

Strength & Durability

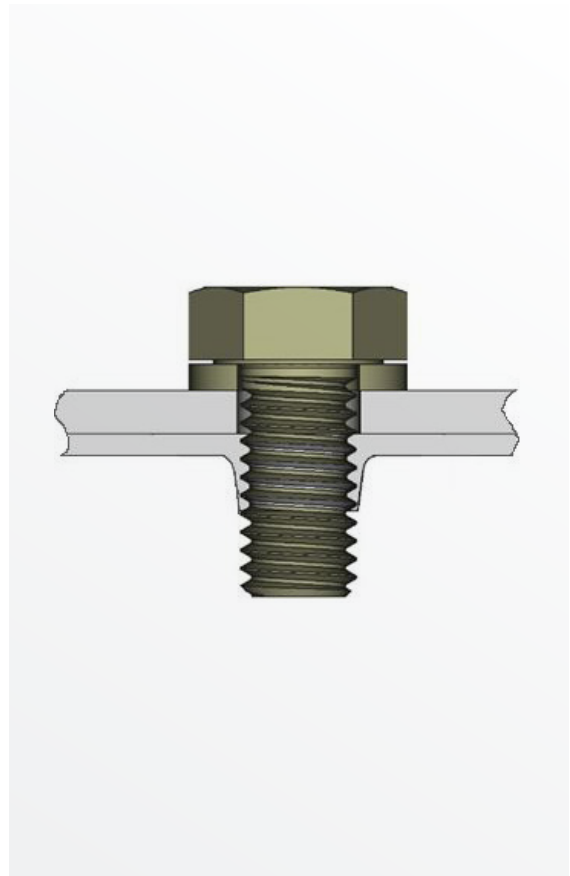


Summary of advantages with Flowdrill

Flowdrill offers several advantages over traditional fastening methods. Friction drilling can serve as a complete replacement, eliminating the need for conventional fasteners.

You may identify those that might be most relevant for your own design and manufacturing decision process:

- ✓ Allows for single-sided accessibility.
- ✓ Achieves weight savings per connection.
- ✓ Suitable for fasteners in high tensile material connections.
- ✓ Chipless process, with no chips inside a profile during drilling.
- ✓ Ideal for designs with specific requirements, such as tight spaces, bent surfaces, or radii, where a nut or rivet cannot easily be used.
- ✓ Cost-optimized designs with reduced internal handling and simple production implementation.
- ✓ Reduces production steps by eliminating the need to handle fasteners, resulting in faster cycle times and less handling.
- ✓ Minimizes potential sources of errors.
- ✓ Increases production capacity.
- ✓ Environmentally friendly.
- ✓ Facilitates easy recycling because there is no need to dismount fastening elements.
- ✓ Creates sealed blind hole connections in axial material racks, such as those used for battery housings.
- ✓ Replaces traditional fastening elements.



A thorough technical analysis is essential to incorporate these advantages into a complete design or redesign and manufacturing process. However, a Flowdrill connection can be used and reassembled reliably.

Strength & Durability

Strength and length of threads

As a general rule of thumb, the strength of a Flowdrill connection increases with the material's tensile strength and thickness.

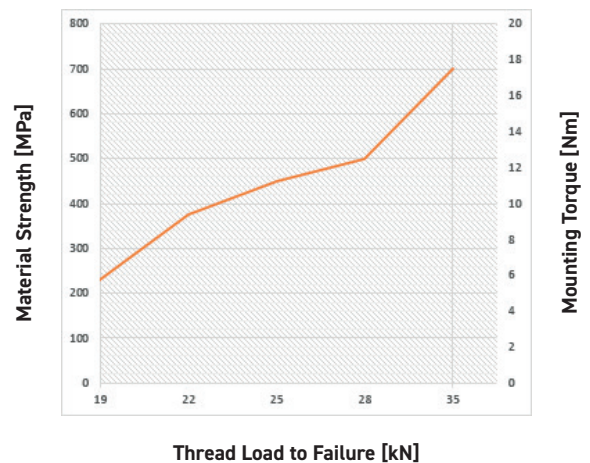
Both the pull-out force and tightening torque increase with a Flowdrill connection. This indicates that the basic material properties remain intact, even though frictional heat may reduce the material strength at the connection point.

Changes in material thickness will result in different thread loads. With Flowdrill, there is no material loss, which affects the length of the bushing and the final thread length. As the material wall thickness of the base / parent material increases or decreases, the possible thread loads will be higher or lower.

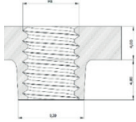
The thickness of the base material determines the maximum amount of material that can be displaced. Consequently, different material thickness or tool sizes result in various thread lengths and, therefore, different strengths.

Softer materials are more easily displaced, leading to slight variations in bush length across different types of materials. However, for a specific material, thickness, and diameter the results will remain consistent.

Flowdrill M6 at 1.5mm Material Thickness



The following table presents a comparison between an M8 connection with Flowdrill versus a rivet and a weld nut.

Comparison of M8 fastening elements	Flowdrill M8 in mild steel*		Rivet M8	Nut M8
				
Material thickness	2.0	4.0	0.5 - 3.5	(5.3)
Thread length (mm)	5.8	8.8	10.0	5.3
Load to failure (kN)	29.6	55.8	27.0	33.0
Possible tightening torque (Nm)	25.0	45.0	24.0	24.6
Achievable strength classification	6	12	6	8

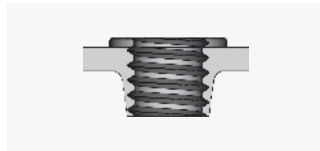
*Please find additional data and sizes for Flowdrill in the attachments

Strength classifications

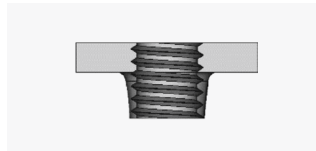
Flowdrill replaces traditional female fasteners such as rivet nuts, press nuts, and weld nuts. Understanding the strength of the Flowdrill thread is essential. The DIN EN ISO 898-2 standard specifies the required load resistance in kilo Newtons (kN) for standard nuts in different strength categories without any noticeable deformation.

Strength categories 6, 8, and 10 are the most commonly used. The Flowdrill thread can be compared directly to these categories. The table below shows the equivalent strength of a Flowdrill thread versus a female nut, highlighting the required material thickness and thread size for each specific classification.

Notes for the table below:



"3,7L" =
Ø3,7mm LONG,
with collar remaining
on top (approx.
+1 extra thread)



"7,3LF" =
Ø7,3mm LONG/FLAT,
NO collar, plane surface

Mild Steel S235			M4		M5		M6		M8		M10		M12	
			3.7 L	3.7 LF	4.5 L	4.5 LF	5.4 L	5.4 LF	7.3 L	7.3 LF	9.2 L	9.2 LF	10.9 L	10.9 LF
Material Thickness (mm)	1.0	kN	6.2	4.3	10.5	8.5	12.24	9.3	15.1	13.6	18.9	16.6	X	
		Nm	3.0	2.3	7	6	10.5	8	17	16	27	28		
	1.5	kN	12.2	8.2	18.5	12.2	19.4	15.9	26.2	23.6	35.4	28.6	41.1	32.4
		Nm	7	5	11	10	16	14	28	23	43	38	67	48
	2.0	kN	13.0	9.6	18.6	14.5	23.3	19.4	32.9	29.6	36.4	30	48.4	34.1
		Nm	8.0	5.5	16	11.5	19	16	33	25	50	40	80	60
	3.0	kN	X	11.4*	X	21.6	32.8	25.5	48.4	43.0	61.5	51.4	74.1	58.5
		Nm		7.5		14	24*	22*	55	40	87	75	135	114
	4.0	kN	X	>11.4*	X	>23	X	>32.8*	X	55.8	X	71.8	98.3	84.3
		Nm		7.8		15		30*		45		100	145	115
Equivalent of a nut per strength classification	6	M _A (Nm) Rp0.2 (90%) µG = 0.12	(5.000)		9.500		13.500		24.900		39.400		59.000	
	8		(6.000)		12.140		17.200		31.800		50.500		74.200	
			3.0		5.9		10.1		24.6		48.0		84.0	
	10	Nut thread proof loads (N) per ISO 898-2	(7.000)		14.800		20.900		38.100		60.300		88.500	
			4.6		8.6		14.9		36.1		71.0		123.0	
			(8.000)		16.300		23.100		42.500		67.300		100.300	
	12		5.1		10.0		17.4		42.2		83.0		144.0	

kN: max. pull load until failure.

Nm: for all torque tests a 12.9 steel screw per DIN 912 was used to identify the maximum possible tightening torque for multiple times threaded joint without failure of the Flowdrilled thread. An overload torque might be considerably higher.

M_A: necessary tightening torque at 90% screw pretension, German Directive VDI 2230-1.

[5.000]: data in brackets [] are only set mathematically as a reference, those are not defined per DIN EN ISO as a nut per ISO4032 with D < 5 mm has a height smaller 0.8xD which does not allow the same test procedure as this would require nuts with even higher strength.

In addition to the table above, individual testing in our test facility may be needed to determine the specific loads for your material, its thickness, and thread size. Please do not hesitate to contact one of our offices for assistance. Additional data for stainless steel materials can be found in the appendix.

Thread strength classifications in mild steel and stainless steel

Mild Steel S235			M4		M5		M6		M8		M10		M12	
			3.7 L	3.7 LF	4.5 L	4.5 LF	5.4 L	5.4 LF	7.3 L	7.3 LF	9.2 L	9.2 LF	10.9 L	10.9 LF
Material Thickness (mm)	1.0	kN	6.2	4.3	10.5	8.5	12.24	9.3	15.1	13.6	18.9	16.6	X	
		Nm	3.0	2.3	7	6	10.5	8	17	16	27	28		
	1.5	kN	12.2	8.2	18.5	12.2	19.4	15.9	26.2	23.6	35.4	28.6	41.1	32.4
		Nm	7	5	11	10	16	14	28	23	43	38	67	48
	2.0	kN	13.0	9.6	18.6	14.5	23.3	19.4	32.9	29.6	36.4	30	48.4	34.1
		Nm	8.0	5.5	16	11.5	19	16	33	25	50	40	80	60
	3.0	kN	X	11.4*	X	21.6	32.8	25.5	48.4	43.0	61.5	51.4	74.1	58.5
		Nm		7.5		14	24*	22*	55	40	87	75	135	114
	4.0	kN	X	>11.4*	X	>23	X	>32.8*	X	55.8	X	71.8	98.3	84.3
		Nm		7.8		15		30*		45		100	145	115
Equivalent of a nut per strength classification	6	M _A (Nm) Rp0.2 (90%) μG = 0.12	(5.000)		9.500		13.500		24.900		39.400		59.000	
	8		(6.000)		12.140		17.200		31.800		50.500		74.200	
			3.0		5.9		10.1		24.6		48.0		84.0	
	10	Nut thread proof loads (N) per ISO 898-2	(7.000)		14.800		20.900		38.100		60.300		88.500	
			4.6		8.6		14.9		36.1		71.0		123.0	
	12		(8.000)		16.300		23.100		42.500		67.300		100.300	
			5.1		10.0		17.4		42.2		83.0		144.0	

kN: max. pull load until failure.

Nm: for all torque tests a 12.9 steel screw per DIN 912 was used to identify the maximum possible tightening torque for a multiple times threaded joint without failure of the Flowdrilled thread. An overload torque might be considerably higher.

M_A : necessary tightening torque at 90% screw pretension, German Directive VDI 2230-1

[5.000]: data in brackets [] are only set mathematically as a reference, those are not defined per DIN EN ISO as a nut per ISO4032 with $D < 5$ mm has a height smaller $0.8 \times D$ which does not allow the same test procedure as this would require nuts with even higher strength.

			Stainless Steel AISI 304		M4		M5		M6		M8		M10		M12	
					3.7 L	3.7 LF	4.5 L	4.5 LF	5.4 L	5.4 LF	7.4 L	7.4 LF	9.3 L	9.3 LF	10.9 L	10.9 LF
Material Thickness (mm)	1.0	kN	10.6	7.6	19.7	14.2	22.9	15.9	25.4	22.5	24.1	20.5	X			
		Nm	5.1	5.1	12	11	16	13	26	25	49	42				
	1.4	kN	9.8	8.1	19.2	14.6	20.6	16.2	28.8	24.8	37.1	34	38.9	31.7		
		Nm	6	5.5	13	12	20	16	35	30	58	48	66.0	65		
	2.0	kN	>11.0*	>11.0*	23.6*	23.5*	24.1	23.5	38.8	32.7	52.9	44	55.9	44.6		
		Nm	7	6.5	17*	16*	24	22	42	40	69	64	110	98		
	3.0	kN	X	>11.0*	X	>23.6*	>25.9*	>26.4*	57.5	48.4	66.8	59.7	87.3	56		
		Nm		7.5		17.5*	28*	25*	52	50	100	88	175	115		
	4.0	kN	X	>11.0*	X	>23.6*	X	>32.8*	X	60.9	X	73.8	101.0	84.7		
		Nm		7.8		18*		30*		54		130	170	155		
Equivalent of a nut per strength classification	50	M _A (Nm) Rp0.2 (90%) μG = 0.12	(4.000)		7.100		10.070		18.310		29.000		42.140			
			1.1		2.3		3.9		9.6		19.0		32.9			
			(5.000)		9.930		14.090		25.630		40.600		58.990			
	70	Nut thread proof loads (N) per ISO 3506-2	3.3		6.5		11.3		27.4		54.3		93.9			
			(6.000)		11.350		16.100		29.290		46.400		67.420			
			4.6		8.6		14.9		36.1		71.0		123.0			

kN: max. pull load until failure

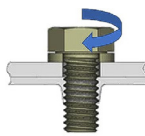
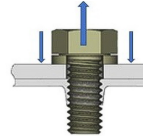
Nm: for all torque tests a 12.9 steel screw per DIN 912 was used to identify the maximum possible tightening torque for a multiple times threaded joint without failure of the Flowdrilled thread. An overload torque might be considerably higher.

M_A: necessary tightening torque at 90% screw pretension, German Directive VDI 2230-1

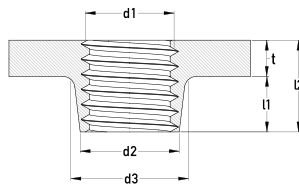
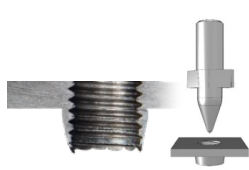
[5.000]: data in brackets [] are only set mathematically as a reference, those are not defined per DIN EN ISO as a nut per ISO4032 with D < 5 mm has a height smaller 0.8xD which does not allow the same test procedure as this would require nuts with even higher strength.

Pull out, torque and thread geometries M5-M12 in Mild Steel

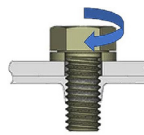
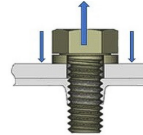
Valid for Mild Steel S235

M5 x 0.8			Flat						Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...
(mm)						(Nm)		(kN)	achieved
1.0	4.5	3.7	2.6	5.1	5.6	7	6	8.5	5
1.5		4.2	2.7	5.3	5.7	11	10	12.2	6
2.0		4.8	2.8	5.2	6.1	12.5	11	14.5	8
3.0		6.2	3.2	5.4	6.3	19.5	14	21.6	12
4.0		7.6	3.6	5.5	6.4	19.5	15	23.0	12

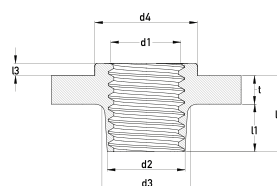
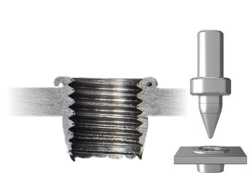
*Diameter for roll forming tap.



Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M5 x 0.8			Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...
(mm)									(Nm)		(kN)	achieved
1.0	4.5	4.0	2.6	3.7	0.3	5.0	5.5	5.1	11	7	10.5	6
1.5		4.6	2.7	4.2	0.4	5.3	5.8	6.9	12	11	18.5	12
2.0		5.6	2.8	4.8	0.7	5.4	5.9	7.0	17	14	18.6	12
2.5		6.0	3.0	6.2	0.7	5.4	6.2	7.4	17	15	>18.5	12
3.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.										
4.0												

*Diameter for roll forming tap.

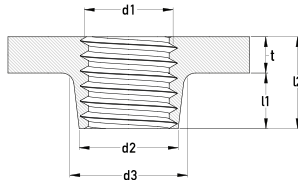
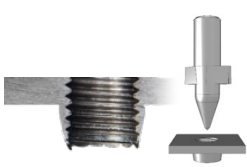


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Mild Steel S235

M6 x 1.0			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)						(Nm)		(kN)	achieved	
1.0	5.4	3.7	2.7	6.0	6.6	8.5	8	12.4	5	
1.5		5.0	3.5	6.2	6.9	15	14	15.9	6	
2.0		5.2	3.2	6.1	6.9	18	16	19.4	8	
3.0		6.6	3.6	6.2	7.2	25	22	25.5	12	
4.0		8.0	4.0	6.5	7.4	35	30	>32.8	12	

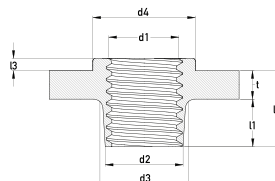
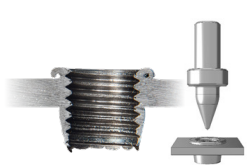
*Diameter for roll forming tap.



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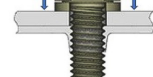
M6 x 1.0			Standard with collar										Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)									(Nm)		(kN)	achieved	
1.0	5.4	4.3	2.8	3.8	0.5	6.0	6.6	7.5	12	10	12.4	5	
1.5		5.7	3.5	5.0	0.7	6.2	6.8	7.8	17	16	19.4	8	
2.0		6.0	3.1	5.1	0.9	6.1	6.9	8.6	23	19	23.3	10	
3.0		7.5	3.6	6.6	0.9	6.2	7.2	9.2	28	24	32.8	12	
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

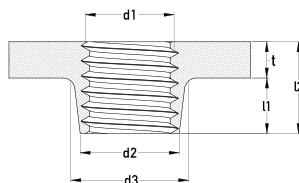
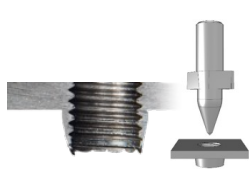


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Mild Steel S235

M8 x 1.25			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)						(Nm)		(kN)	achieved	
1.0	7.3	4.8	3.8	8.2	8.8	17	16	13.6	4	
1.5		5.3	3.8	8.2	9.2	27	23	23.7	5	
2.0		5.8	3.8	8.0	9.1	28	25	29.6	6	
3.0		7.6	4.6	8.1	9.3	42	40	43.0	10	
4.0		8.8	4.8	9.3	9.3	48	45	55.7	12	

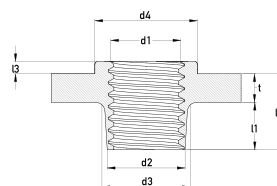
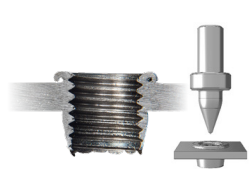
*Diameter for roll forming tap.



Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M8 x 1.25				Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)									(Nm)		(kN)	achieved	
1.0	7.3	5.5	3.9	4.9	0.6	8.8	8.2	9.5	18	17	15.1	4	
1.5		5.9	3.7	5.2	0.7	9.2	8.2	10.5	30	28	26.2	8	
2.0		6.6	3.8	4.6	0.8	9.1	8.0	11.2	35	33	32.9	10	
3.0		8.5	4.4	7.4	1.1	9.3	8.1	12.0	61	55	48.4	12	
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

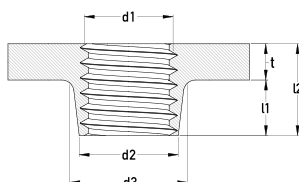
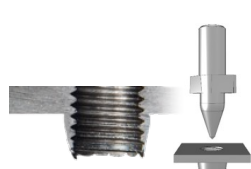


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Mild Steel S235

M10 x 1.5			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)						(Nm)		(kN)	achieved	
1.0	9.2	5.4	4.4	10.3	10.9	32	28	16.6	-	
1.5		5.8	4.3	10.1	11.2	42	38	29.6	4	
2.0		6.5	5.5	9.8	11.2	43	40	30.3	5	
3.0		8.3	5.3	10.7	11.6	78	75	51.4	8	
4.0		10.2	6.2	10.5	11.7	109	100	71.8	12	

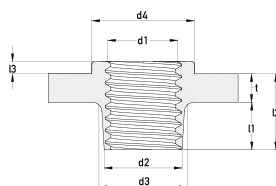
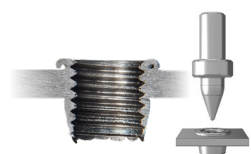
*Diameter for roll forming tap.



Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

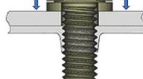
M10 x 1.5			Standard with collar										Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)									(Nm)		(kN)	achieved	
1.0	9.2	6.2	4.8	5.8	0.4	10	11.1	12.1	30	27	18.9	-	
1.5		7.0	4.7	6.2	0.8	9.8	11.2	12.6	48	43	35.4	5	
2.0		7.6	4.7	6.7	0.9	10.7	11.6	13.2	55	50	36.4	5	
3.0		9.6	5.5	8.5	1.1	10.5	11.7	14.3	90	85	61.5	8	
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

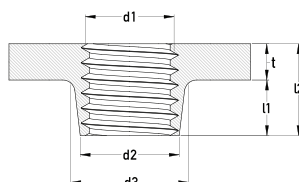
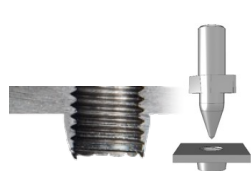


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

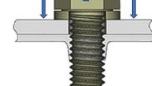
Valid for Mild Steel S235

M12 x 1.75			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)						(Nm)		(kN)	achieved	
1.0	10.9	No recommended connection								
1.5		6.5	5.0	12.3	13.3	54	48	32.4	4	
2.0		7.3	5.3	12.4	13.4	63	60	34.1	4	
3.0		9.0	6.0	13.7	13.7	120	114	58.5	5	
4.0		10.4	6.4	12.6	14.2	126	115	83.3	8	

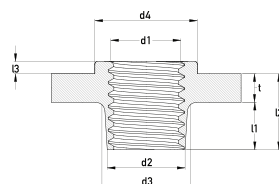
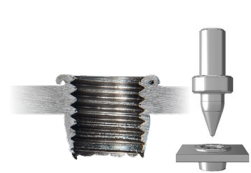
*Diameter for roll forming tap.



Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M12 x 1.75				Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque	Advised max.	Pull/push force at failure	...6/8/10...	
(mm)									(Nm)		(kN)	achieved	
1.0	10.9	No recommended connection											
1.5		7.3	4.3	6.3	1.0	12.3	13.2	14.8	75	67	41.1	5	
2.0		8.3	6.2	8.2	1.1	12.4	13.4	15.2	85	80	48.4	5	
3.0		12.1	7.5	10.5	1.6	13.2	13.7	16.2	150	135	74.1	6	
4.0		13.4	7.7	11.7	1.7	12.6	14.2	17.0	174	145	98.3	10	

*Diameter for roll forming tap.



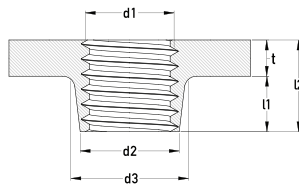
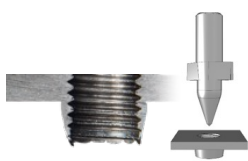
Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Pull out, torque and thread geometries M5-M12 in Stainless Steel Valid for Stainless Steel 1.4301

M5 x 0.8			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)						(Nm)		(kN)	achieved	
1.0	4.5	3.8	2.8	5.3	5.7	14	2.3/4.9/6.5	14.2	80	
1.4		4.3	3.0	5.4	6.0	14	2.3/4.9/6.5	14.6	80	
2.0		5.0	3.0	5.5	6.1	17	2.3/4.9/6.5	23.5	80	
3.0		6.1	3.0	5.7	6.2	23	2.3/4.9/6.5	>23.6	80	
4.0		7.1	3.1	5.9	6.4	24	2.3/4.9/6.5	>23.6	80	

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.

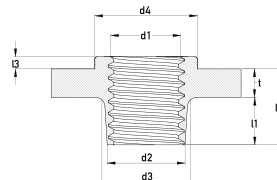
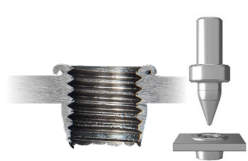


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M5 x 0.8				Standard with collar							Flowdrill Thread Quality Classification		
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque**	Advised max.	Pull/push force at failure	50/70/80	
(mm)									(Nm)		(kN)	achieved	
1.0	4.5	4.5	3.1	4.1	0.4	5.3	5.7	6.6	18	2.3/4.9/6.5	19.2	80	
1.4		5.2	3.2	4.6	0.5	5.4	5.9	7.3	15	2.3/4.9/6.5	19.7	80	
2.0		5.7	3.3	5.2	0.6	5.5	6.1	7.6	19	2.3/4.9/6.5	23.6	80	
2.5		6.4	3.3	5.7	0.7	5.5	6.2	7.8	23	2.3/4.9/6.5	>23.6	80	
3.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											
4.0													

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.



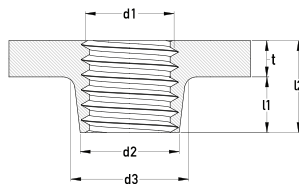
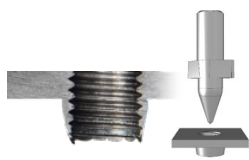
Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Stainless Steel 1.4301

M6 x 1.0			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)						(Nm)		(kN)	achieved	
1.0	5.4	4.3	3.3	6.4	6.7	15	3.9/8.4/11.3	15.9	50	
1.4		4.8	3.4	6.5	6.9	17	3.9/8.4/11.3	16.2	70	
2.0		5.5	3.5	6.7	7.2	27	3.9/8.4/11.3	23.5	80	
3.0		6.5	3.5	6.8	7.3	30	3.9/8.4/11.3	26.4	80	
4.0		7.5	3.6	6.9	7.4	35	3.9/8.4/11.3	32.8	80	

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.

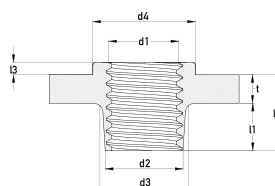
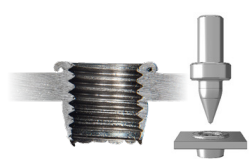


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M6 x 1.0				Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)									(Nm)		(kN)	achieved	
1.0	5.4	4.8	3.3	4.3	0.5	6.4	6.7	8.0	22	3.9/8.4/11.3	20.6	80	
1.4		5.4	3.4	4.8	0.6	6.5	6.9	8.3	26	3.9/8.4/11.3	22.9	80	
2.0		6.2	3.5	5.5	0.7	6.7	7.2	8.6	28	3.9/8.4/11.3	24.1	80	
3.0		7.3	3.5	6.5	0.8	6.8	7.3	9.3	32	3.9/8.4/11.3	25.9	80	
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

** identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.



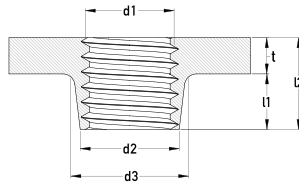
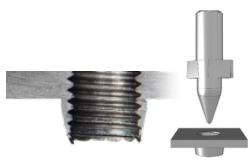
Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Stainless Steel 1.4301

M8 x 1.25			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)						(Nm)		(kN)	achieved	
1.0	7.4	5.1	4.0	8.0	9.0	28	9.6/20.6/--	22.5	50	
1.4		5.4	4.1	8.1	9.1	32	9.6/20.6/27.4	24.8	50	
2.0		6.1	4.3	8.2	9.2	46	9.6/20.6/27.4	32.7	80	
3.0		7.5	4.5	8.2	9.3	55	9.6/20.6/27.4	48.4	80	
4.0		8.6	4.6	8.3	9.5	68	9.6/20.6/27.4	60.9	80	

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.

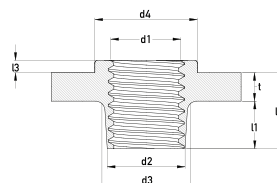
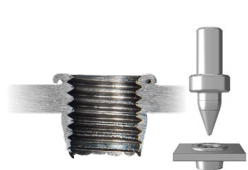


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M8 x 1.25				Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)									(Nm)		(kN)	achieved	
1.0	7.4	5.8	4.0	5.1	0.7	8.0	9.0	10.5	29	9.6/20.6/--	25.4	50	
1.4		6.3	4.1	5.4	0.9	8.1	9.1	10.8	42	9.6/20.6/27.4	28.8	70	
2.0		7.1	4.3	6.1	1.0	8.2	9.2	11.4	48	9.6/20.6/27.4	38.8	80	
3.0		8.6	4.5	7.5	1.1	8.2	9.3	12.2	64	9.6/20.6/27.4	57.5	80	
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.



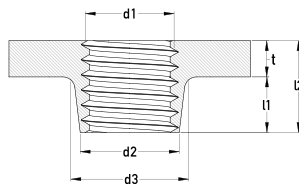
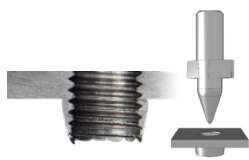
Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Stainless Steel 1.4301

M10 x 1.5			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure		50/70/80
(mm)						(Nm)		(kN)		achieved
1.0	9.3	5.7	4.7	10.3	11.2	50	19.0/40.7/--	20.5		-
1.4		6.0	4.8	10.4	11.2	52	19.0/40.7/54.3	34		50
2.0		7.0	5.0	10.6	11.4	78	19.0/40.7/54.3	44		70
3.0		8.1	5.1	10.6	11.4	92	19.0/40.7/54.3	59.7		80
4.0		9.3	5.3	10.6	12.0	137	19.0/40.7/54.3	73.8		80

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.

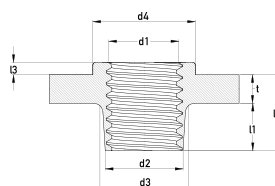
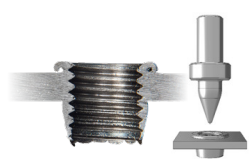


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M10 x 1.5			Standard with collar										Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure		50/70/80
(mm)									(Nm)		(kN)		achieved
1.0	9.3	6.4	4.7	5.7	0.7	10.3	11.2	12.5	52	19.0/40.7/--	24.1		-
1.4		6.8	4.8	6.0	0.8	10.4	11.2	13.0	62	19.0/40.7/54.3	37.1		50
2.0		8.1	5.0	7.0	1.1	10.6	11.4	13.5	71	19.0/40.7/54.3	52.0		80
3.0		9.4	5.1	8.1	1.3	10.6	11.4	14.0	108	19.0/40.7/54.3	66.8		80
4.0		Our standard tools are not made for this thickness, please contact us to discuss the possibilities.											

*Diameter for roll forming tap.

** identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.



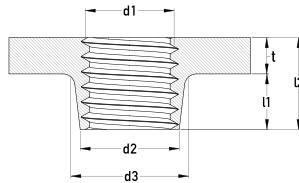
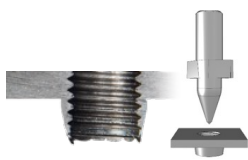
Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

Valid for Stainless Steel 1.4301

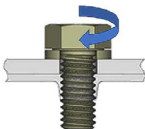
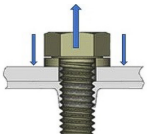
M12 x 1.75			Flat							Flowdrill Thread Quality Classification
t	d1*	l2	l1	d2	d3	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)						(Nm)		(kN)	achieved	
1.0	11.0	No recommended connection								
1.4		6.1	4.7	12.3	13.0	71	32.9/--/--	31.7	--	
2.0		7.6	5.6	12.6	13.2	111	32.0/70.5/93.9	44.6	50	
3.0		8.7	5.7	13.9	12.7	133	32.0/70.5/93.9	56.0	50	
4.0		10.2	6.2	14.0	12.8	199	32.0/70.5/93.9	84.7	80	

*Diameter for roll forming tap.

** Identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.

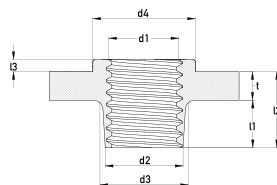
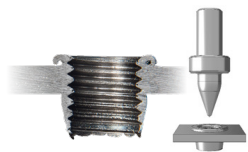


Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.

M12 x 1.75				Standard with collar									Flowdrill Thread Quality Classification
t	d1*	l total = l2 + l3	l1	l2	l3	d2	d3	d4	Over-torque**	Advised max. Nm per classification 50/70/80	Pull/push force at failure	50/70/80	
(mm)									(Nm)		(kN)	achieved	
1.0	11.0	No recommended connection											
1.4		6.9	4.7	5.5	0.8	12.3	13.0	14.0	96	32.9/70.5/--	38.9	--	
2.0		9.0	5.6	7.9	1.2	12.6	13.2	15.1	149	32.9/70.5/93.9	55.9	50	
3.0		10.3	5.7	8.7	1.4	13.9	12.7	16.0	>200	32.9/70.5/93.9	87.3	80	
4.0		11.7	6.2	10.2	1.7	14.0	12.8	17.2	>200	32.9/70.5/93.9	>100	80	

*Diameter for roll forming tap.

** identified over-torque with a 12.9 screw to understand the Flowdrill thread quality limits.



Note: All data are provided without guarantee, although they have been carefully determined through internal tests and analysis. Different materials may lead to variations in geometry, achievable loads, and torque. All results shown were achieved using Flowdrill standard tools and our recommended CNC settings.



Contact



Flowdrill B.V.
Tel.: + 31 30 2416606
info.nl@flowdrill.com



Flowdrill GmbH
Tel.: + 49 6201 29091 0
info.de@flowdrill.com



Flowdrill Ltd.
Tel.: +44 1746 250 003
info@flowdrill.co.uk



Flowdrill France
Tel.: +33 800 941 323
info@flowdrill.fr



Flowdrill Inc.
Tel.: +1 1 636 548 8485
info@flowdrill.com