0. Table of Contents

1. Scope

The Manufacturing Instructions described here are binding for all Eisenmann Group companies (hereinafter referred to as the “Principal”) and all suppliers (hereinafter referred to as “Contractor,”) unless otherwise agreed.

2. Purpose of the Manufacturing Instructions

The specifications contained in these Manufacturing Instructions shall be observed in all planning and implementation phases. They have been developed in accordance with the Principal's technical requirements and are binding for the execution of work. These specifications cover the minimum standard that must be observed. Any deviations from the minimum standard must be approved in writing by the respective specialized department of the Principal before work is started.
In addition, such work shall be carried out in accordance with established engineering practices, the technological state of the art and in compliance with the applicable laws, standards and regulations.
The Contractor remains solely responsible to the Principal for adherence to these Manufacturing Instructions.

3. Interpretation in Cases of Contradictory Content

Should contradictions arise within the scope of the technical documents, the Contractor is obliged to inform the Principal immediately and obtain instructions, or find a joint solution.

4. Contractual Priorities

The interrelationships with and order of priority of these Manufacturing Instructions with respect to other agreements concluded between the Principal and the Contractor shall be dealt with elsewhere, generally in a framework contract and/or in minutes of negotiations and/or in the General Terms and Conditions of Purchasing.

5. Packaging/Transport

Packaging provides protection against damage or any other form of impairment that could lead to a loss of quality in the packaged goods.

On the basis of the properties of the packaged goods (fragility, size, weight etc.), all influences arising from the packaging, transport, storage and unpacking chain, as well as those applying to the customer's chain where this is relevant, that affect the stresses to which the packaging is subjected, shall be taken into account.

In choosing packaging methods and materials, the statutory requirements of the supplier and recipient countries regarding packaging shall be taken into account.

For further details, please refer to our packaging guidelines.

6. Note on Standards

Even if the Manufacturing Instructions do not explicitly refer to them, it is entirely the responsibility of the Contractor to ensure compliance with all requirements applying to the Contractor's performance that go beyond what is contained in these Manufacturing Instructions and that arise from legal and other regulations (e.g. EU Directives, ordnances and other applicable laws) as well as from standards and generally recognized codes of practice.

7. General Tolerances

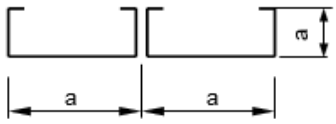
Applicable standards

- DIN ISO 2768-1-m General tolerances (Tolerances for linear and angular dimensions without individual tolerance indications)
- DIN ISO 2768-2-k General tolerances (Geometrical tolerances for features without individual tolerances indications)
- DIN EN ISO 1101 Geometrical tolerancing – Tolerances of form, orientation, location and run-out
- DIN EN ISO 1302 Indication of surface texture
- **Based on** DIN EN ISO 13920 General tolerances for welded constructions (linear and angular dimensions, form and position)

General Tolerances In accordance with DIN EN ISO 13920		Nominal dimensional ranges							
		up to 30	>30 120	>120 400	>400 1000	>1000 2000	>2000 4000	>4000 8000	over 8000
Linear dimensions* [mm]		±1				±2		±3	
Angular dimensions	**[min]**	±20'			±15'	±10'			
	[mm/m]	±6			±4.5	±3			

* Linear dimensions resulting from sawing, cutting, punching, clinching and welding.

Applicable to sheet metal structures s<5 (such as sheet metal plates, sheet pans, basins, roller conveyor plate frames)



depending on bending angle and welding seam "a"

Nominal measurement range a up to 1000 = tolerance ± 1

up to 2000 = tolerance ± 1.5

>2000 = tolerance ± 2

8. Fits

Applicable standard

- DIN ISO 286-1 ISO system of limits and fits - Basis of tolerances, deviations and fits

9. Edge condition

Applicable standard

- DIN ISO 13715 Workpiece edges of undefined shape (terms and drawing specifications)

10. Thread

Applicable standard

- DIN 202 Threads (overview)
- DIN ISO 965-1 ISO general purpose metric screw threads (Tolerances - Principles and basic data)
- DIN ISO 965-2 ISO general purpose metric screw threads (Tolerances - Limits of sizes for general purpose external and internal screw threads)

11. Holes/Countersinks

Applicable standard

- DIN EN 20273 Clearance holes for bolts and screws
- DIN EN ISO 15065 Countersinks for countersunk head screws with head configuration in accordance with ISO 7721
- DIN 74 Countersinks for countersunk head screws (except countersunk head screws with heads according to DIN EN 27721)
- DIN 974-1 Diameters of counterbores - Manufacturing dimensions - Part 1: Screws with cheese head or pan head
- DIN 974-2 Diameter of counterbores for hexagon bolts, screws and nuts

12. Welding/Soldering

Applicable standard

- DIN EN ISO 2553 Welding and allied processes - Symbolic representation on drawings - Welded joints (ISO 2553:2013); German version EN ISO 2553:2013
- DIN EN 1011-1 Welding - Recommendations for welding of metallic materials - Part 1: General guidance for arc welding; German version of 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 1011-3:2000
- DIN EN 1011-4 Welding - Recommendations for welding of metallic materials - Part 4: Arc welding of aluminum and aluminum alloys; German version EN 1011-4:2000

14. *Steel Construction Welding Requirements*

Steel Construction Welding Requirements	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

General Information
In the event of conflicting requirements in the Principal's orders, statutory regulations or technical standards, the more stringent requirement shall always apply. In case of doubt, please consult with the ordering customer beforehand!

Technical Representation on Drawings
Symbols and dimensions shall be provided according to:

- DIN EN ISO 2553 Welding and allied processes – Symbolic representation on drawings – Welded joints (ISO 2553:2013); German version EN ISO 2553:2013

Welding seams shall be prepared as per DIN EN 1090-2 according to:

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

The quality levels applying to the construction shall be indicated on the drawings according to DIN EN 1090-2.

The following applies:

- DIN EN ISO 5817 Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections (ISO 5817:2014); German version EN ISO 5817:2014

Tolerances for welded constructions shall be indicated according to DIN EN 1090-2.

The following applies:

- DIN EN 13920 General tolerances for welded constructions – Linear and angular dimensions; form and position (ISO 13920:1996) German version EN ISO 13920:1996

15. Welding Requirements for Piping of Stainless Austenitic Steels

Welding Requirements for Piping of Stainless Austenitic Steels	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

General Requirements
Translations of welding-related specialist terms as well as calculation, manufacture, design and inspection of all pipework shall be carried out according to standards.

Applicable standards

- DIN EN 1792 Welding – Multilingual list of terms for welding and related processes – Trilingual version EN 1792:2003
- AD 2000 information sheet HP 100 R Construction regulations – Pipes made of metallic materials
- DIN EN 13480-1 to DIN EN 13480-8 Metallic industrial piping

Requirements for the Manufacturer/Supplier
Certification as per AD/HP 0 or Pressure Equipment Directive and/or the respective welding procedure tests.

Applicable standard

- DIN EN ISO 15614-1 Specification and qualification of welding procedures for metallic materials – Welding procedure test. Part 1: Arc welding of nickel and nickel alloys

Welding Requirements for Piping of Stainless Austenitic Steels	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Quality Assurance for Welding Work
For quality assurance in welding work, the following quality requirements shall be observed:

Applicable standard

- DIN EN ISO 3834-2 Quality requirements for fusion welding of metallic materials – Part 2: Comprehensive quality requirements (ISO 3834-2:2005); German version EN ISO 3834-2:2005

in accordance with the following chapters:

- Chapter 5 Review of requirements and technical inspection
- Chapter 6 Subcontracting
- Chapter 7 Welding personnel
- Chapter 8 Inspection and testing personnel
- Chapter 9 Equipment
- Chapter 10 Welding and related activities
- Chapter 11 Welding consumables
- Chapter 12 Storage of parent metals
- Chapter 14 Inspection and testing
- Chapter 17 Identification and traceability

Quality of Welding Joints
The weld quality shall be specified by the designer and entered into the drawings.

Applicable standard

- AD 2000 information sheet HP 100 R Construction regulations – Pipes made of metallic materials
- DIN EN 13480-1 to DIN EN 13480-8 Metallic industrial piping

If nothing has been laid down or specified, quality level “C” applies

Applicable standard

- DIN EN ISO 5817 Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections (ISO 5817:2014); German version EN ISO 5817:2014

Welding Requirements for Piping of Stainless Austenitic Steels	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Requirements for the Parent Metal
Basic material inspection documents 3.1 according to DIN EN 10204 Metallic products - Types of inspection documents; German version EN10204:2004

Requirements for the Filler Metal

- Use equivalent or higher alloyed filler metals
- TÜV approval
- Material certificate 2.2 according to DIN EN 10204.
- Welding without filler metal only permitted with approval by Eisenmann.
- Molybdenum higher alloyed filler metals shall be used for molybdenum alloyed steels!

Tests and Scope of Inspections
are generally to be determined together with the Principal and laid down in writing in accordance with the following standards prior to signing the contract!

- AD 2000 information sheet HP 100 R Construction regulations – Pipes made of metallic materials
- DIN EN 13480-1 to DIN EN 13480-8 Metallic industrial piping
- Checking pipelines for leaks

The inspection/test personnel shall be qualified and certified.

- DIN EN ISO 9712 Non-destructive testing – Qualification and certification of NDT personnel (ISO 9712:2012); German version EN ISO 9712:2012
- DIN EN ISO 9712 Supplement Nondestructive testing – Qualification and certification of NDT personnel; Supplement 1: Recommendations on the application of DIN EN ISO 9712:2012-12

Test Types:

Non-destructive testing must comply with the following standards or, if necessary, other standards according to the requirements for the component and the application:

- General rules according to DIN EN ISO 17635
- Visual testing (VT) DIN EN ISO 17637
- Radiographic testing (RT) DIN EN ISO 17636
- Surface check after penetrant testing (PT) DIN EN ISO 3452
- Ultrasonic testing (UT) DIN EN ISO 17640
- Magnetic particle testing (MT) DIN EN ISO 17638
- Leakage test using the bubble method, with the vacuum chamber, with leak detection spray DIN EN 1779
- Leakage test with excess pressure, with leak detection spray or differential pressure measurement
  DIN EN 1779

Welding Requirements for Piping of Stainless Austenitic Steels	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Processing of Stainless Steels
With the exception of electropolishing, the following applies to processing and reworking:

- DIN EN 1011-3 Recommendations for welding of metallic materials - Part 3: Arc welding of stainless steels; German version EN 1011-3:2000

The surfaces of austenitic stainless steels shall be free of tempering colors and passivated.

Inspections
The Contractor shall ensure that the Principal or the Principal's representative is permitted to inspect the production parts at any time.

General Information
In the event of conflicting requirements in orders, statutory requirements or technical rules, the more stringent requirement shall always apply. In case of doubt, please consult with the ordering customer beforehand!

Technical Representation on Drawings
Symbols and dimensions shall be provided according to:

- DIN EN ISO 2553 Welding and allied processes - Symbolic representation on drawings – Welded joints (ISO 2553:2013); German version EN ISO 2553:2013

Welding seam preparation to be carried out according to:

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

The form of the welded joint shall be in accordance with:

- DIN EN 1708-01 Welding – Basic welded joint details in steel welding – Part 1: Pressurized components; German version EN 1708-1:2010

16. Welding-Related Requirements for Plants, Piping and Containers of Austenitic Stainless Steel (Germany) According to the Federal Water Act (WHG)

Welding-Related Requirements for Plants, Piping and Containers of Austenitic Stainless Steel (Germany) According to the Federal Water Act (WHG)	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

General Requirements

- Translations of welding-related specialist terms shall be carried out according to the prescribed standard
- Calculation, manufacture, design and inspection of all pipework and containers shall be carried out according to standard regulations.
- Regulations on plants for handling substances hazardous to water (VawS) and on specialist companies must be observed and verified.
- Administrative provisions for the implementation of the VawS (VV-VawS) shall be observed.
- Design and manufacturing shall be carried out according to TRbF (Technische Regeln brennbarer Flüssigkeiten - Technical Regulations on Flammable Liquids) and the standards and regulations stipulated therein.
- The requirements of the Building Codes lists shall be observed.

Applicable standard

- DIN EN 1792 Welding – Multilingual list of terms for welding and related processes – Trilingual version EN 1792:2003

Requirements for the Manufacturer/Supplier

Existence of recognition as a specialist company according to the Federal Water Act with monitoring contract including welding technology and recognized welding techniques (welding procedure tests).

Applicable standard

- DIN EN ISO 15614-1 Specification and qualification of welding procedures for metallic materials – Welding procedure test. Part 1: Arc welding of nickel and nickel alloys

Welding-Related Requirements for Plants, Piping and Containers of Austenitic Stainless Steel (Germany) According to the Federal Water Act (WHG)	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Quality Assurance for Welding Work
For quality assurance in welding work, the following quality requirements shall be observed:

- DIN EN ISO 3834-2 Quality requirements for fusion welding of metallic materials – Part 2: Comprehensive quality requirements (ISO 3834-2:2005); German version EN ISO 3834-2:2005

in accordance with the following chapters:

- Chapter 5 Review of requirements and technical inspection
- Chapter 6 Subcontracting
- Chapter 7 Welding personnel
- Chapter 8 Inspection and testing personnel
- Chapter 9 Equipment
- Chapter 10 Welding and related activities
- Chapter 11 Welding consumables
- Chapter 12 Storage of parent metals
- Chapter 14 Inspection and testing
- Chapter 17 Identification and traceability
- Chapter 18 Quality reports

Quality of Welding Joints
The welding joint qualities shall be specified by the designer and entered into the drawings.

Applicable standard

- AD 2000 information sheet HP5/3 Manufacturing and testing of pressure tanks - making and testing the joints - non-destructive testing of the welded joints

Requirements for the Parent Metal
Basic material inspection documents 3.1 according to DIN EN 10204 Metallic products - Types of inspection documents; German version EN10204:2004

Proof of IC (intergranular corrosion) resistance for corrosion-resisting materials.
As an alternative, use LC (low carbon) steels.

Requirements for the Filler Metal
- Use equivalent or higher alloyed filler metals
- TÜV- or DB- Approval
- Material certificate 2.2 according to DIN EN 10204
- Welding without filler metal only permitted with approval from the Eisenmann company.

Welding-Related Requirements for Plants, Piping and Containers of Austenitic Stainless Steel (Germany) According to the Federal Water Act (WHG)	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Tests and Scope of Inspections
As per AD/HP 5/3 and the regulations laid down therein and/or contractual provisions. However, all pipes at least 2% of the weld seam lengths irrespective of material and diameter.

The inspection/test personnel shall be qualified and certified.

- DIN EN ISO 9712 Non-destructive testing – Qualification and certification of NDT personnel (ISO 9712:2012); German version EN ISO 9712:2012
- DIN EN ISO 9712 Supplement **Nondestructive testing - Qualification and certification of NDT personnel; Supplement 1: Recommendations for the application of DIN EN ISO 9712:2012-12**

Test Types:

Non-destructive testing must comply with the following standards or, if necessary, other standards according to the requirements for the component and the application:

- General rules according to DIN EN ISO 17635
- Visual testing (VT) DIN EN ISO 17637
- Radiographic testing (RT) DIN EN ISO 17636
- Surface check after penetrant testing (PT) DIN EN ISO 3452
- Ultrasonic testing (UT) DIN EN ISO 17640
- Magnetic particle testing (MT) DIN EN ISO 17638
- Leakage test using the bubble method, with the vacuum chamber, with leak detection spray DIN EN 1779
- Leakage test with excess pressure, with leak detection spray or differential pressure measurement
  DIN EN 1779

Processing of Stainless Steels
With the exception of electropolishing, the following applies to processing and reworking:

- DIN EN 1011-3 Recommendations for welding of metallic materials - Part 3: Arc welding of stainless steels;
  German version EN 1011-3:2000

The surfaces of austenitic stainless steels shall be free of tempering colors and passivated.

Welding-Related Requirements for Plants, Piping and Containers of Austenitic Stainless Steel (Germany) According to the Federal Water Act (WHG)	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Inspections

The Contractor shall ensure that the Principal or the Principal's representative is permitted to inspect the production parts at any time.

General Information

In the event of conflicting requirements in orders, statutory requirements or technical rules, the more stringent requirement shall always apply. In case of doubt, please consult with the ordering customer beforehand!

Technical Representation on Drawings

Symbols and dimensions shall be provided according to:

- DIN EN ISO 2553 Welding and allied processes - Symbolic representation on drawings – Welded joints (ISO 2553:2013); German version EN ISO 2553:2013

Welding seam preparation to be carried out according to:

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

17. Welding-Related Requirements for Piping and Containers for Deionized Water Plant

Welding-Related Requirements for Piping and Containers for Deionized Water Plant	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

General Requirements

- Translations of welding-related specialist terms shall be carried out according to the prescribed standard
- Calculation, manufacture, design and inspection of all pipework and containers shall be carried out according to standard regulations.
- Regulations on plants for handling substances hazardous to water (VawS) and on specialist companies must be observed and verified.
- Administrative provisions for the implementation of the VawS (VV-VawS) shall be observed.
- For containers under internal or external pressure, the AD Codes apply.

Applicable standard

- DIN EN 1792 Welding – Multilingual list of terms for welding and related processes – Trilingual version EN 1792:2003

Requirements for the Manufacturer/Supplier

Existence of recognition as a specialist company according to the Federal Water Act with monitoring contract including welding technology and recognized welding techniques (welding procedure tests).

Applicable standard

- DIN EN ISO 15614-1 Specification and qualification of welding procedures for metallic materials – Welding procedure test. Part 1: Arc welding of nickel and nickel alloys

Welding-Related Requirements for Piping and Containers for Deionized Water Plant	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Quality Assurance for Welding Work
For quality assurance in welding work, the following quality requirements shall be observed:

- DIN EN ISO 3834-2 Quality requirements for fusion welding of metallic materials – Part 2: Comprehensive quality requirements (ISO 3834-2:2005); German version EN ISO 3834-2:2005

in accordance with the following chapters:

- Chapter 5 Review of requirements and technical inspection
- Chapter 6 Subcontracting
- Chapter 7 Welding personnel
- Chapter 8 Inspection and testing personnel
- Chapter 9 Equipment
- Chapter 10 Welding and related activities
- Chapter 14 Inspection and testing
- Chapter 17 Identification and traceability
- Chapter 18 Quality reports

Quality of Welding Joints
The welding joint qualities shall be specified by the designer and entered into the drawings.

Applicable standard

- DIN EN ISO 5817 Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections (ISO 5817:2003 + Cor. 1:2006); German version EN ISO 5817:2003 + AC:2006

  Generally, quality level 'C' applies for welding seams in corrosion-resistant materials as per

- DVS (German Welding Association) information sheet 0705 Recommendations for quality level assignment acc. to DIN EN ISO 5817:2006-10 and the preceding standard DIN EN 25817:1992-09

Welding-Related Requirements for Piping and Containers for Deionized Water Plant	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Requirements for the Parent Metal
Basic material inspection documents 3.1 according to DIN EN 10204 Metallic products - Types of inspection documents; German version EN10204:2004

Requirements for the Filler Metal

- Use equivalent or higher alloyed filler metals
- TÜV- or DB- Approval
- Material certificate 2.2 according to DIN EN 10204
- Welding without filler metal only permitted with approval from the Eisenmann company.

Tests and Scope of Inspections
Shall generally be determined together with the Principal and taken down in writing prior to signing the contract!

In doing so, proceed in accordance with the following standards:

- AD 2000 information sheet HP 5/3 Manufacturing and testing of pressure tanks - making and testing the joints - non-destructive testing of the welded joints
- AD 2000 information sheet HP 100 R Construction regulations – Pipes made of metallic materials

Test Types:

Non-destructive testing must comply with the following standards or, if necessary, other standards according to the requirements for the component and the application:

- General rules according to DIN EN ISO 17635
- Visual testing (VT) DIN EN ISO 17637
- Radiographic testing (RT) DIN EN ISO 17636
- Surface check after penetrant testing (PT) DIN EN ISO 3452
- Ultrasonic testing (UT) DIN EN ISO 17640
- Magnetic particle testing (MT) DIN EN ISO 17638
- Leakage test using the bubble method, with the vacuum chamber, with leak detection spray DIN EN 1779
- Leakage test with excess pressure, with leak detection spray or differential pressure measurement
  DIN EN 1779

Welding-Related Requirements for Piping and Containers for Deionized Water Plant	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Processing of Stainless Steels

- Processing carried out according to DIN EN 1011 Part 3.
- With the exception of electropolishing, the recommendations contained in DIN EN 1011 P3 apply to reworking.
- The interior and exterior surfaces of plants made of stainless, austenitic steels shall be free of temper colors and passivated.

Inspections

The Contractor shall ensure that the Principal or the Principal's representative is permitted to inspect the production parts at any time.

General Information

In the event of conflicting requirements in orders, statutory requirements or technical rules, the more stringent requirement shall always apply. In case of doubt, please consult with the ordering customer beforehand!

Technical Representation on Drawings

Symbols and dimensions shall be provided according to:

- DIN EN ISO 2553 Welding and allied processes - Symbolic representation on drawings – Welded joints (ISO 2553:2013); German version EN ISO 2553:2013
- DIN EN 1708-1 Welding – Basic welded joint details in steel welding. Part 1: Pressurized components; German version EN 1708-1:2010

Drawings shall be checked regarding welding aspects!

Welding seam preparation to be carried out according to:

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

18. Welding Requirements Selection of Filler Metals

Welding requirements **Filer metal selection**	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Suppliers

Manufacturing Instructions 01-04-36

Material		Inert-gas welding				Manual electric welding		
Combinations		Inert gas according to DIN EN ISO 14175			Welding wire	Electrode	Type of electrical current	
		MAG	MIG	TIG	EN ISO (material number) EN AWS	EN ISO (material number) EN AWS	AC	DC

Standard Joints

Construction steel	Construction 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	~	=/-
	-hot-dip galvanized sheet steel		--				~	=/-
hot-dip galvanized sheet steel	-hot-dip galvanized sheet steel	--	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	--	=/-
Construction 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	~	=/+
	-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	--	=/+
	-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	~	=/+
	-1.4404						~	=/+
	-1.4541						~	=/+
	-1.4571		I 1				~	=/+

Heat-resistant joints up to approx. 300°

1.5415	-1.4541	M12	--	I 1	**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	~	=/+

up to approx. 400°

1.5415	-1.5415	M23/ M21	--	I 1	**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	~	=/+

Welding requirements Filer metal selection	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

up to approx. 600°

Material		Inert-gas welding				Manual electric welding		
1.4541	-1.4541	M12	I 1	I 1	**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	~	=/+
	-1.4828						~	=/+
	-1.4835						~	=/+

up to approx. 1000°

1.4876	-1.4876	--	I 1	I 1	**EN ISO 18274:** S Ni 6082 (NiGr20Mn3Nb) **AWS A5.14:** ER NiCr-3 (2.4806)	**EN ISO 14172:** E Ni 6082 (NiCr20Mn3Nb) (2.4648) **AWS A5.11:** ~ E NiCrFe-3	--	=/+

up to approx. 1100°

1.4828	-1.4828	M12	I 1	I 1	**EN ISO 12072:** G 22 12 H (1.4829) **AWS A5.9:** ~ ER 309	**EN ISO 1600:** E 22 12 R 12 (~1.4829) **AWS A5.4:** E 309-16 mod.	--	=/+
	-1.4835				AVESTA 253 MA (UTP/ AVESTA Company) similar to wp. 1.4835			

up to approx. 1150°

1.4835	-1.4835	--	I 1	I 1	AVESTA 253 MA (UTP/ AVESTA Company) similar to wp. 1.4835	**EN ISO 1600:** E 22 12 R 12 (~1.4829) **AWS A5.4:** E 309-16 mod.	--	=/+

Acid-resistant joints

Material		Inert-gas welding				Manual electric welding		
1.4307	-1.4307	M12	I 1	I 1	**EN ISO 14343-A:** G 19 12 3 LSi (1.4430) **AWS A5.9:** ER 316 LSi	**EN 14700:** E Fe10 (1.4370) **EN 1600:** E 18 8 Mn R 1 2 **AWS A5.4:** ~ E 307-16	~	=/+
	-1.4404						~	=/+
	-1.4541						~	=/+
	-1.4571						~	=/+
1.4404	-1.4404						~	=/+
	-1.4541						~	=/+
	-1.4574						~	=/+
1.4541	-1.4541						~	=/+
	-1.4571						~	=/+
1.4571	-1.4571						~	=/+

Welding requirements Filer metal selection	Prepared by: Fiedler, Wolfgang (PL-GER) Reviewed by: Ruckaberle, Rainer (PL-GER)

Special materials

Sheet Aluminum 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

(Various Al-Mg alloys)		--	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 Protection Gases:

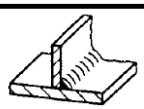
I1: 100% argon (argon 4.8)
M21: 18% CO_2, residual argon
M12: max. 2.5%CO_2, residual argon
M23: 5% O_2, 5% CO_2, residual argon

Black/White Welded Joints in General

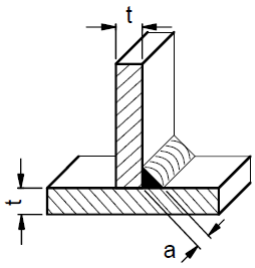
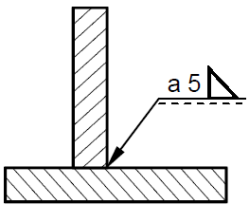
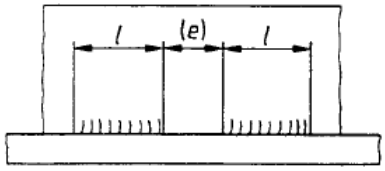
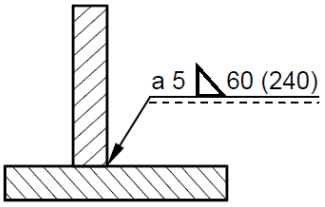
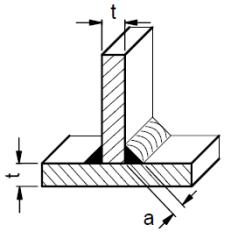
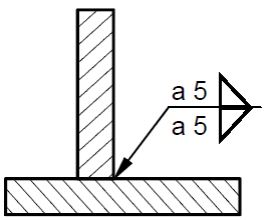
Temperature in the area of the welding seam	Filler metal
lower than 300°C	e.g. 1.4370
higher than 300°C	e.g. 2.4806

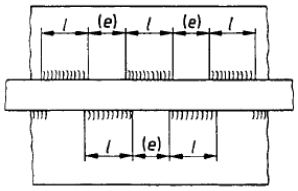
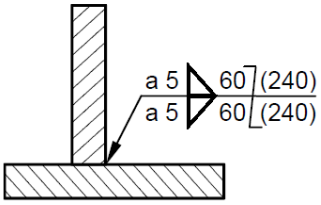
19. Symbolic Representation of Welding Seams Extract from DIN EN 22 553 and ISO 2553

Basic symbols

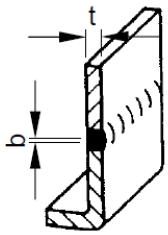
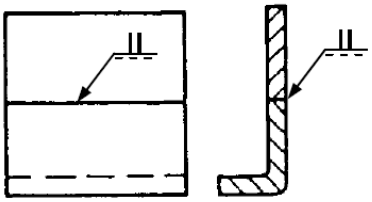
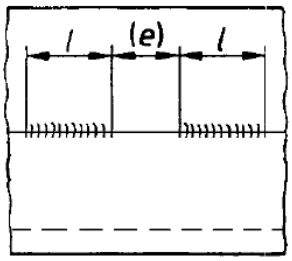
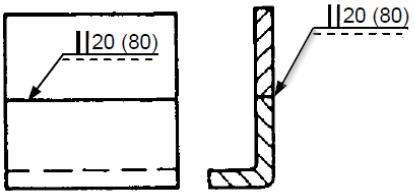
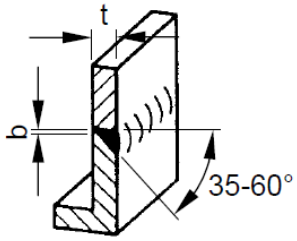
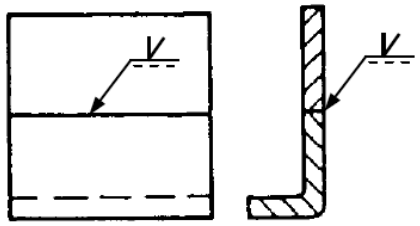
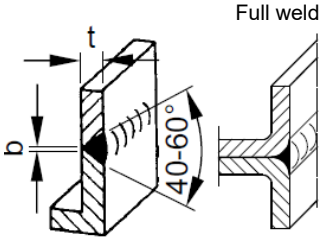
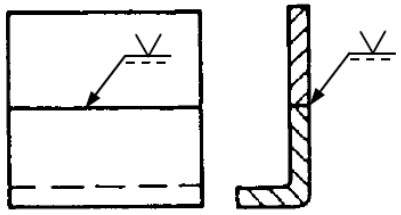
Kehlnaht		◺	I - Naht		‖	HV - Naht		✓
V - Naht		V	Punktnaht		○			

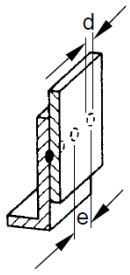
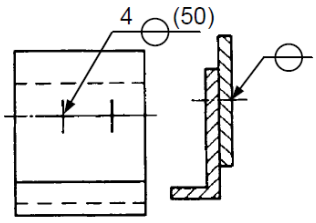
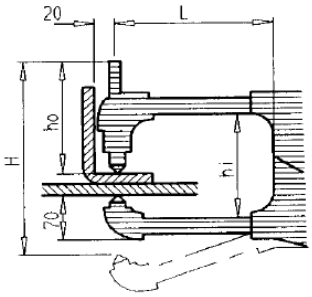
Display

as image	in drawing according to DIN EN 22553	Design instructions
Continuous fillet weld 	 for seam thickness a = 5	**Reference values for fillet weld dimensions** **Seam thickness a** for *t ≤ 2 mm a = 2 *t = 3 – 5 mm a = 3 *t = 6 – 10 mm a = 5 *t = 12 -15 mm a = 7
Interrupted fillet weld 	 for seam thickness a = 5; l = 60; seam spacing (e) = 240	for interrupted seam: **Seam length l** l = 10 x *t **Seam spacing (e)** t ≤ 6 mm e = 40 x *t t ≥ 8 mm e = 20 x *t * for differing sheet thicknesses t min. applies in each case
Double fillet weld continuous 	 for seam thickness a = 5	

Double fillet weld interrupted, offset  	 for seam thickness a = 5; l = 60; seam spacing (e) = 240	

Display

as image	in drawing according to DIN EN 22553	Design instructions
Continuous I weld  for sheet t = ≤ 6 mm	 	**Reference values for butt weld dimensions** for interrupted seam: **Seam length l** l = 10 x *t **Seam spacing (e)** t ≤ 6 mm e = 40 x *t t ≥ 8 mm e = 20 x *t * for differing sheet thicknesses t min. applies in each case **Welding gap b for sheet metal manufacturing:** Automatic welding machine b = 0 manual t ≤ 3 b = 0 t > 3 b = 2 **for pipes** Steel b = 0 Stainless steel Forming gas b = 0 Stainless steel Residual b = 1
I seam interrupted  	 for seam thickness l = 20; seam spacing (e) = 80	
Continuous HV seam  for sheet t = 8 - 10 mm	 	
Continuous V seam  for sheet t ≥ 12 mm		**Reference values for spot weld dimensions** Spot diameter d = 4 Spot spacing (e) = 50 **Options of sheet metal thickness:**

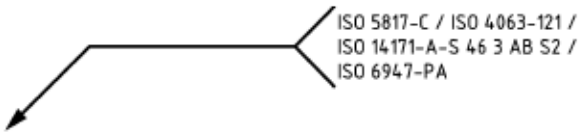
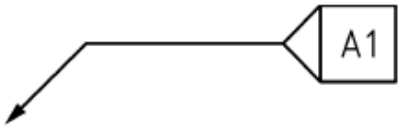
Spot weld 	 for spot diameter d = 4; spot spacing (e) = 50	**bold** = coil sheet 

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

20. Representation and Dimensioning of Welding Seams

Symbolic representation and implementation shall be carried out according to DIN EN 22 553.
Where symbols are included with incomplete dimensioning (seam thickness, seam length, seam spacing), the **reference values** apply.

21. Technical Representation of Welding Symbols With Defined Testing Procedure

Symbol	Usage as below
Example from DIN EN ISO 2553	The welding symbol shall always be represented with details of the testing procedure according to the currently valid standard.
Open fork 	Details in the fork here as examples for welding process, filler metal and welding position
Closed fork 	A closed fork may only be used in order to emphasize a certain instruction, e.g. a welding instruction, the report on qualification of a welding technique or another document such as a testing procedure (TXT reference)

Possible Leakage Test Techniques are:

- Color penetration test DIN EN ISO 3452-1
  If “leak-proof” is noted after the welding symbol, the tightness shall be tested using the procedure indicated above.

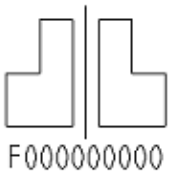
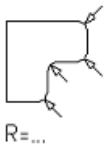
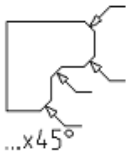
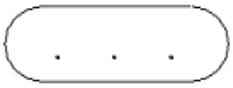
- Leakage test with leak detection spray or differential pressure measurement
  DIN EN 1779

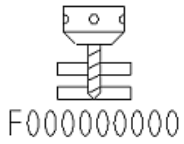
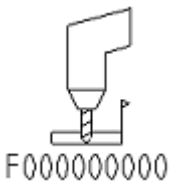
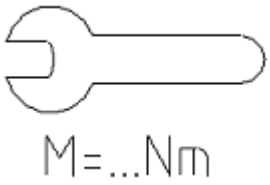
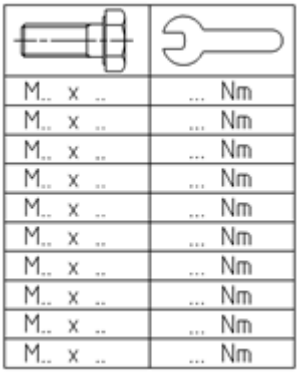
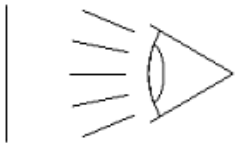
- Underpressure test using a vacuum suction cup and leak detection spray
  DIN EN 1779

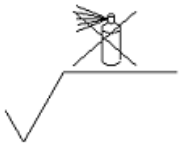
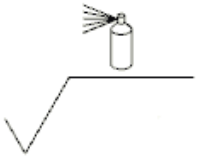
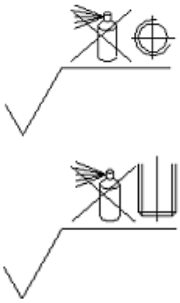
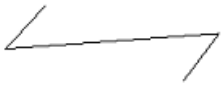
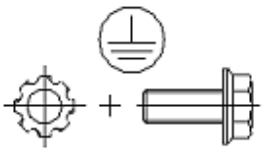
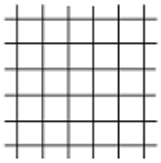
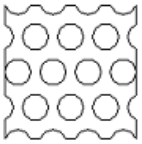
Detailed information (supplementary to the symbol on the drawing) on the test procedure shall be included in the object text. A test report is absolutely necessary.

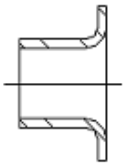
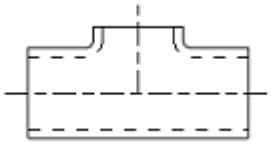
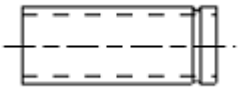
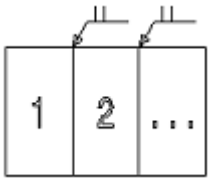
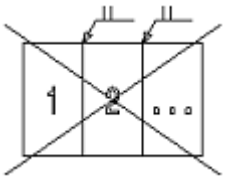
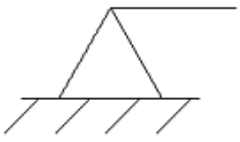
22. Text Symbols on Drawings

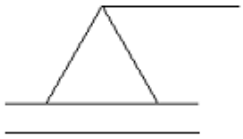
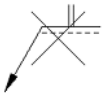
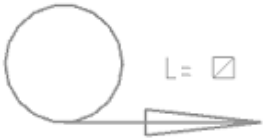
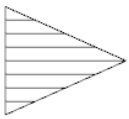
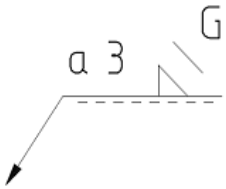
Text Symbols on Drawings	Prepared by: Wacker, Ralf (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

No.	Symbol	Application
1		Explanatory text/description which can be found in the object text in the parts list under “TXT n”. • Special instructions regarding this passage are available • Placed directly at the appropriate passage
2		Explanatory text(s) available for the drawing • Placement above the drawing title block • Note on object texts • Note on assembly instructions etc.
3		Mirrored part is available (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 radii not dimensioned • Placement above the drawing title block
5		Collective symbol for all chamfers not dimensioned • Placement above the drawing title block
6		Extra detail drawing available • See drawing no. ...
7		Control dimensions are on the drawing • Placement above the drawing title block

8		Drilled and reamed with ... • Placement above the drawing title block or at the respective drill holes • F000000000 = item ID of the other component
9		Drilled on assembly with ... • Placement above the drawing title block or at the respective drill holes • F000000000 = item no. of the component to be used for drilling out
10		Tightening torque Torque specifications of screw connections of +/- 6% shall be observed. The appropriate torque tool shall be selected so that the required torque is between 20% and 80% of the adjustment range of the tool. • Placement above the drawing title block or at the respective screw connections
11		Table for multiple tightening torques Torque specifications of screw connections of +/- 6% shall be observed. The appropriate torque tool shall be selected so that the required torque is between 20% and 80% of the adjustment range of the tool. • Placement above the drawing title block
12		Separation point for transportation • Placement at the transport separation points with additional dimensions
13		Visible side must not be scratched • Placement directly at the respective passage or above the drawing title block and the respective passage is marked with a dot-dash line parallel to the workpiece contour (— - —)

14		Surface must not be painted/coated • Placed directly at the appropriate passage
15		Surface must be painted/coated • Placed directly at the appropriate passage
16		Thread(s) shall not be painted/coated • Placement above the drawing title block, in which case it applies to all threads • Placement directly next to the respective thread, in which case it applies only to that thread
17		Conveying direction • Placement at the respective passage
18		Direction of bearing for gratings • Placement at the simplified grating representation
19		Grounding of all metallic parts in the assembly • Placement above the drawing title block • Components required for grounding to be listed in the parts list
20		Representation grid/sieve • Placement at the simplified net and sieve representations • Notes on mesh size to be entered into the object text
21		Representation of perforated plate • Placement at the simplified perforated sheet representation • Notes on diameter and hole spacing to be entered into the object text

22		Representation of bulb plate • Placement at the simplified bulb plate representation • Notes on bulb pattern and size to be entered into the object text
23		Preference shall be given to the fabrication of flanges. • Placement above the drawing title block
24		Preference shall be given to the fabrication of extruded collar(s). • Placement above the drawing title block
25		Victaulic couplings shall be produced at the ends • Placement above the drawing title block
26		Chip-free Components shall be completely free of chips.
27		Multi-part manufacture of the component permitted • Placement above the drawing title block • The component may be manufactured in multiple parts; the production department may determine how it is to be split up • If there is a requirement for fixed separating points, these shall be indicated and dimensioned on the component.
28		Multi-part manufacture of the component NOT permitted • Placement above the drawing title block • Manufacture of the component in multiple parts is NOT permitted
29		Fixed bearing installed at this location • Placed directly at the appropriate passage

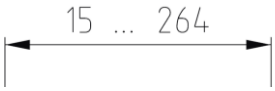
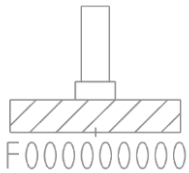
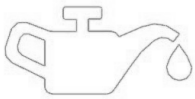
30		Floating bearing installed at this location • Placed directly at the appropriate passage
31		Not permitted • Symbol is placed above a welding sign, meaning: “Welding is not permitted here.” Example 
32		The extended length of the sheet metal • Symbol is placed above the drawing title block • Indication of the extended length
33		Crimp-free section Crimp-free section necessary in the area of the bending edge
34		Wall corrugation direction For packaging materials (corrugated cardboard, twin-wall sheets, ...)
35		Welding symbol with specification about reworking

Supplementary and Additional Images

	Seam surface: hollow (concave)
	Seam surface: flat (even)
	Seam surface: arched (convex)
	Seam surface: Notch-free
	Remaining inset used
	Support used

Selection for Reworking the Welding Seam[1)]

Letter	Procedure (English)	Procedure (German)

		C	*finish by* **c**hipping	*durch* spanende Bearbeitung
		G	*finish by* **g**rinding	*durch* Schleifen
		H	*finish by* **h**ammering	*durch* Hämmern
		M	*finish by* **m**achining	*durch* maschinelle (spanende) Bearbeitung
		R	*finish by* **r**olling	*durch* Walzen
		P	*finish by* **p**eening	*durch* Kugelstrahlen / Strahlhämmern
		[1)] Letters for the reworking are currently only used in the standards of English-speaking countries, e.g. ANSI/AWS A2.4 and currently not mentioned in the DIN, EN or ISO.		
36		Minimum ␣ up to ␣ maximum (…)		
37		Welding studs identification • Placement above the single part drawing title block. The F000000000 = item ID of the parent drawing in which the welding studs are positioned shall be indicated below this symbol. This allows production to mark the welding stud on the individual part if necessary.		
38		Greased/oiled with lubricant, see object text		

23. Drawing Preparation

The drawing shall be prepared independent of the project and/or processing.

When preparing the drawing, make sure that no logistical information such as: (provision, to the attention of …, delivery date, etc.) is specified on the drawing, parts list and in texts describing materials on physical objects.

24. Drawing Format

Generally, drawing formats according to DIN EN ISO 216 shall be used. If different requirements are made, this will be laid down in an individual contract.

25. Data Exchange

CAD data shall be supplied as follows:

- 2D in DGN/DWG format for MicroStation Layout
- 3D in DGN/DWG format for MicroStation Layout
- 3D in Step format for NX Design
- 3D in DXF format for NX Design
- 3D in Parasolid format for NX Design

- Electrical data compatible with EPLAN P8 Version 2.1.4

26. Standard – Assembly of Ancillary Materials

Standard – Assembly of Ancillary Materials Mounting of Hubs onto Shafts	Prepared by: Mutze, Andreas (CS-GER) Reviewed by: Benzinger, Rainer (IT-GER)

“Gleitmo 800” Ancillary Material Supplied by Fuchs Lubritech GmbH

- Gleitmo 800 is a white, high-performance lubricating paste that must be used in the temperature range of -25/+100 °C.
- Gleitmo 800 is silicone-free.
- Gleitmo 800 facilitates the assembly and later removal of hubs onto/from shafts.

EISENMANN Item Numbers	Manufacturer: Fuchs Lubritech GmbH Manufacturer Item Number
■ Item no. M3020080 (1000 ml can) ■ Item no. M3020081 (200 ml can)	■ Item no. 7000170150 (1000 ml can) ■ Item no. 7000170155 (200 ml can)

Standard
The ancillary material “Gleitmo 800” shall be used forassembling hubs (with the exception of clamping sets, shrink disks) onto shafts.

Deviations From the Standard
If a special ancillary material is necessary, this shall be indicated on the drawing and specified in the object text.

If no special ancillary material is to be used, this shall be indicated on the drawing and laid down in the object text.

Application:
“Gleitmo 800” is to be applied thinly to clean sliding surfaces (if possible degreased) using a brush or lint-free cloth.

27. Surface Treatment Coating Technique

If surface treatment is required, this shall be carried out according to the following specifications.

Surface Treatment Coating Technique	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Pretreatment: Black steel Manual degreasing: wash off using solvent e.g. TURCO Prepaint
Pretreatment plant: degreasing und phosphating
Galvanized steel/hot-dip galvanized sheet steel Manual degreasing: wash off using Acetone

Color Shades According to RAL Color Table K1

The required paint quality can be obtained from the Weckerle company.

Weckerle GmbH
Strohgäustrasse 20, 70435 Stuttgart
info@weckerle-lacke.de, www.weckerle-lacke.de
Tel.: +49 (0) 711 82601-0, Fax: +49 (0) 711 82601-70

Alternative paints and paint suppliers may only be used in cases where the physical and optical paint properties correspond with the paints supplied by the Weckerle company.

The respective parts list items shall be identified and painting requirements specified.

Surface Treatment Coating Technique	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Technical Specifications for Water-Based Paints (Without Customer-Specific Requirements)

For components with high degrees of surface roughness (e.g. cast material), the layer thickness is
40 µm + roughness depth of the component.

The following tolerances apply to painting: 0 to +10 µm.

Coating technique: spraying, painting with a brush and rolling.

28. 1. Dry interior

Top coat		Base coat		Base coat Type of paint: Single-component water-based paint Temperature resistance: +150°C/-30°C Gloss level: semi-gloss 5 - 15 GU GU = gloss unit, measurement angle = 60°		Top coat Type of paint: Single-component water-based paint Temperature resistance: +150°C/-30°C Gloss level: semi-gloss 5 - 15 GU GU = gloss unit, measurement angle = 60°	
RAL no.:	*Color name:*	***RAL no.:***	*Color name:*	**Layer thickness Base coat [µm]** (smooth surface Rt max. 10µm)	***Weco number Base coat***	**Layer thickness Top coat [µm]** (smooth surface Rt max. 10µm)	***Weco number Top coat***
1004	**Golden yellow**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140104
1015	**Light ivory**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140115
1021	**Colza yellow**	**9002**	**Grey white**	40 µm	45133140902	60 µm	45133140121
2000	**Yellow orange**	**9002**	**Grey white**	40 µm	45133140902	60 µm	45133140200
2001	**Red orange**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140201
2003	**Pastel orange**	**9002**	**Grey white**	40 µm	45133140902	60 µm	45133140203
2004	**Pure orange**	**9002**	**Grey white**	40 µm	45133140902	60 µm	45133140204
3000	**Flame red**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140300
5010	**Gentian blue**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140510
5012	**Light blue**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140512
6011	**Reseda green**	**5018**	**Turquoise blue**	40 µm	44103010518	40 µm	45133140611
7001	**Silver grey**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140701
7047	**Telegrey 4**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140747

9002	**Grey white**	**9002**	**Grey white**	40 µm	45133140902	40 µm	45133140902

Surface Treatment Coating Technique	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Technical Specifications for EP Two-Component Paint
EP two-component base coat and EP two-component top coat are only used in combination on account of the consistency and weathering properties of the paint. It is not possible to mix them with other paints.

For two-component paints, a water-based composition is standard.

The solvent-based composition is only to be used in special cases.
Coating technique: spraying and painting with a brush **Attention: Rolling is not permitted**

29. 2. Interior dry/wet (with resistance to chemicals) and exterior

Top coat		Base coat		Base coat Type of paint: EP two-component paint (water-based is standard/solvent) A higher degree of resistance to chemicals is possible using a solvent Temperature resistance: +130°C / -30°C Gloss level: matt 5 - 15 GU GU = gloss unit, measurement angle = 60°		Top coat Type of paint: EP two-component paint (water-based is standard/solvent) A higher degree of resistance to chemicals is possible using a solvent Temperature resistance: +150°C/-30°C Gloss level: semi-gloss 8 - 15 GU GU = gloss unit, measurement angle = 60°	
RAL no.:	*Color name:*	***RAL no.:***	*Color name:*	**Layer thickness Base coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Base coat***	**Layer thickness Top coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Top coat***
1004	**Golden yellow**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	40602010104
1015	**Light ivory**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	40602010115
1021	**Colza yellow**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	40602010121
2000	**Yellow orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	40602010200
2001	**Red orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	40602010201
2003	**Pastel orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	40602010203
2004	**Pure orange**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	40602010204
3000	**Flame red**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010300
5010	**Gentian blue**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010510
5012	**Light blue**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010512
6011	**Reseda green**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010611
7001	**Silver grey**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010701
7047	**Telegrey 4**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	40602010747

9002	**Grey white**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	40602010902

Surface Treatment **Coating Technique**	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Technical Specifications for EP Two-Component Paint
EP two-component base coat and EP two-component top coat are only used in combination on account of the consistency and weathering properties of the paint. It is not possible to mix them with other paints.

For two-component paints, a water-based composition is standard.

The solvent-based composition is only to be used in special cases.
Coating technique: spraying and painting with a brush **Attention: Rolling is not permitted**

30. 3. Exterior with resistance to UV rays and seawater

Top coat		**Base coat**		**Base coat** Type of paint: EP two-component paint (water-based is standard/solvent) A higher degree of resistance to chemicals is possible using a solvent Temperature resistance: +130°C / -30°C Gloss level: matt 5 - 15 GU GU = gloss unit, measurement angle = 60°		**Top coat** Type of paint: PUR two-component paint (water-based is standard/solvent) A higher degree of resistance to chemicals is possible using a solvent Temperature resistance: +150°C/-30°C Gloss level: glossy 60 - 80 GU GU = gloss unit, measurement angle = 60°	
RAL no.:	*Color name:*	***RAL no.:***	*Color name:*	**Layer thickness Base coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Base coat***	**Layer thickness Top coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Top coat***
1004	**Golden yellow**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	41522010104
1015	**Light ivory**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	41522010115
1021	**Colza yellow**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	41522010121
2000	**Yellow orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	41522010200
2001	**Red orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	41522010201
2003	**Pastel orange**	**1015**	**Light ivory**	40 µm	41601125144	80 µm	41522010203
2004	**Pure orange**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	41522010204
3000	**Flame red**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010300
5010	**Gentian blue**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010510
5012	**Light blue**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010512
6011	**Reseda green**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010611
7001	**Silver grey**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010701
7047	**Telegrey 4**	**1015**	**Light ivory**	40 µm	41601125144	40 µm	41522010722

9002	**Grey white**	**1015**	**Light ivory**	40 µm	41601125144	60 µm	41522010735

Surface Treatment
Coating Technique

Prepared by: Tietze, Margit (IT-GER)
Reviewed by: Benzinger, Rainer (IT-GER)

Technical Specifications for Aluminum Paint

Components that are outdoors shall also be primed with a base coat layer of 40 µm to provide for weathering resistance. Then the aluminum paint shall be applied with a layer thickness of 20 µm.

Coating technique: spraying

31. 4. Aluminum paint

Top coat		**Base coat**		**Base coat** Type of paint: Single-component water-based paint Temperature resistance: +150°C/-30°C Gloss level: semi-gloss 5 - 15 GU GU = gloss unit, measurement angle = 60°		**Top coat** Type of paint: Water-based aluminum paint Temperature resistance: +150°C/-30°C Gloss level: matt 5 - 15 GU GU = gloss unit, measurement angle = 60°	
RAL no.:	*Color name:*	***RAL no.:***	*Color name:*	**Layer thickness Base coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Base coat***	**Layer thickness Top coat [µm]** (smooth surface Rtmax 10 µm)	***Weco number Top coat***
9006	**White aluminum**	**9002**	**Grey white**	40 µm	45133140902	20 µm	42106513575

Surface Treatment Coating Technique	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

32. 5. Powder coating

As an alternative for painting surfaces with wet paint, powder coating can be used instead.

Eisenmann Processing Guidelines: Paints (powder coating)
(TGIC-free polyester powder, GSB-certified)
in accordance with DIN 55990

Technical specifications	Type of coating 10
	Polyester powder TGIC-free polyester powder, GSB-certifi
For color,	see coating order
RAL no./ *KM no.	see coating order
Gloss level	semi-gloss 8 - 15 GU GU = gloss unit, measurement angle = 6
Temperature resistance	+150°C/-30°C
Particle/grain size distribution µm	5 - 100
Possible layer thicknesses µm	60 - 80
Hazard category	none
Comments	can be painted over with water-based pa

Depending on the requirements and nature of the part, pretreatment for **powder coating** is carried out either by sandblasting or by a wet chemical process. In the process, the parts are degreased, treated with iron phosphate, rinsed with deionized water and then passivated by means of the no-rinse technique. Alternatively, the parts can also be pickled. The coating consists of polyester powder. The powder supplier's processing parameter specifications are to be observed. The layer thickness is either based on the specifications of the customer or generally range between 80 - 120µm. Depending on the part geometry and the surface to be painted, this may vary upwards or downwards!

33. Surface Treatment Techniques Without Painting

Surface Treatment Techniques Without Painting	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Sand Blasting
Scale, rust and coatings are removed so that residue only remains visible as light nuances due to tinting of pores. The blasting material must be completed removed.

Pickling, Galvanizing, Powder Coating

Generally, the following applies:

Electrogalvanizing is to be carried out according to DIN EN ISO 2081!
The parts are degreased, pickled, electrolytically degreased, pickled, electrolytically galvanized using a weak acid process and finally given a blue chromate coating (chromium trivalent). As a guideline, we aim for a galvanizing layer thickness of 8 µm.

Untreated or uncoated components shall always be wrapped with VCI film to protect them from corrosion!

34. Processing regulations for canted and perforated plates

Processing requirements for canted and perforated plates	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Hot-dipped aluminum coated steel sheet metal:

- Plates must not be scratched on the visible side and feature no spots of white rust.
  Marking on the visible side, see text - Symbols on drawings no.13

- Paint welded sections (if present) with aluminum paint, white aluminum KM 3575, no. 4210651 from
  Weckerle.

Sendzimir-galvanized steel sheet metal:

- Plates must not be scratched on the visible side and feature no spots of white rust.
  Marking on the visible side, see text - Symbols on drawings no.13
- Paint welded sections (if present) using zinc powder paint no. 4210651 from Weckerle
  .

Stainless steel sheet:

- Plates must not be scratched on the visible side.
  Marking on the visible side, see text - Symbols on drawings no.13
- Treat welded sections (if present) using pickling paste.

Type of Implementation and Surface Quality According to DIN EN 10088-2

The following surface qualities are laid down for rust-proof sheets in 1.4307, 1.4541, 1.4404, 1.4571.

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

35. Manufacturing Requirements Hot-Dip Galvanized Sheet Steel and Stainless Steel - Sheet Metal Forming

Manufacturing Requirements Hot-Dip Galvanized Sheet Steel and Stainless Steel - Sheet Metal Forming	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

Dryer Components
(e.g. blow-out walls, filter walls, extraction ducts etc.)

1. The manufactured components shall have no scratches. The profile must not be scratched on the visible side.
   (The adjacent edge radii and cut edges are also included as part of the visible side.)

   Marking on the visible side, see text - Symbols on drawings no.13

   Adhere to the following tolerances:

   All edges shall be 90° ± 30′.

   The permitted torsion angle is 1° along the total length.
2. Sheet metal plates and reinforcements shall be accurately produced so that there are no gaps when assembled.
3. Excessive peaking at the welding seams or other unevenness, e.g. sagged roots or welding spatter shall always be removed.
   Welding seams shall be produced flat, without pores, notches and flank errors.
   Distortion shall be avoided.
   No lint should catch during subsequent cleaning with a wool cloth.
   Risk of injury shall be excluded.
4. Surface grinding (e.g. in the area of the welding seam) shall be avoided. Risk of corrosion due to damage of the aluminum coating or stainless steel surface!
5. Lacquers, sealant and similar materials which are not compatible with paint **may not be used under any circumstances**.
6. After manufacture, the components must be “swept clean”.
   Only dry cleaning without the use of a cleaning agent.
7. The components shall be processed and stored dry.
   The packaging for transportation to the delivery address shall be selected so that dirt and moisture cannot ingress into the components.

For Hot-Dip Galvanized Sheet Steel

8. The welds shall be produced so that the hot-dip galvanized sheet steel coating does not burn in the area of the seam and on the rear of the plate.

For Stainless Steel

9. Tempering colors must be completely removed.

36. Manufacturing Requirements Plastic Processing

Manufacturing Requirements Plastic Processing	Prepared by: Tietze, Margit (IT-GER) Reviewed by: Benzinger, Rainer (IT-GER)

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

1. The manufactured components shall have no scratches.
2. Deburr all cut edges.
   Excessive peaking at the welding seams or other unevenness, e.g. sagged roots or welding spatter shall always be removed.
   Welding seams shall be produced flat, without pores, notches and flank errors.
   Distortion shall be avoided as far as possible.
   No lint should catch during subsequent cleaning with a wool cloth.
   Risk of injury shall be excluded.
3. After manufacture, the components must be “swept clean”.
   Only dry cleaning without the use of a cleaning agent.
4. The components shall be processed and stored dry.
   The packaging for transportation to the delivery address shall be selected so that the component will not be damaged and dirt and moisture cannot ingress into the components.

37. List of Amendments

Date	Version	Author/Revision	Reason for the change
07/24/2017	1.0.0	Initial version	replaces: Manufacturing Instructions for EISENMANN drawing parts 01-04-36 Last updated: 03/2015
10/25/2017	1.1.0	RAL no. corrected	In surface treatment with painting, aluminum paint RAL no. corrected from 3575 to 9006 Email address corrected on page 36
12/19/2017	1.2.0	Pretreatment new	Pretreatment newly added to the surface treatment process with coating. On page 39, temperature resistance of aluminum paint corrected from +250 °C to +150 °C.
05/22/2018	1.3.0	Symbol no. 36 new Specifications of symbol no. 10 and 11 added	Symbol on drawing no. 36 min. to max. dimension on page 32 newly added. For symbols no. 10 and 11 on page 28, tolerances newly specified.
11/23/2018	1.4.0	Drawing preparation	Reference to project- and process-neutral drawing preparation added on page 33.
01/15/2019	1.5.0	Packaging guidelines	On page 5, supplier for VCI film has been changed.
04/25/2019	1.6.0	Symbol no. 37 new	Symbol on drawing no. 37 welding stud identification on page 32 newly added
05/23/2019	1.7.0	Packaging guidelines, separate document Symbol no. 38 new	Packaging guidelines in separate document Symbol on drawings no. 22, description revised Symbol on drawing no. 38, oil can newly added
12/05/2023	2.0	Eisenmann GmbH adaptation	