

General/Quality/Services/Manufacturing methods/Standards

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Catalogue 7 chapter I

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Quality

We want quality to be our distinctive feature on the market. This is the introduction to Mattssons's Quality policy. This direction means that we continuously work at being in a front position in the chain, stretching from quality and environmental systems to the performance of the products delivered.

Mattssons is third part certified by DNV according to QS 9000 since 1998, ISO 9001 since 1993 and environmentally certified according to ISO 14001 since 1999. TS 16949 is a global quality standard for suppliers to the car industry. Today, many companies in the industry demand that their suppliers meet the TS 16949 standard. Previously a number of different certificates have been required, for example QS-9000, - one for every manufacturer's demands. All these demands are now covered, as TS 16949 is a flexible system where VDA and other national requirement prescriptions are integrated. This results in that the customer's demands can be co-ordinated.

Mattssons has started to update its QS-9000 system according to this standard.

Mattssons's Quality policy has the slogan "The chase for point zero". This is a concept that is evident all through the company. By fixing external and internal remarks we try, by using different computer validations and improved working methods, to strive towards zero defects. We are working with the world's leading manufacturers of fasteners with a focus on Europe. Through systematic supplier visits, wide knowledge and a unique computer aid to select suppliers we are able to direct our purchases to the best suppliers. Most of our suppliers work with statistic process control, but for some assembly lines it is not enough with the low PPM number that can be achieved through a well-controlled production. We are therefore able to offer machine checked fasteners by using our, or our suppliers, "zero defect control machines".

Laboratory - Testing

Equipment for quality assurance has been prioritised at Mattssons. Our quality department has extensive control equipment to be able to verify products and provide service for our customers. We have, among other things, the following equipment:

- Tensile tester 600kN (for tensile and pressure testing).
- Fatigue tester (for fatigue testing).
- Spectrometer (for materials analysis of steel and stainless steel). See separate section.
- X-ray (for control of surface treatment layers). See separate section.

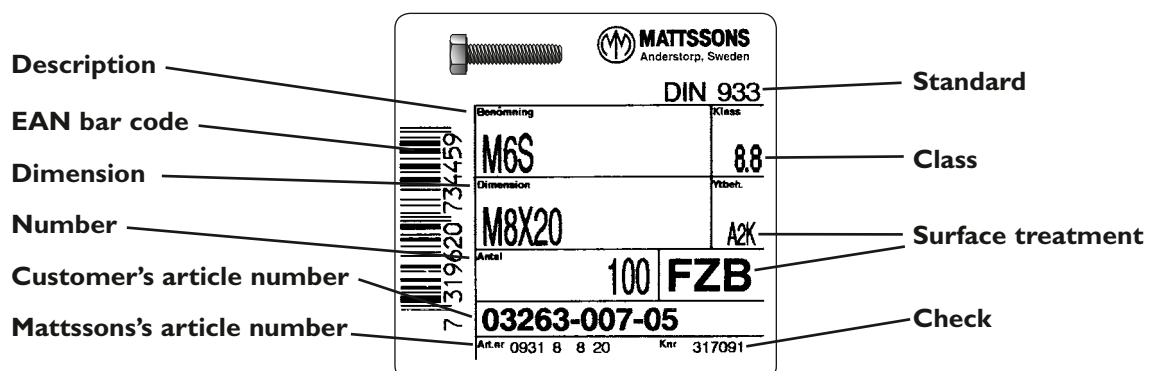
- Slat chamber (for control of surface treatment layers).
- Torque analysis (for control of torque, clamping force testing and friction). See separate section.
- Sclerometer HRC, HB and HV (for control of hardness and case-hardening depth et c.).
- Cylindricity meter, surface smoothness meter, et c.
- Vision Inspection "Zero defect control machine". See separate section.

We also co-operate with independent analysis companies for impartial tests.

Traceability

Mattssons is, by using computer aid, able to control the customers needs of different types of products. The computer system assures that we do not mix different batch numbers in the different process steps. We can also provide individual marking for example socket head cap screws.

Our products are packed into Mattssons's own packages with clear marking. Our labels are provided with full information needed for full traceability. The picture below explains the information on the label.



PPM (Parts per million)

Through continuous improvements and a powerful investment program for control equipment, we have reduced the number of defects to our customers. Our supplier development has contributed to that more and more of our suppliers:

- Are quality certified.
- Are environment certified.
- Work with statistic process controls.
- Work with vision-inspection (Zero-defect control with cameras).

Thanks to these measures and well-educated staff Mattssons has reached a quality level of approximately 500 defect articles per million (PPM). Normally 600-1500 PPM is accepted for fasteners.

The most common reason for high PPM values is foreign articles from washing, hardening, surface conditioning and packing.

Most customers can without any objections accept 500 PPM.

For those customers with automatic assemblage in large series, 500 PPM is completely unacceptable.

Example: If a customer assembles 20 000 screws per day and the batch has a PPM value of 500 it means that there is 10 defect parts in the batch. This causes 10 stops in the automatic assemblage. If each stop takes 5 minutes to correct it will take 50 minutes each day to rectify. The cost will be enormous.

By using zerodefekt control in modern machines it is possible to reach a PPM value below 50.

For more information please see the section about zero defect control machine on page 103.

Quality certificate

The products that we present in our catalogue are standard products, which means that all characteristics are prescribed in national or international standards.

By choosing the right supplier we can also deliver standard products with quality certificate according to the table below. The following certificates can be obtained:

Table 80 Statement of test certificates

Denom.	Certificate	Type of check and test	The contents of the certificate	Delivery directions	The certificate is signed by
2.1	Identity certificate 2.1	Non-specific	No test results	As per contract of sale and if needed, also according to official regulations and corresponding technical regulations	Manufacturer
2.2	Quality certificate 2.2		Test results based on non-specific control and testing		
3.1	Inspection certificate 3.1	Specific	Test results based on specific control and testing	As per contract of sale and if needed, also according to official regulations and corresponding technical regulations	The manufacturer's authorised representative who is independent from the manufacturing department
3.2	Inspection certificate 3.2			As per contract of sale	The manufacturer's authorised representative who is independent from the manufacturing department and the buyer's authorised representative

All quality certificates should be ordered together with products.

2.1 can be issued by Mattssons, others are ordered and are obtained from Mattssons's suppliers.

Source: EN 10204.

* Prices are quoted on request by our sales department.

Zero defect control machine

Automatic assembling puts heavy demands on the defect free details that are to be assembled. Even in manual assemblage, defects that are not discovered can cause unnecessary adjustment costs.

Only by sorting it is possible to reach the PPM-levels that modern industry demands. That is why we at Mattssons have an effective sorting and checking equipment, that helps us remove deviant foreign articles and articles with cracks or deviation in hardness.

What are we able to check/sort?

With our zero defect control machine Warren WI-600 equipped with cameras we check details that have heads. It is able to handle most types of measure deviations and can sort with a precision of $\pm 0,05\text{mm}$.

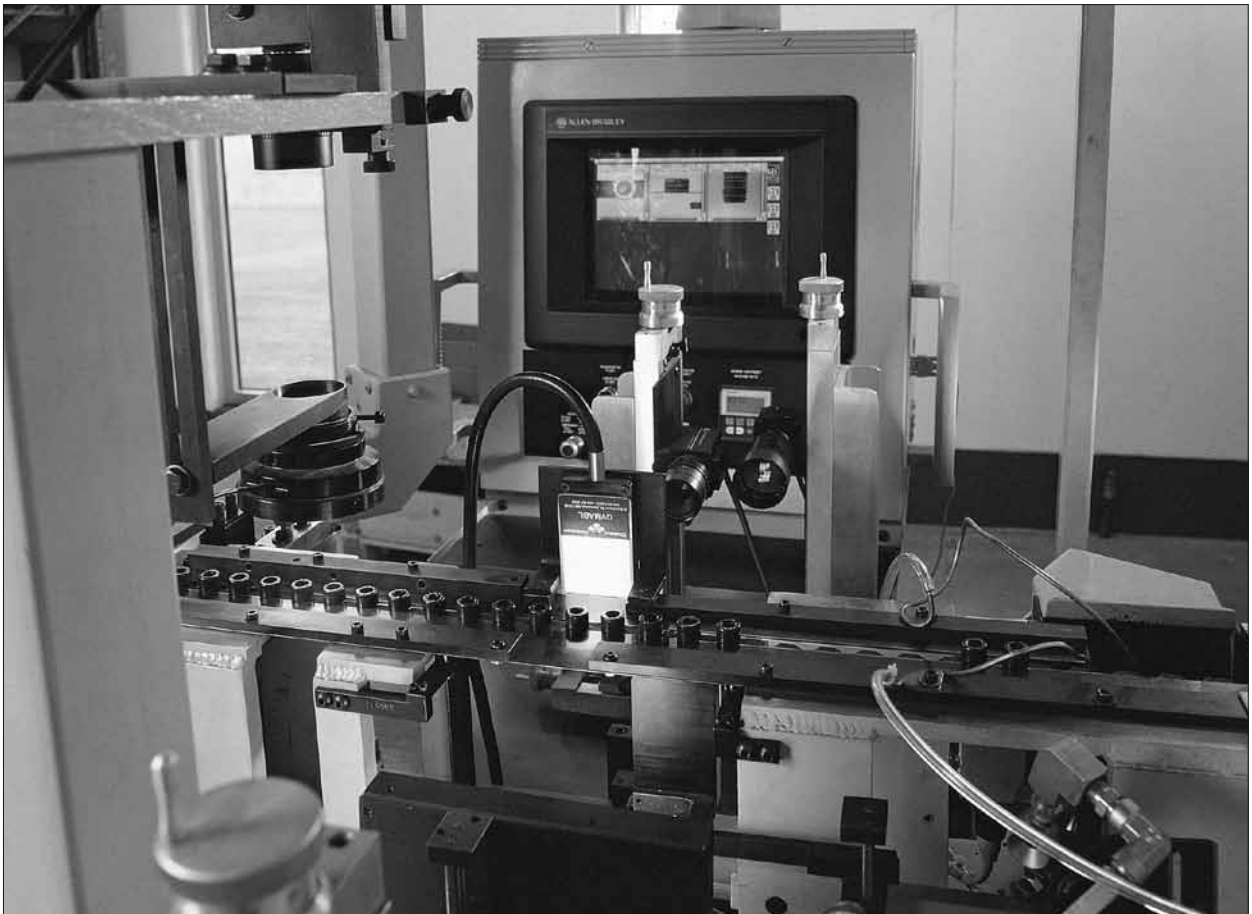
Below follow some examples of what we can check:

- Shank diameter.
- Head diameter.
- Head height.
- Visible cracks.
- Grip shapes.
- Threads (diameters, performances).
- Surface treatment.

We also have access to a sorting machine that works with ultra sound and eddy current.

It is used for the following checks:

- Deviations in shape (measures).
- Deviations in material structure.
- Cracks.
- Hardness.
- Alloy.



Material analysis

As the international trade is opening up more and more, our markets are being flooded by products with all kinds of origins.

To verify our work of keeping a high product quality we have an instrument for material analysis, a spectrometer, at our quality division's disposal.

The spectrometer is of the brand SPECTRO - LAB L and can analyse most FE-based materials, such as stainless-, acid-resistant-, free-cutting-, tool- and low-alloy steel. The sample size is normally 2,0 mm or more.

The instrument is equipped with 20 analysis channels which cover almost all alloy metals for FE-alloys, such as phosphorus (P), sulphur (S), boron (B), carbon (C), silicon (Si), manganese (Mn), chromium (Cr), molybdenum (Mo), vanadium (V), niobium (Nb), copper (Cu), titanium (Ti), cobalt (Co), wolfram (W) and lead (Pb).

As a complement to "Swedish steel grades" the alloy norms from "Stahlschlüssel", "Carpenter Technology Corporation", "Brush Wellmann" and "Inco Alloys International" are in the alloy database and can be used at a routine analysis.

How does the spectrometer work?

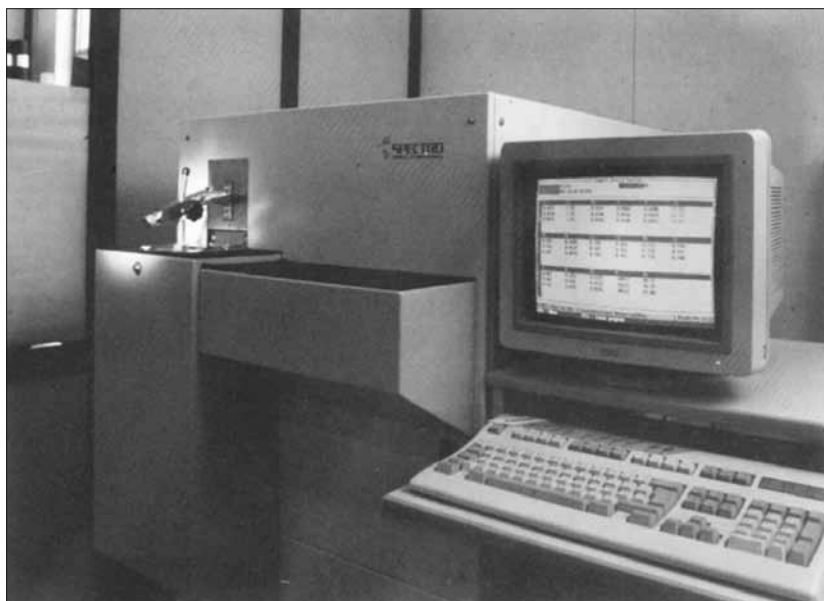
The Spectrolab normally requires a flat sample with a diameter of at least 2 mm. This is placed on a spark stand and then fixed by a spring-loaded clamp.

Below the sample, on a distance of 4,5 mm, is an electrode located.

The space between the sample and the electrode is flushed with argon before the spark discharge, preventing the sample from oxidising and allowing the generated light in the spark discharge to reach the slits in the vacuum spectrometer without any absorption worth mentioning. The light from the spark is also led, via fibre optic cables made of quartz, into spectrometers working in air at atmospheric pressure.

To guarantee that the spectrometer is working, before every analysis there is a test performed to control the stability of the photomultiplier tubes. Every tube is individually illuminated by a diode and if a tube for some reason (usually age phenomenon) does not return a predefined signal, this is reported on the screen.

During the light measuring period, the integration time, the intensity of the reference line is measured for every single discharge, usually 400 times a second, and the intensity value of every single spark is stored in a memory. The outgoing signals are then processed by a microprocessor, where the sample's percentile composition is calculated. The calculating program considers line overlap, background variations and inter-element effects of various kinds in an iterative program, which in a few seconds prints the correct analysis result on screen or on paper.



Tensile testing machine

Our machine Sun 60 from Galdabini has a capacity of 600kN and has equipment to perform testing of screws ranging from M5 up to M33. We also have grips for testing of round details from 3 to 24mm in diameter and for flat details like flat-rolled

steel with thickness of 0 to 20mm. We are able to present the results with diagrams and certificates on your request.



System for fatigue testing

Our machine Vibrophore from Roell Amsler has a capacity of 150kN dynamic load respectively $\pm 150\text{kN}$ for static load, and it performs tests with a frequency of 35 to 300Hz.

With the help from this equipment we have the possibility to test fatigue features according to standard DIN 50100 or other profiled tests.



Vibration test

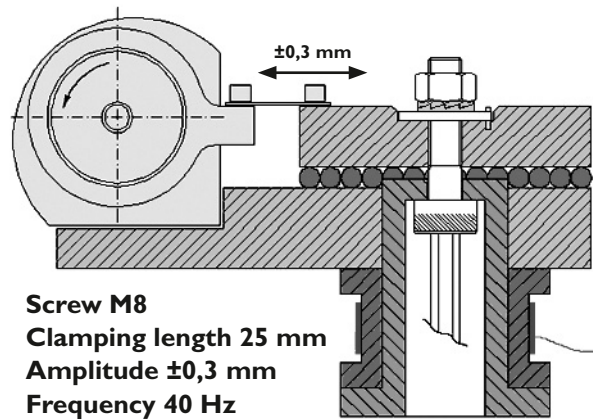
To achieve a comparative test of how a joint is kept together we have special shaking test equipment. In this machine it is possible to simultaneously run two different joints and see how long they withhold their clamping force. For example, with and without locking, different locking elements, different torques, et c.



Source: Nylok

One method of testing the safety of a screw union when vibrating is the so called Junker-method. The clamping force is continuously measured while vibrations are generated in a radius against the screw.

The Junker-method



Screw M8
Clamping length 25 mm
Amplitude $\pm 0,3$ mm
Frequency 40 Hz

Source: Nord-Lock

X-ray

We have x-ray equipment which enlarge objects up to 25 times. It is equipped with a motorised measuring table and laser point sight to be able to measure as exact as possible.

We are able to measure the following:

- Up to four metallic layers on different base materials.
- Thickness and alloy with up to four elements per layer and maximum two layers on different base materials.
- Metal content in galvanic baths.
- The machine is also able to carry out quantitative and qualitative analysis of elements in solid materials.

We are able to measure several types of surface conditioning layers:

- Single layer - Measure the thickness of one layer on a base material.
- Double layers - Measure the thickness of two layers on a base material.
- Triple layers - Measure the thickness of three layers on a base material.
- Alloy layers - Measure the thickness and the alloy, max. three elements on max. two layers on a base material.

We have layer thickness standards for gold, silver, tin, nickel, copper, zinc, zinc-iron, Delta, Dacromet, hot dip galvanizing etc. We are also able to measure on metal bedding, for example steel, stainless steel, brass and copper.



Torque testing



The torque tester we can test the torque at the assembly location.



The torque tester can be connected to a PC in order to get a clearer image and to make print-outs.

The torque tester prints graphs and charts - on location!



Mattssons has two measuring equipments for torque analysis. One stationary equipment from Schatz in Germany and one portable from Crane in England.

ACCRAT ANALYSE from Schatz is a complete measuring equipment for torque analysis that evaluates all measure results at the same time.

Mattssons's torque tester measures clamping force as well as friction, it can measure machine thread as well as thread pressing screw, taptite and plastite. It is also portable and can be brought to the customers' assembly line.

Measures everything!

Mattssons's torque tester can measure:

- Torque.
- Clamping force.
- Friction totally.
- Friction separated below head and in the thread (Schatz).
- Tightening angle.
- Relation torque/angle.
- Printout of all parameters including statistics.
- Test the customers torque wrench at Mattssons or at the customer.

Areas of application

The torque testers can be used in the following applications:

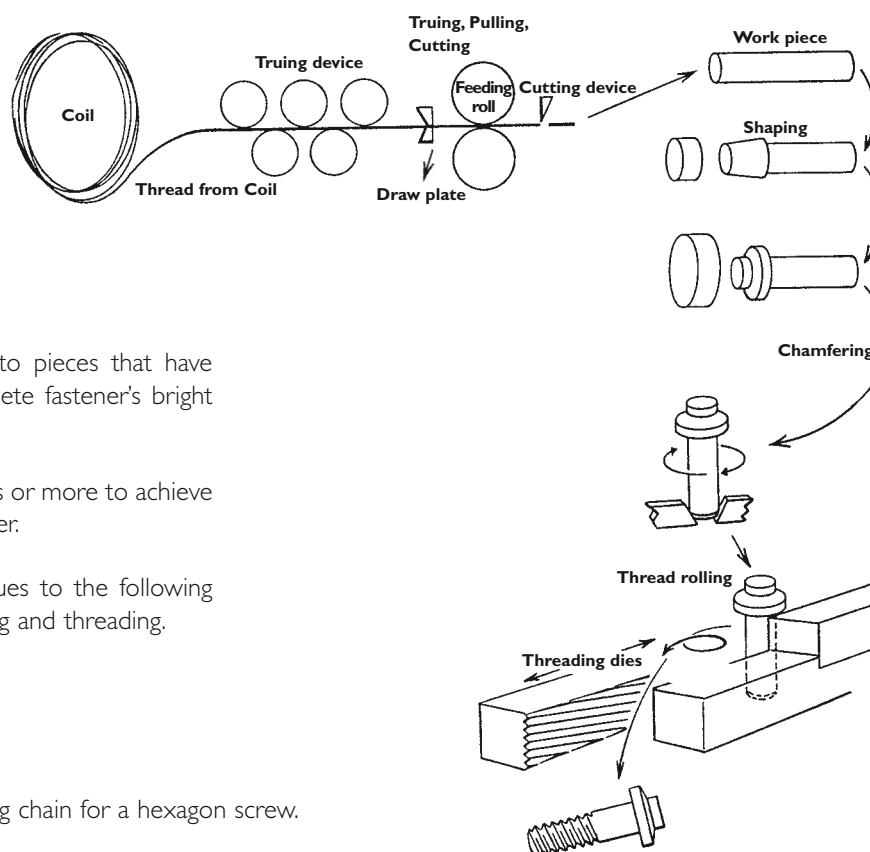
- Test if a screw will endure the intended torque.
- Test clamping force for customers and decide what combination of screw and nut they need to achieve a certain force in their joint.
- Test how much the customer should decrease their tightening torque when using wax or lubricant.
- Test new surface treatments and the way they affect the tightening torque.
- Test which tightening angle needs to be used in order to obtain a certain tightening torque (at accurate and in other ways extreme joints).



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Manufacturing methods



Cold working

The wire is adjusted and cut to pieces that have the same volume as the complete fastener's bright shape.

The piece is shaped in two steps or more to achieve the final geometry of the fastener.

The finished piece then continues to the following operations, which are chamfering and threading.

Table 1. Schematic manufacturing chain for a hexagon screw.

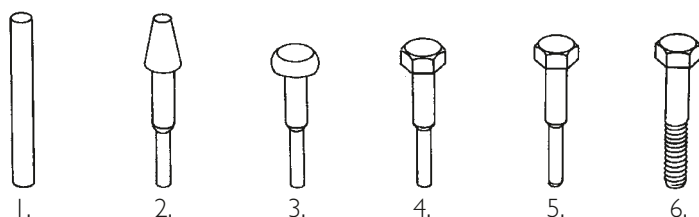


Table 2. Schematic manufacturing chain for a nut.

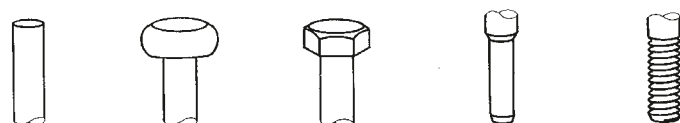


Advantages with cold working

1. Through reshaping the yield and the tensile values are increased.
2. In the reshaped zone a harder surface and an improved material structure are created.
3. A smoother surface that is suitable for surface treatment, for example zincplating.

Hot working

Table 3. Schematic manufacturing chain for a hexagon screw.



Turning

Schematic manufacturing chain for a nut.

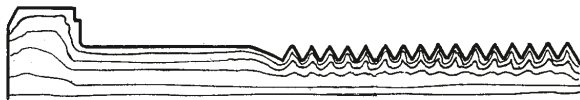


Different material structures

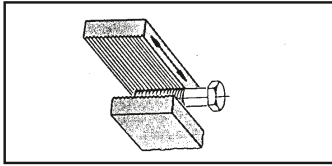
Material structure after turning.



Material structure after cold and hot working.

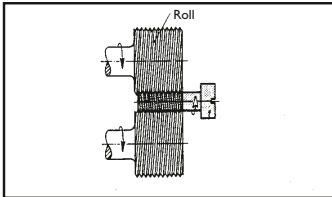


Thread shaping methods



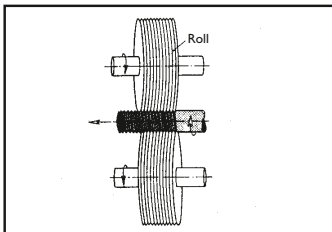
Roll threading between flat cutting dies.

One cutting die is fixed while the other one moves back and forth.



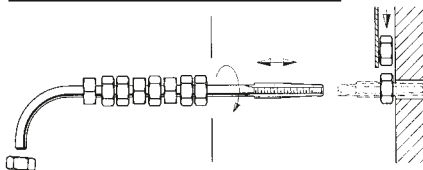
Roll threading between parallel rolls.

The rolls are fitted with the threads pitch and profile.



Roll threading between inclined rolls.

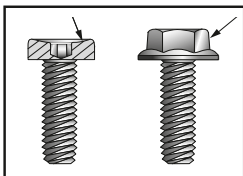
The rolls are angled in the threads pitch. Here the material travels past the rolls.



Threading of nut

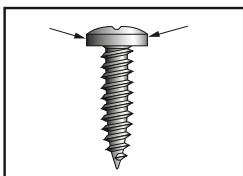
Automatic assembling

- When the screws are meant for automatic assembling machines we have this in mind when working out the contract.
- Based on customer feedback we try to find critical measures at assemblage.
- To minimize production disturbances we are able to offer machine checked details.

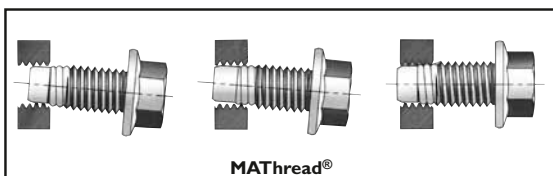
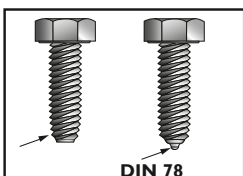


Things to keep in mind that simplifies automatic assembling:

The shape of the head lets the chisel/bit easily fix.



The shape of the head facilitates arranged magazine feed. For example plane sides make it easier to steer the screw.



The bolt tip steers towards the hole via, for example, a bevel or a point.



For a number of years ISO (International Organization of Standardization) has been working on establishing a standard for fasteners which has been accepted world-wide.

The purpose of this ISO standard is partly to improve the products, partly to save raw material in manufacturing. Furthermore a world standard naturally provides great rationalization profits.

The ISO standard first of all means that certain key widths, nut heights and property demands are changed. The thread diameter is not affected.

Table I27 Key widths for M6S-hexagon screw and M6M-hexagon nut

Thread diameter	Key width	
	M6S DIN 931/933 M6M DIN 934	M6S EN/ISO 4014/4017 M6M EN/ISO 4032/4033
M10	17	16
M12	19	18
M14	22	21
M22	32	34

Headmeasures for hexagon socket-, slot and cross recessed screws

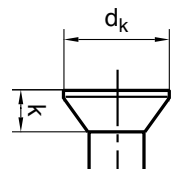


Table I87 Head measures acc. to DIN 7991/ISO 10642

Dimension	M 3	M 4	M 5	M 6	M 8	M 10	M 12	M 16	M 20
Height of the head max. DIN 7991	1,7	2,3	2,8	3,3	4,4	5,5	6,5	7,5	8,5
Height of the head max. ISO 10642	1,86	2,48	3,1	3,72	4,96	6,2	7,44	8,8	10,16
Diameter of the head max. DIN 7991	6	8	10	12	16	20	24	30	36
Diameter of the head max. ISO 10642	6,72	8,96	11,2	13,44	17,92	22,4	26,88	33,6	40,32

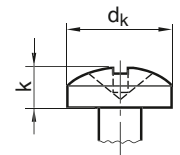


Table I28 Rounded head machine/tapping screw

Thread		M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	M 6	M 8	M 10
d _k max.	EN/ISO 7045	3,2	4	5	5,6	7	8	9,5	12	16	20
	DIN 7985	3,2	4	5	6	7	8	10	12	16	20
k max.	EN/ISO 7045	1,3	1,6	2,1	2,4	2,6	3,1	3,7	4,6	6	7,5
	DIN 7985	1,3	1,6	2	2,4	2,7	3,1	3,8	4,6	6	7,5
Thread		ST 2,2	ST 2,9	ST 3,5	ST 3,9	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5
d _k max.	EN/ISO 7049	4	5,6	7	—	8	9,5	11	12	16	20
	DIN 7981	4,2	5,6	6,9	7,5	8,2	9,5	10,8	12,5	—	—
k max.	EN/ISO 7049	1,6	2,4	2,6	—	3,1	3,7	4	4,6	6	7,5
	DIN 7981	1,8	2,2	2,6	2,8	3,05	3,55	3,95	4,55	—	—

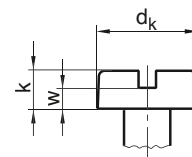


Table 129 Pan head machine/tapping screw

Thread		M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	M 6	M 8	M 10
d _k max.	EN/ISO 1580	3,2	4	5	5,6	7	8	9,5	12	16	20
	DIN 85	—	—	—	6	7	8	10	12	16	20
k max.	EN/ISO 1580	1	1,3	1,5	1,8	2,1	2,4	3	3,6	4,8	6
	DIN 85	—	—	—	1,8	2,1	2,4	3	3,6	4,8	6
w min.	EN/ISO 1580	0,3	0,4	0,5	0,7	0,8	1	1,2	1,4	1,9	2,4
	DIN 85	—	—	—	0,7	0,9	1	1,3	1,4	2,1	2,7

Thread		ST 2,2	ST 2,9	ST 3,5	ST 3,9	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5
d _k max.	EN/ISO 1481	4	5,6	7	—	8	9,5	11	12	16	20
	DIN 7971	4,2	5,6	6,9	7,5	8,2	9,5	10,8	12,5	—	—
k max.	EN/ISO 1481	1,3	1,8	2,1	—	2,4	3	3,2	3,6	4,8	6
	DIN 7971	1,35	1,75	2,1	2,25	2,45	2,8	3,2	3,65	—	—

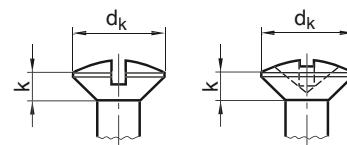


Table 130 Raised countersunk head machine/tapping screw
angle of countersinking: ISO std 90°, DIN std 90°

Thread		M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	M 6	M 8	M 10
d _k max.	EN/ISO 7047	3	3,8	4,7	5,5	7,3	8,4	9,3	11,3	15,8	18,3
	DIN 966	3	3,8	4,7	5,6	6,5	7,5	9,2	11	14,5	18
k max.	EN/ISO 7047	1	1,2	1,5	1,65	2,35	2,7	2,7	3,3	4,65	5
	DIN 966	0,96	1,2	1,5	1,65	1,93	2,2	2,5	3	4	5

angle of countersinking: ISO std 90°, DIN std 80°

Thread		ST 2,2	ST 2,9	ST 3,5	ST 3,9	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5
d _k max.	EN/ISO 1483 och 7051	3,8	5,5	7,3	—	8,4	9,3	10,3	11,3	15,8	18,3
	DIN 7973 och 7983	4,3	5,5	6,8	7,5	8,1	9,5	10,8	12,4	—	—
k max.	EN/ISO 1483 och 7051	1,1	1,7	2,35	—	2,6	2,8	3	3,15	4,65	5,25
	DIN 7973 och 7983	1,3	1,7	2,1	2,3	2,5	3	3,4	3,8	—	—

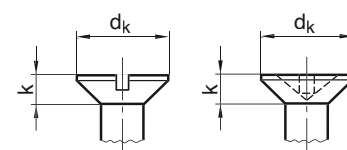


Table 131 Countersunk machine/tapping screw
angle of countersinking: ISO std 90°, DIN std 90°

Thread		M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	M 6	M 8	M 10
d _k max.	EN/ISO 2009 och 7046	3	3,8	4,7	5,5	7,3	8,4	9,3	11,3	15,8	18,3
	DIN 963 och 965	3	3,8	4,7	5,6	6,5	7,5	9,2	11	14,5	18
k max.	EN/ISO 2009 och 7046	1	1,2	1,5	1,65	2,35	2,7	2,7	3,3	4,65	5
	DIN 963 och 965	0,96	1,2	1,5	1,65	1,93	2,2	2,5	3	4	5

angle of countersinking: ISO std 90°, DIN std 80°

Thread		ST 2,2	ST 2,9	ST 3,5	ST 3,9	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5
d _k max.	EN/ISO 7050	3,8	5,5	7,3	—	8,4	9,3	10,3	11,3	15,8	18,3
	DIN 7982	4,3	5,5	6,8	7,5	8,1	9,5	10,8	12,4	—	—
k max.	EN/ISO 7050	1,1	1,7	2,35	—	2,6	2,8	3	3,15	4,65	5,25
	DIN 7982	1,3	1,7	2,1	2,3	2,5	3	3,4	3,8	—	—

Overview standards

Table I32

ISO-Standard	Description	EN ISO-Standard	DIN-Standard
Hexagonal screw and hexagonal nut			
ISO 4161	Hex flange nuts.	EN 1661	DIN 6923
ISO 15071	Hex head flange bolts.	EN 1662	–
–	Hex head flange bolts.	EN 1665	DIN 6921 DIN 6922
ISO 4014	Hex head bolts. Product class A and B.	EN 24014	DIN 931-1
ISO 4016	Hex head bolts. Product class C.	EN 24016	DIN 601
ISO 4017	Hex head screws, full thread. Product class A and B.	EN 24017	DIN 933
ISO 4032	Hex nuts, Type 1. Product class A and B.	EN 24032	DIN 934
ISO 4033	Hex nuts, Type 2. Product class A and B.	EN 24033	–
ISO 4034	Hex nuts. Product class C.	EN 24034	DIN 555
ISO 4035	Hex jam nuts with chamfer. Product class A and B.	EN 24035	DIN 439-2
ISO 4036	Hex jam nuts unchamfered. Product class B.	EN 24036	DIN 439-1
ISO 8673	Hex nuts, fine thread, Type 1. Product class A and B.	EN 28673	DIN 934 DIN 971-1
ISO 8674	Hex nuts, fine thread, Type 2. Product class A and B.	EN 28674	DIN 971-2
ISO 8675	Hex jam nuts, fine thread. Product class A and B.	EN 28675	DIN 439-2
ISO 8676	Hex head screws full thread, fine thread. Product class A and B.	EN 28676	DIN 961
ISO 8765	Hex head bolts, fine thread. Product class A and B.	EN 28765	DIN 960
Locking nut			
ISO 7043	Prevailing torque hex lock nuts with flange and polyamide insert.	EN 1663	DIN 6926
ISO 7044	Prevailing torque hex lock nuts with flange, all-metal.	EN 1664	DIN 6927
ISO 12125	Prevailing torque hex lock nuts with flange and polyamide insert, fine thread.	EN 1666	DIN 6926
ISO 12126	Prevailing torque hex lock nuts with flange, all-metal, fine thread.	EN 1667	DIN 6927
ISO 7040	Prevailing torque hex lock nuts with polyamide insert, heavy type. Type 1.	EN ISO 7040	DIN 982 DIN 6924
ISO 7042	Prevailing torque hex lock nuts, all-metal. Type 2.	EN ISO 7042	DIN 980 DIN 6925
ISO 10511	Prevailing torque hex lock nuts with polyamide insert, regular type.	EN ISO 10511	DIN 985
ISO 10512	Prevailing torque hex lock nuts with polyamide insert, heavy type, fine thread, Type 1.	EN ISO 10512	DIN 982 DIN 6924
ISO 10513	Prevailing torque hex lock nuts, all-metal, fine thread. Type 2.	EN ISO 10513	DIN 980 DIN 6925

ISO-Standard	Description	EN ISO-Standard	DIN-Standard
Machine screw			
ISO 1207	Slotted cheese head machine screws. Product class A.	EN ISO 1207	DIN 84
~ISO 1207	Hexalobular socket cheese head screws. Product class A.	EN ISO 14580	–
ISO 1580	Slotted pan head machine screws. Product class A.	EN ISO 1580	DIN 85
ISO 2009	Slotted flat countersunk head screws. Product class A.	EN ISO 2009	DIN 963
ISO 2010	Slotted raised countersunk oval head screws. Product class A.	EN ISO 2010	DIN 964
ISO 7045	Cross recessed pan head machine screws. Product class A.	EN ISO 7045	DIN 7985
~ISO 7045	Hexalobular socket pan head screws. Product class A.	EN ISO 14583	–
ISO 7046-1	Cross recessed countersunk flat head screws. Product class A part 1.	EN ISO 7046-1	DIN 965
ISO 7046-2	Cross recessed countersunk flat head screws. Product class A part 2.	EN ISO 7046-2	DIN 965
ISO 7047	Cross recessed countersunk oval head screws. Product class A.	EN ISO 7047	DIN 966
~ISO 7047	Hexalobular socket raised countersunk head screws.	EN ISO 14584	–
Hex socket head cap screw			
ISO 4762	Hex socket head cap screws.	EN ISO 4762	DIN 912
ISO 10664	Hexalobular socket head cap screws.	EN ISO 14579	–
ISO 7380	Hex socket button head cap screws.	EN ISO 7380	–
ISO 10642	Hex socket countersunk head cap screws.	EN ISO 10642	DIN 7991
Tapping screw			
ISO 1479	Hex head tapping screws.	EN ISO 1479	DIN 7976
ISO 1481	Slotted pan head tapping screws.	EN ISO 1481	DIN 7971
ISO 1482	Slotted countersunk head tapping screws.	EN ISO 1482	DIN 7972
ISO 1483	Slotted raised countersunk head tapping screws.	EN ISO 1483	DIN 7973
ISO 7049	Cross recessed pan head tapping screws.	EN ISO 7049	DIN 7981
~ISO 7049	Hexalobular socket pan head tapping screws.	EN ISO 14585	–
ISO 7050	Cross recessed countersunk head tapping screws.	EN ISO 7050	DIN 7982
~ISO 7050	Hexalobular socket countersunk head tapping screws.	EN ISO 14586	–
ISO 7051	Cross recessed raised countersunk head tapping screws.	EN ISO 7051	DIN 7983
~ISO 7051	Hexalobular socket raised countersunk head tapping screws.	EN ISO 14587	–
–	Hexagon washer head drilling screws with tapping screw thread.	EN ISO 15480	DIN 7504
–	Cross recessed pan head drilling screws with tapping screw thread.	EN ISO 15481	DIN 7504
–	Cross recessed countersunk head drilling screws with tapping screw thread.	EN ISO 15482	DIN 7504
–	Cross recessed raised countersunk head drilling screws with tapping screw thread.	EN ISO 15483	DIN 7504

ISO-Standard	Description	EN ISO-Standard	DIN-Standard
Set screw			
ISO 4766	Slotted set screws with flat point.	EN 24766	DIN 551
ISO 7434	Slotted set screws with cone point.	EN 27434	DIN 553
ISO 7435	Slotted set screws with dog point.	EN 27435	DIN 417
ISO 7436	Slotted set screws with cup point.	EN 27436	DIN 438
Pins			
ISO 2339	Taper pins.	EN 22339	DIN 1
ISO 2340	Clevis pins without head.	EN 22340	DIN 1443
ISO 2341	Clevis pins with head.	EN 22341	DIN 1444
ISO 8736	Taper pins with internal thread.	EN 28736	DIN 7978
ISO 8737	Taper pins with thread and constant threaded part.	EN 28737	DIN 7977
ISO 8738	Flat washers. Product class A.	EN 28738	DIN 1440
ISO 1234	Split pins.	EN ISO 1234	DIN 94
ISO 2338	Parallel pins.	EN ISO 2338	DIN 7
ISO 8733	Parallel pins unhardened, internal thread.	EN ISO 8733	DIN 7979
ISO 8734	Parallel pins hardened.	EN ISO 8734	DIN 6325
ISO 8735	Parallel pins hardened, internal thread.	EN ISO 8735	DIN 7979
ISO 8739	Grooved pins - Full-length parallel grooved, with pilot.	EN ISO 8739	DIN 1470
ISO 8740	Grooved pins - Full-length parallel grooved, with chamfer.	EN ISO 8740	DIN 1473
ISO 8741	Grooved pins - Half-length reverse taper grooved.	EN ISO 8741	DIN 1474
ISO 8742	Grooved pins - One-third-length centre grooved.	EN ISO 8742	DIN 1475
ISO 8744	Grooved pins - Full-length taper grooved.	EN ISO 8744	DIN 1471
ISO 8745	Grooved pins - Half-length taper grooved.	EN ISO 8745	DIN 1472
ISO 8746	Grooved pins with round head.	EN ISO 8746	DIN 1476
ISO 8747	Grooved pins with countersunk head.	EN ISO 8747	DIN 1477
ISO 8748	Spiral pins, heavy duty.	EN ISO 8748	DIN 7344
ISO 8750	Spiral pins, medium duty.	EN ISO 8750	DIN 7343
ISO 8752	Spring-type straight pins-slotted, heavy duty.	EN ISO 8752	DIN 1481
ISO 13337	Spring-type straight pins-slotted, light duty.	EN ISO 13337	DIN 7346