

Pipe Threads

Whitworth Pipe Threads

Using Whitworth pipe threads it has to be distinguished between those threads which are thought to be sealing on the thread and those which produce a mechanical connection without sealing function.

Those threads which are sealing on the thread are specified in various national and international standards. Basic thread dimensions are common for all threads mentioned below. ISO 7/1 and BS 21 do not only specify the connection of cylindrical internal and taper external thread as DIN 2999 does, but in addition define a taper internal thread (taper 1 : 16). Gauging systems for all three threads differ and may lead to different results and decisions.

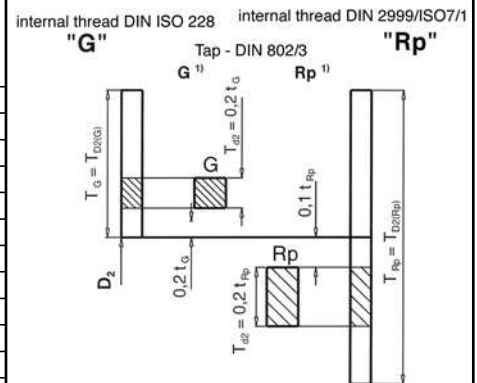
The thread connection given in DIN ISO 228 is not meant to be sealing on the thread. Basic thread dimensions and pitch is common to the sealing threads.

1	standard	4	internal-/external thread
2	title of standard	5	short sign for thread
3	kind of connection	6	kind of gauges

1	ISO 7/1		DIN 2999		BS 21		DIN ISO 228 part 1 ²⁾	
2	Pipe threads where pressure tight joints are made on the threads		Whitworth pipe threads for threaded pipes and fittings		Pipe threads for tubes and fittings where pressure tight joints are made on the threads		Pipe threads where pressure-tight joints are not made on the threads	
3	sealing on the thread		sealing on the thread		sealing on the thread		not sealing on the thread	
4	internal thread cylind.	taper	internal thread cylindrical	external thread taper	internal thread cylind.	taper	external thread taper	internal and external thread cylindrical
5	Rp	Rc	R	Rp	R	Rp	Rc	R
6	taper limit plug gauge - ISO 7/2 ¹⁾		taper limit ring gauge - ISO 7/2 ¹⁾		taper limit plug gauge - DIN 2999-4	cylindrical limit ring gauge - DIN 2999-5		taper limit plug gauge - BS 21
					taper limit ring gauge - BS 21			cylindrical Go / No Go plug gauge cyl. Go ring gauge tolerance A or B DIN ISO 228 part 2

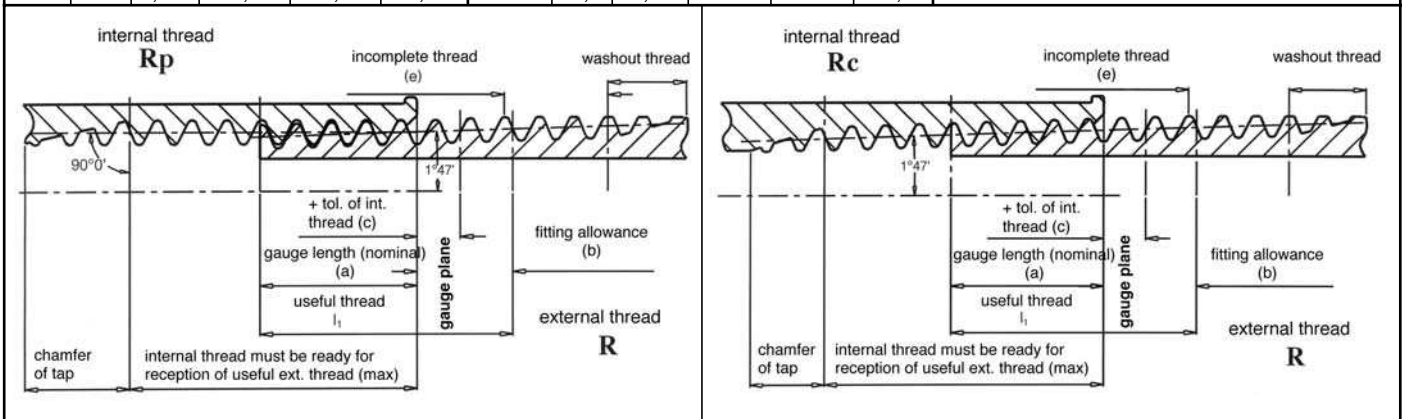
- Standard ISO 7/2 specifying the appropriate gauges is subject to general revision.
- DIN ISO 228 has replaced **DIN 259** (Whitworth pipe threads - cylindrical internal and external threads). For the cylindrical internal and external thread short sign "R" has been applied, which could have led to confusion, because the same short sign is used for the taper external thread of DIN 2999 or ISO 7/1. Compared to DIN ISO 228 there are no differences between the threads but some minor differences between the gauges.

G	P [TPI]	p [mm]	Out.-Ø d = D	Pitch-Ø d ₂ = D ₂	Minor-Ø d ₁ = D ₁	Rp / Rc R	a	Tolerances of internal thread pitch-Ø [mm]	turns	Toleran. of external thr. turns	mm
1/16	28	0,907	7,723	7,142	6,561	1/16	4	±0,071	±1.1/4	±1	±0,9
1/8	28	0,907	9,728	9,147	8,566	1/8	4	±0,071	±1.1/4	±1	±0,9
1/4	19	1,337	13,157	12,301	11,445	1/4	6	±0,104	±1.1/4	±1	±1,3
3/8	19	1,337	16,662	15,806	14,950	3/8	6,4	±0,104	±1.1/4	±1	±1,3
1/2	14	1,814	20,955	19,793	18,631	1/2	8,2	±0,142	±1.1/4	±1	±1,8
5/8	14	1,814	22,911	21,749	20,587						
3/4	14	1,814	26,441	25,279	24,117	3/4	9,5	±0,142	±1.1/4	±1	±1,8
7/8	14	1,814	30,201	29,039	27,877						
1	11	2,309	33,249	31,770	30,291	1	10,4	±0,18	±1.1/4	±1	±2,3
1.1/8	11	2,309	37,897	36,418	34,939						
1.1/4	11	2,309	41,910	40,431	38,952	1.1/4	12,7	±0,18	±1.1/4	±1	±2,3
1.1/2	11	2,309	47,803	46,324	44,845	1.1/2	12,7	±0,18	±1.1/4	±1	±2,3
1.3/4	11	2,309	53,746	52,267	50,788						
2	11	2,309	59,614	58,135	56,656	2	15,9	±0,18	±1.1/4	±1	±2,3
2.1/4	11	2,309	65,710	64,231	62,752						
2.1/2	11	2,309	75,184	73,705	72,226	2.1/2	17,5	±0,217	±1.1/2	±1.1/2	±3,5
2.3/4	11	2,309	81,534	80,055	78,576						
3	11	2,309	87,884	86,405	84,926	3	20,6	±0,217	±1.1/2	±1.1/2	±3,5
3.1/2	11	2,309	100,330	98,851	97,372						
4	11	2,309	113,030	111,551	110,072	4	25,4	±0,217	±1.1/2	±1.1/2	±3,5



Tolerances for internal Whitworth pipe threads and taps.

1) Hahnreiter taps are being produced with closer tolerance band



Pipe Threads

American Pipe Threads

		pipe thread	external thread	internal thread	remarks
NPT		„general purpose“	taper	taper	
NPTF		dry sealing	taper	taper	
NPSC	C=coupling	„general purpose“	taper (NPT)	cylindrical	profile as NPT
NPSM	M=mechanical	fastening thread	cylindrical	cylindrical	UN-thread profile
NPSF		dry sealing	taper (NPTF)	cylindrical	profile as NPTF
NPSI		dry sealing	taper (NPT-SAE / NPTF)	cylindrical	thread diameter slightly increased with, same width of tolerance field
NPSL	L=Locknut		cylindrical	cylindrical	

NPT-, NPSC-, NPSM- and NPSL-thread are defined in ANSI/ASME B1.20.1, NPTF, NPSF and NPSI-thread are given in ANSI B1.20.3

fitting	pipe	line pitch-ø	D	P	P	E ₁	L ₁	L ₁	L ₂	L ₃ (3Turns)	L ₅	NPT										
												D	P									
												[mm]	[TPI]	[mm]	Ø-pitch	[mm]	[Gg]	[mm]	[mm]	[mm]		
													1/16	7,938	27	0,941	7,142	4,064	4,32	6,632	2,822	4,750
													1/8	10,287	27	0,941	9,489	4,102	4,36	6,703	2,822	4,821
													1/4	13,716	18	1,411	12,487	5,786	4,10	10,206	4,234	7,384
													3/8	17,145	18	1,411	15,926	6,096	4,32	10,358	4,234	7,536
													1/2	21,336	14	1,814	19,772	8,128	4,48	13,556	5,443	9,929
													3/4	26,670	14	1,814	25,117	8,611	4,75	13,861	5,443	10,234
													1	33,401	11,5	2,209	31,461	10,16	4,60	17,343	6,627	12,924
													1.1/4	42,164	11,5	2,209	40,218	10,668	4,83	17,953	6,627	13,536
													1.1/2	48,260	11,5	2,209	46,287	10,668	4,83	18,377	6,627	13,960
													2	60,325	11,5	2,209	58,325	11,074	5,01	19,215	6,627	14,798
													2.1/2	73,025	8	3,175	70,159	17,323	5,46	28,892	6,350	22,542
													3	88,900	8	3,175	86,068	19,456	6,13	30,480	6,350	24,130
													3.1/2	101,600	8	3,175	98,776	20,853	6,57	31,750	6,350	25,400
													4	114,300	8	3,175	111,433	21,438	6,75	33,020	6,350	26,670

portrayal of NPT-thread

D	outside-Ø of pipe	L₃	wrenching allowance
E₁	pitch-Ø at length L ₁	L₄	length of external thread
L₁	position of handtight engagement	L₅	external thread with complete thread profile (on the length of 2 P beyond L ₅ external thread profile is incomplete at the top of the threads because the cone of thread profile meets the cylindrical outside diameter of the pipe)
L₂	useful external thread	v	incomplete thread produced by the chamfer of thread cutting tool

The difference between thread profile of NPT and NPTF threads is the width of flat of profile on the outside and minor diameter. NPTF thread has got an overlap of profiles of internal and external thread. By this method, drysealing property is achieved. Compared to the NPT, NPTF is one thread longer on L₁ + L₃ and L₂.

P [TPI]	NPT				NPTF			
	internal thread				internal thread			
	external thread				external thread			
width of flat of profile		height of profile		width of flat of profile				
min.		max.		ground		top		
min.		max.		min.	max.	min.	max.	
27	0,036	0,104	0,634	0,753	0,102	0,152	0,051	0,102
18	0,053	0,145	0,974	1,129	0,127	0,178	0,076	0,127
14	0,069	0,163	1,288	1,451	0,127	0,178	0,076	0,127
11 1/2	0,084	0,185	1,590	1,767	0,152	0,229	0,102	0,152
8	0,122	0,229	2,356	2,540	0,203	0,279	0,152	0,203