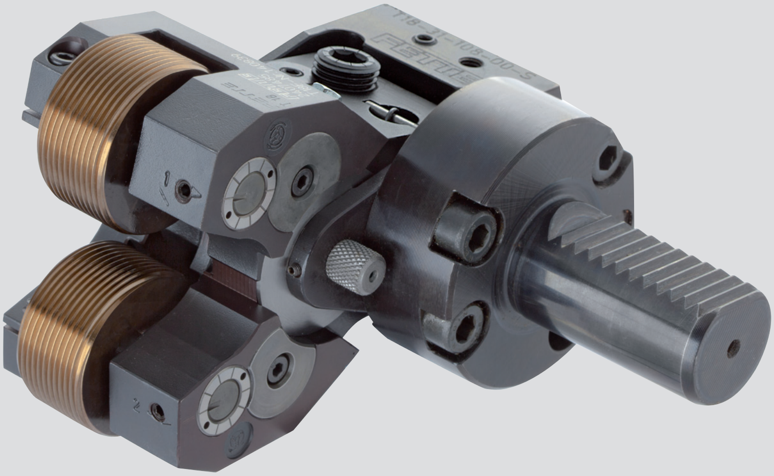
Operating Manual
Tangential Rolling System
T18F - T27F



www.lmt-fette.com

Manufacturer
The tangential rolling system specified on the title page is manufactured by:

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Contact LMT Fette Werkzeugtechnik GmbH & Co. KG (see Chapter 13 Service Information, page 50)

- if you have any questions or problems.
- for ordering spare and wearing parts.

Table of contents

1 Introduction

Congratulations on choosing a LMT Fette tangential rolling system. This tool offers decisive advantages in terms of economic viability and efficiency and sets new standards in chipless thread forming.

Setting up and working with the tangential rolling system is very easy. Only a short training period is needed to ensure cost-effective production.

That said: before using the tool for the first time please make sure to read carefully and thoroughly through this Operating Manual, paying special attention to the safety instructions! This will quickly familiarize you with all the features of this tool and help to prevent damage occurring to the tool and machine.

Expertise help is also available from LMT Fette at any time (see Chapter 13 Service information).

Notes on this Operating Manual
This Operating Manual (OM) contains all the information which you need to know about transport, storage, assembly, installation, putting into operation and use. This Operating Manual does not permit the operation of the processing machine into which the tangential rolling system is or is to be integrated. Information relating to the said processing machine is contained in the respective Operating Manual. This Operating Manual is designed to help you avoid improper handling. Personal safety can only be ensured if you strictly follow the instructions provided in the Operating Manual. Therefore, this Operating Manual should be kept in close proximity to the tangential thread rolling head.

Target group
This Operating Manual is intended for use by appropriately trained and qualified personnel who are entrusted with the responsibilities of mounting, putting into operation and using the tangential rolling system.
The following conventions are valid for this Operating Manual:

- Abbreviations are used in the text. Each chapter provides an explanation of the abbreviations used when they appear for the first time. The respective abbreviation is contained in brackets after the term.
  Example: Operating Manual (OM)
- The pages are numbered consecutively in each chapter. Tables and figures are numbered consecutively.
- Cross references in the text are linked to additional or more in-depth information.
- Some chapters specify part numbers. Part numbers with the addition “SP” contain a reference to the spare parts list (Figure 24 on page 48).

Chapter 2 Safety, page 1, contains generally valid safety instructions relating to hazards which may occur during the operation of the tangential rolling system. Specific safety instructions also appear immediately in front of instructions where there is a risk of danger to persons or the tangential rolling system.

This Operating Manual is subject to change management. Should changes serving technical progress be made to the tangential rolling system, you will be required to include any additional or updated pages at the relevant position.

Explanation of symbols and notes
This Operating Manual uses different symbols to convey safety instructions and information.

The safety instructions include information on the hazard source, possible or likely consequences as well as measures to avoid the hazard.

DANGER

This warning category indicates an imminent hazardous situation which, if not avoided, will result in serious injury or death.

CAUTION

This warning category indicates a potentially hazardous situation which, if not avoided, could result in serious injury.

CAUTION

This warning category indicates a potentially hazardous situation which, if not avoided, could result in minor injury.

ATTENTION

This warning category indicates a potentially hazardous situation which, if not avoided, could result in material damage.

NOTICE

This symbol appears next to hints containing special information on key functions or special application tips designed to optimize the use of all functions.

2 Safety

General safety instructions
The tangential rolling system was constructed in compliance with all binding rules and regulations and safety standards. It complies with the current state of technology and EC conformity requirements.

- The tangential rolling system must be put into operation in accordance with the Operating Manual.
- The general safety instructions for processing machines (machine room) apply.
- Operating personnel must be trained using this Operating Manual. Successful completion of training must be confirmed in writing. This applies in particular to operating personnel without knowledge of the respective national language or national writing system.
- For the replacement of spare parts only original LMT Fette spare parts must be used for safety reasons.

Residual dangers
Even if the tangential rolling system is used as intended, it is not possible to exclude all dangers.
Such dangers not only arise from the tangential rolling system itself, but generally through negligence or operating errors.

Make sure to observe

- the general legal and operational safety regulations pertaining to the use of a tangential rolling system.
- the universally recognized technical rules to ensure safe and professional working practices.
- all the safety instructions in this Operating Manual.
- the safety markings on the tangential rolling system.
- the accident prevention regulations.
- the environmental protection regulations.

Obligations of the operator

- The operator is responsible for ensuring that the tangential thread rolling head is used as intended, that the safety regulations are adhered to and that this Operating Manual is always accessible to personnel for consultation at all times.
- The operator must ensure that all persons commissioned by him to perform commissioning work, operation and maintenance tasks have read and understood this Operating Manual.
- The operator is required to provide all the necessary protective equipment for the personnel.

Authorized personnel, operating personnel training
All operating personnel must have the required training for their tasks and meet the requirements for using the tangential rolling system. The valid regulations concerning the occupational safety and protection of minors must be observed.

The operating personnel must be trained in the correct use of the tangential rolling system before using the tangential thread rolling head for the first time, after accidents and also at regular intervals.

What to do in an emergency

Accident

- Perform first aid measures if necessary.
- Notify a doctor.

Fire

- Notify the fire department.

Environmental hazard

- Notify the fire department and the appropriate authorities.
- Provide information on special hazardous substances.

NOTICE

Also observe the in-house alarm and emergency plans.

Packaging

CAUTION

Risk of foot injury!
Personnel must take care when handling the packaging as there is a risk of the tangential thread rolling head falling down and causing injury. Wear safety shoes to prevent foot injuries.

CAUTION

Risk of hand injury!
Personnel must take care when handling the packaging as there is a risk of injury from rough surfaces or sharp edges on transport cases, cartons, pallets and packaging aids.
Wear safety gloves to prevent hand injuries.

During packaging secure the tangential thread rolling head against uncontrolled movements.
The tangential rolling system is packed in cartons. The tangential thread rolling head is packed in cartons or plastic containers. Any protruding parts must be padded to prevent damage.

NOTICE

Improper disposal of the used packaging materials can pose a threat to the environment. All materials must be disposed of separately and in accordance with national and local regulations.

Transport

CAUTION

Risk of hand injury!
Personnel must take care when handling the packaging as there is a risk of injury from rough surfaces or sharp edges on transport cases, cartons, pallets and packaging aids. Wear safety gloves to prevent hand injuries.

CAUTION

Risk of foot injury!
During transport there is a risk of transport cases, cartons and pallets falling down and causing injury.
Wear safety shoes to prevent foot injuries.

During transport secure the unit against uncontrolled movements.
Check that the delivery is complete and that no parts have been damaged in transit. Refer to the delivery note for information on the scope of delivery. Conduct an on-site inspection of the tangential rolling system upon acceptance for external damage. Any damage must be reported to the manufacturer immediately.

Storage

CAUTION

Risk of hand injury!
During storage there is a risk of injury from rough surfaces or sharp edges on transport cases, cartons, pallets and packaging aids. Wear safety gloves to prevent hand injuries.

CAUTION

Risk of tripping and falling over!
During storage there is a risk of injury from tripping or falling over transport cases, cartons or pallets positioned in gangways. Wear safety shoes to prevent foot injuries and make sure to keep all paths free from obstruction at all times.

Store the tangential rolling system in a dry, dust-free environment away from direct sunlight.

If prolonged storage is planned, agree on strictly defined contractual storage conditions with the manufacturer.

If the tangential thread rolling head is stored under extreme temperature conditions, there is a risk of injury to personnel from hot or cold surfaces.

Do not remove or damage the packaging of the tangential rolling system during storage.

If, for operational reasons, the tangential rolling system is stored in areas in which it is exposed to the effects of weather or aggressive substances, it must be checked for proper condition by a qualified person prior to initial operation.

Storage temperature	min. –10 °C (14 °F)
	max. +30 °C (86 °F)
Relative humidity	60 % ± 5 %

3 Design and function

3.1 The method

During the thread rolling process, the workpiece is produced by cold forming. This ensures that the flow of the fibers within the thread profile is not interrupted. Notch effects are thus avoided. The surfaces in the thread flanks are press-finished. Threads produced by thread rolling are characterized by high fatigue strength, wear resistance and corrosion resistance.

LMT Fette tangential thread rolling attachments have been primarily designed for rolling either in front of or behind a shoulder. The thread length is limited by the maximum roll width. This makes the rolling head particularly suitable for short threads.

Operation takes place according to the plunge method. The rolling head is moved at a constant feed laterally onto the workpiece. The workpiece rotates. The thread rolls which are synchronized via a gear unit are rotated by the workpiece. The thread is rolled within a few workpiece rotations and the rolling head is drawn back again from the workpiece.

Tangential thread rolling heads can be used on all machine tools which are provided with automatic feed motion. The tangential thread rolling head is held in a rolling head holder. This is adapted to the respective tool holder of the machine. Before using a tangential thread rolling head, check whether the rolling head is suitable for use on the automatic lathe and clarify whether the shoulder diameter could collide with the rolling head.

The rolling head for right-hand threads is also used for left-hand threads. This then requires the use of special left-hand thread rolls. The thread length, including the thread run-out, cannot be larger than the width of the roller.

In particular the following profiles can be produced:
- Threads behind a shoulder
- Extremely short threads
- Threads with a very short run-out (approx. 1 x pitch)
- Tapered threads
- Knurling profiles as per DIN 82
- Burnishing
- Forms

3.2 Application area/working range

LMT Fette tangential thread rolling heads cover a working range of up to 64 mm. The way in which this range is divided is shown in the following table:

Working range of parallel threads								
Rolling head type	**Workpiece major diameter**				**Max. pitch**		**Max. roll width**	
	Min.		**Max.**					
	[mm]	**[Zoll]**	**[mm]**	**[Zoll]**	**[mm]**	**[Thread/ inch]**	**[mm]**	**[Inch]**
T18F	2	5/64	30	1 3/16	2	12	21.5	0.8465
T27F	2	5/64	42	1 5/8	2.5	10	31	1.2205

Working range of tapered threads				
Rolling head type	**Standard**	**Min.**	**Max.**	**Allowed shoulder diam. and working**
T18F	DIN 158 DIN 2999 DIN 3858 ANSI B 1.20.1	M6 x 1 keg. R 1/16–28 R ⅛–28 1/16–27 NPT (NPTF)	M30 x 1.5 keg. R ¾–14 R ¾–14 ½–14 NPT (NPTF)	For profiles as per DIN 158, DIN 2999 & DIN 3858, the shoulder diameter and working strokes with parallel threads of the same dimensions are identical; for profiles as per ANSI B1.20.1 see Internet
T27F	DIN 158 DIN 2999 DIN 3858 ANSI B 1.20.1	M6 x 1 keg. R 1/16–28 R ⅛–28 1/16–27 NPT (NPTF)	M42 x 2 keg. R 1¼–11 R 1¼–11 1–11.5 NPT (NPTF)	

3.3 Materials

The tangential rolling method can be used for all metallic materials with a breaking elongation A ≥ 7 %. The tensile strength R_m should not exceed approx. 1000 N/mm^2 (145.000 Pa). If the material properties are close to the said limiting values, the rollability is dependent on the required volume of forming. If the volume of forming is very small, these values can be exceeded. In general, the materials should have a minimum breaking elongation of approx. 7 % and not exceed a tensile strength of 1700 N/mm^2 (246.000 Pa). Accordingly, structural and case-hardening steels, stainless steels, heat-treated steels up to approx. 1600 N/mm^2 (232.000 Pa) are suitable. Soft brass, copper, light metals, ferritic castings such as GGG 40 or GTS 35 etc.
Brittle materials with a low breaking elongation such as gray cast iron, hard brass alloys and hardened materials are not suitable.

Warning

Only materials with a breaking elongation > 7 % are suitable for processing. Brittle materials may cause splinters. Risk of injury!

3.4 Thread length

On each roll side there is a chamfer of the width of the thread pitch P. The largest theoretical thread length L thus corresponds to the maximum roll width B_2 (see Chapter 12.1) minus 2 x thread pitch P (also make sure to note the requirements specified in Chapter 3.5!).

If smaller thread lengths are required, recessed rolls can be used, if necessary. It is also necessary here that the roll width A is at least the screwable thread length on the workpiece plus 2x thread pitch P. The standard dimensions specified in the table are preferably to be used. When placing orders for rolls include details of the minimum and maximum possible roll width.

Table 1: Standard roll width version

Rolling head	Roll widths A [mm]																	
T18F	6	8	10	12	14	16	18	21.5										
T27F		8	10	12	14	16	18	20	22	24	26	28	31					

The forces which occur during the thread rolling process vary depending on the tensile strength of the workpiece, the major diameter d of the thread and the thread pitch P. Therefore, not all thread sizes can be rolled with the maximum roll width. The maximum rollable thread length L can be estimated using the formulas from the following table. The following is to be used:

L =	rollable thread length	[mm]
P =	thread pitch	[mm]
d =	major diameter of the thread	[mm]

All values are indicative and may vary in individual cases.

Table 2: Maximum rollable thread length L

Rolling head	Tensile strength of the material [N/mm²]			
	< 500	500 … 700	700 … 900	> 900
T18F	$L = \frac{580.5}{P \cdot d}$	$L = \frac{483}{P \cdot d}$	$L = \frac{446}{P \cdot d}$	$L = \frac{414}{P \cdot d}$
T27F	$L = \frac{1255.5}{P \cdot d}$	$L = \frac{1046}{P \cdot d}$	$L = \frac{965}{P \cdot d}$	$L = \frac{896}{P \cdot d}$

3.5 Position of the thread run-out

The thread can be produced on the workpiece very close to a shoulder, or similar. In such cases, corresponding safety distances must always be maintained (see Figure 1). The thread roll (1) must have the safety distance c to the shoulder of the workpiece (2). The screwable thread begins at the distance a_1 from the shoulder.
The following applies: $a_1 = b + c$ [mm]

Lead chamfer angle	Thread lead b	Distance a_1	
45°	$0.6 \cdot P$	$1.1 \cdot P$	
60°	P	$1.5 \cdot P$	Standard
70°	$1.55 \cdot P$	$2.05 \cdot P$	

In standard cases (lead chamfer angle = 60°) the thread lead b on the roll corresponds to the thread pitch P. The safety distance corresponds to $c = 0.5 \cdot P$.

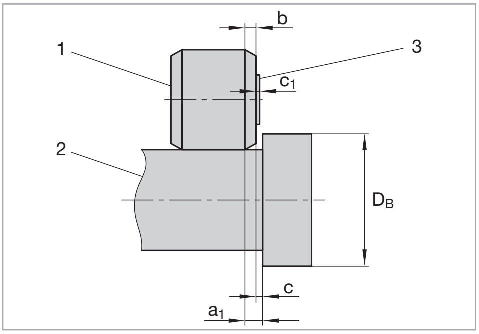

Figure 1: Distance of the thread roll from the shoulder

If the geometrical proportions are unfavorable – especially if the shoulder diameter D_B is very large in proportion to the thread – it will still be necessary to add the width c_1 of the bearing washer (3) to the safety distance. This will result in the maximum distance of the thread from the shoulder:

$a_1 = b + c(+c_1) = P + 0.5 \cdot P(+c_1) = 1.5 \cdot P(+c_1)$ [mm]

Rolling head type	Width of bearing washer c_1
T18F	0.6 mm | 0.0236 inch
T27F	0.8 mm | 0.0314 inch

At the free end of the thread or the workpiece tip, the leading edge of the thread roll (1) must ideally be located at the dimension $b + P = 2 \cdot P$ before the start of the thread (see Figure 2-left). If this dimension is not achieved it may result in a significant tool life reduction of the thread roll.

The same applies also to a thread undercut (see Figure 2-right). The dimension $b + P$ must be maintained. The correct safety distance c is automatically achieved if the length g_2 of the thread undercut is as per DIN 76-A. The length is then approx. $g_2 \approx 3.5 \cdot P$.

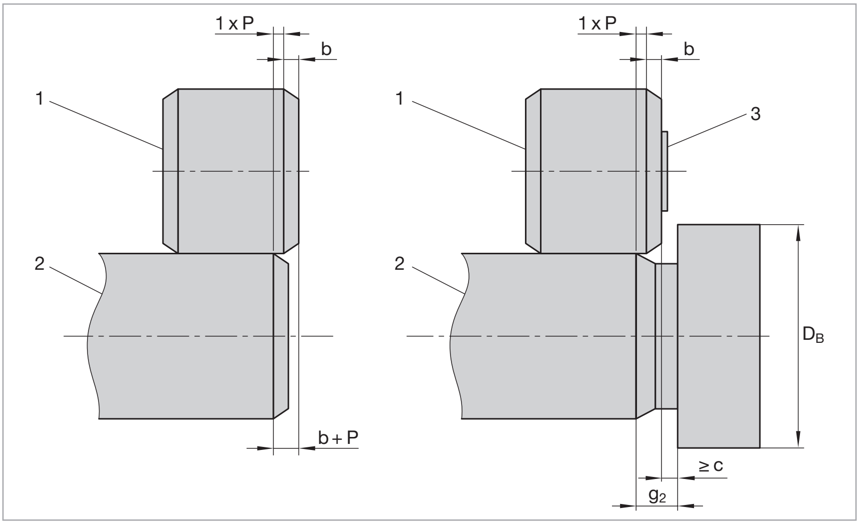

Figure 2: Thread roll at the free end and thread undercut

4 The rolling equipment

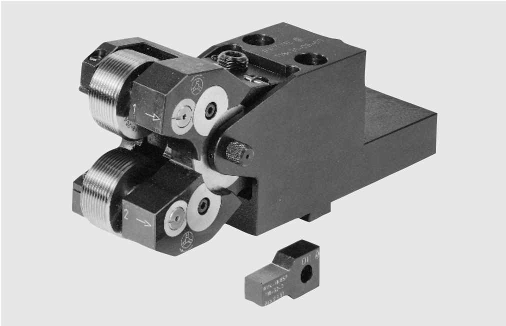

Figure 3: Rolling equipment

Your complete rolling equipment consists of four components:

- Rolling head
- Rolling head holder
- Rolls (1 set = 2 pieces)
- Setting gauge

As the rolling equipment can be used flexibly for different processing applications the individual components are delivered independently of each other.

4.1 The rolling head – selecting the size

The rolling head is the core of the tangential rolling equipment. The respective version is available in two sizes: T18F and T27F.

It is recommended to use the largest suitable rolling head for the respective machine tool to ensure that the largest possible working range is available. This also helps to achieve larger thread lengths, the max. shoulder diameter D_B on the workpiece as well as the maximum cost-efficiency of the rolling head.

Using the following tables and figures check whether the selected rolling head could result in collisions with the machine tool, spindle or workpiece.

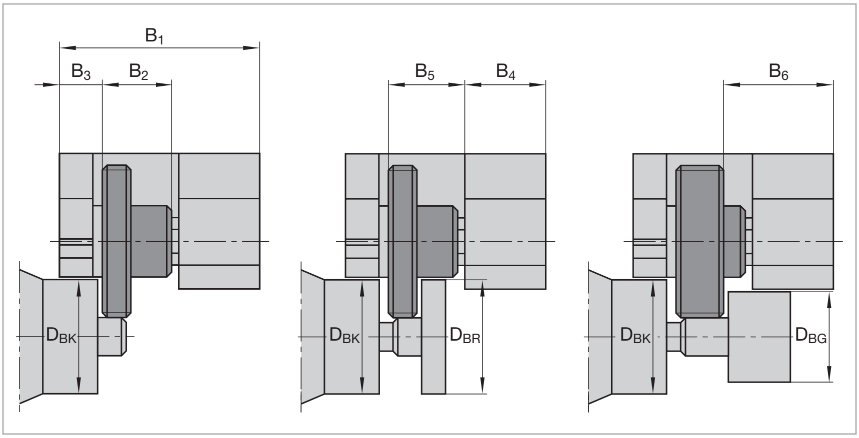

Figure 4: Width dimensions and shoulder diameter at the tangential rolling head

The width dimensions B_1 … B_6 of the rolling head are specified in Chapter 12.1. Note that the rolling head can also be rotated in the holder. That is, either the narrow arm side B_3 or the wide arm side B_4 may be facing towards the workpiece clamping.

The maximum shoulder diameters D_{BK}, D_{BG} and D_{BR} at the workpiece are dependent on the respective thread size. The values are specified in table form online at www.fette.de/rk/fettekat.

Abbreviations used in the following table (excerpt only):

D_{BK} = Max. shoulder diameter under the narrow ("short") arm side of the rolling head
D_{BR} = Max. shoulder diameter under a recessed thread roll
D_{BG} = Max. shoulder diameter under the wide ("drive") arm side of the rolling head
A_v = Theoretical working stroke of the rolling head (see Chapter 4.4 and 6.3)
Z = Number of starts on the roll (see Chapter 4.4)

Table 3: Shoulder diameter and operation data (excerpt from the Internet)

LMT • FETTE — Online Catalogue Thread Rolling Heads

Tools Search Basket of goods Direct-Order Imprint Deutsche Version

Thread Rolling Systems
Axial Thread Rolling Heads
New Developments
Radial Thread Rolling Heads
Tangential Thread Rolling Heads
Rolling Attachments
T120F
T160F
T350F
T220F
T18F
T27F
T42
Turning Heads

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Back Print

Thread Rolls and Capacity Cat.No. 7218, Tangential Thread Rolling Head T18F
Side Rolling Attachment Sizes in accordance with Thread Sizes, max. Shoulder Diameter and Stroke

kein Eintrag in ktx_1010!

GB_Amerikanisches Rohrgewinde, kegelig, ANSI B 1.20.1 NPT

Gew.Abm.	DBK	DBR	DBG	AV	KM	Z
1/16 - 27 NPT	32.5	26.1	24.9	4.1	0	6
1/16 - 27 NPT	32.5	26.1	24.9	4.1	0	6
1/8 - 27 NPT	30.8	23.9	23.8	4	0	4
1/8 - 27 NPT	30.8	23.9	23.8	4	0	4
1/4 - 18 NPT	32.9	26	25.1	5.1	0	3
1/4 - 18 NPT	32.9	26	25.1	5.1	0	3
3/8 - 18 NPT	31.4	24.4	24.2	5	0	2
3/8 - 18 NPT	31.4	24.4	24.2	5	0	2
1/2 - 14 NPT	33.5	33.5	20.4	6.3	0	2
1/2 - 14 NPT	33.5	33.5	20.4	6.3	0	2

GB_Amerikanisches Rohrgewinde, kegelig, ANSI B 1.20.1 NPTF

Gew.Abm.	DBK	DBR	DBG	AV	KM	Z
1/16 - 27 NPTF	33.1	26.7	25.1	3.8	0	6
1/16 - 27 NPTF	33.1	26.7	25.1	3.8	0	6
1/8 - 27 NPTF	31.2	24.3	24.1	3.7	0	4
1/8 - 27 NPTF	31.2	24.3	24.1	3.7	0	4
1/4 - 18 NPTF	33.2	26.3	25.1	4.9	0	3
1/4 - 18 NPTF	33.2	26.3	25.1	4.9	0	3
3/8 - 18 NPTF	31.6	24.6	24.3	4.8	0	2
3/8 - 18 NPTF	31.6	24.6	24.3	4.8	0	2
1/2 - 14 NPTF	33.4	33.4	20.4	6.2	0	2
1/2 - 14 NPTF	33.4	33.4	20.4	6.2	0	2

GB_Metrisches ISO-Gewinde DIN 13

Gew.Abm.	DBK	DBR	DBG	AV	KM	Z
M 2 x 0,4*	30	23.5	23	2.3	0	27
M 2 x 0,4*	30	23.5	23	2.3	0	27
M 2,2 x 0,45*	30.7	24.2	23.6	2.5	0	25

NOTICE

With tapered threads (metric and Whitworth profiles) the shoulder diameter and working strokes with parallel threads of the same dimensions are identical.

Each rolling head size can be used for the complete working range; only the rolls and the setting gauge need to be adapted to the individual work applications.

4.2 The rolling head holder

The rolling head holder serves as an adapter between the machine tool and the rolling head. Since machine tools are available in many versions (e. g. multi-spindle, turning centers etc.) from different manufacturers, this requires that the rolling head holder also needs to be adapted to the highly individual machine conditions. The rolling head holder mount has been adapted to the respective mounted tool holder of the machine, e. g. T-slot, parallel shank, prisma or square mount.

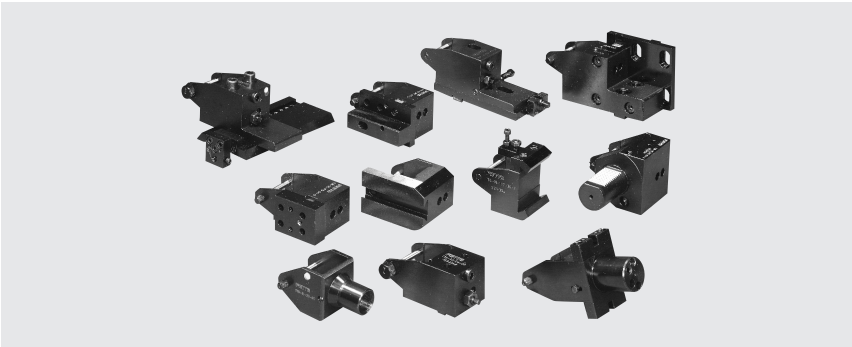

Figure 5: Different rolling head holder versions

On our homepage www.fette.de/rk/fettekat you can find a list of possible applications with Fette tangential rolling heads on different machine tools. This database is constantly updated. If your application is not included, please contact us.
A drawing of the working areas in the machine is definitely helpful.

Table 4: Holder for machine (excerpt from the Internet)

LMT • FETTE — Online Catalogue Thread Rolling Heads

Tools Search Basket of goods Direct-Order Imprint Deutsche Version

Thread Rolling Systems
- Axial Thread Rolling Heads
- New Developments
- Radial Thread Rolling Heads
- Tangential Thread Rolling Heads
  - Rolling Attachments
  - T120F
  - T160F
  - T350F
  - T220F
  - T18F
  - T27F
  - T42
- Turning Heads

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Tangential Thread Rolling Heads Attachments

Print
New choice

Manufacturer: Gildemeister
Machine type: Turning machine
Machine name: twin 32 ; twin 42 ; twin65 mit

	T12	T120F	T160F	T18F
IDNR:	aufnehmbar	2407411	2406780	2178309
Einsatz auf Lage:				
Aufnahmeart:	ø 25	ø 25	ø 25	ø 25
Rev.-Grösse:	12	12	12	12
durchschaltbar:	ja	ja	ja	ja
Spitzenarbeit:				
Rev.Nr.:	1 ; 2	1 ; 2	1 ; 2	1 ; 2
Sonstiges:				

	T220F	T27F	T350F	T42
IDNR:				
Einsatz auf Lage:				
Aufnahmeart:				
Rev.-Grösse:				
durchschaltbar:				
Spitzenarbeit:				
Rev.Nr.:				
Sonstiges:				

4.3 The thread rolls

A set of thread rolls is required for each thread size. A set consists of 2 different thread rolls. They are labeled with the numbers 1 and 2.
Depending on the rolling head size and the thread size the thread rolls are either constructed with a single or multiple thread design. In principle, the largest number of starts on the roll Z and thus also the largest possible roll diameter D_r should be aimed for in order to consider the largest possible shoulder diameter at the workpiece.

The thread rolls for the thread tolerance 6g (for threads as per DIN), 7e (for trapezoid threads) and 2A (for UN threads) are delivered by default. A lot of other thread tolerances are also possible.

4.3.1 Tool life

The tool life of the thread rolls is dependent on many factors. This includes, e. g.:
- Material properties (especially tensile strength and breaking elongation)
- Hardening behavior of the material during cold forming
- Profile rolling degree
- Type of chamfers during workpiece preparation
- Correct adjustment of the tool
- Rolling speed and working feed
- Sufficient supply of clean coolant
- Avoidance of chips on workpieces and thread rolls prior to the rolling process

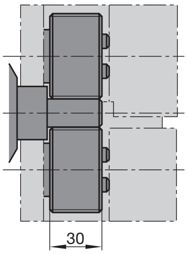
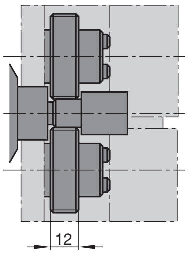
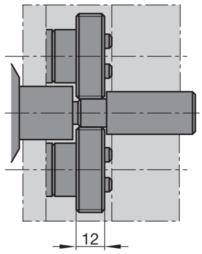
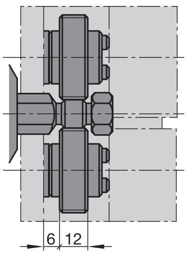
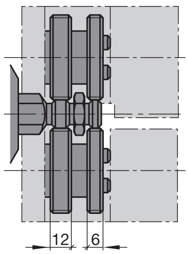
Depending on the application it can make sense to use thread rolls with a special design (e. g. from another roll material) instead of thread rolls with a standard design. Contact LMT Fette for more information (see Chapter 13).

After the thread rolls have become worn they will need to be replaced with new ones; see Chapter 5.1.2 for more information

4.3.2 Versions

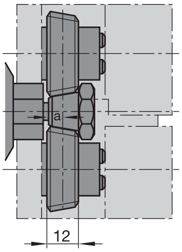
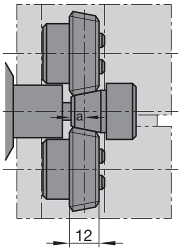
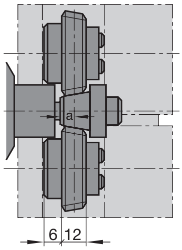
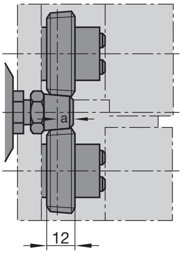
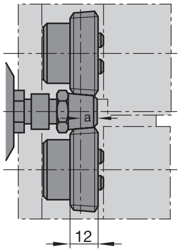
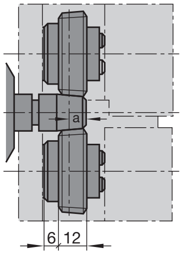
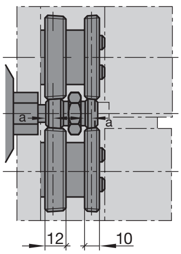
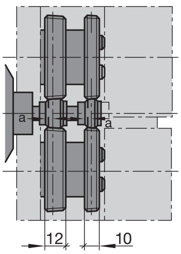
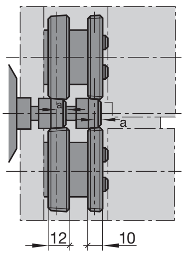
Thread rolls are available in different versions depending on the respective application (see table 5 and table 6). Version “A” is standard.

Table 5: Roll versions for parallel threads

Roll version		
Full roll width	**A**	**B**
		
Code number (example)		
T27-10-31	T27-10-12A	T27-10-12B
M	**AB**	
	Only possible when the thread size is identical	
		
Code number (example)		
T27-10-12M6	T27-10-12A-6B	
	If both thread lengths are identical, then: T27-10-12AB	

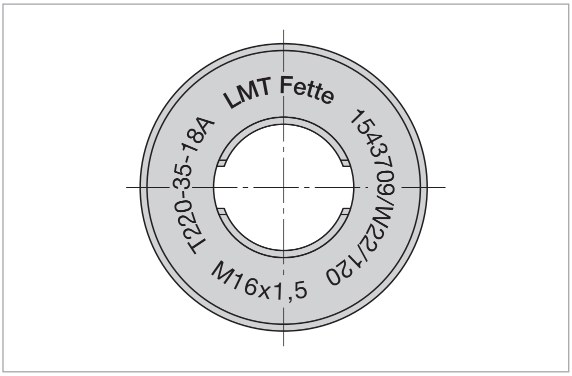
In the case of tapered threads please specify the standard and the version (“standard” or “short”). If the threads differ from the standard, please inform us of the location of the measuring plane (a). In this case the maximum roll run-out is 1 x pitch.

Table 6: Roll versions for tapered threads

Roll version		
A	**B**	**M**
		
Code number (example)		
T27-100-12A	T27-100-12B	T27-100-12M
AV	**BV**	**MV**
		
Code number (example)		
T27-100-12AV	T27-100-12BV	T27-100-12MV
ABV	**AB**	**AVBV**
Only possible when the thread size is identical	Only possible when the thread size is identical	Only possible when the thread size is identical
		
Code number (example)		
T27-100-12A-10BV If both thread lengths are identical, then: T27-100-12ABV	T27-100-12A-10B If both thread lengths are identical, then: T27-100-12AB	T27-100-12AV-10BV If both thread lengths are identical, then: T27-100-12AVBV

4.3.3 Labeling

The labeling on the rolls is made up of the thread size (e. g. M16x1.5), the code number (e. g. T220-35-18A), the 7-digit ID number (e. g. 1543709) and the unique set number (e. g. W22/120). The set number serves to prevent thread rolls from different roll sets getting mixed up.

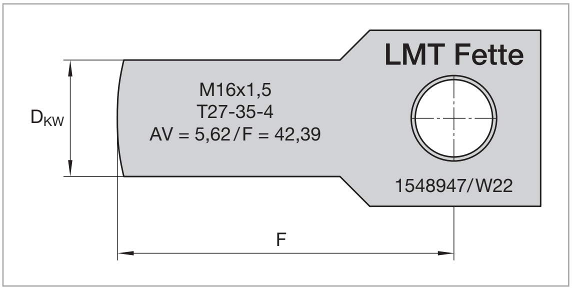


Code number (example):
T220: Rolling head size
35: Consecutive number
18: Roll width
A: Version

Figure 6: Roll labeling

4.4 The setting gauge

There is a setting gauge for each thread size. The setting gauge has two tasks:
1. For setting the distance between the axes of the thread rolls. The width dimension D_{KW} of the gauge is equivalent to the minor diameter d_3 of the thread. This dimension has to be set between the rolls (see also Chapter 5.1.5).
2. For setting the length of the transverse stroke via the setting dimension F. The rolling head holder is mounted on the machine. The setting gauge is mounted on the bolt of the rolling head holder. The cross slide has to be advanced towards the center of workpiece until the leading edge of the gauge touches the blank diameter d_A. This position is the end point of the transverse stroke (see also Chapter 6.3).



Code number (example):
T27: Rolling head size
35: Consecutive number
4: Number of starts on the roll

Figure 7: Setting gauge

The setting gauge is marked with the thread size (e. g. M16x1.5), the code number (e. g. T27-35-4) and the 7-digit ID number of the gauge (e. g.1548947) and also the setting dimensions F and A_v.

For each thread size a roll set and a setting gauge are required. The first two number groups of the code numbers of the thread roll and the setting gauge must match.

NOTICE

It is a prerequisite that the rolling head size (e. g. T27) and the consecutive number (e. g. 35) of the setting gauge and the thread rolls must be identical in the code number for the gauge to be suitable for the thread rolls.

5 Assembly and installation

5.1 Preparing the rolling head

5.1.1 Checking the gear settings

ATTENTION

Check that the rolling head is working properly prior to initial operation!

The thread rolls are synchronized via a gear unit. The synchronous operation of the gear unit must be checked after assembly.

For this, loosen the cap screw (ET-25)[1] Pull out the pins (ET-3) in the direction of the arrow. Remove the rolls (ET-18) if necessary. The driving claws of the pinion (ET-8) must be able to engage in the steel reference gage (ET-36) (see Figure 8). It may be necessary to adjust the distance between the axes (see Chapter 5.1.5).

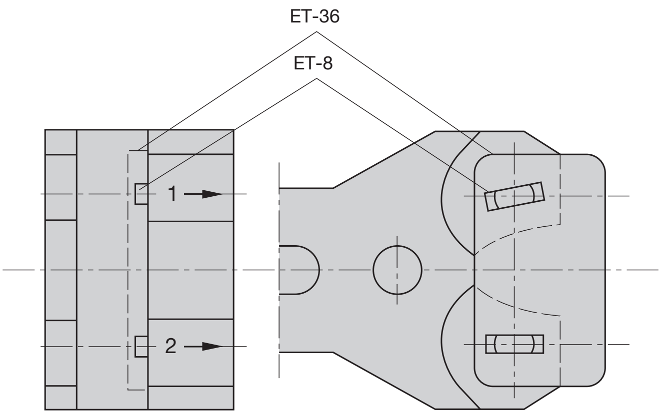


Figure 8: Checking the gear settings

If the driving claws are not aligned correctly with one another, the gear unit will have to be synchronized. For this, loosen the set screw (ET-27), pull out the bushing (ET-4) from the hinge.

[1] For part numbers with the addition “SP” see the spare parts list Figure 24 on page 48.

NOTICE

To facilitate handling, the bushing (ET-4) can be inserted from the rear into the rolling head.

Remove the combined gear (ET-11+12). Then engage the driving claws into the steel reference gage and reinstall the combined gear (ET-11+12) with the toothing facing down. Insert the bushing (ET-4) into the hinge. Tighten the set screw (ET-27). Now install the thread rolls.

5.1.2 Inserting the thread rolls

The thread rolls have a defined position on the rolling head. The rolling head (3) is marked on the front end with number 1 on the upper side and number 2 on the lower side (see Figure 9). The thread rolls (8) are marked on the claw side with number 1 and 2. Roll number 1 has to be mounted in the hinge arm, which is also marked with number 1 on the front end. When mounting the roll, make sure that number 1 on the roll is facing towards the outer side of the head or the workpiece (4). Roll number 2 has to be mounted in the rolling head side marked with number “2”. Number 2 on the roll must also be facing towards the outer side of the head or the workpiece (4). Both numbers 1 and 2 on the rolls must be facing towards the outer side of the head.

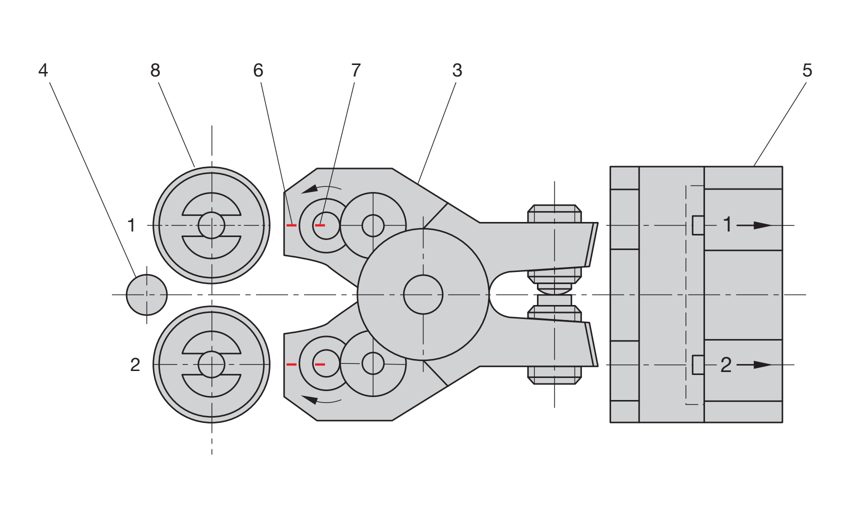


Figure 9: Mounting of rolls

To mount the thread rolls, proceed as follows:
Apply a light coat of molybdenum sulfide grease (e. g. Molykote) to the thread roll

bore (8). Insert the bushings (ET-1)[2] into the thread rolls. Slide the roll marked with number "1" onto the hinge side on the pinion claw (ET-8) marked with number 1, making sure that number "1" on the roll is facing towards the workpiece (4), (see Figure 9). Also apply a coat of molybdenum sulfide grease to the axis (ET-3) and insert it from the gear unit side (5) into the thread roll hole. Slide the washer (ET-15) between the roll and the narrow rolling head arm side. Slide the axis up to the end stop. In the 0 position, the slot (7) on the axis – viewed from the gear unit arm side – must be aligned with the line (6) on the gear unit arm. Firmly clamp the axis with the cap screw (ET-25). Proceed in the same way to mount thread roll 2.

NOTICE

After thread roll number 1 has been mounted make sure that it is no longer rotated. Ensure that both numbers are facing towards the workpiece, see Figure 9.

ATTENTION

To ensure a good frictional behavior between the roll and the carbide axis, it is essential to apply a coat of molybdenum sulfide grease (e. g. Molykote) to the roll hole and the carbide axis in the region of the roll and the pinion!

5.1.3 Adjusting the roll movement, axial direction

After the thread rolls have been mounted the axial rolling clearance is adjusted. Controlling the axial rolling clearance is especially important in the case of fine threads. With very fine thread pitches P there is a risk of chip formation during the rolling process. If the clearance becomes greater than 0.1 mm | 0.004 inch (in the case of fine thread pitches greater than 0.05 mm | 0.002 inch) the fine setting has to be adjusted. The washer (ET-15) also has to be checked and replaced if excessively worn.

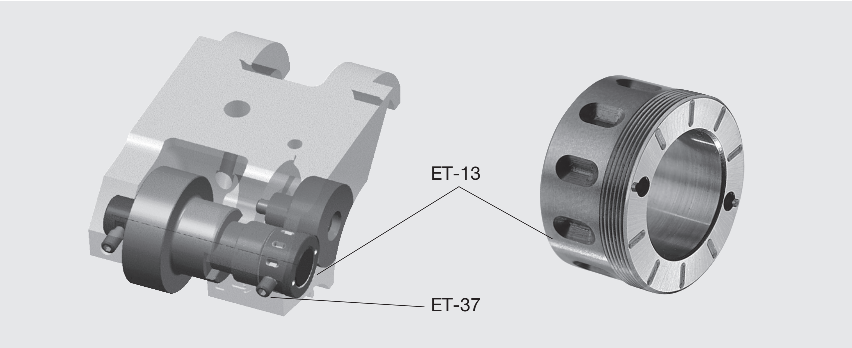


Figure 10: Adjusting the axial clearance

[2] For part numbers with the addition "SP" see the spare parts list Figure 24 on page 48.

The axial rolling clearance is adjusted as follows: loosen the clamping screw (ET-37). Place the supplied face spanner on the bushing (ET-13) and rotate in a clockwise direction until the thread roll can no longer be rotated. Then rotate the bushing (ET-13) back in a counterclockwise direction until the clamping screw (ET-37) is able to engage in the next groove of the bushing (ET-13). Tighten the clamping screw (ET-37). Check whether the thread roll can now easily be rotated again. The axial clearance of the thread roll is now max. 0.05 mm (0.002 inch).

5.1.4 Functional testing

Proper operation of the roll head is ensured when the rolls can be rotated smoothly and, if one roll is held tight, the other can be rotated to the inner side of the head. Here the spring is extended in the equalizing gear. When the turned roll is released, it must rotate back automatically to the initial position.

5.1.5 Adjusting the distance between the axes

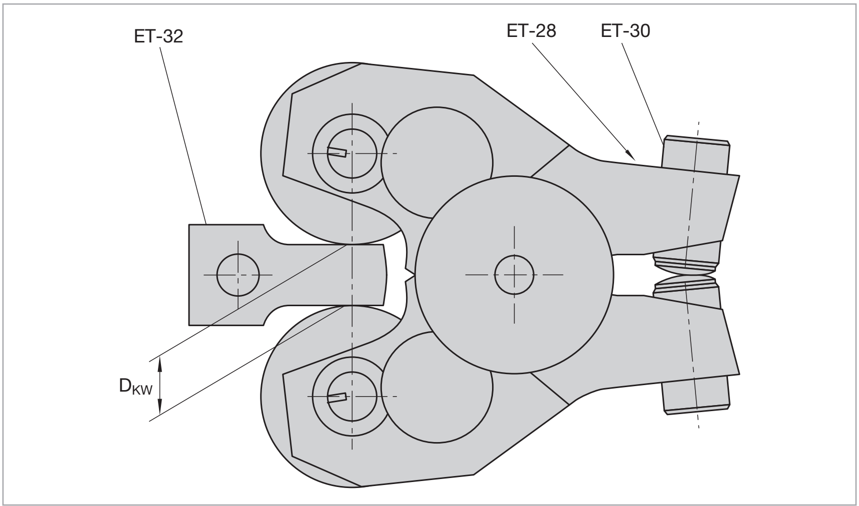


Figure 11: Adjusting the distance between the axes

The distance of the thread rolls – known as the distance between the axes – has to be set to the required workpiece core dimension by adjusting the two set screws (ET-30). The set screw (ET-28) is used to lock the set screw (ET-30). Loosen the set screw (ET-28). The width D_{KW} of the setting gauge (ET-32) roughly corresponds to the minor diameter d_3 of the workpiece (see Figure 11). Adjust the set screws (ET-30) until the setting gauge fits exactly between the rolls. Make sure that both set screws are equally adjusted in the upper and lower part to ensure that the hinge is always opened or closed symmetrically. When the distance between the axes has been adjusted, the set screws (ET-28) must be tightened again.

5.2 Installation on the machine tool

5.2.1 Preparing the workpiece

To ensure optimum true-running, the workpiece has to be pre-machined and chamfered in the same clamping immediately before rolling. Figure 12 shows pre-machined workpieces. The version with thread undercut is recommended. In such case, the undercut width g_2 should be as per DIN 76-A (see also 3.5).

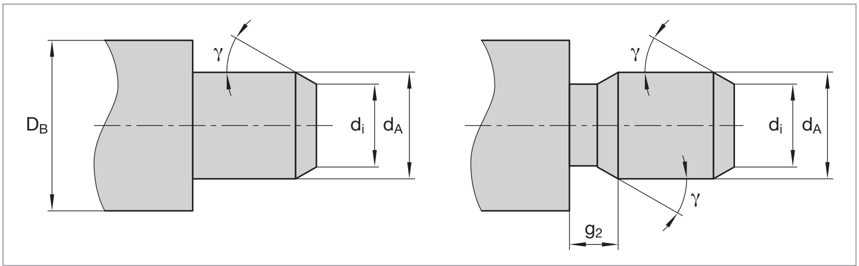


Figure 12: Pre-machining of workpiece

The blank diameter d_A of the thread to be rolled is similar to the pitch diameter d_2:
$d_A = d_2 - 0.3$ mm [mm]

Upward or downward deviations may be necessary due to the flow behavior of the material or due to the special tolerance position of the thread. Note the following when adjusting the blank diameter: in Figure 13 the areas 1 and 2 are equal in size. Consequently, an increase of the blank diameter d_A by Δd_A results in a 3 to 5-fold increase of the major diameter d_1 by Δd_1. A change of $\Delta d_A = 0.01$ mm | 0.0004 inch leads to an major diameter increased by 0.05 mm | 0.002 inch.

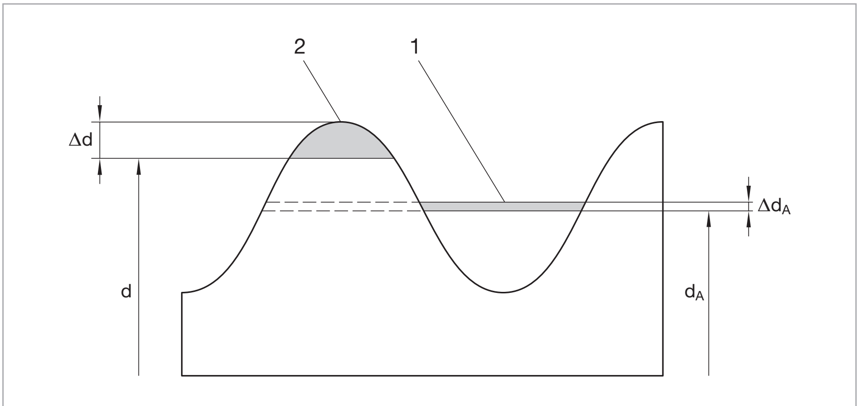


Figure 13: Change of the blank diameter

ATTENTION

The determined blank diameter must be maintained with a tolerance of ± 0.015 mm | 0.0005 inch!

The chamfer angle should be γ = 10 … 30°. The inner diameter d_i should be below the thread core diameter d_3:

$d_i \leq d_3 - 0.1$ mm [mm]
$d_i \leq d_3 - 0.004$ inch [inch]

A chamfer angle γ = 30° produces a chamfer of approx. 45° after rolling on the workpiece.

NOTICE

Larger chamfers significantly reduce the tool life of the thread rolls.

5.2.2 Placing the rolling head into the holder

Install the rolling head holder on the machine tool. Insert the tangential rolling head into the rolling head holder. To do this, proceed as follows (see also Figure 14):

- Loosen the set screws (ET-31-12) on the rolling head holder
- Pull the axis (ET-31-4) sideways out of the rolling head holder
- Slide the rolling head between the two brackets of the holder and insert the axis (ET-31-4) through the rolling head holder and through the rolling head on the bushing (ET-4)
- Check whether the rolling head can pivot freely about the holder axis
- Retighten the set screws (ET-31-12)

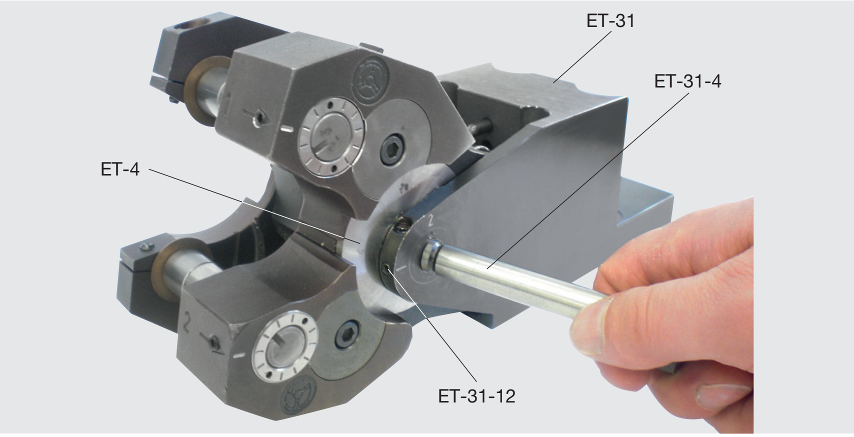


Figure 14: Setting the rolling head in the holder

ATTENTION

First check whether the working area in the machine is sufficient for the rolling head. For this, mount the rolling head holder on the machine and place the rolling head into the rolling head holder. Slowly move the rolling head!
In particular when mounting on a tool turret,
check whether the rolling head is within the permissible circuit diameter.
Use an adjustable holder and adjust it accordingly.

5.2.3 Adjusting the pendulum clearance

The rolling attachment must be inserted into the holder at a slightly inclined angle, rotated about the holder axis. This ensures that the correct roll touches the workpiece first. During the rolling process the rolling head is then centered in the holder on the workpiece through the pendulum clearance.

The pendulum clearance is achieved in the holder variants by two different principles: there are holder versions available with a spring-loaded bolt (ET-31-2) in combination with a stop bolt (ET-31-3) or holder versions available with a spring steel sheet (ET-31-6).

NOTICE

With both holder versions make sure that the thread roll first touches the workpiece which has the arrow direction marked on the rolling head and which has the same rotational direction as the workpiece (page 26).

The pendulum clearance is set as follows:

a) Version with spring-loaded bolt and stop bolt:

The spring-loaded bolt (ET-31-2) can be inserted in the rolling head holder at two positions (see Figure 15). If the upper thread roll (1) rotates in the same direction as the workpiece (2), the spring-loaded bolt (ET-31-2) also has to be inserted in the holder at the top (and accordingly).
Move the rolling head in front of the pre-turned workpiece (2) so that both thread rolls (2 and 3) can pivot against the workpiece. In this position manually press the roll rotating in the same direction against the workpiece. Adjust the stop bolt (ET-31-3) so that the second roll has a pendulum clearance e ≈ 0.5 mm to the workpiece. Then secure the stop bolt with the nut (ET-31-11).

ATTENTION

Make sure that the stop bolt (ET-31-3) is not located at the edge of the plate (ET-14). Otherwise the stop bolt could slide beyond the edge of the plate. In such a case, select the alternative location holes for the spring-loaded bolt and the stop bolt, which are located further inwards (or further outwards) in the rolling head holder.

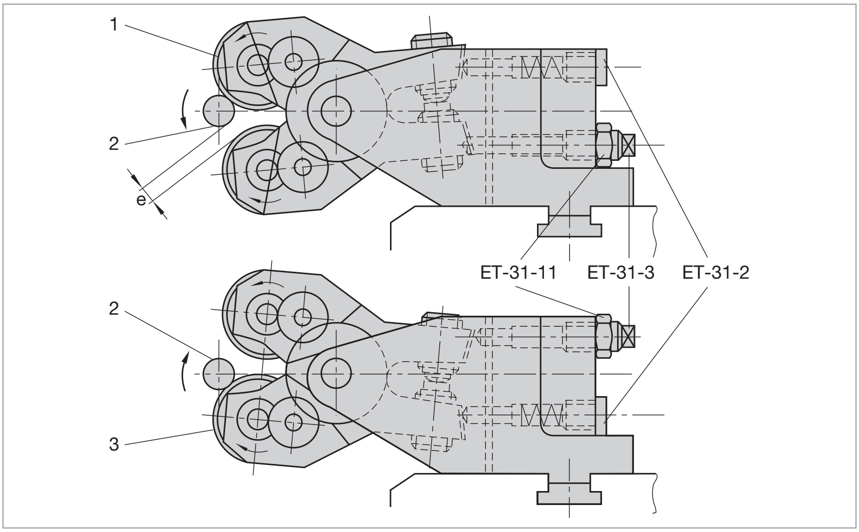


Figure 15: Adjusting the pendulum clearance with a spring-loaded bolt

b) Version with spring steel sheet:

In the case of a holder with a spring steel sheet design (see Figure 16), the spring steel sheet (ET-31-7) engages between the set screws (ET-30) of the rolling head. An angle of inclination is achieved by the set screws moving out of their symmetrical position. The pendulum clearance also has to be adjusted to max. e ≈ 0.5 mm | 0.02 inch here.

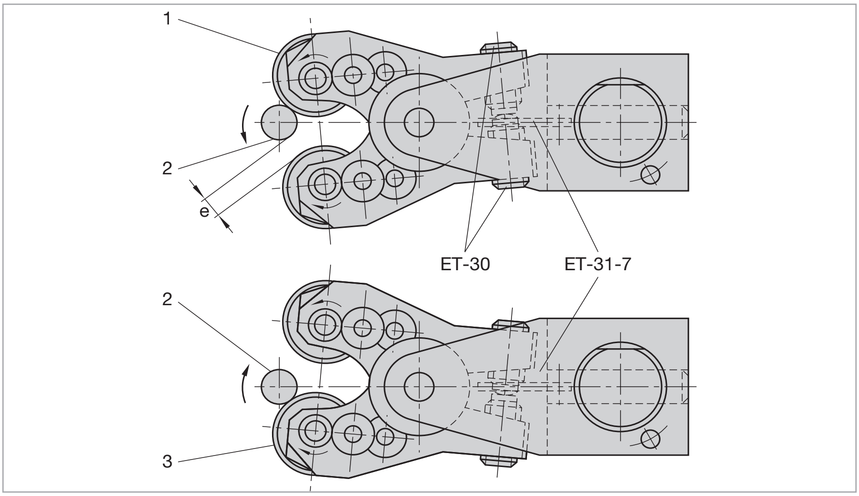


Figure 16: Adjusting the pendulum clearance with a spring steel sheet

ATTENTION

After the set screws (ET-30) have been adjusted the distance between the axes must be checked (see Chapter 5.1.5).

NOTICE

In special cases, deviations are possible from the defined adjustment values.

5.2.4 Coolants and lubricants

To dissipate the heat created during the rolling process, cooling is necessary (minimum lubrication quantity is only available on request). Suitable coolants and lubricants include liquids which are also used during machining operations. Use emulsions with a dilution factor of 1:10 to 1:20, if appropriate with high-pressure additives, and low-viscosity cutting oils. Always follow the instructions of the manufacturer as well as the machine manufacturer.

ATTENTION

Make sure that the coolant is free of chips and particles to prevent any foreign substances from rolling into the thread and to keep the wear of the thread rolls and the rolling head to a minimum.

Furthermore, a high amount of chips can have a negative effect on rolling operations. For this reason, the rolling head should ideally be connected to the central lubrication/cooling system of the machine tool so that the coolant can flush any chips out of the rolling head.

If possible, the rolling head should be provided with a chip protection system. The rolling head should be inserted into the machine tool in such a way so that it is not immediately contaminated with chips (e. g. using the top turret instead of the lower turret for assembly).

6 Putting into operation and setup

6.1 Rolling speed and RPM

NOTICE

Never use a rolling speed below 20 m/min. Otherwise the material cannot start to flow.

The rolling speed v should be between 20–60 m/min. For specific work applications, rolling speeds of up to 100 m/min are also possible.

Tensile strength and breaking elongation of the material:
A higher material tensile strength R_m requires a smaller rolling speed. We recommend approx. 20–30 m/min for high material strengths and large forming volumes. In addition, the rolling speed for materials with a higher breaking elongation A must be set higher than for smaller elongation values.

Profile form:
In principle, V-threads can be created with a higher rolling speed than trapezoidal threads. Depending on the workpiece profile and existing workpiece RPM, 20–60 m/min is recommended for V-threads. For trapezoidal threads and similar profiles, 15–30 m/min is recommended.

The estimated value for the rolling speed v is used to calculate the RPM n of the drive spindle as follows:

$$n = \frac{1000 \cdot v}{d_a \cdot \pi} \quad [1/\text{min}]$$

The rotational direction (rotating to the left or right) of the machine spindle is arbitrary.

Calculation example:

Thread	M16 x 1.5
Blank diameter	d_A = 15.03 mm
Rolling speed	v = 60 m/min

$$n = \frac{1000 \cdot 60}{15.03 \cdot \pi} \frac{1}{\text{min}} = 1270.7 \frac{1}{\text{min}}$$

6.2 Working feed – number of workpiece rotations

With the tangential method, the complete length of the thread or the profile is created with several workpiece rotations. It is important that the number of workpiece rotations n_W is strictly maintained during the rolling process. The rolling process should be ended within n_W = 10 … 35 workpiece rotations.

The number of workpiece rotations is dependent on the rolling head size, the thread pitch P, the thread length L and the tensile strength of the material. In general, the following applies: the larger the forming operation, the higher the number of workpiece rotations to be selected. Table 7 lists reference values for medium tensile strength materials.

Deviations are possible depending on the respective work application.

Table 7: Number of workpiece rotations for medium tensile strength materials

Rolling head size	T18F		T27F	
Pitch	**L**	**n_w**	**L**	**n_w**
[mm ǀ inch]	**[mm ǀ inch]**	**[–]**	**[mm ǀ inch]**	**[–]**
< 0.5 < 0.02	< 10 ǀ 0.394	10 … 12	< 14 ǀ 0.551	12 … 15
	10 … 16 0.394 … 0.630	15 … 20	14 … 22 0.551 … 0.866	18 … 20
	16 … 21.5 0.630 … 0.846	20 … 25	22 … 31 0.866 … 1.220	20 … 25
0.5 … 0.8 0.02 … 0.03	< 10 ǀ 0.394	12 … 15	< 14 ǀ 0.551	15 … 18
	10 … 16 0.394 … 0.630	15 … 20	14 … 22 0.551 … 0.866	18 … 22
	16 … 21.5 0.630 … 0.846	20 … 25	22 … 31 0.866 … 1.220	22 … 25
0.8 … 1.1 0.03 … 0.04	< 10 ǀ 0.394	15 … 18	< 14 ǀ 0.551	18 … 20
	10 … 16 0.394 … 0.630	18 … 22	14 … 22 0.551 … 0.866	20 … 25
	16 … 21.5 0.630 … 0.846	22 … 30	22 … 31 0.866 … 1.220	25 … 30
1.1 … 1.5 0.04 … 0.06	< 10 ǀ 0.394	18 … 20	< 14 ǀ 0.551	20 … 23
	10 … 16 0.394 … 0.630	20 … 25	14 … 22 0.551 … 0.866	23 … 26
	16 … 21.5 0.630 … 0.846	25 … 30	22 … 31 0.866 … 1.220	26 … 30
1.5 … 1.8 0.06 … 0.07	< 10 ǀ 0.394	18 … 20	< 14 ǀ 0.551	20 … 25
	10 … 16 0.394 … 0.630	20 … 25	14 … 22 0.551 … 0.866	23 … 26
	16 … 21.5 0.630 … 0.846	25 … 30	22 … 31 0.866 … 1.220	26 … 30
1.8 … 2.0 0.07 … 0.08	< 10 ǀ 0.394	20 … 25	< 14 ǀ 0.551	20 … 23
	10 … 16 0.394 … 0.630	23 … 28	14 … 22 0.551 … 0.866	23 … 26
	16 … 21.5 0.630 … 0.846	25 … 35	22 … 31 0.866 … 1.220	26 … 30
2.0 … 2.5 0.08 … 0.1			< 14 ǀ 0.551	20 … 25
			14 … 22 0.551 … 0.866	25 … 30
			22 … 31 0.866 … 1.220	25 … 30
2.5 … 3.2 0.1 … 0.13				

The number of workpiece rotations results in the working feed s per rotation or the feed rate f (for A_v see setting gauge or Internet):

$$s = \frac{A_v}{n_w} \quad [mm/U] \qquad \text{or } f = \frac{A_v \cdot n}{n_w} \quad [mm/min]$$

6.3 Traverse paths

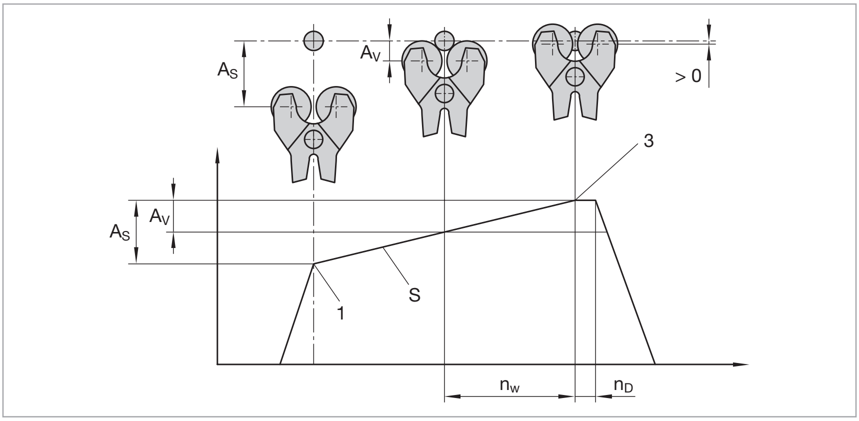


Figure 17: Traverse paths

The tangential rolling head is moved sideways against the rotating workpiece. Figure 17 contains a schematic representation of the traverse path of the tangential rolling head:

1. The tangential rolling head is rapidly moved to position 1. This is located in the safety distance A_s in front of the workpiece axis. A_s is calculated from A_v (see setting gauge or Internet) plus 50 % · A_v:
   $A_s = A_v + 50\ \% \cdot A_v = 1.5 \cdot A_v$ [mm]

   This value results in an X-coordinate D_s (with reference to the diameter) in a CNC program of:

   $$D_s = 2 \cdot \left(\frac{d_A}{2} + 1.5 \cdot A_v\right) = 2 \cdot \left(\frac{d_A}{2} + A_s\right) \quad \text{[mm]}$$

2. From position 1, the head is moved in working feed (see above) s or f up to position 3.

> **ATTENTION**
>
> Make sure that the thread rolls are never moved beyond the center of the workpiece.

Ensure that position 3 is correct using the suitable setting gauge for the tangential rolling head and the thread rolls via the F-gauge (see Figure 18):

- For this, mount the rolling head holder (3) on the machine tool
- Insert the setting gauge (2), instead of the tangential rolling head, into the rolling head holder by sliding the setting gauge in the rolling head holder on the bolt (ET-31-4). Clamp the bolt with the set screw (ET-31-12).

- Move the rolling head holder with the setting gauge towards the workpiece (1) until the leading edge of the setting gauge touches the initial diameter d_A on the workpiece. This position is the end point of the traverse path. The rolling head must not be moved any further onto the workpiece. Especially in the case of cam-controlled machines a fixed stop must be set here.

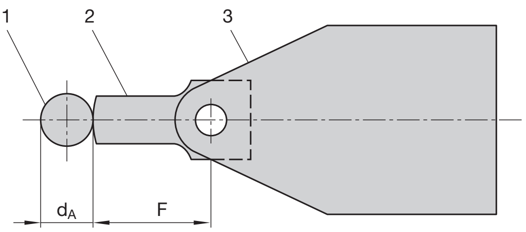


Figure 18: Using the setting gauge

3. It is an advantage when the tangential rolling head remains at position 3 depending on the application for a few dwell-time rotations $n_d = 2 \dots 5$. It is important here that the maximum number of total workpiece rotations $n_d + n_w$ does not exceed < 35. Especially in the case of cam-controlled machine tools it may be advisable not to dwell at the position.

   The dwell time t_d is calculated as follows:

$$t_d = \frac{60 \cdot n_d}{n} \quad [s]$$

4. Move the rolling head rapidly back to position 1. This completes the rolling process.

Instructions for designing a control cam for cam-controlled machine tools
A control cam for thread rolling should be produced by the machine manufacturer.
For this, the following data is required:

- Machine manufacturer, machine type and serial no.
- Spindle position (rolling station)
- Thread size and material
- Workpiece rotation during rolling
- Spindle RPM
- Path in working feed

The following should be noted when designing the control cam:

- The cam roller should be kept as small as possible.
- The return stroke must be ensured by a return cam or by a reverse device.
- It is essential that the feed motion of the cross slide, after the highest point of the cam has been reached, is limited by a fixed stop.
- The calculated working feed must be correct.
- The maximum number of $n_{W\,max} = 35$ must not be exceeded.

6.4 Tangential force, drive power and torque

Tangential force

The tangential rolling head is designed to work according to the plunge method. The two rolls (Figure 19-1) are moved sideways across the workpiece (Figure 19-2), and the rolling profile enters the workpiece tangentially thus creating the desired form. The machine is required to produce the tangential force F_T during this process. The radial force F_R is absorbed by the rolling head.

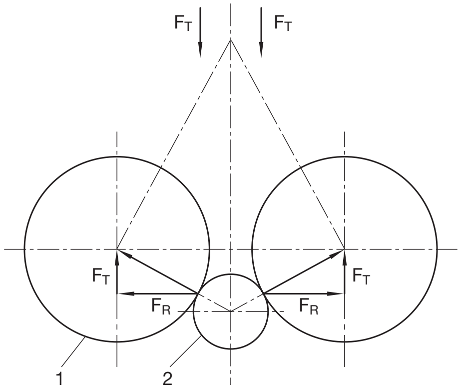


Figure 19: Forces exerted during tangential rolling

The force required to roll the profile must be produced by the cross slide or the turret slide. This is normally not a problem on cam-controlled automatic lathes. On hydraulic or electric-controlled slides it is necessary to check the tangential force.

The tangential force F_T is calculated as follows:

$$F_T = \frac{2340 \cdot L \cdot K_{WT}}{n_w} (0.06 \cdot d^{0.82} + 0.46 \cdot P - 0.1 \cdot Z + 1) \quad [N]$$

The material constant K_{WT} results from the following table:

Tensile strength R_m of the material [N/mm²]	K_{WT}
0 … 500	1
500 … 700	1.2
700 … 900	1.3
> 900	1.4
Copper	1.1
Brass	0.9

Calculation example:

Thread	M22 x 2.5
Thread diameter	d = 22 mm
Thread pitch	P = 2.5 mm
Workpiece RPM	n = 480 1/min
Material constant	K_{WT} = 1.2
Thread length	L = 18 mm
Number of workpiece rotations	n_w = 30 (see Chapter 6.2)
Thread starts on roll	Z = 3

$$F_T = \frac{2340 \cdot 18 \cdot 1.2}{30} (0.06 \cdot 22^{0.82} + 0.46 \cdot 2.5 - 0.1 \cdot 3 + 1)N = 4391.8\ N$$

If the determined values initially indicate that the calculated tangential force is too great for the respective machine, a lower tangential force can be achieved by changing the number of workpiece rotations (max. 35).

Drive power and torque
The drive power of the spindle is generally large enough because the thread is created with several workpiece rotations during the tangential rolling method.

The drive power N is calculated as follows:
$N = 0.105 \cdot 10^{-5} \cdot n \cdot F_T$ [kW]

The drive torque is calculated as follows:
$M = 0.01 \cdot F_T$ [Nm]

Calculation example (continued):

Thread	M22 x 2.5
Workpiece RPM	n = 480 1/min
$F_T = 4391.8$ N	

$N = 0.105 \cdot 10^{-5} \cdot 480 \cdot 4391.8 \text{ kW} = 2.21 \text{ kW}$

$M = 0.01 \cdot 4391.8 \text{ Nm} = 43.92 \text{ Nm}$

6.5 Rolling time

The rolling time t_r is the result of the time t_v spent moving with working feed plus the dwell time t_d on the workpiece. The times can be calculated on the basis of the spindle RPM n or the selected rolling speed v.

When the workpiece RPM forms the basis of calculation:

$$t_r = t_v + t_d = \frac{60}{n} \cdot (n_W + n_d) \quad [s]$$

When the rolling speed forms the basis of calculation:

$$t_r = t_v + t_d = \frac{0.06 \cdot d_A \cdot \pi}{v} \cdot (n_W + n_d) \quad [s]$$

Calculation example:

Thread	M16 x 1.5
Initial diameter	$d_A = 14.97$ mm
Spindle RPM	n = 635 1/min
Rolling speed	v = 30 m/min
Number of workpiece rotations	$n_W = 20$
Dwell time rotations	$n_d = 3$

$$t_r = t_v + t_d = \frac{60}{635} \cdot (20 + 3)s = 2.17 \text{ s}$$

oder

$$t_r = t_v + t_d = \frac{0.06 \cdot 14.97 \cdot \pi}{30} \cdot (20 + 3)s = 2.16 \text{ s}$$

7 Special applications

7.1 Rolling tapered threads

Several points must be considered when rolling tapered threads.

1. Adjusting the distance between the axes:
   To adjust the distance between the axes (see also Chapter 5.1.5), place the setting gauge (ET-32)[3] in the region of the largest roll diameter between the two thread rolls (ET-18), see Figure 20-left. Adjust the distance between the axes with the set screws (ET-30) until the setting gauge in this region fits exactly between the thread rolls.

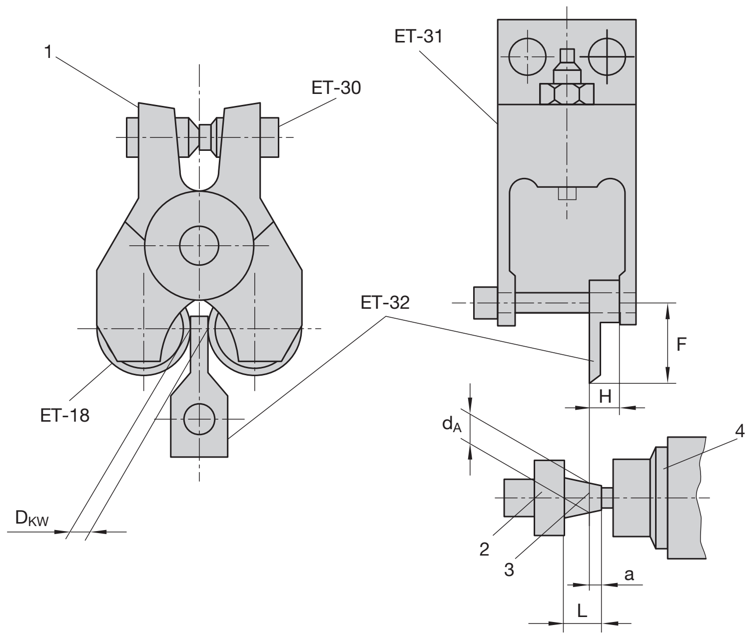


Figure 20: Using the setting gauge for tapered threads

2. Adjusting the traverse paths:
   Figure 20-right shows the workpiece (2) in the collet (4) of the machine spindle.
   To adjust the rolling position (see also Chapter 6.3) for a conical thread, it must be ensured that the setting gauge is touching the workpiece (2) at the reference plane (3) of the tapered thread. This is located on the workpiece at the distance a from

[3] For part numbers with the addition “SP” see the spare parts list Figure 24 on page 48.

the start of the thread. Insert the setting gauge (ET-32) into the rolling head holder (ET-31) in such a way that the shoulder surface is against the side in the rolling head holder at which the short arm side of the tangential rolling head[4] is usually located. The height dimension H of the setting gauge ensures that the tip of the setting gauge is located where the reference plane of the thread roll will be later. It is now possible to move the rolling head as described in Chapter 6.3 towards the workpiece and set the rolling position via the F-gauge.

7.2 Knurling and burnishing

Tangential rolling heads can also be used to produce knurling and burnishing on work-pieces. Several points need to be considered:

1. For knurling or burnishing a special tangential rolling head is required:
   This can either be ordered as a complete tangential rolling head with a knurling design or modified from an existing tangential rolling head.

   a) To order a tangential rolling head with a knurling design, use the following ID numbers:

Tangential rolling head	ID number
T18FR	9167474
T27FR	9180963

   b) To modify an existing tangential rolling head, proceed as follows (see also Figure 21):
   - Order the spacer 38 and bushing 39 – the parts are also referred to as a kit for knurling and burnishing – which are suitable for your rolling head in duplicate:

Tangential rolling head	ID number	
	Spacer 38	Bushing 39
T18FR	2173977	9167408
T27FR	2173979	9180993

   - Disassemble the pinion (ET-8), the gears (ET-10), the bushings (ET-13), and also the bearing bushings (ET-7).
   - Replace the bushing (ET-13) with the bushing (39)
   - When inserting the knurling/burnishing roll (ET-18) slide the spacer (38) onto the roll axis (ET-3). This replaces the missing driving grooves on the knurling/burnishing rolls.

[4] The prerequisite for this is that a standard roll is used and that the rolling head is aligned in an axial direction to the workpiece.

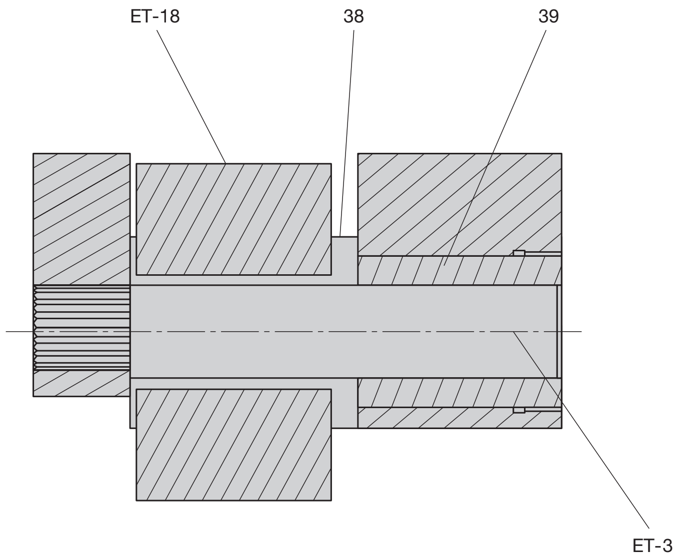


Figure 21: Kit for knurling and burnishing

2. The maximum roll width corresponds to the width of a normal thread roll.

3. Preparing the workpiece
   For burnishing and knurling the blank diameter d_A should be within a tolerance of ± 0.015 mm | 0.0006 inch.

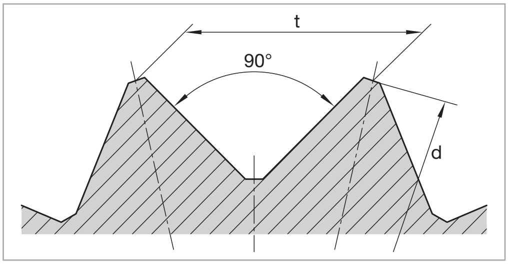
   For burnishing the blank diameter d_A must be selected approx. 0.04 mm | 0.0016 inch larger than the desired finished size. Here the achievable surface quality and diameter tolerance is always dependent on the surface quality and diameter tolerance of pre-machining.

   For knurlings the nominal diameter d is specified. This corresponds to the major diameter of the workpiece[5]. The blank diameter d_A of the workpiece for the forms RAA (knurling with axially parallel grooves), RBL (left-handed knurling), RBR (right-handed knurling), RGE (left-right-handed knurling) und RKE (cross knurling) is approximately calculated from:
   $d_A = d - h$ [mm]

[5] As per DIN 82, Edition 1973

The tooth height results from the following table:

Pitch t	Tooth height h
0.5	0.23
0.6	0.25
0.8	0.37
1.0	0.47
1.2	0.5
1.5	0.64
1.6	0.75
2.0	0.95



4. Adjusting the traverse paths:
   a) During the knurling process (see also Chapter 6.3) the dwell time is very short otherwise "overlaps" may soon occur.
   b) During the burnishing process the dwell time is greater to ensure that the press-finished surface is formed better.

7.3 Thread rolling on pipes

The rolling of threads on seamless drawn pipes is dependent on the available pipe wall thickness. In general, rolling tests are necessary for the respective work application when the ratio between the pipe bore and the thread core diameter d_3 is ≤ 0.65. During the rolling process on pipes the number of workpiece rotations achieved should be less than $n_w = 25$.

NOTICE

In special cases, deviations are possible from the defined adjustment values.

8 The first rolling process

After completing all the adjustments described in the previous chapter you can roll the first thread with the tangential rolling head.

ATTENTION

During the thread rolling process always use the calculated working feed (machine tool set to 100 %)! Never move the rolling cycle in single block (CNC machines) operation and never reduce the RPM.

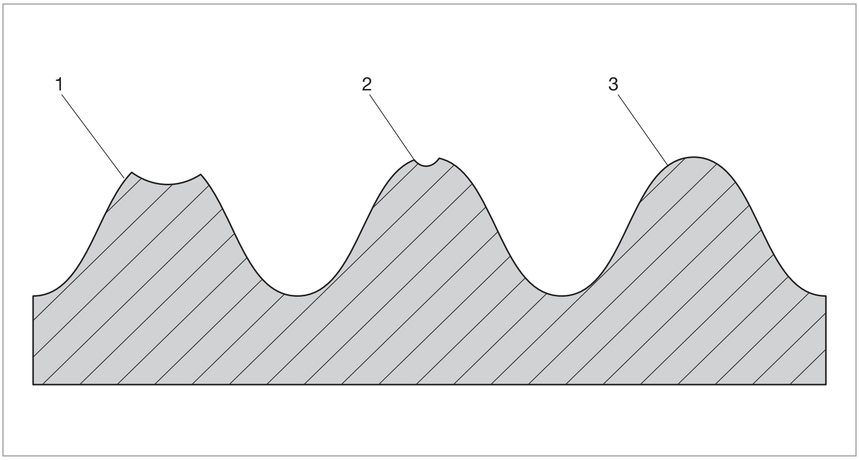


Figure 22: Degree of forming on the thread tooth

Check the rolled profile exactly! Figure 22 shows the possible degrees of forming of a thread tooth:

- Tooth 1 shows a non **formed thread** tooth. The thread flanks are available in almost the entire length, the beginning of the tip radius is hardly visible. This degree of forming is generally sufficient to produce a stable thread. This is the desired degree of forming in most applications. This provides enough safety to prevent over-forming (rolling with overpressure) (see below).
- Tooth 2 shows a **formed** thread tooth. The tip radius of the tooth can be clearly seen. Only a small “channel” remains free of material in the center of the tooth. This degree of forming is used to meet the highest requirements in terms of appearance and tightness. Achieving this, however, requires exact and constant pre-machining. Minor variations in the blank diameter can lead to over-forming (see below).
- Tooth 3 shows an **over-formed** thread tooth. The tip radius is fully closed. The tooth tip appears completely press-finished. In this case, rolling took place with overpressure. This leads to a significant reduction of the roll tool life.

NOTICE

The workpiece major diameter d should not have a burnished finish or be over-formed after rolling in the thread tips. That is, no overpressure should occur which could lead to increased roll wear.

If you have adjusted the distance between the axes with the setting gauge (see Chapter 6.3) and pre-machined the blank diameter in accordance with Chapter 5.2.1, you should normally receive a non-formed thread tooth (tooth 1). It is possible that the pitch diameter d_2 may be slightly too large and the major diameter d too small. In this case, adjust the settings as follows:

1. Reduce the distance between the axes (see Chapter 8.1). This makes the rolling head more narrow and the pitch diameter smaller.
2. The reduction of the distance between the axes means that more material is pressed into the tip of the tooth. This automatically makes the major diameter of the thread larger.
   a) If the pitch diameter is correct after the distance between the axes has been adjusted, but the thread tooth is over-formed, you will have to reduce the blank diameter d_A to ensure that less material flows into the tooth tip (see Chapter 5.2.1). It may be necessary to slightly increase the distance between the axes.
   b) If the pitch diameter is correct after the distance between the axes has been adjusted, but the major diameter is too small, you will have to increase the blank diameter. This means that more material will flow into the tip of the tooth. It may be necessary to slightly reduce the distance between the axes.

If the result is still not satisfactory despite making the adjustments, refer to Chapter 9.

8.1 Correcting the distance between the spindels

If the workpiece major diameter d or the workpiece pitch diameter d_2 is too small and/or the thread is not rolled out, it will be necessary to correct the distance between the spindels.

To correct the distance between the axes, proceed as follows:

- Loosen the set screws (28)
- It is now possible to turn the set screws (30). Clockwise: the distance between the axes is reduced. Counterclockwise: the distance between the axes is increased. Only turn the set screws in small steps! A partial step on the scale roughly corresponds to a distance between axes of 0.15 mm | 0.06 inch for T18F and 0.2 mm | 0.08 inch for T27F
- When the distance between the axes has been corrected, retighten the set screws (28).

After adjusting the distance between the axes check whether the set pendulum clearance is still sufficient.

8.2 Correcting the axis inclination

Before the first rolling process, the axis inclination should be set to the 0 position (see Chapter 5.1.2). If the rolled profile is tapered, it can be corrected by changing the inclination of the roll axes to one another. To do this, proceed as follows:

- Loosen the cap screw (ET-25)[6]
- It is now possible to slightly pull out and turn the roll axis (3).
  The roll axes are marked on the gear unit arm side with a slot (1). This points to the marking (2) on the rolling head arm (see Figure 23-left) in the zero position. To increase the workpiece pitch diameter on the narrow arm side, turn the slot of both axes by the same amount against each other to the inner side of the rolling head, as depicted in Figure 23-right. To reduce the workpiece pitch diameter on the narrow arm side, turn the markings outward.

ATTENTION

Make sure to retighten the cap screws (ET-25) before the next rolling process. Otherwise this may result in damage to the roll or gear unit.

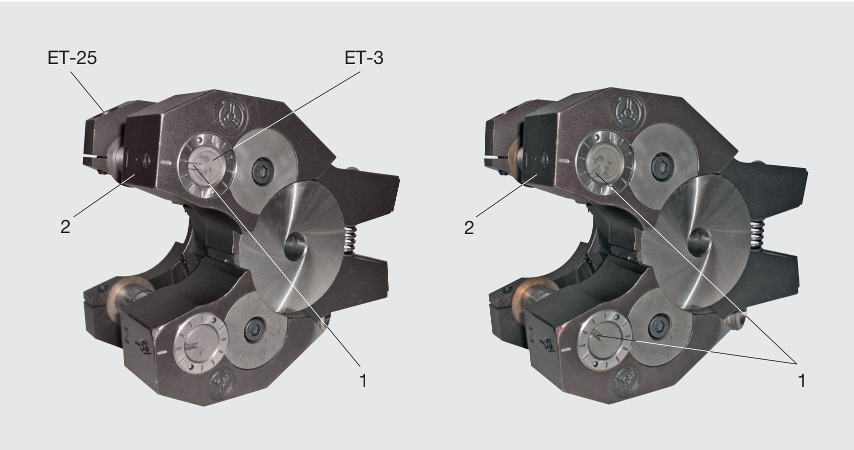


Figure 23: Correcting the axis inclination

[6] For part numbers with the addition “SP” see the spare parts list Figure 24 on page 48.

9 Troubleshooting

	Fault	Cause	Remedy
1	Pitch diameter and/or major diameter of thread incorrect	Distance between axes and/or blank diameter incorrect	Adjust blank diameter and/or distance between axes (see Chapter 5.1.5 and 5.2.1)
2	Thread not smooth, chips produced when rolling, cracks on workpiece, markings in threads of workpiece or splinters	Roll sets mixed up by mistake	Check markings on rolls, set number must be the same on all rolls (see Chapter 4.3.3)
		Rolls assembled incorrectly in rolling head	See Chapter 5.1.2
		Thread starts of rolls incorrectly positioned to each other	Gears incorrectly assembled, check position of pinion tags (roll mount) with checking gauge (see Chapter 5.1.1)
		Workpiece axis not parallel to roll axis	Align roll axes in parallel (see Chapter 8.2)
		Centre height of roll unit incorrect	Adjust centre height, maximum vertical tolerance max. ± 0.5 mm (see Chapter 6.3)
		Stroke of cross slide turret incorrect (rolls engaged for too long or not enough)	Check feed movement of slide (see Chapter 6.3)
		Thread rolls and geartrain in rolling head jam	Gears or roll bearing dirty, compensating spring in dual gear may need to be re-tensioned or replaced.
		Rolls worn or broken	Install new rolls
		Workpiece bends through during rolling operation	Support workpiece
		Material already shows cracks prior to rolling	Not suitable for rolling
		Material not suitable for cold forming	Change material, if possible
		Axial washer worn	If possible, adjust axial clearance (see Chapter 5.1.3), otherwise replace axial washer (15)
3	Thread out of round	Blank diameter out of round	Workpiece must be machined properly
		Roll axis not parallel to workpiece axis	Establish parallelism (see Chapter 8.2)
		Working stroke of cross slide per workpiece rotation too great	Check, correct if necessary (see Chapter 6.2)

	Fault	Cause	Remedy
3	Thread out of round	Rolling speed too low	Rolling speed should not be less than 20 m/min (see Chapter 6.1)
		Material not suitable for cold forming	Change material, if possible
		Rolled with overpres-sure	Reduce blank diameter (see Chapter 8)
		Dwell time too short	Increase dwell time, do not exceed $n_W < 35$ (see Chapter 6.3)
4	Drunken thread	Roll sets mixed up by mistake	Check markings on rolls, set number must be the same on all rolls (see Chapter 4.3.3)
		Rolls assembled in-correctly in rolling head	See Chapter 5.1.2
		Thread starts of rolls incorrectly positioned to each other	Gears incorrectly assembled, check position of pinion tags (roll mount) with checking gauge (see Chapter 5.1.1)
		Workpiece axis not parallel to roll axis	Workpiece axis not parallel to roll axis
		Centre height of roll unit incorrect	Correct centre height, maximum vertical tolerance ± 0.5 mm I 0.02 inch
		Stroke of cross slide turret incorrect (rolls engaged for too long or not enough)	Check feed movement of slide (see Chapter 6.2)
		Rolled with overpressure	Reduce blank diameter (see Chapter 8)
5	Threads on rolls break off after short use	Incorrect chamfer angle on workpiece	Chamfer angle (also – if present – in run-out) of max. 30° (see Chapter 5.2.1)
		Roll sets mixed up by mistake	Check markings on rolls, set number must be the same on all rolls (see Chapter 4.3.3)
		Rolls assembled in-correctly in rolling head	See Chapter 5.1.2
		Thread starts of rolls incorrectly positioned to each other	Gears incorrectly assembled, check position of pinion tags (roll mount) with checking gauge (see Chapter 5.1.1)
		Stroke of cross slide turret incorrect (rolls engaged for too long or not enough)	Check feed movement of slide (see Chapter 6.3)
		Rolled with overpressure	Reduce blank diameter (see Chapter 8)
6	On short lengths of thread, heavily tapered profile at start and run-out	Too much material flowing in direction of axis	Increase diameter at start and run-out end of workpiece

	Fault	Cause	Remedy
7	Poor rolling results on workpieces with thin walls (pipes)	Remaining wall thickness too thin for rolling	Reduce bore or drill after thread rolling. Place arbor into bore when thread rolling (see Chapter 7.3)
		Stroke of cross slide turret incorrect (rolls engaged for too long or not enough)	Check feed movement of slide (see Chapter 6.3)
		Workpiece bends through during rolling operation	Support workpiece
		Pipes have non-uniform wall thickness due to welding seam or in-correct pre-machining	Pipe walls must have uniform thickness (welded pipes are mostly unsuitable for rolling)
8	Parallel threads come out tapered after rolling	Pre-machined with taper	Make sure there is no taper on blank (see Chapter 5.2.1)
		Roll axis not parallel to workpiece axis	Establish parallelism (see Chapter 8.2)
		Workpiece bends through during rolling operation	Support workpiece
		Non-uniform bending apart of axes due to too strong rolling pressure	Correct axis inclination (see Chapter 8.2)
9	Gear breakage or roll driving claws sheared off	Rolled with excessive overpressure (blank diameter too large)	Reduce blank diameter (see Chapter 8)
		Axes twisted	Axes must always be securely tightened (part 25)!
		Cross slide in travel not limited by fixed stop	Rolls must not pass beyond center of workpiece. Set fixed stop (see Chapter 6.3)
		Gears assembled incorrectly	Rolls must be able to move freely and smoothly. When holding one roll back, the other must be able to rotate towards the inside of the head. This roll must spring back automatically. (see also Chapter 5.1.1)
		Axes have seized	Cooling and lubrication must be sufficiently available, coolant must be free of chips (see Chapter 5.2.4).
			Workpiece rotations n_W too low during rolling operation, resulting in too much of a force ratio, increase n_W (see Chapter 6.4)

10 Cleaning, maintenance and servicing

10.1 Changing the thread rolls

Check the rolled profile exactly after changing the rolls. If in particular the workpiece major diameter is not correct, compensate for this by adjusting the head setting, see Chapter 8.

ATTENTION

It is only permitted to use thread rolls with the same roll set number
Make sure to apply a coat of molybdenum sulfide
(e. g. Molykote) to the roll hole and axes (3).
Retighten the cap screw (25) after approx. 100 rolling operations!

10.2 Maintenance intervals

The required maintenance intervals must be observed to ensure the proper function of the rolling head. The cleaning and maintenance intervals will need to be shortened if the rolling system is used under difficult conditions.

Interval	Person responsible	Task
Weekly (recommended daily)	Machine operator	Remove the rolling head from the rolling head holder. Ensure the rolling head and holder are free of chips, clean if necessary. Insert the rolling head back into the holder.
		Check the axial clearance of the rolling head and adjust if necessary (see Chapter 5.1.3)
Weekly	To be performed by fitter or foreman only	Loosen the cap screw (ET-25) and pull out the axis (ET-3); hold the thread roll (ET-18) with your hand to prevent it from falling out and take it out of the rolling head. Clean the thread roll, axis, washer and bushing to remove any dirt and chips and apply a light coat of molybdenum sulfide (e. g. Molykote). Reinsert the roll (see also Chapter 5.1.2)
Weekly	To be performed by fitter or foreman only	Check the washer (ET-15) for even wear. Replace both washers when: ■ the thickness of both washers differs by > 0.05 mm I 0.02 inch from each other ■ for T18 the thickness of a washer is less than 0.45 mm I 0.018 inch ■ for T27 the thickness of a washer is less than 0.6 mm I 0.024 inch

Interval	Person responsible	Task
Weekly	To be performed by fitter or foreman only	Lubricate the synchronous gear with some gear grease over the lubricating nipples (ET-21). Alternatively, remove the lubricating nipples and connect the rolling head directly to the central lubrication system of machine tool (provided this is free of contamination).
Every three months/after a long period of non-use	To be performed by fitter or foreman only	Disassemble the complete tool and remove any contamination or chips. Lubricate all parts during reassembly according to guidelines.
Every three months/after a long period of non-use	To be performed by fitter or foreman only	Visually inspect all parts for run-in marks, especially: ■ Axis (ET-3) in the region of the carbide bushings ■ Gears in the region of the tooth flanks ■ Pinion (ET-8) in the region of the driving cams ■ Hinge upper and lower part in the region of the washer (ET-15) If there is substantial wear (depth > 0.05 mm I 0.002 inch) we recommend that you have the parts replaced or reworked **Alternative:** **send the rolling head to LMT Fette for inspection!**

10.3 Wear parts

The following parts are main wear parts:

- Washer (ET-15)[7]
- Spindels (ET-3)
- Pinion (ET-8)
- Gears (ET-10), (ET-11), (ET-12)
- Bushing (ET-13)

It is recommended that you keep a supply of these parts.

[7] For part numbers with the addition “SP” see the spare parts list Figure 24 on page 48.

11 Putting out of operation, disassembly and disposal

CAUTION

Risk of hand injury!
Personnel must take care when performing tasks relating to decommissioning, disassembly and disposal as there is a risk of injury from rough surfaces or sharp edges on transport cases, cartons, pallets and packaging aids.
Wear safety gloves to prevent hand injuries.

NOTICE

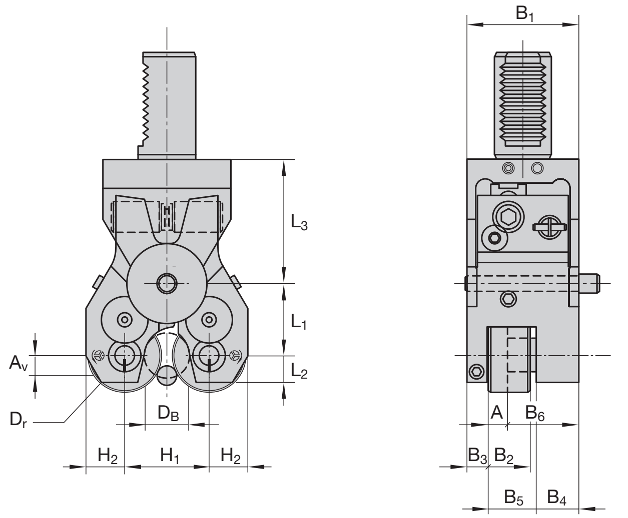
Tangential thread rolling heads with hazardous types of residue, such as oils and greases, must be disposed of pursuant to regulations.
Improper disposal of the used materials can pose a threat to the environment. All materials must be disposed of in accordance with national and local regulations.

Make sure that all national and local safety requirements are observed.

- After the tangential thread rolling head has been withdrawn from service, ensure all parts are disposed of sorted by material type.
- Separate iron, nonferrous metals, etc.
- Greases, oils and any parts or connecting pieces contaminated by these substances have to be disposed of separately.

12 Technical data

12.1 Tool dimensions



Dimensions [mm]		Rolling head type	
		T18F	**T27F**
A		Desired roll width ≤ B_2	
B_1		58 ǀ 2.2834	83 ǀ 3.2677
B_2		21.5 ǀ 0.8464	31 ǀ 1.2204
B_3		11.1 ǀ 4.37	15.8 ǀ 0.62204
B_4		22.5 ǀ 0.8858	33 ǀ 1.2992
B_5		24.4 ǀ 0.9606	34.2 ǀ 1.3464
B_6	Min.	25.4 ǀ 1	36.2 ǀ 1.4251
L_1	Min./max.	30.1/37.8 ǀ 1.185/1.4881	43.1/53.5 ǀ 1.6968/2.1062
L_2		14 ǀ 0.5511	20 ǀ 0.7874
L_3	Min.		
H_1	Min./max.	40.5/61 ǀ 1.5944/2.4015	59.5/87 ǀ 2,3425/3.4251
H_2		19.8 ǀ 0.7795	28 ǀ 1.1023
D_r	Max.	44 ǀ 1.7322	63 ǀ 2.4803
D_B	Max.	See Internet	
A_V		See setting gauge or Internet	
Weight [kg]	Rolling head	1.7	4.9
	Rolling head holder	2.4	4.2
	Rolls (1 set = 2 pieces)	0.45	1.4
	Total	4.55	10.6
	ID number	2407485	2408492

12.2 Spare parts lists

When re-ordering rolling heads, spare parts, rolling head holders and thread rolls, please make sure to state the specified description and ID number!

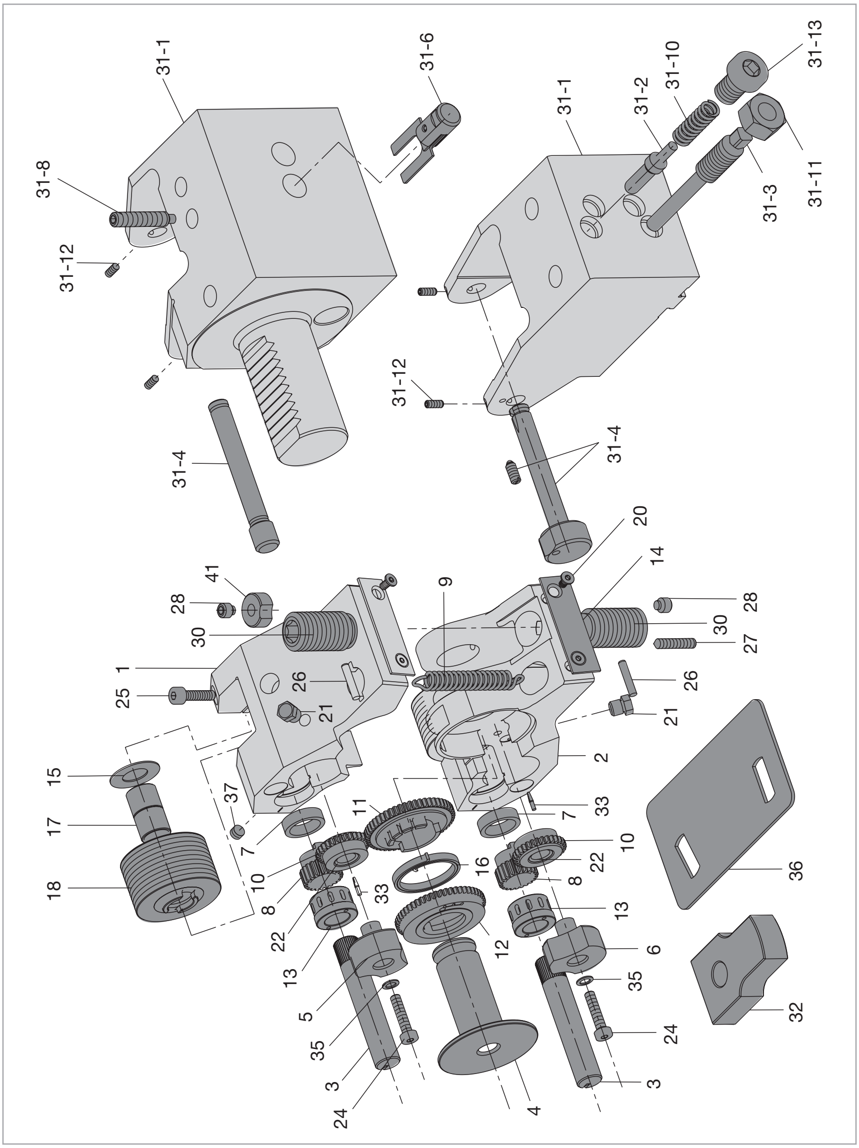


Figure 24: Exploded view

Rolling head				T18F	T27F
Part no.	**Qty.**	**Part description**		**ID number**	**ID number**
1[1)]	1	Upper arm		2407486	2408504
2[1)]	1	Lower arm			
3	2	Spindels		2173433	2143453
4	1	Bushing		2173434	2173454
5	1	Bushing with grooved pin		2407487	2408500
6	1	Bushing		2407488	2408501
7	2	Bearing bushing		2173437	2173457
8	2	Pinion		2173438	2173458
9	1	Tension spring		2173439	2173459
10	2	Gear with bushing		2173440	2173460
11	1	Gear set with coil spring		2174925	2174825
12					
13	2	Bushing		2407489	2408502
14	2	Plate		2173444	2173464
15	2	Washer		2173445	2173465
16	1	Coil spring (see. consec. no. 11, 12)		2173446	2173466
17	4	Bushing		2173447	2173467
18	2	Thread roll		see separate case	
20	4	Countersunk screw		2143237	2143244
21	2	Lubricating nipple		2149168	2149168
22	2	Bushing (see consec. no. 10)		2148865	2148854
24	2	Cap screw		2127376	2148742
25	2	Cap screw		2142013	2142021
26	2	Straight pin		2141245	2141258
27	1	Threaded pin		2148369	2142132
28	2	Threaded pin		2148366	2142172
30	2	Threaded pin		2173449	2173468
31	1	Rolling head holder, complete		depending on type of machine	
31-1	1	Basic housing		see separate case	
31-2	1	Spring-loaded bolt	A[2)]	2174493	2174615
31-3	1	Stop bolt	A[2)]	2174494	2174494
31-4	1	Bolt	A[2)]	2174495	2174616
		Bolt	B[2)]	2174563	2174581
31-6	1	Spring clip holder, complete	B[2)]	see separate case	
31-8	1	Threaded pin	B[2)]	see separate case	
31-10	1	Pressure spring	A[2)]	2174496	2174617
31-11	1	Hexagon nut	A[2)]	2148399	2148399
31-12	2	Threaded pin	A, B[2)]	2142113	2142122
31-13	1	Cap screw	A[2)]	2148875	2148875
32	1	Setting gauge		see separate case	
33	2	Grooved pin (see consec. no. 2 + 5)		2148843	2148842
35	2	Schnorr circlip		2149269	2149274
36	1	Sheet metal gage		2173450	2173469
37	2	Threaded pin		2142119	2142119
41	2	Locking block		2175329	2175733

[1)] Can only be delivered and used in pairs, [2)] A only applies to cross slide holder, B only to indexing turret

13 Service information

Service hotline and e-mail address
Use our service hotline: +49 (0) 41 51 12-391 or US: 1-800-225-0852
or write to teamrollen@lmt-tools.com

We can provide you with help and useful information on our products.

Maintenance and repair
The maintenance and repair of your rolling tools can either be performed at the LMT Fette head office in Schwarzenbek or at one of our worldwide representatives by experienced personnel. We recommend that you entrust this work to us. Trust the expertise and experience of the manufacturer of your tools and only use original spare parts. This way you can always ensure the proper functioning of your precision tool and your production.

Technical field staff
Our technical field staff have decades of experience in the use of rolling tools. They are available to offer support and training when you use your new precision tool for the first time.

… giving you the freedom to concentrate on your production!

Engineering
When planning the manufacture of your threads and profiles and introducing modern and rational production processes you can rely on the know-how of our technical field staff and the expertise of our development and construction departments.

Our state-of-the-art “Engineering” service is designed to secure your benefits and success!

Seminars and training
We offer intensive personnel training programs at your premises, tailored to meet your special requirements. Using the state-of-the-art tools, seminars and product training sessions take place at our head office and at our global subsidiaries and representatives. These training sessions are held by our technical customer service and the LMT Academy. For more information, please visit **http://www.lmt-tools.com** → **Downloads** → **Seminars**.

The product range
We offer our customers the world’s most extensive range of rolling tools for the production of external threads and profiles. In addition, we stock the largest range of precision tools for the production of internal and external threads in different designs such as solid steel, solid carbide with indexable inserts and with different wear protection surfaces:

- Rolling tools
- Turning heads and chamfering tools
- Thread taps
- Thread milling cutters
- Thread dies

Our range also includes:
- Gear cutting tools
- Bore type milling cutters
- End mills
- Solid carbide milling cutters
- Drills
- Reamers
- Saw blades
- Special tools for cutting
- Clamping devices
- Services such as regrinding and thermal treatment
- Engineering
- Training seminars

Catalogs, brochures and flyers
Extensive guides are available to help you get an overview of our huge product range. Tables and sets of standards, aids, catalogs, brochures and flyers are available for collection at our subsidiaries and representatives. Please request them!

LMT Fette in the Internet
You can also visit us online at
http://www.lmt-tools.com

Detailed information on rolling systems can be found at
http://www.fette.de/rk/fettekat

14 Quick Guide

WARNING

This Quick Guide is only intended for use by competent and trained personnel. To prevent possible damage make sure to read the complete Operating Manual beforehand!

To set up your tangential rolling head, proceed as follows:

1. Check the respective application using Chapter 3 and 4:
   a) Is the rolling head capable of withstanding the loads exerted on it?
   b) Do collisions occur with the workpiece or the machine tool?
   c) Is the material suitable for rolling?
   d) Check the occurring tangential force and the required torque and the drive power (Chapter 6.4)
2. Check the gear settings (Chapter 5.1.1).
3. Insert the thread rolls into the rolling head (Chapter 5.1.2). Set the axis inclination to the 0 position.
4. Adjust the axial rolling clearance (Chapter 5.1.3) and perform a function test.
5. Adjust the distance between the axes (Chapter 5.1.5).
6. Prepare the workpiece according to Chapter 5.2.1.
7. Insert the rolling head into the holder and adjust the pendulum clearance (Chapter 5.2.3). Check the distance between the axes afterwards!
8. Select the rolling speed (Chapter 6.1) and calculate the RPM.
9. Determine the number of workpiece rotations and the working feed (Chapter 6.2).
10. Adjust the traverse paths: position 1 with safety distance and rolling position 3 (Chapter 6.3).
11. Carry out the first rolling process and correct the settings according to Chapter 8.

15 Calculation sheet

Application		Workpiece no.	
Customer		Customer no.	
Machine		Installation position	
Rolling head type		Rolling head holder no.	
Roll type		Roll width A	
Thread		Material	

Thread		Tolerance zone		Pitch P	

	Maximum size	Minimum size	Average value
Major diameter d			
Pitch diameter d_2			
Minor diameter d_3			

			see
Number of starts on the roll	$Z =$		Setting gauge/ Internet
Working stroke	$A_V =$		Setting gauge/ Internet
F-gauge	$F =$		Setting gauge
Blank diameter	$d_A = d_2 - 0.03\text{ mm} =$		Chapter 5.2.1
Internal diameter	$d_i \leq d_3 - 0.1\text{ mm} =$		Chapter 5.2.1
Chamfer angle	$\gamma =$		Chapter 5.2.1
Rolling speed	$v =$		Selection according to Chapter 6.1
RPM	$n = \frac{1000 \cdot v}{d_A \cdot \pi} =$		Chapter 6.1
Number of workpiece rotations	$n_W =$		Selection according to Chapter 6.2
Working feed (per rotation)	$s = \frac{A_v}{n_w} =$		Chapter 6.2
Feed rate	$f = \frac{A_V \cdot n}{n_w} =$		Chapter 6.2
Safety distance	$A_s = 1.5 \cdot A_v =$		Chapter 6.3
X-coordinate	$D_s = 2 \cdot \left(\frac{d_A}{2} + A_s\right) =$		Chapter 6.3
Dwell-time rotations	$n_D = 2 \ldots 5$		Selection according to Chapter 6.3
Dwell time	$t_d = \frac{60 \cdot n_d}{n} =$		

Notes

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