PENTANOVA
smart solutions
for tomorrow

Technical Design Guideline

Manufacturing Instruction

Table of contents

1 Scope of application

Unless otherwise agreed, the Technical Design Guideline – Manufacturing Instruction described here are binding for all PENTANOVA CS GmbH companies (hereinafter referred to as "Client") and all suppliers (hereinafter referred to as "Contractor").

2 Purpose of the Technical Design Guideline – Manufacturing Instruction

The specifications in this Technical Design Guideline – Manufacturing Instruction must be taken into account in all planning and implementation phases. They have been drawn up in accordance with the technical requirements of the client and are binding for the execution of the work.
This Technical Design Guideline – Manufacturing Instruction represents the minimum standard that must be adhered to. Any deviations from the minimum standard must be approved in writing by the relevant specialist department of the client before work commences.
The work must also be carried out in accordance with the recognised rules of technology, the current state of the art and in compliance with the applicable laws, standards and regulations.
The Contractor shall remain solely responsible to the Client for compliance with these Technical Design Guideline – Manufacturing Instruction.

3 Normative references

The Contractor shall be fully responsible for ensuring that, in addition to the requirements specified in this Technical Design Guideline – Manufacturing Instruction, all requirements applicable to its performance arising from laws and other regulations (e.g. EC directives, ordinances and other applicable laws) as well as from standards and generally recognised rules of technology are complied with.

4 Interpretation of contradictions

In the event of contradictions within the technical documentation, the contractor is obliged to inform the client immediately in writing and to obtain the client's instructions or to reach an amicable solution with the client.

5 Contractual order of precedence

The relationship and order of precedence of these Technical Design Guideline – Manufacturing Instruction to other agreements made between the Client and the Contractor are regulated elsewhere, generally in the framework agreement and/or in the negotiation protocol and/or in the General Terms and Conditions of Purchase.
The information in the (pdf) drawings is binding, **dxf and stp are non-binding** and only supplied for information purposes as part of the production documentation.

6 Packaging / Transport

Information on this can be found in the **PENTANOVA** CS GmbH **packaging guidelines** according to document no. D000335922.

7 Alternative raw material

In principle, the specifications of the raw materials in the production documents are binding.

7.1 Sheet steel:

The standard for cold-formed sheet metal is S355MC from 1.5 mm to 20 mm thick.
Alternatively: S355J2, if no cold forming is required.

7.2 Round steel profiles:

Bright round bars according to DIN EN 10278 tolerance h9 have the material specification S355J2C+C/SH 1.0579+C/SH, if drawn and peeled is permissible.

- Standard is cold drawn with S355J2C+C 1.0579+C
- Alternatively permissible: peeled S355J2+SH 1.0577

If **+C** is expressly required, the semi-finished product must be cold-drawn.

7.3 Wear-resistant sheet steel:

HARDOX is the standard for wear-resistant sheet steel.
Alternatively: Steel sheets from other manufacturers with the same hardness.

8 General tolerances

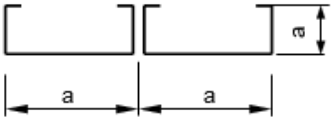
Applicable standards:

- DIN ISO 2768-1-m General tolerances (tolerances for linear and angular dimensions without individual tolerance entries)
- DIN ISO 2768-2-k General tolerances (tolerances for shape and position without individual tolerance entry)
- DIN EN ISO 1101 Geometric tolerancing - Tolerancing of form, direction, location and runout
- DIN EN ISO 1302 Specification of surface finish
- **Based on** DIN EN ISO 13920 General tolerances for welded constructions (length and angle dimensions, shape and position)

General tolerances Based on DIN EN ISO 13290		Nominal size ranges							
		until 30	>30 120	>120 400	>400 1000	>1000 2000	>2000 4000	>4000 8000	about 8000
Length dimensions* [mm]		± 1				± 2		± 3	
Angle dimensions	**[min]**	± 20			± 15	± 10			
	[mm/m]	± 6			± 4,5	± 3			

* Length dimensions produced by sawing, cutting, punching, notching and welding.

For sheet metal constructions s<5 (such as sheet metal plates, sheet metal troughs, basins, roller conveyor sheet metal cheeks) apply



per bend and weld seam "a"
Nominal dimension range a to 1000 = tolerance ± 1
up to 2000 = tolerance ± 1.5
>2000 =tolerance ± 2

9 Fits

Applicable standard:

- DIN EN ISO 286-1 ISO system for tolerances and fits - Principles for tolerances, dimensions and fits

10 Edge finish

Edges must always be deburred or not sharp-edged in order to minimise the risk of injury during use.
Standard to be applied for special requirements on the drawing:

- DIN EN ISO 13715 Workpiece edges with indeterminate shape (terms and drawing specifications)

11 Thread

Applicable standards:

- DIN 202 thread (overview)
- DIN ISO 965-1 Metric ISO thread general application (Tolerances - Principles and fundamentals)
- DIN ISO 965-2 Metric ISO thread for general use (Tolerances - Limiting dimensions for external and internal threads for general use)

If the threads are galvanised, the tolerance of the thread-finishing tool may have to be selected accordingly.

12 Welding/soldering

Applicable standards:

- DIN EN ISO 2553:2022 Welding and allied processes - Symbolic representation in drawings - Welded joints (ISO 2553:2013); German version EN ISO 2553:2019
- DIN EN 1011-1 Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding; German version EN 1011-1:2009
- DIN EN 1011-2 Welding - Recommendations for welding of metallic materials - Part 2: Arc welding of ferritic steels; German version EN 1011-2:2001
- DIN EN 1011-3 Welding - Recommendations for welding of metallic materials - Part 3: Arc welding of stainless steels; German version EN 1011-3:2018
- DIN EN 1011-4 Welding - Recommendations for welding of metallic materials - Part 4: Arc welding of aluminium and aluminium alloys; German version EN 1011-4:2000

13 Welding requirements for conveyor technology

Contractors who include welding work in their scope of work must provide evidence of a quality assurance system in accordance with **DIN EN ISO 3834-3** or similar. If work is subcontracted, proof must be provided by the subcontractor and handed over to the contractor.

General:
In the event of conflicting requirements between the client's orders, the legal requirements or the technical standards, the higher quality requirement always applies. In case of doubt, the client must be consulted in advance!

Technical representation on drawings:
The symbolic representation and dimensioning are in accordance with:

- DIN EN ISO 2553 Welding and allied processes - Symbolic representation in drawings - Welded joints (ISO 2553:2021) German version EN ISO 2553:2019

The weld seam is prepared in accordance with DIN EN 1090-2:

- DIN EN ISO 9692 Welding and allied processes - Recommended weld preparation - Part 1: Manual metal arc welding, gas-shielded arc welding, gas welding, TIG welding and beam welding of steels (ISO 9692-1:2013); German version EN ISO 9692-1:2013

The assessment groups must be specified in the drawings by the design in accordance with DIN EN 1090-2 if they deviate from the minimum standard **DIN EN ISO 5817-C**.

- DIN EN ISO 5817 Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (without beam welding) - Assessment groups of irregularities (ISO 5817:2023); German version EN ISO 5817:2023

The tolerances for welded constructions are specified in Section 8. Deviating specifications must be given in the drawings in accordance with DIN EN 1090-2.

- DIN EN 13920 General tolerances for welded structures -
  Length and angle dimensions - Shape and position (ISO 13920:2023) German version EN ISO 13920:2023

14 Welding requirements Selection of filler material

Material		Gas-shielded welding				Manual electric welding		
Combinations		Shielding gas according to DIN EN ISO 14175			Welding rod	Electrode	Electricity type	
		MAG	MIG	TIG	EN ISO (material number) EN AWS	EN ISO (material number) EN AWS	AC	DC
Standard connections								
Structural steel	Structural steel	M23/ M21	--	I 1	**EN ISO 14341-A:** G 42 3 M G3Si1 **AWS A5.18:** ER 70S-6 (1.5125)	**EN ISO 2560-A:** E 42 0 RR 12 **EN 499:** E 42 0 RR **12** **AWS A5.1:** E 6013	~	=/-
Structural steel	-FAL		--				~	=/-
FAL	-FAL	--	I 1		**EN ISO 24373:** S Cu 6100 (CuAl7) **AWS A5.7:** ER Cu Al - A1 (2.0921)	**EN ISO 2560-A: E** 38 0 RC 11 **EN 499: E 38 0** RC 11 **AWS A5.1:** E **6013**	--	=/-
Structural steel	-S235+C -S355+C	M23/ M21			**EN ISO 17632-A:** T 46 4 M M 1 H5 **AWS A5.18:** E70C-6M H4	**EN ISO 2560-A:** E 38 3 B12 H10 **AWS A5.1:** E 7016-H8	~	=/+
Structural steel	-1.5415	M23/ M21			**EN ISO 21952-A:** G Mo Si **(**1.5424) **AWS A5.28:** ER 70S-A1	**EN ISO 2560-A:** E 50 4 Mo B 4 2 H5 **EN ISO 3580-A:** E Mo B 42 H10 **AWS A5.5:** E7018-A1-H4	--	=/+
Structural steel	-1.4307	M12			**EN ISO 14343-A:** G 18 8 Mn (1.4370) **AWS A5.9:** ~ ER 307	**EN 14700:** E Fe10 (1.4370) **EN 1600:** E 18 8 Mn R 1 2 **AWS A5.4:** ~ E 307-16	~	=/+
Structural steel	-1.4404						~	=/+
Structural steel	-1.4541						~	=/+
Structural steel	-1.4571		I 1				~	=/+
Special materials								
Sheet aluminium 99.5%								
3.0255	-3.0255	--	I 1	I 1	**EN ISO 18273:** S AL 1450 (Al 99.5Ti) **DIN 1734:** SG-Al 99.5 Ti (W-No.3.0805)			
Profile								
(Div. Al-Mg Leg.)		--	I 1	I 1	**EN ISO 18273:** S AL 5356 (AlMg5Cr(A)) **DIN 1732:** SG-AlMg5 (W-No.3.3556) **AWS A5.10:** ER 5356			

Composition of the protective gases:

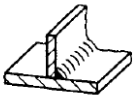
I1: 100% argon (argon 4.8)
M21: 18% CO_2, rest argon
M12: max. 2.5%CO_2, rest argon
M23: 5% O_2, 5% CO_2, rest argon

15 Weld seams Symbolic representation

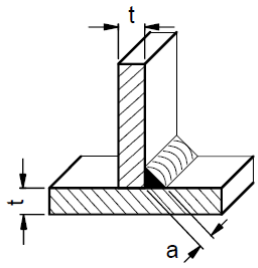
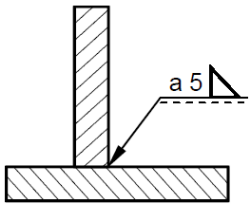
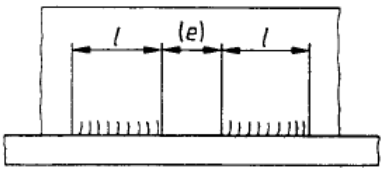
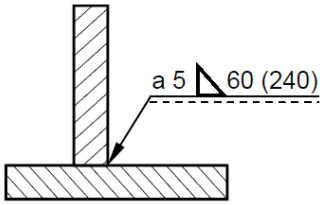
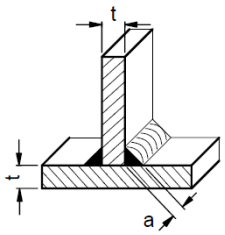
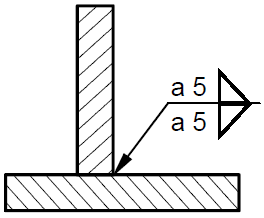
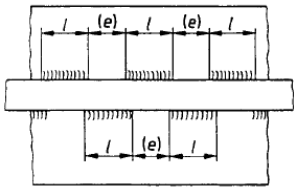
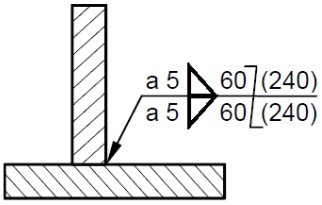
Symbolic representation and design must be carried out in accordance with DIN EN ISO 2553.

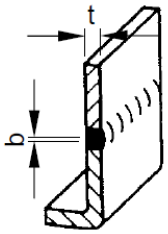
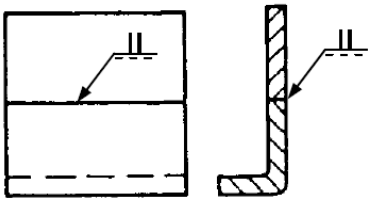
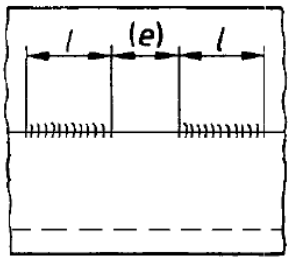
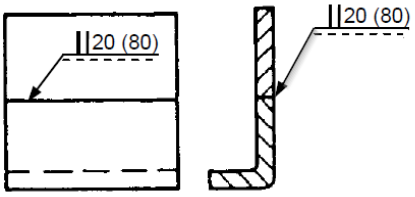
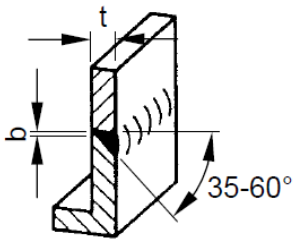
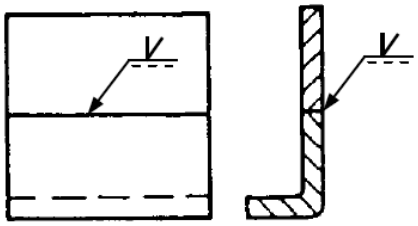
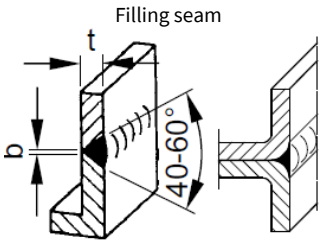
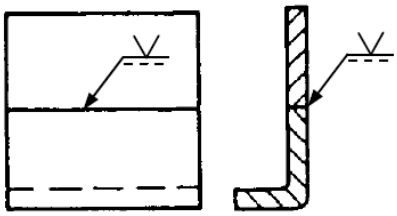
For symbols with incomplete dimensions (seam thickness, seam length, seam spacing), the standard values apply.
Extract from DIN EN ISO 2553

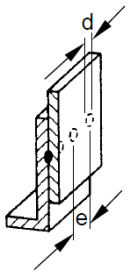
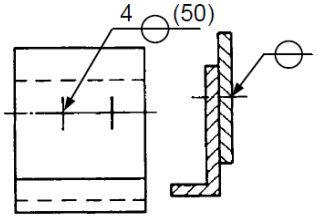
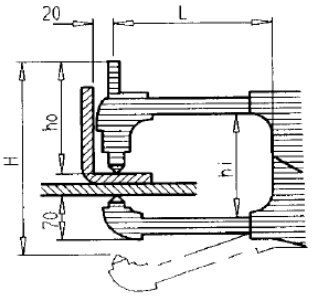
15.1 Basic symbols

Kehlnaht		△	I - Naht		‖	HV - Naht		∨
V - Naht		V	Punktnaht		○			

15.2 Representation

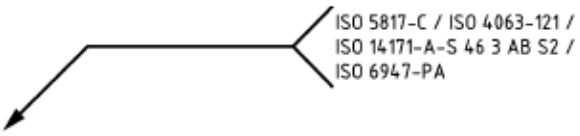
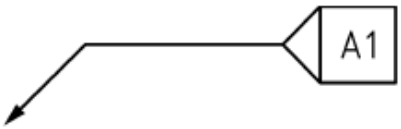
Figurative	Symbolic according to DIN EN ISO 2553	Design note
Continuous fillet weld 	 for seam thickness a = 5	**Standard values for fillet weld dimensions** **Seam thickness a** at *t ≤ 2 mm a = 2 *t = 3 - 5 mm a = 3 *t = 6 - 10 mm a = 5 *t = 12 -15 mm a = 7 **with interrupted seam:** **Seam length l l** = 10 x *t Seam distance (e) t ≤ 6 mm e = 40 x *t t ≥ 8 mm e = 20 x *t * for different sheet thicknesses, t min. applies in each case.
Fillet weld interrupted 	 for seam thickness a = 5; l = 60; Seam distance (e) = 240	
Continuous double fillet weld 	 for seam thickness a = 5	
Double fillet weld interrupted, offset 	 for seam thickness a = 5; l = 60; seam distance (e) = 240	

Figurative	Symbolic according to DIN EN ISO 2553	Design note
I - Continuous seam  for sheet metal t = ≤ 6 mm		**Standard values for butt seam dimensions** **with interrupted seam:** **Seam length l l** = 10 x *t Seam distance (e) t ≤ 6 mm e = 40 x *t t ≥ 8 mm e = 20 x *t * for different sheet thicknesses, t min. applies in each case. **Welding gap b** for sheet metal Production: Automatic welder b = 0 manual t ≤ 3 b = 0 t > 3 b = 2 **for pipes** Steel b = 0 Stainless steel Forming gas b = 0 Stainless steel remainder b = 1
I - Seam interrupted  for seam thickness l = 20; seam distance (e) = 80	 	
HV - continuous seam  for sheet metal t = 8 - 10 mm		
V - continuous seam  for sheet metal t ≥ 12 mm		

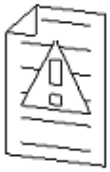
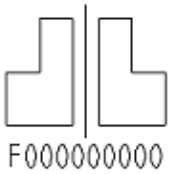
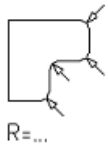
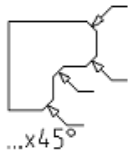
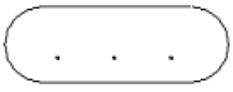
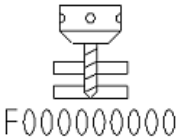
Figurative	Symbolic according to DIN EN ISO 2553	Design note
Point seam 	 for point diameter d = 4; point spacing (e) = 50	**Point seam dimensions** Point diameter d = 4 Point spacing (e) = 50 Possible sheet thicknesses: bold = coil sheet 

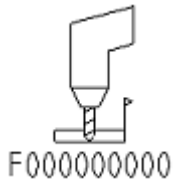
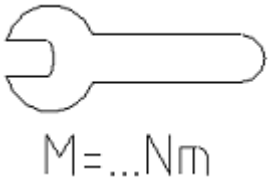
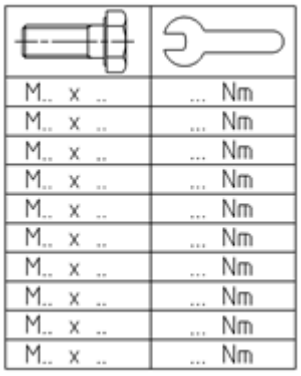
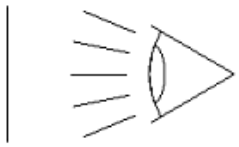
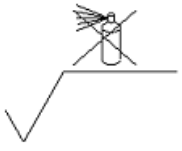
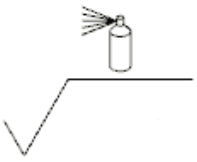
t ≤ mm	L	hi	ho	H
2 + 2	**850**	140	220	320
2,5 + 2,5	510	250	370	450
3 + 3	200	140	220	310

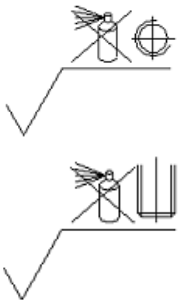
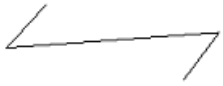
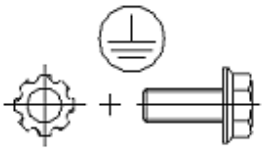
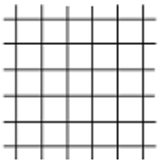
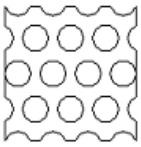
16 Technical representation of welding symbols with specified test procedure

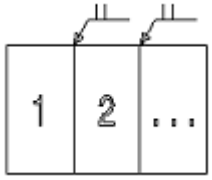
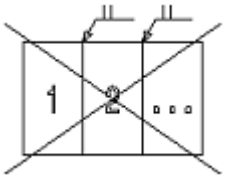
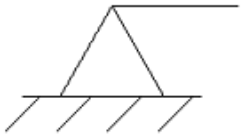
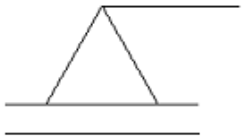
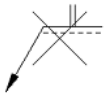
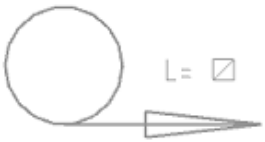
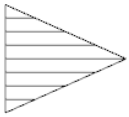
Symbol	**Use as below**
Example from DIN EN ISO 2553	The welding symbol must always be displayed with details of the test method in accordance with the currently applicable standard.
Open fork 	Information in the fork here as an example for welding process, filler material and welding position
Closed fork 	A closed fork may only be used to refer to a specific instruction, e.g. a welding procedure specification, the report on the qualification of a welding procedure or another document, such as a test procedure (TXT specification)
Possible leak test methods are: • Colour penetration test EN ISO 3452-1:2021 If the marking "tight" is noted behind the welding symbol, the tightness must be tested according to the above procedure. • Overpressure test with leak detection spray or pressure differential measurement DIN EN 1779 • Vacuum test with the vacuum suction bell and leak detection spray DIN EN 1779 Detailed information (in addition to the symbol on the drawing) on the test procedure must be defined in the object text. A test report is mandatory.	

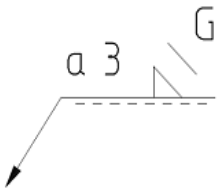
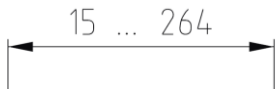
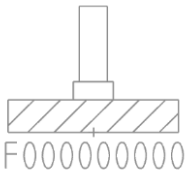
17 Text - Symbols on drawings

No.	Symbol	Utilisation
1		Note text / description, which can be read in the object text on the parts list under "TXTn". There are special notes on this point Attachment directly to the relevant location
2		Note(s) available for the drawing Attachment above the title block of the drawing Note on object texts Note on installation instructions etc.
3		Mirror image part is present (see item ID) Original part = symbol and item ID of the mirrored part Mirrored part = symbol and item ID of the original part
4		Collective symbol for all non-dimensioned radii Attachment above the title block of the drawing
5		Collective symbol for all non-dimensioned chamfers Attachment above the title block of the drawing
6		Extra detailed drawing available see Z.- No. ...
7		Test dimension on drawing available Attachment above the title block of the drawing
8		Drilled and grated with ... Attachment above the title block of the drawing or to the relevant holes F000000000 = Item ID of the other component

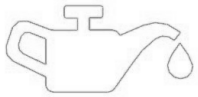
9		Drilled during assembly with ... Attachment above the title block of the drawing or to the relevant holes F000000000 = Part no. of the component with which drilling is required
10		Screw tightening torque Torque specifications on screw connections must be adhered to within +/- 6%. The appropriate torque tool must be selected so that the required torque is between 20% and 80% of the tool's setting range. Attachment above the title block of the drawing or on the relevant screw connections
11		Table for several screw tightening torques Torque specifications on screw connections must be adhered to within +/- 6%. The appropriate torque tool must be selected so that the required torque is between 20% and 80% of the tool's setting range. Attachment above the title block of the drawing
12		Separation point for transport Attachment to the transport separation points with additional dimensions
13		Visible side must not be scratched Attachment directly at the relevant point or above the title block and the relevant point is marked with a dotted line parallel to the workpiece contour (- - -)
14		Surface must not be painted / coated Attachment directly to the relevant location
15		Surface must be painted / coated Attachment directly to the relevant location

16		Threads must/may not be painted/coated Attachment above the title block of the drawing, then this is valid for all threads Attachment directly to the relevant thread, then this is only valid for this thread
17		Conveying direction Attachment at the relevant location
18		Support bar direction for gratings Attachment to the simplified representation of gratings
19		Earthing of all metal parts in the assembly Attachment above the title block of the drawing the components required for earthing must be listed in the parts list
20		Representation of net / sieve Attachment to the simplified representations of nets and sieves Information on the mesh size must be entered in the object text
21		Perforated plate illustration Attachment to the simplified representation of perforated sheet metal Notes on diameter and hole spacing must be entered in the object text
22		Depiction of tear plate Attachment to the simplified representation of tear plate Notes on tear arrangement and size must be entered in the object text
23		Chip free Component must be absolutely chip-free.

24		Multi-part production of the component permitted Attachment above the title block of the drawing multi-part production of the component is permitted, whereby the division may be freely determined by the production department If a fixed specification of the separation points is required, the separation points must be drawn and dimensioned on the component.
25		Multi-part production of the component NOT permitted Attachment above the title block of the drawing multi-part production of the component is NOT permitted
26		Fixed bearing mounted at this point Attachment directly to the relevant location
27		Floating bearing mounted at this point Attachment directly to the relevant location
28		Not permitted Symbol is placed over a welding symbol means: "Welding not permitted here." Example 
29		The stretched length of the sheet Symbol is placed above the drawing header Display of the stretched length
30		Crush free cut Pinch-free cut required in the area of the bending edge
31		Bar wave direction for packaging materials (corrugated cardboard, twin-wall sheets, ...)

<table>
<tr><td>32</td><td> 
</td><td>
Welding symbol with information on post-processing
<table>
<tr><td colspan="3">Supplementary and additional images</td></tr>
<tr><td></td><td colspan="2">Seam surface: hollow (concave)</td></tr>
<tr><td></td><td colspan="2">Seam surface: flat (even)</td></tr>
<tr><td></td><td colspan="2">Seam surface: curved (convex)</td></tr>
<tr><td>  </td><td colspan="2">Seam surface: Notch free</td></tr>
<tr><td> 
</td><td colspan="2">remaining insert used</td></tr>
<tr><td> 
</td><td colspan="2">Underlay used</td></tr>
<tr><td colspan="3">Selection for reworking the weld seam1)</td></tr>
<tr><td>Letter</td><td>Procedure (English)</td><td>Procedure (German)</td></tr>
<tr><td>C</td><td>finish by chipping</td><td>through machining</td></tr>
<tr><td>G</td><td>finish by grinding</td><td>by grinding</td></tr>
<tr><td>H</td><td>finish by hammering</td><td>by hammering</td></tr>
<tr><td>M</td><td>finish by machining</td><td>through mechanical (machining) processing</td></tr>
<tr><td>R</td><td>finish by rolling</td><td>by rolling</td></tr>
<tr><td>P</td><td>finish by peening</td><td>by shot blasting / shot peening</td></tr>
<tr><td colspan="3">1) Letters for post-processing have so far only been used in standards of English-speaking countries such as ANSI/AWS A2.4 and are not yet mentioned in DIN, EN or ISO.</td></tr>
</table>
</td></tr>
<tr><td>33</td><td> 
</td><td>Minimum dimension ␣ to ␣ Maximum dimension
(...)</td></tr>
<tr><td>34</td><td> 
</td><td>Weld stud labelling

Placed above the title block of the individual part drawing. The F000000000 = item ID of the superordinate drawing in which the welding studs are positioned must be specified under this symbol. This enables the production department to place the weld stud mark on the individual part if necessary.</td></tr>
</table>

35		Greased / oiled with lubricant see object text

18 Supplies and parts list details

The FBOM = list of materials provided lists all items that the contractor does not have to buy/manufacture, but receives from the client free of charge. There are special cases in which there are apparent contradictions between assembly BOMs and provision lists.

18.1 Goods by the metre, e.g. roller chains, hoses

In the parts lists, the lengths required at the place of use are specified in the items, e.g. L=2853mm. There is a note in the basic data text: manufactured from "article no.", delivery length 5m
This item is a standard packaging unit and can be purchased and provided if necessary.
For roller chains, the 5m strands are connected using spring connecting links and the lengths are cut to length according to parts lists.
Hoses and electrical cables are cut from a 25 metre drum, for example.

18.2 Incompletely defined articles, e.g. adhesive labels

Signs are often defined in general terms and without labelling. Size, material, adhesive properties, font size, colours, etc. are specified. The missing information, e.g. the labelling text itself, is added via a document that is linked via the parts list.
For barcode tapes, the length and the start value are added.
The surface information is also added according to this principle.

19 Auxiliary materials for mounting hubs on shafts

For the assembly of hubs (except clamping sets, shrink discs) on shafts, for example, the standard auxiliary is
The standard auxiliary material is "Gleitmo 800" from Fuchs Lubritech GmbH.

- Gleitmo 800 is a white high-performance lubricating paste that must be used in a service temperature range between -25/+100°C.
- Gleitmo 800 is silicone-free.
- Gleitmo 800 facilitates the assembly and subsequent disassembly of shaft-hub connections.
- Container:
    - 1kg tin, PENTANOVA article no. M3020080
    - 250g tin, PENTANOVA article no. M3020081

Application:
"Gleitmo 800" should be applied thinly to clean, preferably degreased sliding surfaces with a brush or non-fibrous cloth
Alternatively, the auxiliary material supplied by gear motor manufacturers, e.g. SEW "NOCO-Fluid NSF-H1", can be used.
Deviation from the standard
If a special auxiliary material is required, this is labelled on the drawing and defined in the parts list text.
If no auxiliary material is to be used, this is also labelled on the drawing and noted in the parts list text.

20 Surface treatment: Process with lacquering

If a surface treatment is required, this must be carried out in accordance with the following specifications.
The surface to be painted must be smooth with a roughness depth of max. Rt 10µm.

Pre-treatment:

- Black steel:
  - Hand degreasing: wash off with solvent, e.g. TURCO-Prepaint
- Galvanised steel / FAL:
  - Hand degreasing: wash off with ethylene glycol

Colours according to RAL colour table K1
The required paint quality **can be** achieved using paints from Weckerle GmbH (www.weckerle-lacke.de), for example.

Alternative paints and paint suppliers may only be used if the physical and optical properties of Weckerle's paints match.

Parts list items that require a surface treatment have a reference to documents of type 151, in which the colour specifications are described in detail.
There may also be a requirement for sandblasted pre-treatment of the surfaces to be coated.

20.1 Water-based paint, interior, dry (1)

Technical data for water-based paints (without customised requirements)

- For components with high surface roughness (e.g. cast iron), the coating thickness is 40µm + roughness depth of the component.
- The following tolerances apply to the coating thickness: 0 to +10 µm.
- Processing technique: Spraying
- Temperature resistance: -30°C - 150°C
- Gloss level: semi-glossy 5 - 15 GE (gloss units) at measuring angle 60°

20.2 2-component EP lacquer, interior and exterior, dry/wet (with chemical resistance) (2)

Technical data for 2K EP lacquer

- 2K-EP basecoat and 2K-EP topcoat are only used in combination due to the consistency and weather resistance of the paint. Mixing with other paints is not possible.
- The water-based version is standard for 2-component coatings.
- Only for special applications should the solvent-based version be selected, as this can achieve a higher chemical resistance.
- For components with high surface roughness (e.g. cast iron), the coating thickness is 40µm + roughness depth of the component.
- The following tolerances apply to the coating thickness: 0 to +10 µm.
- Processing technique: Spraying
- Temperature resistance: -30°C - 130°C
- Gloss level: semi-gloss 5 - 15 GE (gloss units) at measuring angle 60°

20.3 2K PUR lacquer, exterior, with UV and seawater resistance (3)

Technical data for 2K PUR lacquer

- 2K EP basecoat and 2K PUR topcoat are only used in combination due to the consistency and weather resistance of the paint. Mixing with other paints is not possible.
- The water-based version is standard for 2-component coatings.
- Only for special applications should the solvent-based version be selected, as this can achieve a higher chemical resistance.
- For components with high surface roughness (e.g. cast iron), the coating thickness is 40µm + roughness depth of the component.
- The following tolerances apply to the coating thickness: 0 to +10 µm.
- Processing technique: Spraying
- Temperature resistance: -30°C - 130°C
- Gloss level: semi-gloss 5 - 15 GE (gloss units) at measuring angle 60°

20.4 Aluminium water-based paint

Technical data for 1K aluminium water-based paint

- Components that are located outdoors must also be pre-coated with a base coat of 40µm due to the weather resistance. The aluminium lacquer must then also be applied with 20µm.
- For components with high surface roughness (e.g. cast iron), the coating thickness is 40µm + roughness depth of the component.
- The following tolerances apply to the coating thickness: 0 to +10 µm.
- Processing technique: Spraying
- Temperature resistance: -30°C - 150°C
- Gloss level: semi-gloss 5 - 15 GE (gloss units) at measuring angle 60°

20.5 Powder coating:

As an alternative to surface coating with wet paints, surface coating with powder paints can also be applied on a case-by-case basis following **prior written** approval.

Processing guidelines of PENTANOVA CS GmbH for powder coatings (polyester powder TGIC free GSB) according to DIN 55990)

Technical data	Lacquer type 10
	Polyester powder TGIC free GSB
Colour tone	see paint application
RAL no./ *KM no.	see paint application
Gloss level	Semi-glossy 8 - 15 GE GE=gloss unit, measuring angle = 60°
Temperature resistant	-30°C /+85°C
Grain spectrum µm	5 - 100
Possible layer thicknesses µm	60 - 80
Hazard class	none
Remarks	Can be painted over with water-based paint

20.5.1 Pre-treatment

The pre-treatment for **powder coating is** carried out either by sandblasting or by a wet-chemical process, depending on the requirements and part properties. The parts are degreased, iron-phosphatised, rinsed with demineralised water and then passivated in a no-rinse process. Alternatively, the parts can also be pickled. The coating is applied using polyester powder and the specified process parameters of the powder supplier. The coating thickness is based on the customer's specifications and is generally between 80 - 120 µm. Depending on the part geometry and substrate, this may vary upwards or downwards!

21 Surface treatment Process without painting

Sandblasting in general
DIN EN ISO... Sa 2.5: Scale, rust and coatings are removed to such an extent that residues remain visible only as slight shading as a result of tinting of pores. The blasting material used must be completely removed.
The specification in the order context may differ and is binding.

Galvanised zinc coating:
Galvanising is carried out in accordance with DIN EN ISO 2081 Zn12/B!
The parts are degreased, pickled, electrolytically degreased, decapacitated, electrolytically galvanised in a weak acid process and finally provided with a blue chromate coating (chromium 3-valent). We aim for a galvanised layer thickness of min. 8µm, max. 12µm.

Hot-dip galvanising
Hot-dip galvanising is carried out in accordance with DIN EN ISO 1461!
Extraction for non-spun workpieces:

Workpiece	Thickness [mm]	Localised layer thickness [µm]	Average layer thickness [µm]
Steel	>6	70	85
Steel	>3 to ≤6	55	70
Steel	≥1.5 to ≤3	45	55
Steel	<1,5	35	45
Casting	≥6	70	80
Casting	<6	60	70

Teniferate
Teniferising is a form of salt bath nitrocarburising (also known as tenifer treatment or bath nitriding). It increases the surface hardness and improves the sliding properties. The post-treatments Q, P and Q additionally increase the corrosion protection.

Burnishing
The layer should be produced chemically. The usual layer thickness is approx. 1µm. To ensure long-lasting corrosion protection, the surface should be oiled or greased. Oiling or greasing should be carried out immediately after burnishing, but at the latest before packaging.

22 Processing instructions for edged and perforated panels

- Hot-dip aluminised sheet steel:
    - Panels must not be scratched on the visible side and must not have any white rust spots. For marking visible side, see text - symbols on drawings no. 13
    - Welding points (if present) with aluminium paint white aluminium KM 3575, No. 4210651 of the
      Weckerle paint company.
- Sendzimir galvanised sheet steel:
    - Panels must not be scratched on the visible side and must not have any white rust spots. For marking visible side, see text - symbols on drawings no. 13
    - Paint welds (if present) with zinc dust paint, No. 4210651 from Weckerle.
- Stainless steel sheet:
    - Panels must not be scratched on the visible side.
      For marking visible side, see text - symbols on drawings no. 13
    - Treat welds (if present) with pickling paste.

Design type and surface finish in accordance with DIN EN 10088-2
The following surface quality is specified for stainless steel sheets in 1.4307, 1.4541, 1.4404, 1.4571:

- for 1D applies>= 3.0 mm sheet metal hot-rolled heat-treated, pickled scale-free (pickled = matt)
- for 2B applies< 2.5 mm sheet metal cold-rolled, heat-treated, pickled, cold re-rolled (pickled = matt)

23 Production specifications: Plastics processing

Plastic parts (e.g. gear wheels etc.)

- Components must be produced without scratches.
- All cut edges must be deburred.
  Any protrusions on weld seams or other irregularities, such as roots that have fallen through or weld spatter, must generally be removed.
  Weld seams must be even, without pores, notches and flank defects.
  Distortion should be avoided as far as possible.
  There must be no lint left behind when cleaning later with a woollen cloth.
  There must be no risk of injury.
- The components must be "swept clean" after production.
  They may only be cleaned dry, without the addition of cleaning agents.
- The components must be processed and stored in a dry place.
  For transport to the delivery address, the packaging must be selected in such a way that the component is not damaged and dirt and moisture cannot get into the components.