GLAUNACH

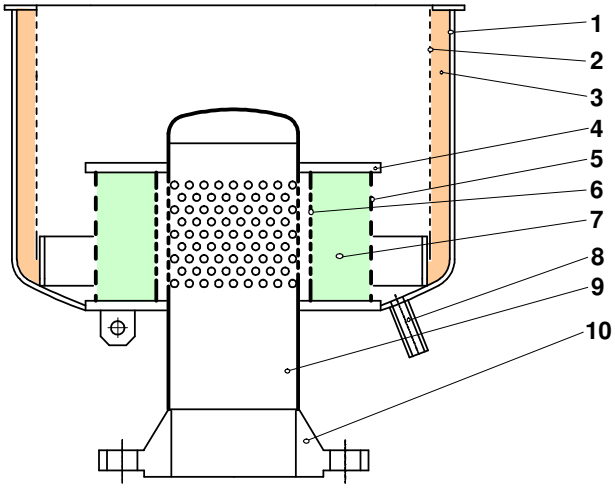
THE SILENCER HANDBOOK

MATERIALS & STANDARDS

ENSURING SUISTAINABLE QUALITY AND SAFETY IN OPERATION

1. SILENCER STANDARD MATERIALS

All materials used in GLAUNACH silencers have been chosen according to European technical codes and standards. The respective material properties are listed on the following pages. On request, also materials according to ASTM or other standards can be used.



Item No.	Part	Standard Materials		
		up to 400 °C | 750 °F	up to 510 °C | 950 °F	up to 540 °C | 1000 °F
1	Silencer Shell	FE360B (*1.0037*)	P265GH (*1.0425*)	16Mo3 (*1.5415*)
2	Perforated Noise Absorber Sheet	X5CrNi18-10 (*1.4301*)	X5CrNi18-10 (*1.4301*)	X6CrNiTi18-10 (*1.4541*)
3	Noise Absorber	mineral wool with long-strand glass fabric lining		
4	Diffuser Top Plate	P265GH (*1.0425*)	16Mo3 (*1.5415*)	16Mo3 (*1.5415*)
5	Perforated Diffuser Cartridge Sheet	P265GH (*1.0425*) 16Mo3 (*1.5415*)	16Mo3 (*1.5415*)	16Mo3 (*1.5415*)
6	Diffuser Tube	St35.8 I (*1.0305*)	16Mo3 (*1.5415*)	16Mo3 (*1.5415*)
7	Diffuser Wrapping	X5CrNi18-10 (*1.4301*)	X5CrNi18-10 (*1.4301*)	X6CrNiTi18-10 (*1.4541*)
8	Dewatering Pipe	St35.8 I (*1.0305*)	St35.8 I (*1.0305*)	St35.8 I (*1.0305*)
9	Inlet Pipe	St35.8 I (*1.0305*)	16Mo3 (*1.5415*)	13CrMo4-5 (*1.7335*)
10	Flange	C 22 (*1.0402*)	16Mo3 (*1.5415*)	13CrMo4-5 (*1.7335*)

NOTE: We reserve the right to substitute materials with higher-grade materials for technical reasons.

GLAUNACH silencers are designed for an effective operating time of 10,000 hrs. Since blow-off silencers are normally operated intermittently and loaded only for short durations of time, our products have typical gross lifetimes of many years.

COMPARISON OF RELEVANT INTERNATIONAL MATERIAL STANDARDS

Germany		France	United Kingdom	Italy	Sweden	USA
Material No	*DIN Marking*	*AFNOR*	*B.S.*	*UNI*	*SS*	*AISI / SAE / ASTM*
1.0425	P265GH	A 42 CP; AP	1501 Gr. 161-400; 151-400 1501 Gr. 164-360; 161-400 1501 Gr. 164-400; 154-400	Fe 410 1 KW; KG; KT Fe 410 2 KW; KG	1430 1432	A 516 Gr. 60 [1)]
1.5415	16 Mo 3	15 D 3	-	16 Mo 3 (KG; KW)	2912	A 204 Gr. A 4017
1.7335	13 CrMo 4-5	15 CD 3.5 15 CD 4.5	620-440 620-470 620-540 1501-620; 621	14 CrMo 3 16 CrMo 3	2216	A 182-F11; F12 A 387 Gr. 12 Cl.2
1.0305 [1)]	St 35.8 I	---	---	C14	---	A 106 Gr.A
1.0402	C 22	AF 42 C 20 XC 25 1 C 22	055 M 15 070 M 20 1449 22 HS, CS	C 20 C 21 C 25	1450	(M) 1020 M 1023
1.4301	X 5 CrNi 18 10	Z 4 CN 19-10 FF Z 5 CN 17-08 Z 6 CN 18-09 Z 7 CN 18-09	304 S 15 304 S 16 304 S 17 304 S 18 304 S 25 304 S 31	X 5 CrNi 18 10	2332 2333	304 304 H
1.4541	X 6 CrNiTi 18 10	Z 6 CNT 18-10	321 S 18 321 S 22 321 S 31 321 S 51 (490; 510) 321 S 59 LWCF 24	X 6 CrNiTi 18 11	2337	321

NOTE: This comparison has been compiled for informational purposes, based on C. Wegst & M. Wegst: Key to Steel*, 16th Ed., 1992*

P265GH is included in Key to Steel as H II, 16Mo3 as 15Mo3 and 13CrMo4-5 as 13CrMo44; materials marked with [1)] are not included in the original international comparison of material norms & standards in Key to Steel, and have been added based on information from other sources.

2. MATERIAL DATA

2.1 MATERIAL COMPOSITION

Material			Chemical composition								
Material Marking	*Material No.*	*Relevant Standard*	*%C*	*%Si*	*%Mn*	*%P*	*%S*	*%Mo*	*%Cr*	*%Ni*	*%Ti*
FE360B	1.0037	DIN EN 10025	≤ 0.17	-	-	≤ 0.045	≤ 0.045	-	-	-	-
P265GH	1.0425	DIN EN 10028-2	≤ 0.20	≤ 0.40	0.50 - 1.40	≤ 0.03	≤ 0.025	≤ 0.08	≤ 0.30	-	-
16Mo3	1.5415	DIN EN 10028-2	0.12 - 0.20	≤ 0.35	0.40 - 0.90	≤ 0.03	≤ 0.025	0.25 - 0.35	≤ 0.30	-	-
13CrMo 4-5	1.7335	DIN EN 10028-2	0.08 - 0.18	≤ 0.35	0.40 - 1.00	≤ 0.03	≤ 0.025	0.40 - 0.60	0.70 - 1.15	-	-
St35.8 I	1.0305	DIN 17175	≤ 0.17	≤ 0.35	0.40	≤ 0.05	≤ 0.05	-	-	-	-
X5CrNi 18-10	1.4301	DIN 17441	≤ 0.07	≤ 1.0	≤ 2.0	≤ 0.045	≤ 0.03	-	17.0 - 19.0	8.5 - 10.5	-
X6CrNiTi 18-10	1.4541	DIN 17441	≤ 0.08	≤ 1.0	≤ 2.0	≤ 0.045	≤ 0.03	-	17.0 - 19.0	9.0 - 12.0	≥ 5×%C ≤ 0.8

2.2 GENERAL MECHANICAL PROPERTIES

Material	Yield Stress	Elastic Limit (*proof stress*)		Tensile Strength	Elongation at Break
	N/mm²	*0,2 %*	*1 %*	*N/mm²*	*%*
P265GH (*1.0425*)	≥255	130 (@ 400°C)	-	410 - 530	≥23
16Mo3 (*1.5415*)	≥275	140 (@ 500°C)	-	440 - 590	≥24
13CrMo4-5 (*1.7335*)	≥300	165 (@ 500°C)	-	440 - 590	≥19
St35.8 I (*1.0305*)	≥240	-	-	350 - 450	≥25
X5CrNi18-10 (*1.4301*)	-	195	230	500 - 700	≥40
X6CrNiTi18-10 (*1.4541*)	-	200	235	500 - 730	≥35

2.3 CREEP RUPTURE STRENGTH

Material	Temperature [°C]																			
	380	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570
P265GH | St35.8I																				
10,000 h – N/mm²	183	169	153	139	126	114	102	90,4	80	68,8	60									
100,000 h – N/mm²	132	118	106	94,4	82,4	72,8	63,2	55,2	47,2	40	33,6									
16Mo3																				
10,000 h – N/mm²								238	218	198	178	157	137	118	100	81,,6				
100,000 h – N/mm²								196	167	139	114	93,6	74,4	59,2	47,2	37,6				
13CrMo4-5																				
10,000 h – N/mm²								296	278	262	243	218	191	167	143	123	103	87	73	61
100,000 h – N/mm²								228	201	176	152	130	110	92,8	75,2	62,4	48,4	39	32	26

NOTE: The table above lists the tension on the original cross section leading to rupturing after 10,000 hrs respectively 100,000 hrs, for different operation temperatures.

3. CODES AND STANDARDS RELEVANT TO VENT SILENCERS

	EU	US
Certified Quality Assurance	ISO 9001:2008 EN 729-2	ISO 9001:2008
Pressure Equipment Directives	PED 97/23/EC	ASME Section VIII Div.1 B31.1 NBEP
Harmonised Pressure Vessel Standards	AD-2000 [1)] TRD [2)] EN 13480	- *N/A* -
Welder Performance Qualification	EN 287-1 / A1	ASME Section IX
Welding Procedure Specification	EN 288-3 / A1	ASME Section IX
Approval of Welding Procedures	ÖNORM M 7812 AD2000-HP0 TRD 201	- *N/A* -
Pressure Equipment Marking	PED 97/23/EC Kat I,II,III	- *N/A* -
Sandblasting	ISO 12944-4:1998	SSPC-SP 10
Inlet Pipe Materials	EN & DIN Material Standards	ASTM & ASME Material Standards
Non-Destructive Testing	SO-EN 473 VT, PT, RT, MT, UT	ASNT SNT-TC-1A- VT, PT, RT, MT, UT

1) *Arbeitsgemeinschaft Druckbehälter* (Work Group of Pressure Vessels): Safety requirements according to the European Pressure Equipment Directive (PED), www.ad-2000-online.de

2) *Technische Regeln für Dampfkessel* (Technical Directives for Steam Boilers)

4. QUALIFICATIONS

GLAUNACH is nationally and internationally accredited to manufacture silencers according to PED and ASME standards.

5. QUALITY CONTROL

GLAUNACH's comprehensive quality management system covers construction and production of vent silencers, following applicable national and international standards and rules (ISO, TRD, PED, TRB, AD Codes of Practice) as well as customer-specified Quality Assurance procedures and systems.

MATERIAL QUALITY

The quality of the materials for pressurised parts is certified by Inspection Certificates according to DIN 50049 / DIN EN 10204, sections

3.1A for materials 16Mo3 and 13CrMo4-5

3.1B for materials P265GH, St35.8 I, and ASTM-compliant materials

2.2 for all other materials used

QUALITY CONTROL OF WELDED JOINTS

We furnish full proof that the manufacturing quality requirements according to AD-2000 Merkblatt HP 0 are fulfilled.

GLAUNACH

- ❑ uses appropriate production and welding equipment, which enables us to manufacture silencers in compliance with the technical state of the art,
- ❑ employs qualified welding personnel and certified welding supervisors,
- ❑ operates testing facilities that guarantee that manufacturing and inspection of our products comply to applicable technical rules and standards, and
- ❑ employs qualified inspectors and inspection supervision personnel.

If necessary, also welding qualification in accordance to ASME Sec. IX can be supplied. For applications where a code stamp according to ASME is prescribed, an official inspection is performed and documented by an Authorised Inspection Agency.

QUALITY MANAGEMENT:

GLAUNACH has a Quality Management System in accordance to ISO 9001 in place. First certified in 1993 by Lloyd's Register, our QM-systems continues to be constantly supervised and recertified annually.

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Glaunach GmbH
Klagenfurt
Austria

has been approved by Lloyd's Register Quality Assurance
to the following Quality Management System Standard:

ISO 9001:2008

The Quality Management System is applicable to:

Design and Manufacturing of vent silencers and inline silencers for air/gas/steam flows

Approval
Certificate No: VNA0004709

Original Approval: 30th March 1993
Current Certificate: 23rd March 2009
Certificate Expiry: 31st March 2011

Issued by: Lloyd's Register EMEA Niederlassung
Wien for and on behalf of
Lloyd's Register Quality Assurance Limited

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