11.1 Sensor Series IBFD-HTG for Superheated Steam to 5880 PSI

Description

Sensor series IBFD-HTG is designed to measure volumetric / mass flow of superheated steam. Because of high safety related requirements the sensor is only manufactured in a welded construction, which afterwards is stress-free annealing. A (German) VdTÜV component test is done for certain types of IBFD-26 HTG.

Materials	Max. steam temperature
1.5415 (15 Mo 3)	986 °F
1.7335 (10 CrMo 4 4)	1022 °F
1.7380 (10 CrMo 9 10)	1058 °F
1.4903 (10 CrMoVNB 91)	1202 °F

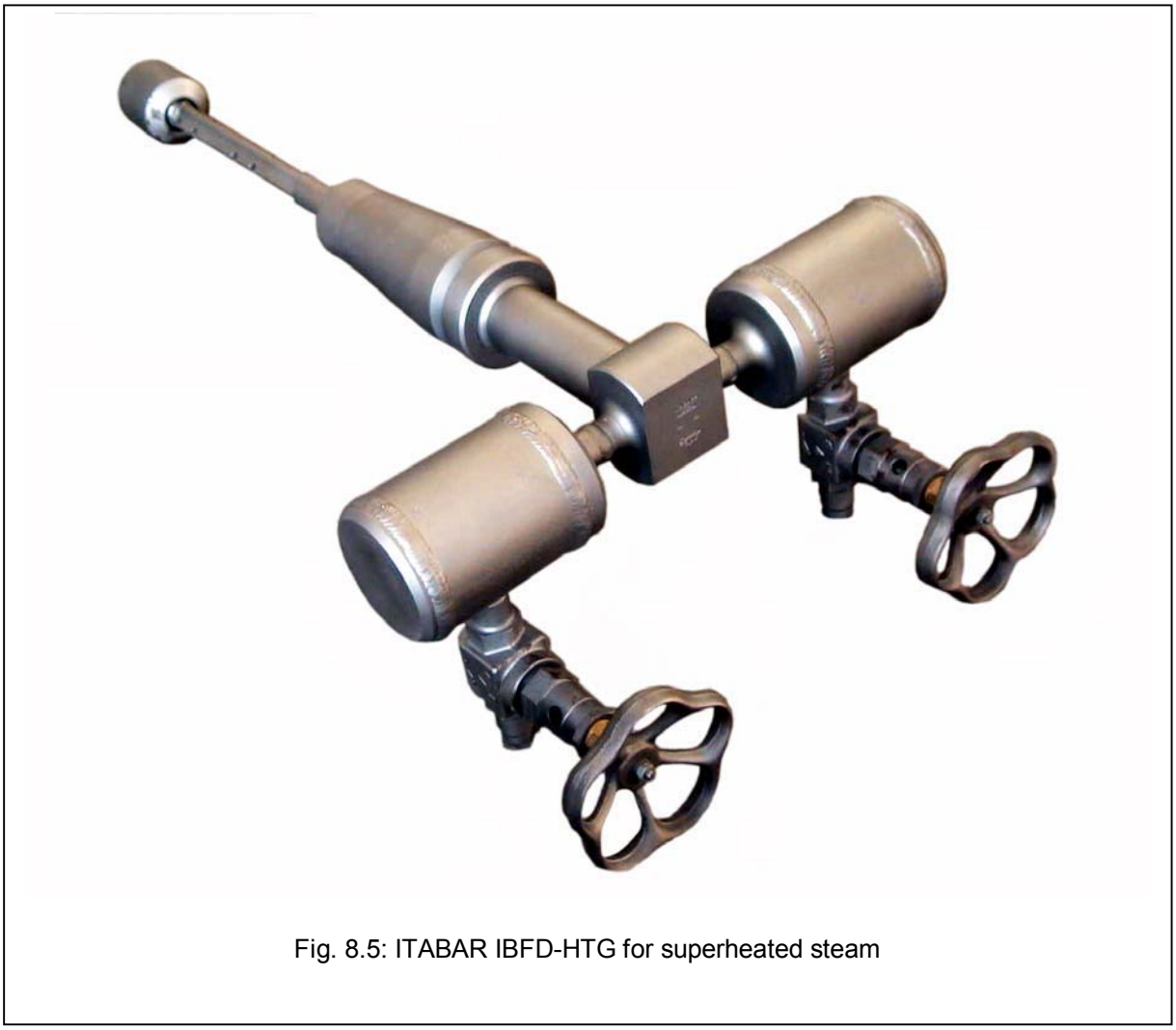
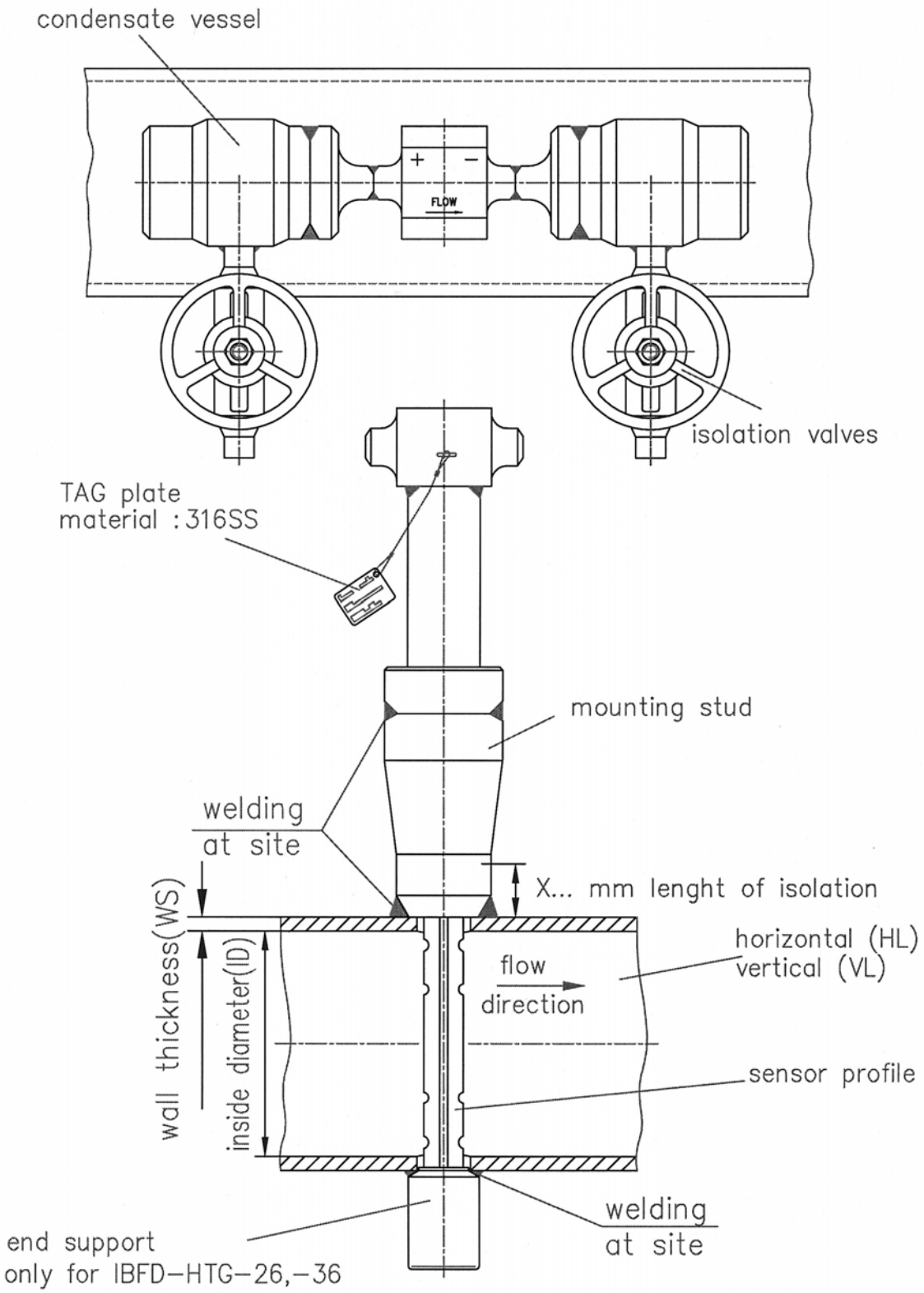


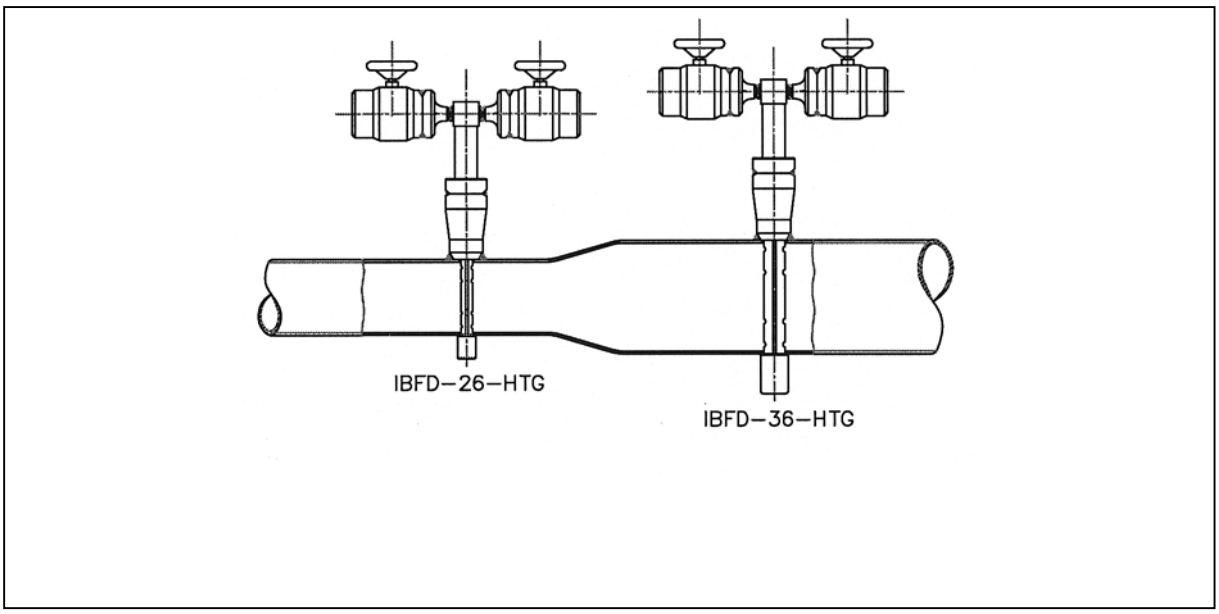
Fig. 8.5: ITABAR IBFD-HTG for superheated steam

Drawings for ITABAR Series IBFD-HTG



Oder Data for ITABAR Series IBFD-HTG

1. Sensor Type



Pipe Size	Maximum flow volume Q_v in GPM	
	IBFD –26-HTG	IBFD –36-HTG
4	4857	---
5	6415	---
6	7972	---
8	11083	---
10	14476	---
12	18145	19826
14	21696	23786
16	25137	27755
20	32340	35323
24	39419	42803

These values are for water of 0.999 SGU and at a temperature T = 68 °F. To calculate volumetric or mass flow of fluids with other densities see chapter 6 „Specifications of DP Sensors with WINFLOW“.

1. Order specification ITABAR-FLOW-Sensor, series IBFD-HTG-26

	1. type of sensor							
	26-HTG	IBFD-26-HTG						
		2. inside diameter and wall thickness.						
		ID / W.-thickn.	inside diameter and wall thickness in inches (or mm), please specify					
			3. sensor material				**max. op. temperature**	
			P	1.5415 (15 Mo 3)			530°C	
			V	1.7335 (13 CrMo 4 4)			550°C	
			R	1.7380 (10 CrMo 9 10)			570°C	
			C	1.4903 (10 CrMoVNb 91)			650°C	
				4. condesate vessel with connection				
					s. page 152			
					5. thermal isolation			
					KI	without		
					X..	thermal isolation in inches or mm,		
						please specify		
						6. piping run		
						HL	horizontal	
						VL	vertikal	
							12. process connection, s page 155	
IBFD-	26-HTG	/						

1. Order specification ITABAR-FLOW-Sensor, series IBFD-HTG-36

	1. type of sensor							
	36-HTG	IBFD-36-HTG						
		2. inside diameter and wall thickness.						
		ID / W.-thickn.	inside diameter and wall thickness in inches (or mm), please specify					
			3. sensor material		**max. op. temperature**			
			P	1.5415 (15 Mo 3)	530°C			
			V	1.7335 (13 CrMo 4 4)	550°C			
			R	1.7380 (10 CrMo 9 10)	570°C			
			C	1.4903 (10 CrMoVNb 91)	650°C			
				4. condesate vessel with connection				
				s. page 152				
					5. thermal isolation			
					KI	without		
					X..	thermal isolation in inches or mm,		
						please specify		
						6. piping run		
						HL	horizontal	
						VL	vertikal	
								12. process connection, s page 155
IBFD-	36-HTG	/						

Pressure Rating Assembly Flange

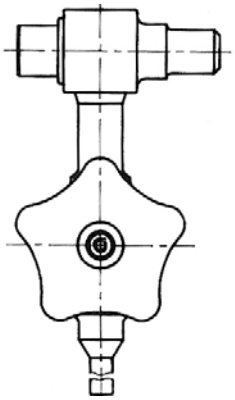
Code	Material	Pressure rating	Operating temperature (°F)															
			Max Operating Pressure PSI															
			572	662	752	842	932	950	968	986	1004	1022	1040	1058	1076	1112	1148	1202
C1	C22.8	PN16 / 150 lbs	139	88														
S1	1.4571		169	161	161	147												
P1	1.5415		161	147	139	132	117											
R1	1.7335		176	161	174	139	139	117	102	88,2	73	59						
S1	1.7380																	
V1	1.4903																	
C1	C22.8	PN40 / 300 lbs	352	147														
S1	1.4571		382	382	367	352												
P1	1.5415		397	367	338	323	308											
R1	1.7335		441	396	382	352	352	294	250	220	191	147						
S1	1.7380																	
V1	1.4903																	
C1	C22.8	PN63 / 300 lbs																
S1	1.4571																	
P1	1.5415																	
R1	1.7335																	
S1	1.7380																	
V1	1.4903																	
C1	C22.8	PN100 / 600 lbs	882	808														
S1	1.4571		1014	970	940	882												
P1	1.5415		970	926	867	837	808											
R1	1.7335		1073	999	940	896	867	735	646	543	455	382						
S1	1.7380																	
V1	1.4903																	
C1	C22.8	PN160 / 1500 lbs	1411	1323														
S1	1.4571		1617	1543	1381	1396												
P1	1.5415		1558	1470	1381	1337	1293											
R1	1.7335		1705	1587	1514	1425	1381	1176	1029	882	735	602						
S1	1.7380																	
V1	1.4903																	
C1	C22.8	PN250 / 1500 lbs	2822	2058														
S1	1.4571		3101	2425	2352	2205												
P1	1.5415		3131	2205	2175	2102	2028											
R1	1.7335		3425	2499	2366	2234	2175	1764	1411	1264	1102	940						
S1	1.7380		3469	2616	2499	2381	2249	1778	1440	1308	1131	999	867	779				
V1	1.4903																	
C1	C22.8	PN320 / 2500 lbs	2822	2646														
S1	1.4571		3101	3087	2940	2675												
P1	1.5415		3131	2954	1778	2690	2601											
R1	1.7335		3425	3189	3028	2866	2793	2175	1764	1558	1396	1205						
S1	1.7380		3586	3351	3204	3057	2881	2263	1852	1675	1470	1293	1117	999				
V1	1.4903																	
R1	1.7335	PN400 / 2500 lbs	4454	4160	3983	3792	3513	2793	2175	1999	1690	1543						
S1	1.7380		4483	4189	3998	3822	3601	2866	2307	2087	1837	1617	1396	1249				
V1	1.4903																	

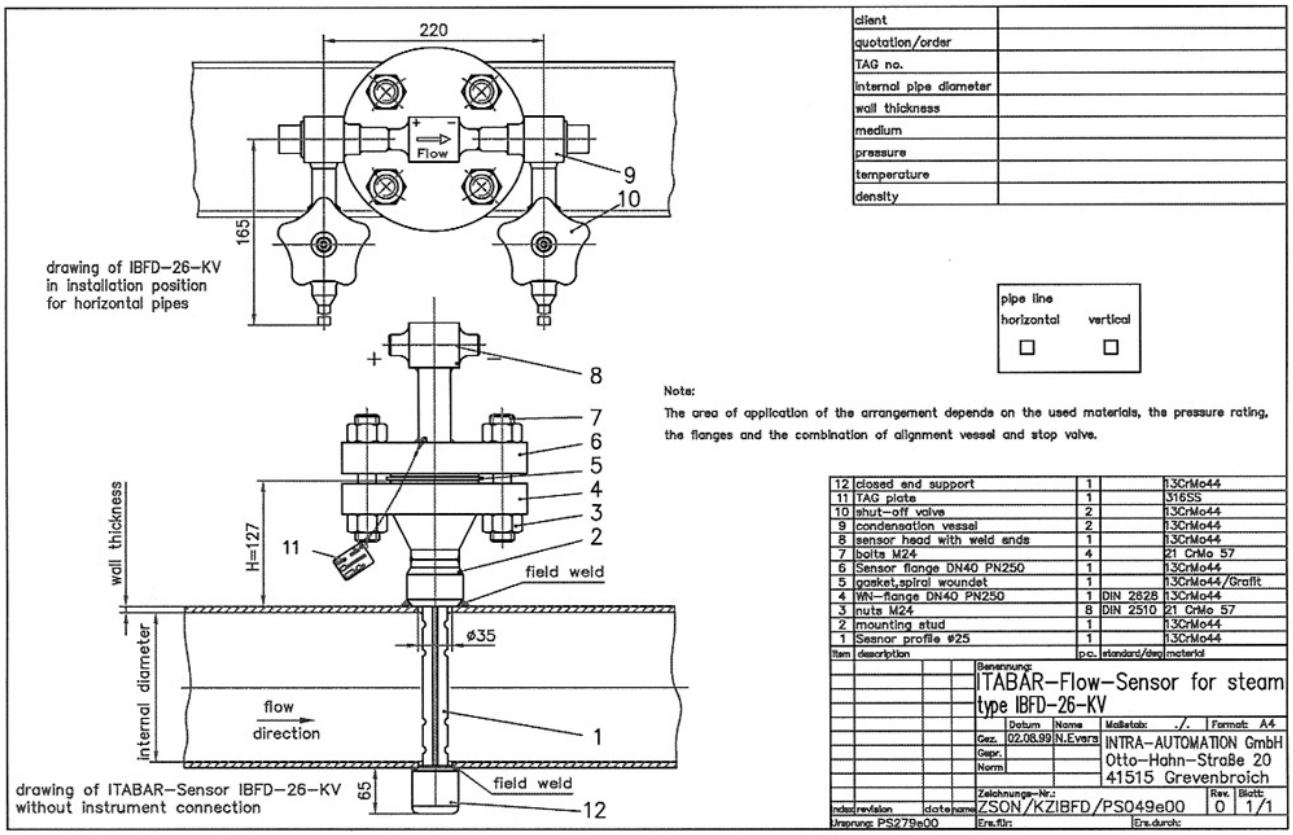
Combination Condensate Ppots / Shut-Off Valves

Basically it is possible to use a combination of condensate pots and shut-off valves for sensor types IBFD-/IBFD21 and IBFD –25/26. Such combinations are welded directly onto the sensor head. Preferably such a construction is used in applications with high differential pressures.

Advantages are:

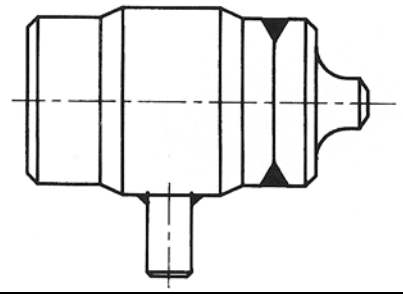
- low weight
- smaller dimensions
- quick local installation

Schematic drawing	Description	Material	Code	Max. Operating Data	
				p PSI	At T (°F)
	Combination of condensate pot and shut-off valve process connection: welding boss 21 mm with graphite packing	15 Mo 3 1.5415	KV02	3675	248
				1764	932
		13 CrMo 4 4 1.7335	KV03	3675	248
				1837	1022
		10 CrMo 910 1.7380	KV04	2940	1742



Interpretation Condensate vessel

One important requirement for a trouble-free functioning of the ITABAR steam sensors is that the transition process from steam to condensate only takes place inside the condensate pots designed for this purpose. With this in mind different style condensate pots are offered for various operating conditions.



Condensate pots, Dimensions ¢ 3.54 x 0.69 inches (90 x 17,5 mm) with weld sockets 0.84 inches (21,3 mm)

The following table gives the pressure rating of the condensate pots

Material st steel	Wall thickness	Operating temperature (°F)															
		Max Operating pressure / PSI															
	mm	572	662	752	842	932	950	968	986	1004	1022	1040	1058	1076	1112	1148	1202
1.5415	4	1705	1499	1411	1323	1278	1264	1264									
1.7335	4	1911	1793	1675	1587	1528	1514	1514	1499	1484	1470	1176	1029				
1.7335	12,5				7350	6409	5350	4233	3454	2778	2175	1778	1440				
1.7380	15				7350	6556	5733	4968	4307	3719	3160	2734	2352	2013	1749		
1.4903	15																

Pressure- Temperature Table for Shut-Off Valves

Code	Description	Pressure Psi	Enclosure material abberv name / DIN		Connections Inches	Packing	Used for
A13	Shut-off valves	5880	15 Mo 3	1.5415	0.85 x 0.13	graphite	IBFD-HT, IBFD-HTG
A14		5880	13 CrMo 4 4	1.7335	0.85 x 0.13	graphite	
A15		5880	10 CrMo 9 10	1.7380	0.85 x 0.13	graphite	
A16	Shut-off valve (component pest to TRD 110, TRB 801 Nr. 45)	4704	15 Mo 3	1.5415	0.85 x 0.13	graphite	IBFD-HT, IBFD-HTG
A17		4704	13 CrMo 44	1.7335	0.85 x 0.13	graphite	
A18		4704	10 CrMo 9 10	1.7380	0.85 x 0.13	graphite	
A19		5880	15 Mo 3	1.5415	1.06 x 0.2	graphite	
A20		5880	13 CrMo 44	1.7335	1.06 x 0.2	graphite	
A21		5880	10 CrMo 9 10	1.7380	1.06 x 0.2	graphite	
A22		5880	X10 CrMoVNb9-1	1.4903	1.06 x 0.2	graphite	

Code	Maxiumum operating pressure (PSI) at operating temperature °F																
	302	392	482	572	662	752	797	842	887	932	950	968	986	1004	1022	1040	1058
A13	5424	4983	4527	4086	3630	3189	2969	2734	2513	2278	2190	2102	2013	1925	1837	-	-
A14	5424	4983	4527	4086	3630	3189	2969	2734	2513	2278	2190	2102	2013	1925	1837	-	-
A15	5880	5880	5880	5880	5512	5145	4777	4410	4042	3675	3528	3381	3234	3087	2940	-	-

Code	Maxiumum operating pressure (PSI) at operating temperature °F																					
	572	662	752	797	842	887	932	950	968	986	1004	1022	1040	1058	1076	1094	1112	1130	1148	1166	1184	1202
A16	4704	4674	4380	4307	4233	4160	2631	1999	1572	1264	-	-	-	-	-	-	-	-	-	-	-	-
A17	4704	4704	4704	4704	4704	4630	4027	3366	2660	2175	1749	1367	-	-	-	-	-	-	-	-	-	-
A18	4704	4704	4704	4704	4704	4704	4204	3675	3189	2763	2381	2028	2028	1499	1293	-	-	-	-	-	-	-
A19	8085	7114	6659	6541	6423	6306	4263	3395	2704	2146	-	-	-	-	-	-	-	-	-	-	-	-
A20	8085	8085	7805	7570	7350	7247	6291	5321	4307	3572	2793	2249	-	-	-	-	-	-	-	-	-	-
A21	8085	8085	8085	8085	8026	7805	6188	5409	4718	4130	3572	3116	2660	2337	2013	-	-	-	-	-	-	-
A22	8085	8085	8085	8085	8085	8085	8085	8085	8085	8085	8085	7438	6659	4968	5277	4674	4130	3572	3116	2660	2337	2013

Fig. 8.14: Design of shut-off valves, materials:
15 Mo 3
13 CrMo 44
10 CrMo 910

Fig. 8.15: Design of shut-off valves, materials:
15 Mo 3
13 CrMo 44
10 CrMo 910
X10 CrMoVNb9-1

Order specification condensate vessel

IBFD-HT/HTG 26, 36

condensate vessel		material case	
		short name	material no.
K0	without condensate vessel		
K5	condensate vessel with welding stud 21,3mm	15 Mo 3	1.5415
	size: ø 90 x 17,5 mm		
K6	condensate vessel with welding stud 21,3mm	13 CrMo 4 4	1.7335
	size: ø 90 x 17,5 mm		
K7	condensate vessel with welding stud 21,3mm	10 CrMo 9 10	1.7380
	size: ø 80 x 12,5 mm		
K8	condensate vessel with welding stud 21,3mm	10 CrMoVNb 91	1.4903, not weld together with A14, A20
	size: ø 80 x 12,5 mm		

The material of the condensate vessel should correspond with the material of the stop valve.

Order specification connection and shut-off device

type IBFD-HT/HTG 26, 36

shut-off device for effect pressure pipe		material case		connection	packing
		short name	material no.		
A00	without shut-off valve				
A13	shut-off valve, nominal pressure: PN400	15 Mo 3	1.5415	21,3 x 3,2 mm	graphite
A14	shut-off valve, nominal pressure: PN400	13 CrMo 4 4	1.7335	21,3 x 3,2 mm	graphite
A15	shut-off valve, nominal pressure: PN400	10 CrMo 9 10	1.7380	21,3 x 3,2 mm	graphite

high-pressure shut-off valve acc. VdTÜV

A16	shut-off valve, nominal pressure: PN320	15 Mo 3	1.5415	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A17	shut-off valve, nominal pressure: PN320	13 CrMo 4 4	1.7335	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A18	shut-off valve, nominal pressure: PN320	10 CrMo 9 10	1.7380	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A19	shut-off valve, nominal pressure: PN500	15 Mo 3	1.5415	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A20	shut-off valve, nominal pressure: PN500	13 CrMo 4 4	1.7335	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A21	shut-off valve, nominal pressure: PN500	10 CrMo 9 10	1.7380	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				
A22	shut-off valve, nominal pressure: PN500	10 CrMoVNb 91	1.4903	21,3 x 3,2 mm	graphite
	Component test acc. TRD 110, TRB 801 Nr.45				

If double stop valves are required please to code, for example: A13-A13

Combination codensate vessel an shut-off valve

IBFD-HT/HTG 26, 36

shut-off device for effect pressure pipe		material case		packing
		short name	DIN material no.	
KV02	condesate vessel and shut-off valve as	15 Mo 3	1.5415	graphite
	weld unit, welding stud 21,3 mm			
KV03	condesate vessel and shut-off valve as	13 CrMo 4 4	1.7335	graphite
	weld unit, welding stud 21,3 mm			
KV04	condesate vessel and shut-off valve as	10 CrMo 9 10	1.7380	graphite
	weld unit, welding stud 21,3 mm			