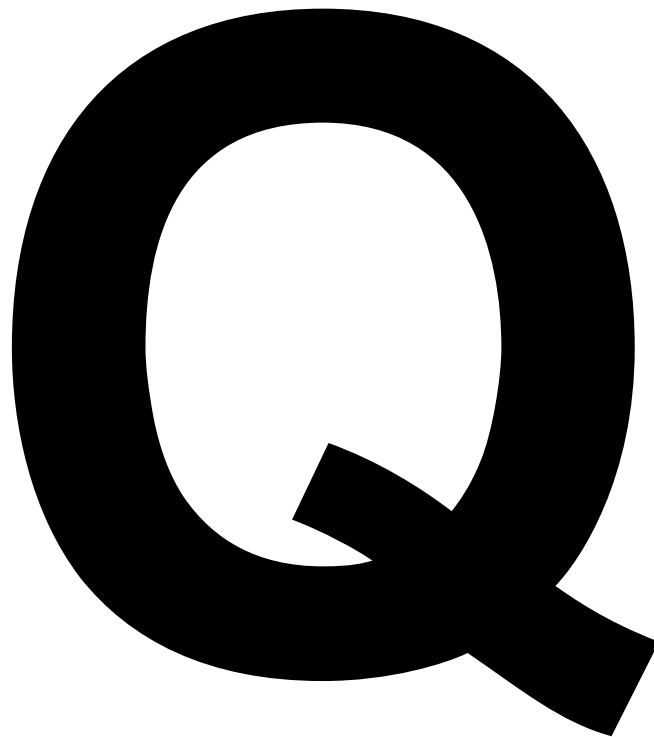




Technical Delivery Specifications



AVK HOLDING A/S

Dear supplier

In publishing this supplement, "Technical delivery specification for castings", we have tried to gather all the conditions applying to the supply of castings, other raw materials and components to the AVK Group. Our intention with this manual is to create a better communication, improving day-to-day working conditions for everybody.

Because of its clear definitions, this supplement will provide the individual AVK Departments with a simple and exact description for notification to the suppliers regarding faults and defects and required modifications which have been found through receiving inspection of the shipments.

AVK is an international organization with suppliers all over the world. Language often presents a problem - what is the English word for this and that. This supplement will eliminate the language barrier. In the supplement we have included all frequent errors and illustrated them by means of a series of photos. Each photo has a reference number which is to be used when communicating with the purchase department on quality issues.

Further, this supplement contains already known technical terms, handling and packing instructions etc.

We hope this supplement will be a good tool to everyone and we would like to know your opinion as a user. Also, if you would recommend any amendments in some fields.

Quality has to right first time and we hope this supplement will be a tool for this. Therefore, the objective for all of us must be to ensure

The right quality at the right time.

Kind regards

Arne Hjortshøj
Purchasing Manager AVK

Michael Christensen
Group Quality Manager AVK

REMARK:

This document is only for internal AVK use.

For our AVK selected supplier and deliveries into the AVK Group.

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 3 of 50
-------------------------------	------------------------------	-----------------------	--------------------------------	---------------------

Contents:

1.	Requirements	4
1.1	Castings	4
1.2	Coating	5
1.3	Materials	5
1.3.1	Nodularity	6
2.	Surface	6
3.	Casting defects	7
3.1	Defects on faces not to be machined	7
3.2	Defects on non-sealing faces	7
3.3	Defects on edges	8
3.4	Welding	8
3.5	Defects on sealing faces	8
3.6	Defects on faces to be machined	9
3.7	Part line deviations / mismatch /	9
3.8	Wall thickness	10
3.9	Subsurface material defects	10
4.	Machining allowance	11
5.	Quality inspection	11
5.1	Process of first Samples, approval and release for production	11
5.2	Process for running batch production (inside AVK Group)	12
5.3	Process for any raw casting materiel (out of AVK Group)	13
5.4	Inspection reports and certificates	13
5.5	Marking, identification and traceability	14
6.	Handling, storage and packing	14
7.	Rejection	15
8.	Purchase specification for new / replacement patterns	15
8.1	Ownership in pattern	15
8.2	Maintenance	16
8.3	Life of pattern	16
8.4	Identification	16
8.5	Purpose	16
9.	Responsibility and liability	16
10.	Confidentiality	16
	Non Conformity Report	17
	Defects (codes)	20
	Inspection certificate	48
	Sample Plan	49
	AVK Inspeition Form AVK	50

Scope and application

The aim of this Specification is to provide suppliers to the AVK Group with details of AVK requirements for metal castings. This Specification covers all AVK companies, collectively referred to as AVK. The requirements in this Specification shall be supplementary to the requirements specified on AVK drawings and in relevant documentation. AVK will apply these specifications as a basis for their inspection processes during receiving inspection and production. All castings in grey or ductile iron, steel or copper alloys are required to comply with this Specification.

Information contained in this Specification may be superseded by information on the purchase order.

In case of ambiguity or dubiety about the meaning or effect of this Specification questions should be referred to AVK.

Any requirement specified on the purchase order shall take precedence over this Specification.

1. Requirements

1.1 Castings

All castings supplied must meet the requirements in this Specification and must be in accordance with the relevant specifications stated on the order, drawing etc.

All castings supplied shall be free from contamination and impurities, surface imperfections & defects, porosities and other defects unless within agreed tolerance limits as specified herein.

Edges and corners should not be sharper than a radius of 3 mm.

The casting material and specification shall be as stated on the drawing (minimum specification). Alternative materials may only be used upon written permission from AVK or when specified on purchase order.

The castings shall conform to the dimensions and tolerances stated on the drawing. If tolerances are not stated on the drawing, they shall be to ISO 8062 CT9.

All castings shall be marked with date code, foundry identification mark and casting number (where applicable) to ensure traceability. The position of date code and casting number shall be agreed between AVK and the supplier, unless stated on the relevant drawing.

All castings shall be free from adhering or burnt-on sand and scale. They shall be well dressed and fettled and shot blasted to SIS 05 5900 SA 2 quality prior to coating.

No pitting, burnt-on sand, voids, porosity, indentations, weld splatter or other defects are acceptable. Surface profile shall be such as to enable a peak-to-valley height of between 50 m and 100 m after shot blasting. This is equivalent to a minimum standard of SIS 05 5900 SA 2 quality.

Where part lines exist that contain a step or flash, they shall be settled until they are smooth and blended in. The general profile of castings should be as smoothly contoured as other design considerations will allow. The maximum allowable mismatch, wall thickness variation and disposition of tolerances will be in accordance with ISO 8062 CT9.

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 5 of 50
------------------------	-----------------------	----------------	-------------------------	--------------

Failure to meet the above requirements shall be cause for rejection of the casting.

1.2 Coating

When specified on purchase order, the castings must be completely covered with one even coat of zinc phosphate primer, applied either by brush, spray or dipping. The paint should be allowed to dry for one hour before further handling.

1.3 Materials

The European Standards EN 1561: 2011 & EN 1563: 2011 replace National Standards & introduce new designations to describe the irons in common usage throughout the AVK group.

This data sheet provides a cross reference to the previous designations.

New CEN Standards		Old National Standards		US Equivalent Standards
	European	UK	Germany	USA
Grey Iron				
Standard	EN 1561 : 2011 (Grey Iron)	BS 1452 :	DIN 1691	ASTM A48
Grade Designation	EN-GJL-250	Grade 250	GG25	Class 35B
Ductile Iron				
Standard	EN 1563 : 2011 Ductile Iron	BS 2789	DIN 1693	ASTM A536
	EN-GJS-500-7	Grade 500/7	GGG50	80-55-06
Grade / Designation	No Direct Equivalent Use EN-GJS-450-10 EN-GJS-450-10	Grade 420/12	No Direct Equivalent Similar to GGG40 GGG40	65-45-12

- NB:
- (1) It is advisable to specify on AVK purchase orders that hardness should be maintained within the range HB160 - 210.
 - (2) BS EN 1561 does not apply to Grey Iron used for pipes and fittings according to Pr EN 877-1. - 5Rain water goods.
 - (3) BS EN 1563 does not apply to ductile irons used for pipes, fittings and accessories which are subject to:
 - BS EN 545** Ductile iron pipes, fittings and accessories, and their joints for water pipelines (requirements and test methods).

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 6 of 50
------------------------	-----------------------	----------------	-------------------------	--------------

BS EN 598 Ductile iron pipes, fittings and accessories, and their joints for sewerage applications (requirements and test methods).

BS EN 969 Specification for ductile iron pipes, fittings and accessories, and their joints for gas pipelines (requirements and test methods).

ISO 2531 Ductile iron pipes, fittings and accessories for pressure pipelines.

A draft standard Pr EN 1503-3 also is under development and will cover the additional requirements for irons for water shells etc. It should also include requirements resulting from the Pressure Equipment Directive.

Copper Alloy & Steels: To be as specified in AVK Purchase Order

1.3.1 Nodularity

Classification of ductile iron is given in EN ISO 945:2008.

Nodularity shall not be less than 80%, nodular shape shall be form V or VI.

2. Surface

To ensure compliance with international standard and AVK customers' requirements in respect to corrosion protection, fitness for purpose and performance and to ensure high-quality end-product surface finish the following requirements must be met:

1. Internal and external surfaces shall have a surface finish as follows:
Ra = 25-50 m and 50-100 m for hand moulding.
2. Thin and/or sharp flashes and burrs must be ground off;
3. Cavities or flashes from core joints are unacceptable.
4. All surfaces shall be free from adhering sand and other impurities.
5. Feeder in-gates on machined surfaces shall not be higher than 3 mm.

3. Casting defects

3.1 Defects on faces not to be machined

3.1.1 The maximum acceptable number of single defects as described below (fig. 3.1.1) must not exceed 5 per 25 cm²

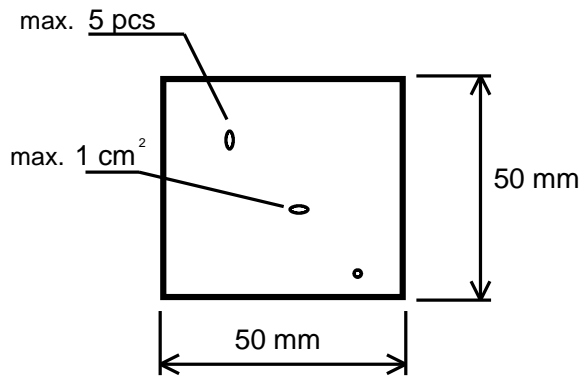


fig. 3.1.1

3.1.2 Spacing between defects must not be less than 5 mm.

3.2 Defects on non-sealing faces

3.2.1 For non-sealing faces, defects within limits listed below will normally be acceptable, subject to agreement by AVK:

Category of casting defect	Pressure-carrying walls	Non pressure-carrying walls
Max. cavity depth	0.75 mm *	1.00 mm
Max. rise height	0.75 mm	0.75 mm
Max. Size	1.00 cm ²	1.00 cm ²

* Specified wall thickness must not be reduced.

3.2.2 Spacing between defects shall be not less than 5 mm. Defective areas shall be ground smooth and be free from sharp edges.

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 8 of 50
------------------------	-----------------------	----------------	-------------------------	--------------

3.3 Defects on edges

3.3.1 For edges not connecting with sealing faces, defects within limits listed below will normally be accepted subject to agreement by AVK:

Size: max. depth 2.0 mm, max. length 20.0 mm 2.0 20.0
--

Repair of casting defects on edges by grinding will normally be accepted, subject to agreement by AVK, if perfect surface is obtained. Grinding area shall not exceed above dimensions without prior agreement by

3.3.2 For edges connecting with sealing faces, defects within limits listed below will normally be accepted subject to agreement by AVK:

Size: max. depth 1.0 mm, max. length 15.0 mm 1.015.0

3.4 Welding

3.4.1 From supplier (raw casting) into our OC's:

1. Ductile iron
 - a. Repair of casting defects by welding or Iron Kit will not be accepted on ductile or grey iron.
 - b. AVK do not accept welding repair on raw casting (delivered by external supplier).
2. For Fitting we will comply standard DS/EN 545 – this standard allows minor level of welding. Local work instruction (repair plan) shall be available and shall describe detailed condition for welding and acceptance.
3. For Steel we will comply to standard DS/EN10213.
 - a. Welding on steel castings may be accepted provided the repair is at least 30 mm from cutting area for machining.
 - b. Weld repairs on steel castings shall be leak-tight under hydrostatic pressure of at least 1.5 x the maximum working pressure of the equipment.

3.5 Defects on sealing faces

3.5.1 For sealing faces defects within limits listed below will be accepted subject to agreement by AVK:

Category of casting defect	Sealing face
Max. cavity depth	0.2 mm
Max. protrusion height	0.2 mm
Max. size	1.0 cm ²

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 9 of 50
------------------------	-----------------------	----------------	-------------------------	--------------

3.5.2 Spacing between defects shall be at least 10 mm. Defective areas must be smooth and free from sharp edges.

Repair of casting defects by grinding will be accepted provided perfect castings are obtained. Grinding must not exceed the requirements of all clauses in section 3 of this Specification and the sealing face must remain intact. Additional grinding shall not be carried out without the prior agreement of AVK.

Where recesses are cast for the purpose of accepting a seat ring or other components, *without further machining*, the surface finish shall be uniform and free from protrusions or other defects that could interfere with good sealing or location. This shall also apply to "O" ring grooves cast in bonnets, etc. No steps at any core box "part line" can be accepted.

3.6 Defects on faces to be machined

3.6.1 Cavities of any form which disappear during machining are acceptable.

3.6.2 Solid protrusions or peaks of any kind within machining allowance as specified under section 4 are acceptable.

3.7 Part line deviations / mismatch /

3.7.1 Mould mismatch

Shall not exceed the relevant tolerance given in ISO 8062: 1994 (E) CT 5, table 1.
Grinding off mismatch must produce an even and smooth joint.

3.7.2 Core deviation

Shall not exceed the relevant tolerance given in ISO 8062: 1994 (E) CT 4, table 1, except for sealing faces, where the accepted deviation shall not exceed + or - 0.3 mm.
Smoothing / leveling of core deviations on sealing faces must be done with great care.

3.7.3 Foam production

3.7.3.1 Mismatch on flange (raw material)

For some foam casting materiel – there can be some mismatch on flanges.
When this occurs, the following must be complied with:

1. Mismatch must not exceed > 0.5 mm (before shot blasting)
2. The foot shall always be flat (pattern draft accepted)
3. The finished product after shot blasting and coating) must not have a sharp edge on the flange



Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 10 of 50
-------------------------------	------------------------------	-----------------------	--------------------------------	----------------------

3.7.3.2 Material Mismatch (on back)

1. Mismatch on back - edges after shot blasting and coating may be visible - but may not be sharp. Those marks/areas are accepted (and not seen as a reject “mismatch”).



3.8 Wall thickness

- 3.8.1 Wall thickness shall not vary greater than the allowable tolerance specified in ISO 8062: (E) CT 11, table 1.

3.9 Subsurface material defects

Included shrinkage cavities and holes will not normally be accepted. However, where the casting thickness exceeds the normal shell wall thickness, then provided the area is not required to be machined, internal shrinkage which has no detrimental effect on the strength or leak tightness can be accepted.

If included cavities and porosities are found in castings after machining or in pressure testing to an extent affecting density and/or strength, the castings will be rejected. In such circumstances AVK reserve the right to reject all castings from the same foundry production batch.

4. Machining allowance

The material to be removed by machining shall not exceed 7 mm (see fig. 4.1) or the limits specified in table 4.1.

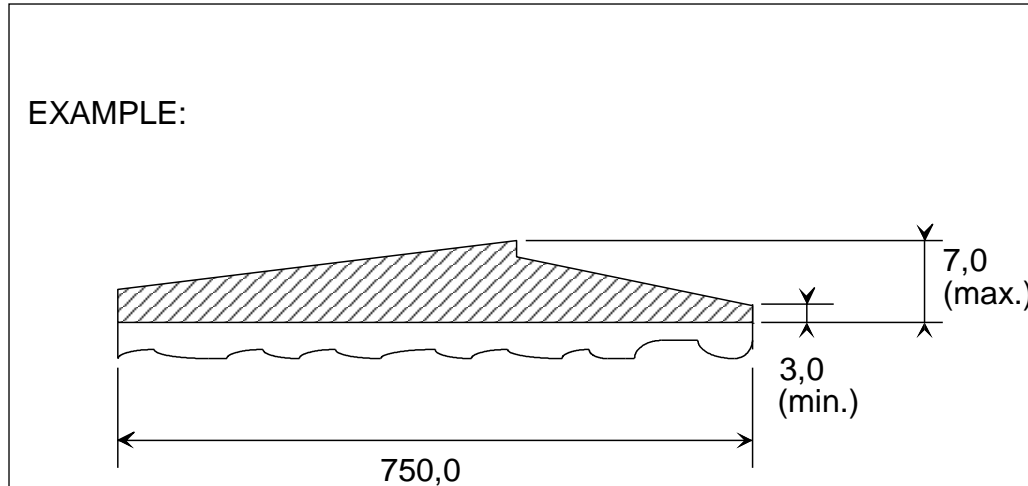


fig. 4.1

Table 4.1 4.1

Maximum length or width	Minimum mm	Maximum * mm
0 - 50 mm	1.5	2.5
51 - 100 mm	1.5	3.0
101 - 200 mm	2.0	4.0
201 - 500 mm	2.5	5.0
501 - 1.000 mm	3.0	7.0

* Maximum allowance includes:
casting draft, mismatch, inlet gates, flash etc.

5. Quality inspection

5.1 Process of first Samples, approval and release for production

5.1.1 When new pattern equipment is laid down or renewed, test samples will be required by AVK. With the order for test samples AVK will enclose drawing, measuring record for casting and, if machining is to be carried out by the supplier, inspection form for machined part.

5.1.2 When the supplier has notified AVK that the test samples are ready, a preliminary measuring and inspection will be carried out by AVK inspection staff stationed near the supplying foundry, where possible. This inspection and measuring aims at excluding the worst and immediately measurable or visually detectable faults. Upon release of test samples by local inspection staff, the samples shall be forwarded to the AVK facility in question.

Certification according to clause 5.3 must be included.

5.1.3 The Quality Department at the AVK facility in question will measure and inspect the sample. Subsequently the sample will be machined (if not delivered in machined condition); coating will be carried out and then final assembly and pressure testing conducted.

5.1.4 The outcome of this process will be reviewed by the Quality Assurance Department and a report to the supplier will be issued in co-operation with the purchaser responsible at the AVK facility in question. Copies of the report will be sent to the supplier and in some circumstances to the Quality Assurance Department at Customer. The sample may then either be released for trial batch production or it may be rejected.

5.1.5 If the sample is released for trial batch production, AVK will order a suitably sized batch. If the sample has been rejected, the seriousness of the fault / faults will be evaluated and if the fault is minor, the sample may be approved for trial batch production. The fault must be corrected before the next shipment. If the fault is major, a new sample will be requested from the supplier.

5.1.6 The trial batch will be delivered to the future production site, where the Quality Department will carry out an extended receiving inspection, i.e. all functional dimensions will be measured and the castings will be inspected visually. If any difference from the drawing or original sample is found, and the difference is essential for the finished item, the Quality Assurance Department at the AVK facility in question will review the matter and the supplier will be notified of their conclusion and where applicable, AVK local inspection staff will receive copies of this notification. If no differences are found or if the differences are not essential or crucial to the finished product, trial batch documents will be prepared and will follow the production order through the production process.

5.1.7 The trial batch follow-up form will follow the production order documents through the production process in the AVK facility in question until the item has been finished satisfactorily. After each operation, the AVK operator will add his comments for each individual operation on the trial batch follow-up form.

5.1.8 Upon completion of the production process, the comments on the trial batch documents will be reviewed by the Quality Assurance Department, who will prepare a report for the supplier. If there are no comments, the casting will be released for batch production and the supplier will be notified; the Quality Assurance Department at Customer will receive copies of this Release Notification.

5.1.9 After release for batch production orders can be placed. After test samples have been approved and released for production by AVK, their function, look, quality and material and the production methods applied must not be changed without the prior written consent of the approval of any test samples by AVK shall not reduce the liability for warranty by the supplier. All cases of non-conformance with the specifications supplied by AVK shall be notified to AVK prior to any delivery with a view to obtaining a concession. Delivery, if any, shall be made separately and shall bear a note of the concession granted.

5.2 Process for running batch production (inside AVK Group)

The supplier must ensure that finished goods complies to AVK specifications and the previously approved sample.

5.2.1 Subsequent continual receiving inspection will be carried out by the AVK Quality Assurance Department and any comments on faults will be forwarded to the individual suppliers (Claim report); see also clause 7 of this Specification. Care shall be taken to ensure that descriptions are as clear and adequate as possible, supported by sketches or markings on drawings if needed. In order to prevent any misunderstandings, the Casting Defect Reference Master will be used as general illustration in the claim report. In case of major differences or substantial faults, the purchaser responsible at AVK and the Logistics Department will be advised and provided with copies of the report.

5.2.2 Batch production quality inspection. The supplier must ensure that the finished castings comply with AVK specifications. AVK representatives may visit suppliers to check pattern equipment prior to production and to inspect castings prior to shipment. AVK will focus on this inspection activity in order to reduce rejection and complaint rates.

AVK shall be entitled to inspect the production at the facilities of the supplier, to have samples taken and to make other appropriate tests at the supplier's. The scope of sampling and the inspection time shall be agreed with the supplier.

The supplier shall, free of charge, replace, rework or repair any defective goods delivered or shade fray any expenses incurred by AVK in connection with the adjustment of any such defect goods delivered or faulty delivered subject to proper notification and agreement by the supplier.

AVK shall notify the supplier before reworking any defective goods delivered. Upon approval by the supplier such adjustment shall be made at the expense of the supplier. AVK has the right to make the decision on the best and most economical solution. In the case of defective goods delivered or faulty deliveries, the supplier shall refund to AVK the freight expenses of AVK, and upon proper notification and agreement by the supplier, the supplier shall further defray the return freight in case of a return of goods.

5.3 Process for any raw casting materiel (out of AVK Group)

For any raw casting materiel that may go out of the AVK group (after machining or other material handling) AVK will only measure drawing marked "Critical dimension" – using work instruction for identification and inspection of Critical dimension.

See AVK Q-document 03.160 "Critical dimension inspection".

It recommend to progress one Quality agreement with external customer to agree condition for any delivery of raw casting material.

5.4 Inspection reports and certificates

5.4.1 Certificates

Material certificates complying with EN 10204 3.1, shall be available on all items, which acc. to the drawings, are marked with melt date.

Material certificates shall be uploaded to AVK SharePoint.

5.4.2 Material Certification

When required, and requested prior to manufacture, suppliers shall submit material certification for castings or other material/components supplied to AVK. This certification shall include mechanical, physical and chemical properties of the material supplied.

When required this certification shall comply with DIN 50049 / EN 10204 - 3.1.

Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 14 of 50
------------------------	-----------------------	----------------	-------------------------	---------------

5.4.3 All samples from new, corrected or refurbished patterns shall be supplied with 100% dimension inspection reports according to the measuring record. Such samples shall be packed separately and bear proper markings on the packing (samples, order no., etc.).

5.5 Marking, identification and traceability

5.5.1 All items must be marked clearly with all information shown on the relevant piece part drawing. The lettering must be legible and have no sharp corners.

5.5.2 When required the casting date shall be positioned on the casting below the AVK reference no. of the supplying foundry, or according with drawing specification.

The format shall be as the following example: **01H20**

01 = 2001 ek.	01=2001
H = 8th month = August	H=8=8
20 = date cast	20=

Letters / numbers shall be 10 mm high x 5 mm wide raised min. 1.5 mm above surface level.

When a foundry operates their own cast dating system, this may be used in preference to the above provided AVK are provided with any information required to recognize the cast date.

6. Handling, storage and packing

6.1 All castings are to be handled, stored and packed in such a way that each casting is prevented from causing damage to itself or another casting which would have a detrimental effect to its performance. Each package must bear quantity, AVK part no., description, supplier name, date and purchase order no.

6.2 All shipments must comply to such technical requirements and other rules and instructions as are stated on the relevant order. The supplier shall be liable for any costs or damage inflicted upon AVK as a consequence of any non-observance of such rules and instructions on the part of the supplier.

6.3 All consignments shall be delivered on approved EURO pallets (1200 mm x 800 mm), According to DS/EN 13545, and AVK specification for pallets and Frames.

Maximum weight on each pallet shall not exceed 1000 kg. Frames must be used; max. 5 frames per pallet. The last frame shall cover the castings in such a way that further pallets can be placed directly on top of the first pallet.

Metal bands shall be secured around each pallet and frame assembly. All pallets shall have a label affixed showing item no. and quantity. Any necessary repacking of the castings on pallets will be invoiced by AVK to its supplier at current hourly wage rate.

6.4 If the above is not observed, the castings will be returned at supplier's cost. Furthermore, any costs incurred by AVK production will be invoiced to the supplier.

7. Rejection

7.1 In case of rejection, the supplier will receive a claim report from AVK and is required to reply immediately. The claim report will give the supplier details of the rejected items, such as position of defect(s) and type of defect according to Castings Defects Reference Master.

AVK

Procedure for handling of NCR Material: NCR

- I. The supplier/foundry has 7 days to decide on the following options:
 - A: Accept or rejection based on the NCR report
 - B: Accept or rejection of cost for rework at the plant at AVK.
 - C: Accept or rejection based on sample of NCR Material
 - D: Return of hole batch of NCR Material for rework by the supplier
- II. AVK cannot rework or scarp NCR Material during the above mentioned period. If this should happen by mistake or otherwise the supplier/foundry cannot be held responsible for this, and AVK cannot claim compensation.
- III. Should the supplier wish to have a sample of the NCR Material, AVK has to deliver samples in the fastest possible way. The supplier then has 7 days to accept or reject after receiving the NCR Material.
- IV. If the supplier doesn't respond within the above mentioned time frame, AVK can scarp or rework the material and still claim compensation

7.2 Each supplier will receive monthly rejection reports when necessary (page 18) specifying number of castings rejected for specific items; specification of defects (Castings Defects Reference Master No. NX).

These reports will be the basis of financial settlements with the supplier. The supplier may request that rejected castings be returned to him (at his cost) or may visit AVK to verify rejections. The Castings Defects Reference Master will be a key instrument in the communication with the supplier.

The pictures illustrate the most frequent faults and defects, found by AVK production world-wide. Therefore the illustrations and numbers constitute the reference material everyone in the AVK Group shall refer to in their claim reports and monthly reports to the suppliers.

8. Purchase specification for new / replacement patterns

8.1 Ownership in pattern

AVK shall enjoy full ownership and title in all patterns purchased and shall have the right to withdraw the pattern from the possession of the supplier at any time.

8.2 Maintenance

The supplier shall be responsible for all maintenance of patterns. Routine maintenance of the pattern is to be provided free of charge by the supplier assuming the pattern remains in the uninterrupted possession of the supplier.

The supplier shall guarantee that the complete pattern, including any loose items, will produce components in accordance with drawings specified on the pattern order.

8.3 Life of pattern

All patterns shall have a guaranteed life as agreed between the supplier and AVK and as detailed on the order. This is the expected life before AVK would be liable for any cost associated with major repair or refurbishment, assuming the pattern remains in the uninterrupted possession of the supplier.

8.4 Identification

Patterns are to be permanently marked "Property of AVK" and are to include the part numbers of components produced by the pattern together with supplier's serial number.

The supplier is to maintain full records of quantities produced from the pattern and any maintenance carried out on the pattern. Each pattern must have a number and if there are more than one pattern of the same item in the moulding equipment, the patterns must bear consecutive numbering (e.g. 1-2-3-4).

8.5 Purpose

Castings produced for AVK are generally pressure-containing parts and shall be free of contamination and impurities, surface imperfections, porosity or other defects.

Castings supplied may be subjected to a pneumatic or hydraulic pressure test at AVK works, after assembly.

Failure to meet specified requirements will result in components being rejected.

8.6 Specification

All components supplied from the pattern shall be in full accordance with the specification requirements. Application for concessions shall be made in writing to the AVK ordering company.

9. Responsibility and liability

When orders are placed for pattern equipment, the supplier shall take full responsibility for the design and manufacture of the pattern. However, AVK shall be consulted on the pattern design as the assembly and performance of the finished product may be affected. The position of ejector pin marks, the avoidance of split lines in critical areas and porosity are of paramount importance.

The supplier shall take full responsibility for the selection of size and output rate of the manufacturing process to meet AVK production requirements. AVK shall supply all necessary technical documentation and is responsible for the design & construction and retains the ownership of the Intellectual Property Rights in the equipment, designs and specifications etc.

10. Confidentiality

All aspects of the design of the product and production methods disclosed by AVK are strictly confidential and AVK's competitive position shall be protected at all times. The supplier shall ensure that any

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 17 of 50

subcontract suppliers maintain this confidentiality. They must not be disclosed to or used by any person within the organization of the supplier other than such persons as are involved in the production of goods for delivery to AVK. Without the consent of AVK in writing, the supplier must not advertise or in any other way make public that he is supplying castings to, or has entered into any agreement for the supply of castings to AVK. The supplier does not have any rights to dispose of the pattern, transfer the pattern to another supplier or permit the pattern to be used for any other purpose without AVK's express permission in writing.

Note: This is supplementary to any instructions on specific casting drawings. In event of any dubiety or contradiction between instructions on drawings and this standard, the supplying foundry shall be responsible for obtaining clarification from AVK before proceeding.

ENCLOSURES:

Non Conformity Report

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 18 of 50

Non Conformity Report

页码, 1/2

GENERAL			
Scenario	China Supplier	Status	Started
Number	01490	Created on	09-07-2015 09:17:34
Parent		Start date	09-07-2015 11:02:19
Created by	Niels Martin Jørgensen [nijo]	Created by company	AVK International A/S
Modified on	27-07-2015 11:26:21	Modified by	Stella Peng [stpe]

ATTACHMENTS						
PICTURES						
	D5C02265.JPG	D5C02266.JPG	D5C02267.JPG	D5C02268.JPG	D5C02269.JPG	D5C02270.JPG

SUPPLIER	
Number	7006
Name	Wujang Union Casting Co., Ltd.
Address	Union Village Melyang Town Wujang City CN
Phone	
E-mail	

OTHER			
Department	AVK DK - BST 2	Internal source of discovery	2
Internal source of discovery	2	Internal source of discovery (person)	jrn
Item	554527391		
Description	90 GR. PL/PL BOND UNCO. DND60		
Product series	PARTS		
Receiver	<input type="text" value="Niels Martin Jørgensen"/>		
Customer order number		Order number	
Purchase order	p209667	Serial number	
Heat number	50436	Total batch quantity	100
Quantity of rejected	100	Quantity of scrapped	0
Failure group	2 Not machined properly		
Failure	2C: Not machined, missed operation		
Failure detailed description	Bad chamfering. 槽角不干净		
Expected date of response	Bad chamfering, 槽角不干净		
Root cause	14-07-2015 11:02:19		
Credit note schedule		Credit note invoice	
Supplier response date	07-08-2015	Concession	
Item type	3. Raw material / purchased part		

CORRECTIVE/PREVENTIVE ACTIONS			
Action	Responsible	Executed	Date
Concession	<input type="text"/>		
Returning to supplier	<input type="text"/>		
Next supply will be checked	<input type="text" value="Michael Nielsen"/>		13-07-2015
Re-invoicing to supplier	<input type="text"/>		
Written response from supplier	<input type="text" value="Jens Christensen"/>		

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 19 of 50

Non Conformity Report

页码, 2/2

To be scrapped	<input type="text"/>		
To be renovated	<input type="text"/>		
Returning to stock	<input type="text"/>		
Raw materials stock is checked	<input type="text"/>		
Component stock is checked	<input type="text"/>		
Goods in production are checked	<input type="text"/>		
Stock of finished goods is checked	<input type="text"/>		
Customer stocks are checked	<input type="text"/>		
Adjustment of moulds	<input type="text"/>		
Change of construction	<input type="text"/>		
Change of drawing/specification	<input type="text"/>		
Instruction of staff	<input type="text"/>		
Change of process/procedure	<input type="text"/>		
Inspection/repair of machines	<input type="text"/>		
Other things 1 Received goods checked	<input type="text" value="Peter Najmans"/>		08-07-2015
Received goods checked			
Other things 2	<input type="text"/>		

Deadline for

corrective/preventive actions

Corrective/preventive action 13.07.15/MIN

notes

The incoming inspection level was changed from reduced to tightened. There is made a comment in the nota field on the pallet note.

13.07.15/MIN The incoming inspection level was changed from reduced to tightened. There is made a comment in the nota field on the pallet note.

COSTING

Estimated cost	0,00	Additional cost	0,00
Claim cost	0,00	Standard cost of NC item	0,00
Direct labour cost	0,00	Total item cost	0,00
Total labour cost	0,00	Total NC cost	0,00

Defects (codes)

- 1A: Not coated properly: holiday in coated surface
- 1B: Not coated properly: run in coated surface
- 1C: Not coated properly: coating mask not used
- 1D: Not coated properly: excessive coating
- 1E: Not coated properly: failed holiday free test
- 1F: Not coated properly: chipped
- 1G: Not coated properly: wrong color
- 1H: Not coated properly: color bleed
- 1I: Not coated properly: over spray
- 1J: Not coated properly: blast media not cleaned out before coating
- 1K: Not coated properly: debris in coating
- 1L: Not coated properly: old coating not removed
- 1M: Not coated properly: out gassing
- 2A: Not machined properly: hole not drilled
- 2B: Not machined properly: hole not tapped

Document no. 03.061	Process owner MICH	Revision 03	Date made 24.08.2015	Page 21 of 50
-------------------------------	------------------------------	-----------------------	--------------------------------	----------------------

- 2C: Not machined properly: not machined, missed operation
- 2D: Not machined properly: not machined parallel
- 2E: Not machined properly: not to print requirements, too big
- 2F: Not machined properly: not to print requirements, too small
- 2G: Not machined properly: chatter on machined surface
- 2H: Not machined properly: surface too rough
- 2I: Not machined properly: hole in wrong location
- 2J: Not machined properly: chucked off center
- 2K: Not machined properly: broken tap
- 2L: Not machined properly: rough grinding
- 3A: Failed pressure test two times: A1 dimension out of tolerance
- 3B: Failed pressure test two times: B1 dimension out of tolerance
- 3C: Failed pressure test two times: core shift at parting line
- 3D: Failed pressure test two times: parting line gap
- 3E: Failed pressure test two times: excess material
- 3F: Failed pressure test two times: lack of material

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 22 of 50

- 4A: Cracked or broken casting:
- 4B: Cracked or broken part:
- 5A: Stripped threads: bolts
- 5C: Stripped threads: bolt hole
- 5E: Stripped threads: other
- 6A: Bad casting: lack of material, poured short, metal bleed
- 6B: Bad casting: excess material, scap / swell / sag / erosion of mold
- 6C: Bad casting: cold shut, rat tail or misrun
- 6D: Bad casting: sand fall-out, drop
- 6E: Bad casting: cast to wrong dimension
- 6F: Bad casting: excessive chilling, hard spots
- 6G: Bad casting: pattern cracking, fin, vein
- 6H: Bad casting: core shift
- 6I: Bad casting: cope and drag shift
- 6J: Bad casting: inclusion, dirt / sand / slag etc.
- 6K: Bad casting: poor chemistry

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 23 of 50

- 6L: Bad casting: hot tears
- 6M: Bad casting: rough surface / bad marking
- 6N: Bad casting: excess material, sand sticker
- 6O: Bad casting: warped
- 6P: Bad casting: gap, core fin not removed or not cleaned
,
- 6Q: Bad casting: run out, weak core
- 6R: Bad casting: welded
- 6S: Bad casting: core improperly set
- 6T: Bad casting: wash
- 6U: Bad casting: blow holes
- 6V: Bad casting: mismatch
- 7A: Porosity: minor
- 7B: Porosity: moderate
- 7C: porosity: major
- 8A: Thorn: gasket
- 8B: Thorn: O-ring

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 24 of 50

8C: Thorn: other

9A: Improper set-up: machining center

10A: Damage: during packing or handling

11A: Incorrect packing: between pallets

11B: Incorrect packing: pallet and frames

11C: Incorrect packing: in box

Painting defects

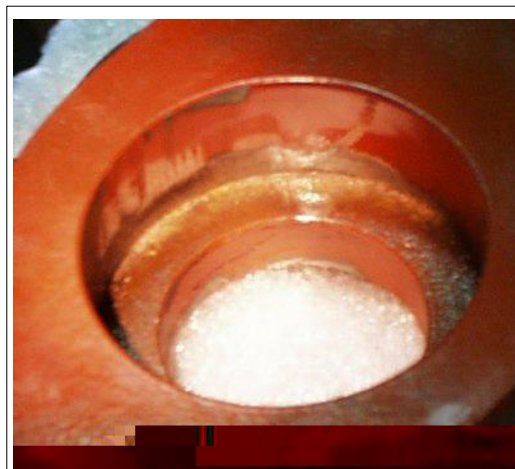
1A:
holiday in coated surface



1B:
run in coated surface



1C:
coating mask not used



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

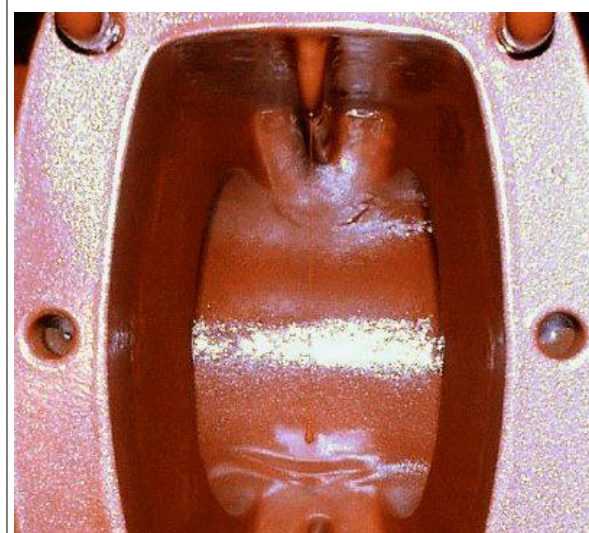
Process owner
MICH

Revision
05

Date made
09.06.2021

Page 26 of 50

1D:
excessive coating



1E:
failed holiday free test

NO PHOTO

1F:
chipped



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 27 of 50

1G:
wrong color



1H:
color bleed

NO PHOTO

1I:
Over spray



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 28 of 50

1J:
blast media not cleaned out before coating



1K:
debris in coating



1L:
old coating not removed



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 29 of 50

1M:
out gassing



Machining Defects

2A:
hole not drilled



2B:
hole not tapped

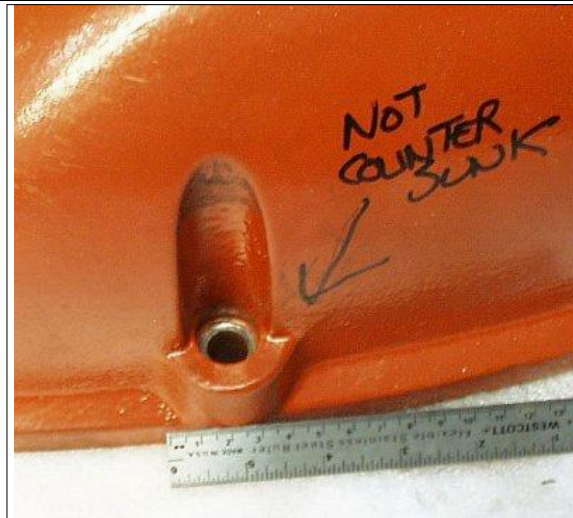


TECHNICAL DELIVERY SPECIFICATION

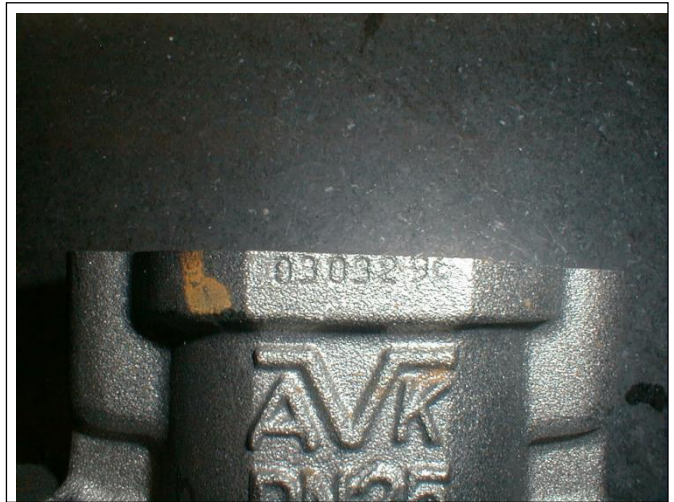


Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 30 of 50
------------------------	-----------------------	----------------	-------------------------	---------------

2C:
not machined, missed operation



2D:
not machined parallel



2E:
not to print requirements, too big



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
03

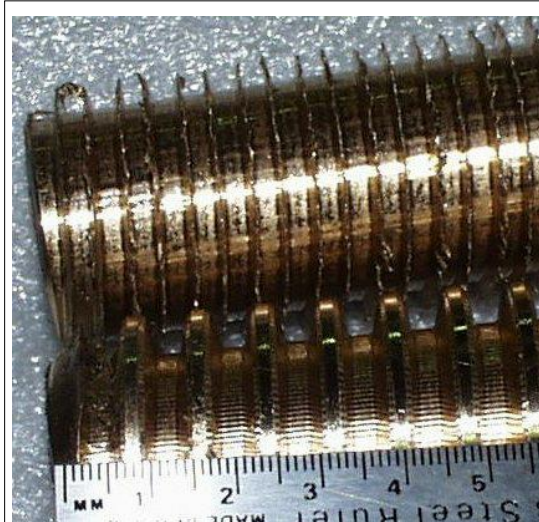
Date made
24.08.2015

Page 31 of 50

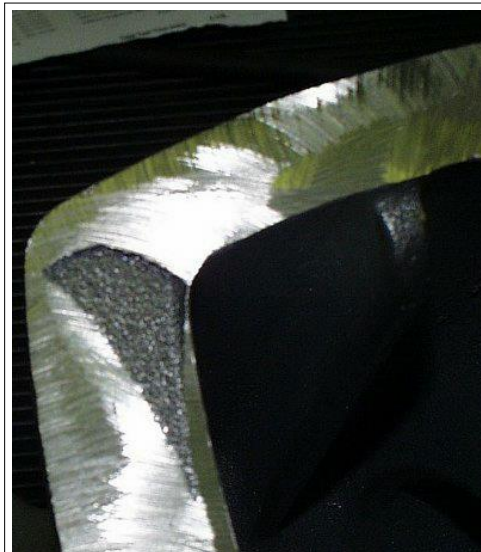
2F:
not to print requirements, too small



2G: chatter on machined surface



2H:
surface too rough



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

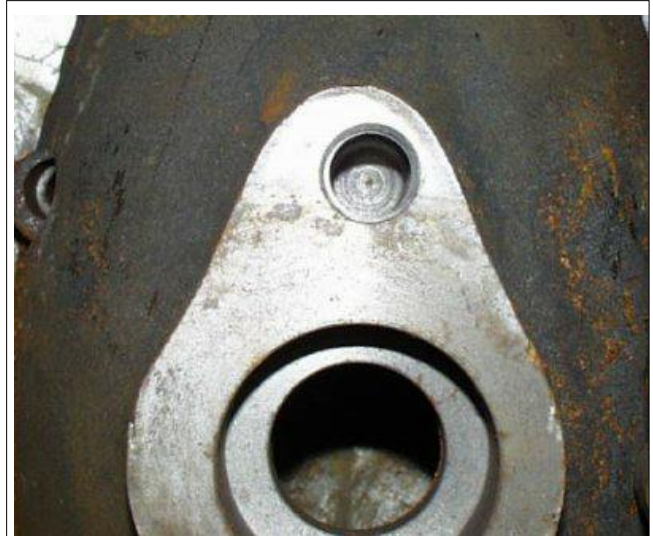
Process owner
MICH

Revision
05

Date made
09.06.2021

Page 32 of 50

2I:
hole in wrong location



2J:
chucked off center



2K:
broken tap



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 33 of 50

2L:
rough grinding



Failed pressure test:

3A:
A1 dimension out of tolerance

NO PHOTO

3B:
B1 dimension out of tolerance

NO PHOTO

3C:
core shift at parting line

NO PHOTO

3D:
parting line gap

NO PHOTO

3E:
excess material

NO PHOTO

3F:
lack of material

NO PHOTO

Cracks

4A:
Cracked or broken casting



4B:
Cracked or broken part



Stripped threads

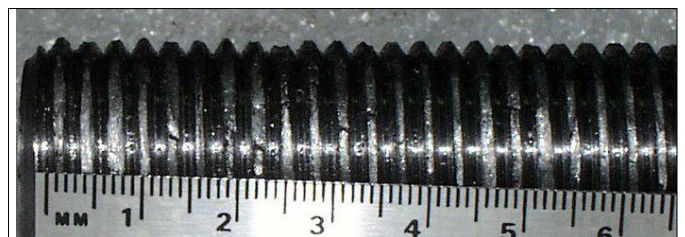
5A: Stripped thread :bolts



5B:
bolt hole



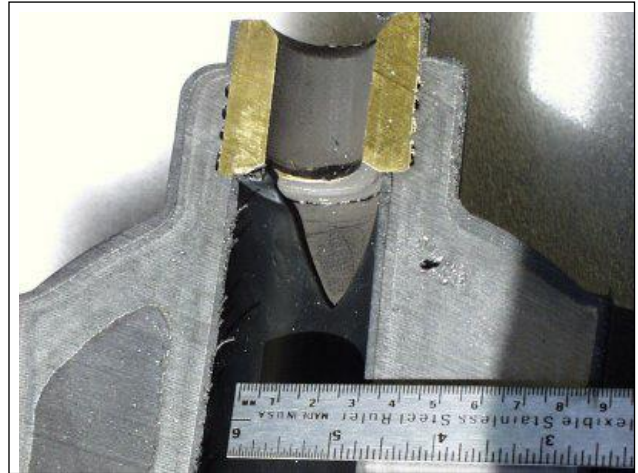
5C:
Other



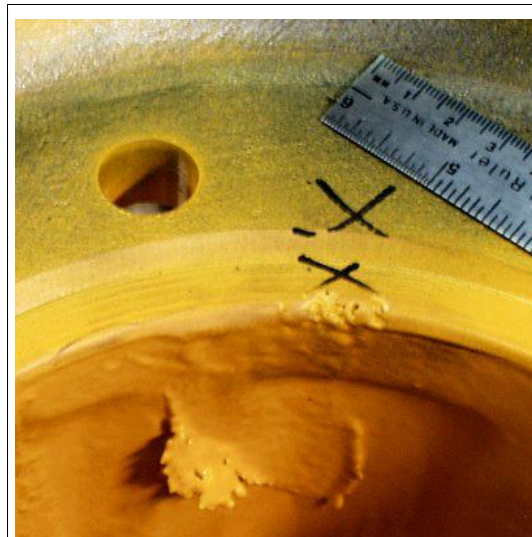
Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 36 of 50
------------------------	-----------------------	----------------	-------------------------	---------------

Casting defects

6A:
lack of material, poured short, metal bleed



6B:
excess material, scap / swell / sag / erosion of mold



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 37 of 50

6C:
cold shut, rat tail or misrun



6D:
sand fall-out, drop



6E:
cast to wrong dimension



6F:
excessive chilling, hard spots



6G:
pattern cracking, fin, vein

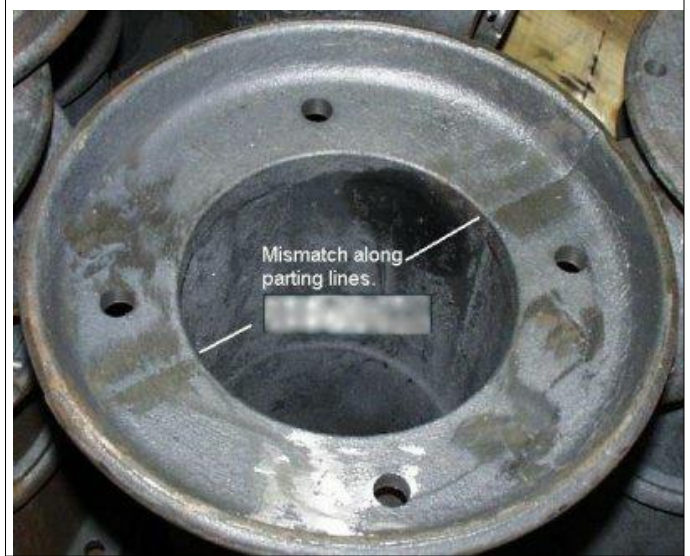


6H:
core shift

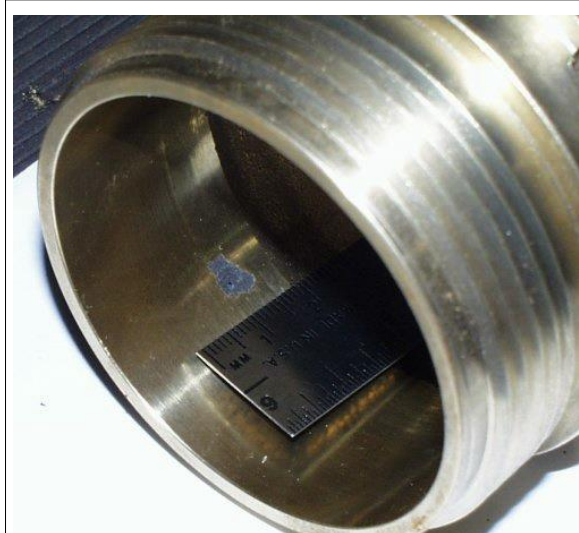


Document no. 03.061	Process owner MICH	Revision 03	Date made 24.08.2015	Page 39 of 50
------------------------	-----------------------	----------------	-------------------------	---------------

6I:
cope and drag shift



6J:
inclusion, dirt / sand / slag etc.



6K:
poor chemistry

NO PHOTO

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 40 of 50

6L:
hot tears

NO PHOTO

6M
rough surface / bad marking



6N:
excess material, sand sticker



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 41 of 50

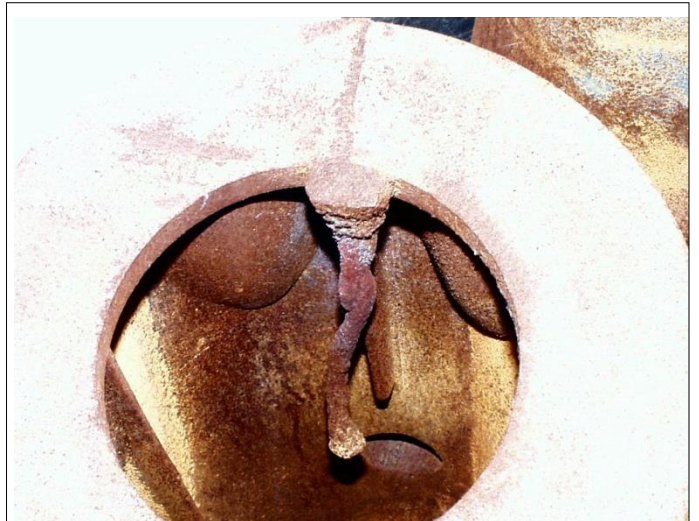
6O:
warped

NO PHOTO

6P:
gap, core fin not removed or not cleaned



6Q:
run out, weak core



TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 42 of 50

6R:
Welded



6S:
core improperly set

NO PHOTO

6T:
Wash



Document no.
03.061

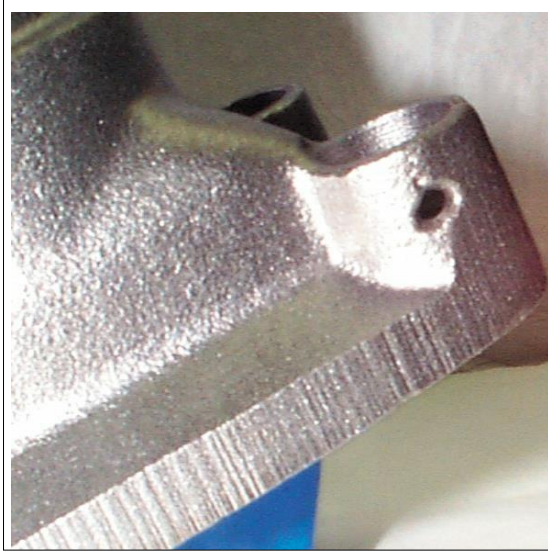
Process owner
MICH

Revision
03

Date made
24.08.2015

Page 43 of 50

6U:
blow holes



6V:
mismatch



Porosity

7A:
Minor

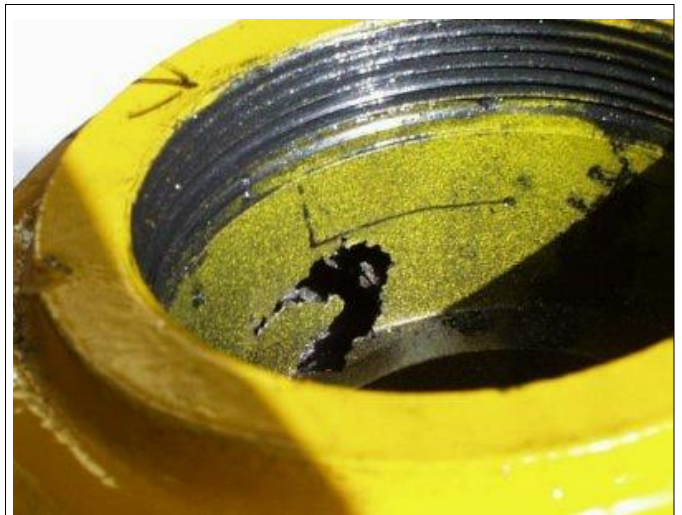


Document no. 03.061	Process owner MICH	Revision 05	Date made 09.06.2021	Page 44 of 50
------------------------	-----------------------	----------------	-------------------------	---------------

7B:
Moderate



7C:
Major



Torn:

8A:
Gasket



Document no.
03.061

Process owner
MICH

Revision
03

Date made
24.08.2015

Page 45 of 50

8B:
o-ring

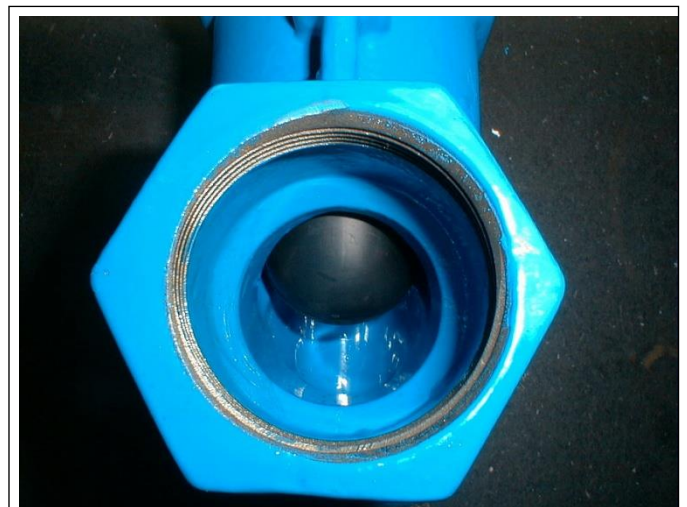


8C:
Other



Improper set-up

9A:
machining center

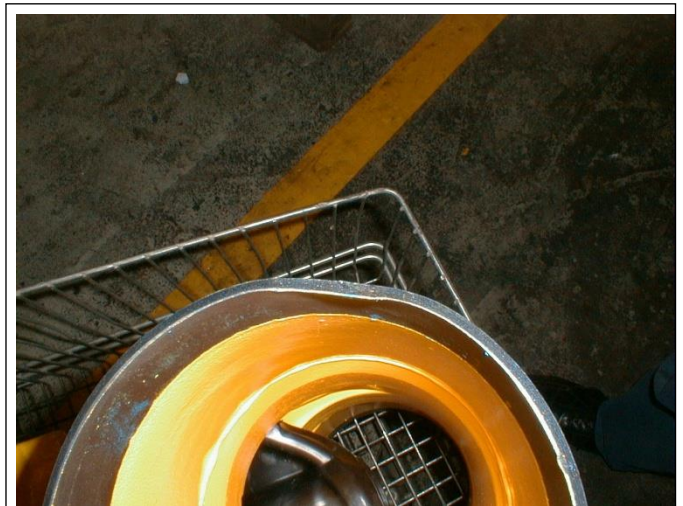


Damage

10A:
Packing



10B:
Drop



Incorrect Packing

11A:
between pallets



11B:
pallet and frames



11C:
in box



Inspection certificate

XXXXXX Foundry Co., Ltd

Material TEST CERTIFICATE

PRODUCT: xxx		Certificate No: xxx	
MATERIAL: xxx		Melt Number: xxx	
TECHNICAL SPECIFICATIONS OR STANDARDS: xxx		QUANTITY: xxx	
CUSTOMER: xxx		PURCHASE ORDER NO.: xxx	
MECHANICAL PROPERTIES	SPECIFICATIONS		RESULTS
	Minimum	Maximum	
TENSILE STRENGTH (Mpa)	xxx		xxx
YIELD STRENGTH (Mpa)	xxx		xxx
ELONGATION IN ZIN (%)	xxx		xxx
HARDNESS (HB)	xxx	xxx	xxx
CHEMICAL COMPOSITION	SPECIFICATIONS		RESULTS
	Minimum	Maximum	
C (%)			xxx
Si (%)			xxx
Mn (%)			xxx
S (%)			xxx
P (%)			xxx
Re (%)			xxx
Mg (%)			xxx
Graphite Form (min80%form V orVI)	Graphite Size (5-8)	Pearlite % ≤50	Ferrite % ≥50
xxx	xxx	xxx	xxx
Pressure test	xxx	Pressure	xxx
		Time	xxx
Inspection Date	Inspector		Approved By
xxx	xxx		xxx

Inspection Certificate Comply With3.1,EN10204

Sample Plan

Note: The sample plan complies with the standard of ISO 2859 Inspection S4 and S2 Level AQL=1.5

Batch Size	Sample Size (level)		Accept	Reject
	S4	S2		
2-8	5*	5*	0	1
9-15	5*	5*	0	1
16-25	5*	5*	0	1
26-50	5	5*	0	1
51-90	5	5*	0	1
91-150	8	5*	1	2
151-280	13	5	1	2
281-500	13	5	2	3
501-1200	20	5	3	4
1201-3200	32	8	3	4
3201-10000	32	8	3	4

* Minimum sample level established by AVK exceeds AQL requirements.

Roles for inspection:

- AVK supplier use sample size S4.
Sign of shall be done by Suppliers quality manager and production responsible.
- AVK SH use sample size S4.
Sign of shall be done by AVK SH inspector.
- AVK customer (IQC) use sample size S2.

If there are any problems experience with the sampling – contact the AVK Quality department for further action.

TECHNICAL DELIVERY SPECIFICATION



Document no.
03.061

Process owner
MICH

Revision
05

Date made
09.06.2021

Page 50 of 50

AVK Inspection Form AVK

This document refers to AVK Tech QMS Doc. No. 03.160.

Expect...

INSPECTION REPORT (Sheet 1 of 7)

 Released (BOX dimension)
 Prototype (ALL dimension)

Supplier: Weifang Jinli Foundry Co.,Ltd.			Supplier no.: GP4310			Date.: 24-08-2015			
Drawing no.: 40010001			Drawing Rev.: A1			Material: DI EN 1563; GJS-500-7			
Item no.: 4001000191			3D weight: 11,92			Description: Body DN100 PN16			
Order No.: PROV1191			Batch size: 1400			Approval Supplier:		Approval SH:	Approval Customer:

NO	Drawing Location	Drawing			Actual Measurements															Remark					
					By Supplier					By Local Engineer					By local AVK										
					Dimension	Min	Max	1	2	3	4	5	1	2	3	4	5	1	2		3	4	5		
1	1.D	59,7	52,9	54,5																					
2	1.E	105	103,00	106,00																					
3	1.J	192	190,00	193,00																					
4	2.M	6	5	7																					
5	4.G	172	171,2	172,8																					
6	4.L	6	5	7																					
7	5.K	6	5	7																					
8	6.E	190	189,00	191,00																					
9	8.F	6	5	7																					
10	10.E	6	5	7																					
11	11.E	57	56,75	57,25																					
12	11.G	19	17,00	21,00																					

Surface inspection		
Text and Logo		
Part Number		
Size		
Pressure class		
General surface		
Core shift		
Sharp edges		
Weight		
Material certificate		
A and B dimension check by inspection tool		

Batch production: Inspection size and AQL level shall be according AVK inspection document 04.062