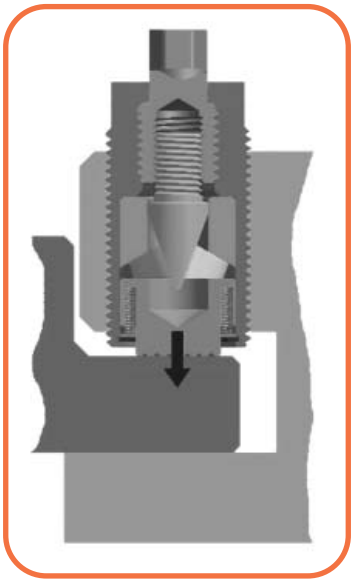
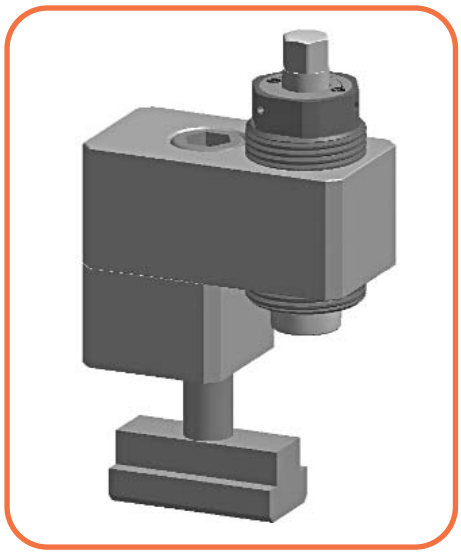
Mechanical clamping elements





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Clamping elements

Content

Mechanical clamping elements with force amplifier

Efficient manufacturing of parts in the metal-cutting and metal-forming industry is inconceivable today without quick clamping elements. The requirements go nowadays far beyond the handling and operation capacity of conventional clamping elements, since higher gripping power and more flexibility due to smaller lot sizes are demanded.
Quick clamping units are a must to improve the quality, to gain rationalization and to humanize the work place.
The mechanical clamping elements of ENEMAC meet these requirements perfectly, due to their different patented force amplifying systems. They are a true alternative as well to the conventional clamping elements as to the expensive half or fully automated clamping systems.

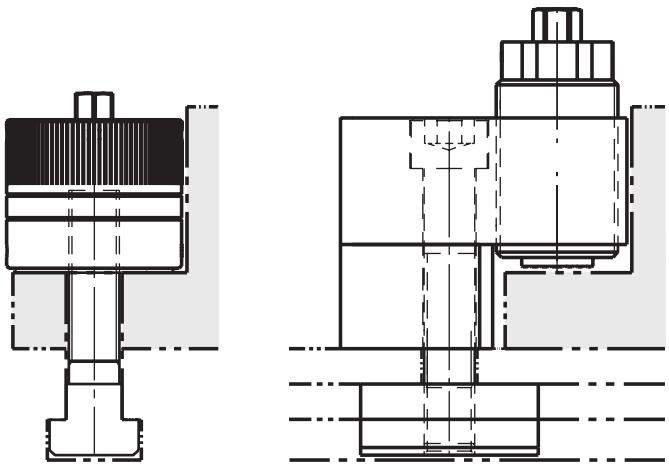
Whether as standard equipment or as retrofit for machine tools, presses, stamping machines etc. ENEMAC clamping units hold tool and workpiece reliably in position.

Special characteristics

- **+ high gripping power / low tightening torques / large clamping strokes**
- **+ high operational safety due to self-locking**
- **+ improved technology for economical clamping**
- **+ humanizing of the workplace / reduced danger of accidents**
- **+ simple manual operation / easy installation**
- **+ gripping power check due to defined tightening torques**
- **+ versatile application due to compact, flexible design**

Scale comparison: application example - Die clamping

Gripping power per element: 60 kN
Clamping height h = 40 - 50 mm
T-slot gauge: m = 22 mm



power-clamping nut
Type ESB 60 - M 20
Gripping power: 60 kN
Holding force: 120 kN

Slide-in clamping unit
Type ESSE 60 - 60 - 22
Gripping power: 60 kN
Holding force: 120 kN

Power clamping nut Type ESB + ESD

- **maximum gripping power due to force amplification**
- **simple manual operation - low tightening torques**
- **high operation safety due to selflocking**
- **corrosion-resisting, sturdy, up to 400°C**

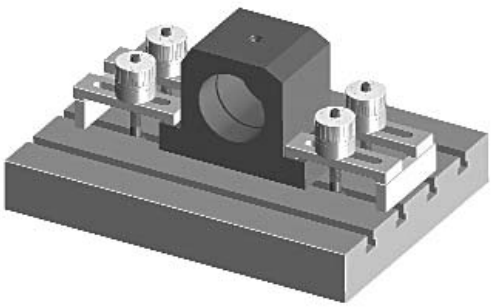
ESB

The salient design feature of the mechanical power clamping nut ESB is an integrated planetary gearbox for the multiplication of the manual tightening torque. Therefore, the user has a sturdy and flexible clamping element, which enables highest gripping power with simple manual operating and maximum operating safety. The ESB power clamping nut can be used for various clamping tasks throughout the machine tool industry, particularly for die clamping in presses and punches. Additional versions with star knob and t-grip or for through bolts are available.

Function and handling:

Only two easy manual operations are required to gain the very high gripping power of the ESB. First the nut has to be turned clockwise to bring all clamping surfaces in tight contact. The knurled housing makes prestressing possible if needed. Then the sun wheel is activated by turning the actuation hexagon SW1 clockwise, and the t-bolt is pulled into the nut, and force amplified by the planetary gearbox.
The system is self-locking in each and every position. Combined with a t-screw the ESB nut can be used as a flexible t-slot slide-in clamping device. The clamping and operating forces are supported via an axial bearing and a pressure plate directly at the table or at the fixture. This clamping mechanism enables a theoretically unlimited clamping stroke, which, is limited in practice due to the screw-in depth. The release is carried out in reverse order by turning the operating hexagon anti-clockwise. When laying out the actual screw-in depth of the threaded bolt, the necessary stroke must be considered, i. e. the max. specified screw-in depth "t_{max}" must be reduced at least by the amount of the stroke. To visually check the actual screw-in depth of the t-bolt two (2) grooves have been provided on the housing circumference matching the dimensions t_{min} and t_{max} (see technical data). It must be ensured, that the screwed-in t-bolt is firm, i. e. it cannot turn with the ESB during applicationof actuation torque. The mechanical clamping nut ESB is maintenance free under normal conditions. The housing and the thread-nut are made of high-tensile, heat-treated steel with a corrosion resisting coating.

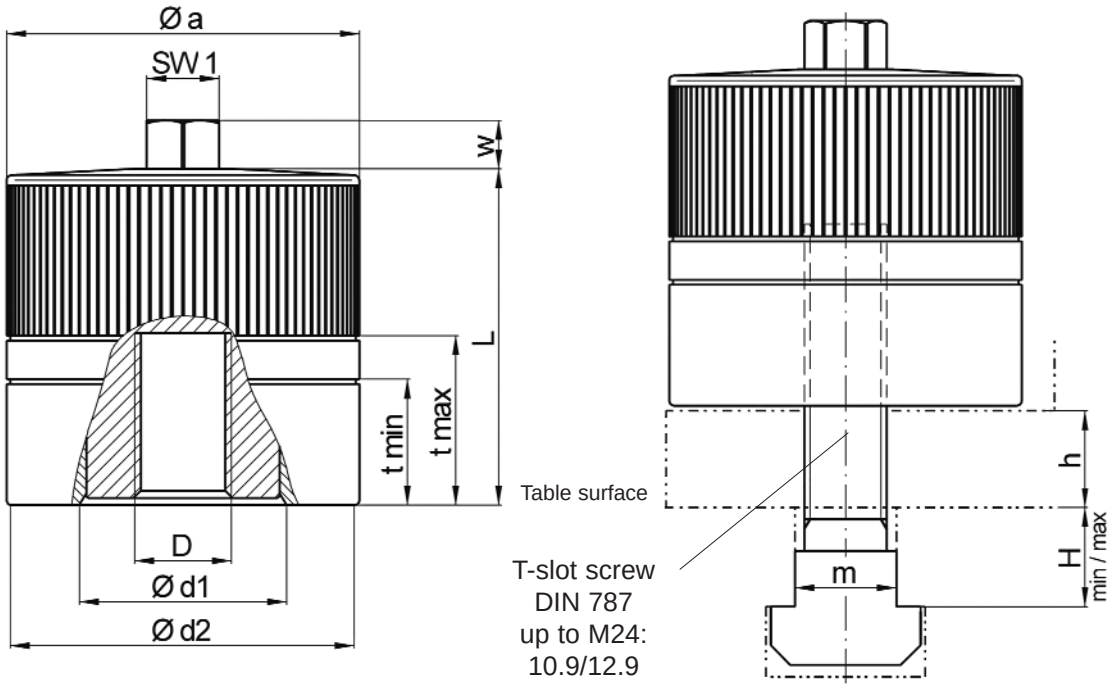
ESD



Application example:
workpiece-clamping on a machining centre table with ESB clamping nut

Power clamping nut Type ESB

- **with bottomed thread**
- **thread protected - centrical operation - compact design**



Technical data and dimensions: (mm) length dimensions according to DIN ISO 2768 mH

ESB Size	nominal gripping power [kN]	thread D *	max. tightening torque [Nm]	max. static load [kN]	T-slot - DIN 650 " m "	T-slot - DIN 650 " H " min / max	weight approx. [kg]	Ø a	Ø d1	Ø d2	L	screw-in depth " t " min	screw-in depth " t " max	SW1	w
60	60	M 12	20	70	14	14 / 19									
		M 16	25	120	18	18 / 24	0,9	62	32	60	50	16	24	13	10
		M 20	30	120	22	22 / 29									
100	100	M 16	35	130	18	18 / 24									
		M 20	40	200	22	22 / 29	1,8	73	42	71	70	25	35	15	10
		M 24	45	200	28	28 / 36									
		M 30	50	200	36	36 / 46									
150	150	M 24	60	300	28	28 / 36	2,5								
		M 30	70	300	36	36 / 46	2,4	83	52	81	75	30	40	17	12
		M 36	75	300	42	42 / 53	2,3								
		M 42	80	300	48	48 / 59	2,2								
200	200	M 36	120	400	42	42 / 53	4,9								
		M 42	125	450	48	48 / 59	4,8								
		M 48	130	450	54	54 / 66	4,7	120	82	118	80	35	45	17	12
		M 56	140	500	-	-	4,5								
		M 64	150	500	-	-	4,3								

* Property class of the threaded bolt up to M24 minimum Q10.9; from M30 Q 8.8
(further thread sizes e.g. inches on request)

Ordering example: Clamping nut

ESB 100 - M 24

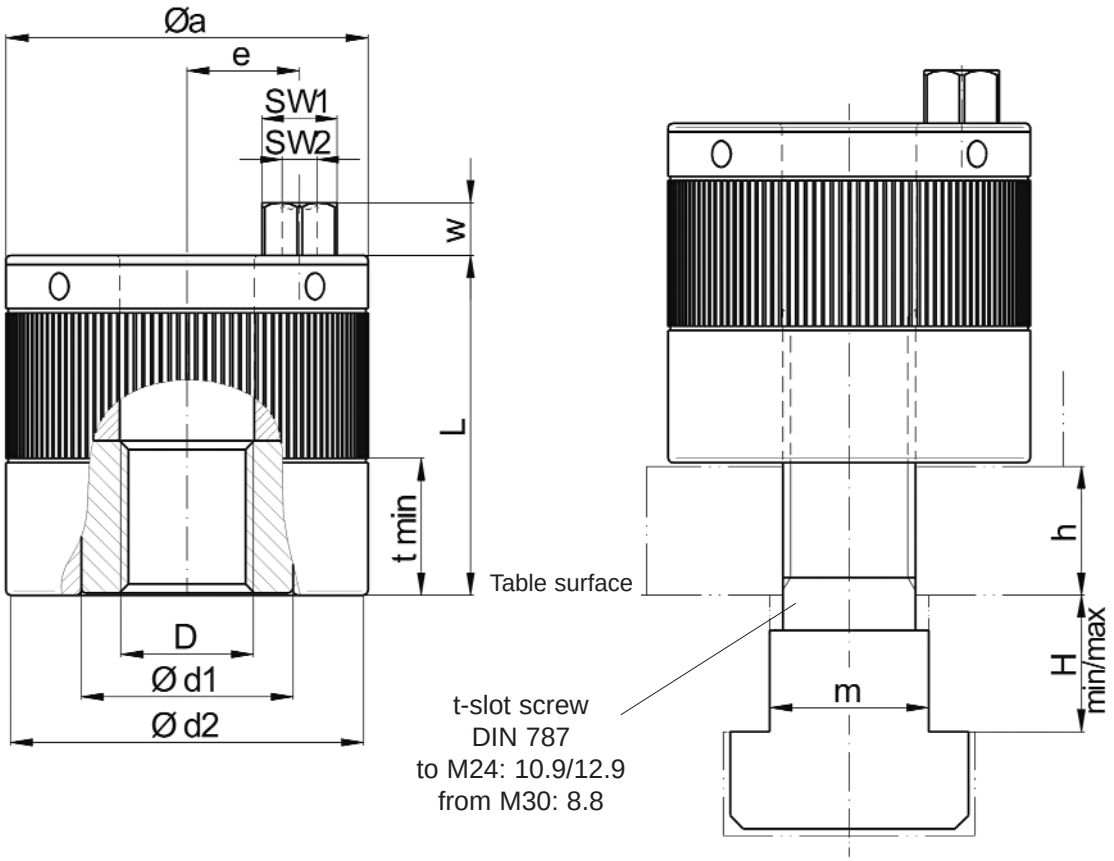
incl. T-bolt

ESB 100 - 28 - 50 - 32

Series and size (max. clamping force 100 kN)
T-slot dimension according to DIN 650 (dimension "m"=28 mm)
Clamping height ("h"= 50 mm)
Rootface of t-slot ("H"= 32 mm)

Power clamping nut Type ESD

- **with through hole thread**
- **for variable clamping edges - unlimited clamping stroke**



Technical data and dimensions: (mm) length dimensions according to DIN ISO 2768 mH

ESD Size	Nominal gripping power [kN]	thread D *	max. tightening force [Nm]	max. static load [kN]	T-slot - DIN 650 " m "	" H " min / max	weight approx. [kg]	Øa	Ød1	Ød2	e	L	tmin	SW1 /SW2 outside/ inside		w
100	100	M16	55	130	18	18/24	2,9	84	48	82	26,5	77	30	17	8	12
		M20	60	200	22	22/29	2,9									
		M24	65	200	28	28/36	2,8									
		M30	70	200	36	36/46	2,8									
150	150	M30	100	300	36	36/46	5,0	105	63	103	35	91,5	50	17	8	12
		M36	110	400	42	42/53	4,9									
		M42	115	450	48	48/59	4,8									
		M48	125	450	54	54/66	4,7									

* Property class of threaded bolt up to M24 minimum Q10.9; from M30 Q8.8
(futher thread sizes e.g. inches on request)

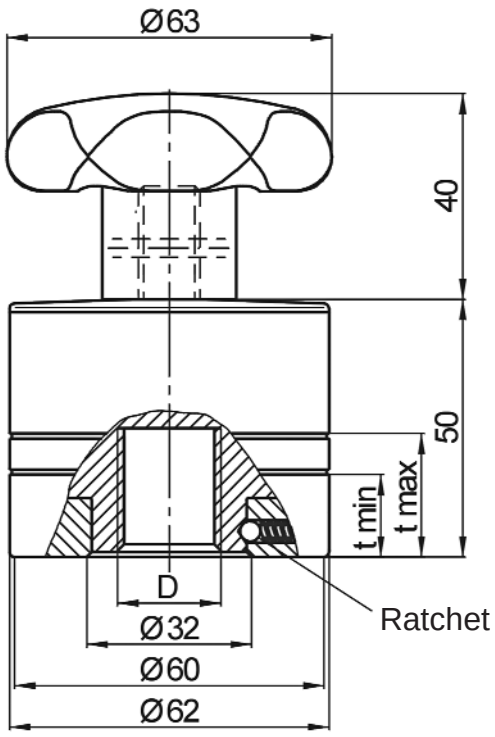
Ordering example: Clamping nut **ESD 100 - M 24**

incl. t-bolt **ESD 100 - 28 - 50 - 32**

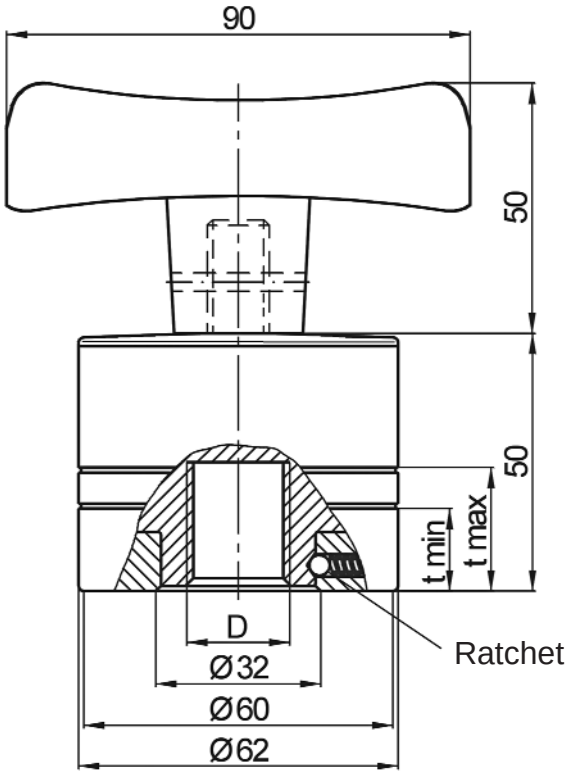
Type and size (max. clamping force 100 kN)
T-slot dimension according to DIN 650 (dimension “m”=28 mm)
Clamping height (“h”= 50 mm)
Root face of t-slot (“H”= 32 mm)

Power clamping nut Type ESBS / ESBT

- **simple, manual operating with grip**
- **fast feed motion due to automatic change over**



Clamping nut ESBS with star grip



Clamping nut ESBT with t-grip

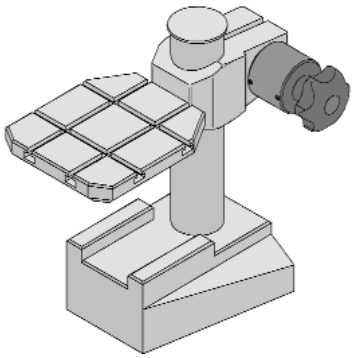
Technical data and dimensions: (mm)

Length dimensions according to DIN ISO 2768 mH

Type	Nominal gripping power [kN]	thread	max. static load [kN]	screw in depth t min [mm]	screw in depth t max [mm]	weight approx. [kg]
ESBS ESBT	40	M 10	50	16	24	1,0
		M 12	70			
		M 16	120			
		M 20	120			

Notice:

Property class of threaded bolt should be at least Q10.9. Sizes of thread smaller than M 16, should be used with a property class of Q 12.9, or the maximum static load must be reduced.



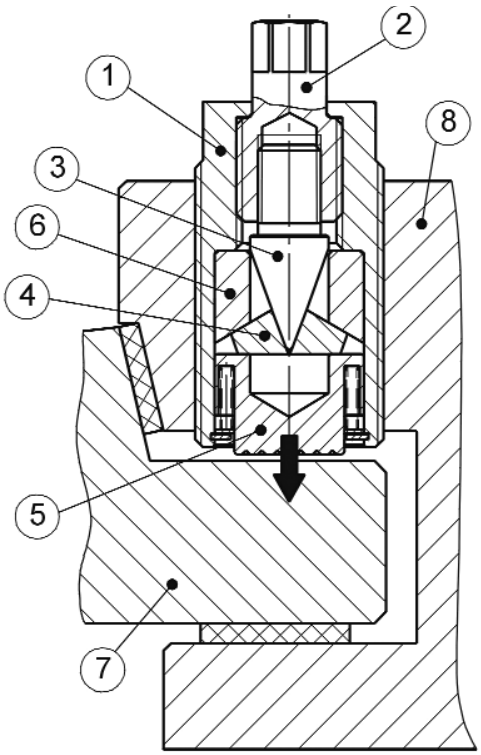
Application of ESBS

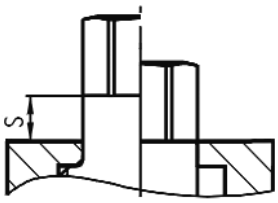
Ordering example: **ESBS - M10 or ESBT - M16**

Power clamping screw Type ESS

- **wedge machanism as force amplifier**
- **high gripping power up to 250 kN**
- **low tightening torque - simple manual operation**

The clamping screws of type ESS are equipped with a patented wedge clamping system as a force amplifier. This newly developed system enables highest gripping power with low tightening torques, simple manual operation and high operating safety. The clamping screws type ESS have various application possibilities, mainly in presses, punches and machine tools, as well as in jigs, fixtures and similar devices.





Release position Fig. A1

max. clamping position Fig. A2

Function

The wedge clamping system of the ESS clamping screw is self-locking in each clamping position, due to its geometry, and offers a clamping stroke of up to 2,5 mm. This way, dependent on tightening torque, very high clamping forces up to the nominal gripping power can be achieved.

Clamping Procedure

The infeed of the clamping screw down to a solid contact with the part to be clamped (7) is the first step, done by manually turning the housing (1) clockwise. Only then the hexagon of the actuation spindle (2) should be turned clockwise, thus moving the forced-in key (3) in axial direction and pressing the slide gores (4) in radial direction. The latter motion results in the axial stroke of the thrust piece (5) against the part to be clamped (7). The gripping power is lead over the gore bedding (6) through the housing (1) into the yoke of the clamping devise (8).

After approximately two turns of the actuation hexagon the travel of the thrust piece will be blocked by an internal positive stop and the torque wrench will disengage although the required clamping force has not been generated; the clamping operation has to be repeated. The clamping travel “s” is indicated as optional clamping motion control. The maximal clamping position is reached when the lower cylindrical portion of the actuation hexagon is even with the top of the housing (Fig. A2).

Release

The release procedure is carried out in reverse order. By turning the operating hexagon to the left up to the fixed back stop (Fig. A1), the wedge slide moves back and the clamping mechanism is released.
Coil springs push the pressure piece and the wedges back into the starting position.

Power clamping screw Type ESS

Note:

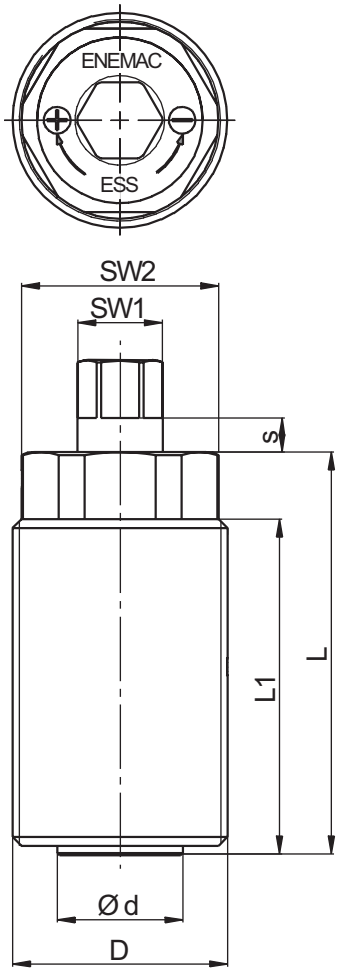
To reliably ensure the required gripping power on the one hand, and on the other hand to protect the drive or clamping mechanism against damages through excess tightening torque, we recommend the use of a torque wrench for applying the actuation torque.

With certain preconditions clamping is also acceptable with the usual ring or socket wrench.
The clamping screws are lubricated for life and maintenance free under normal operating conditions.

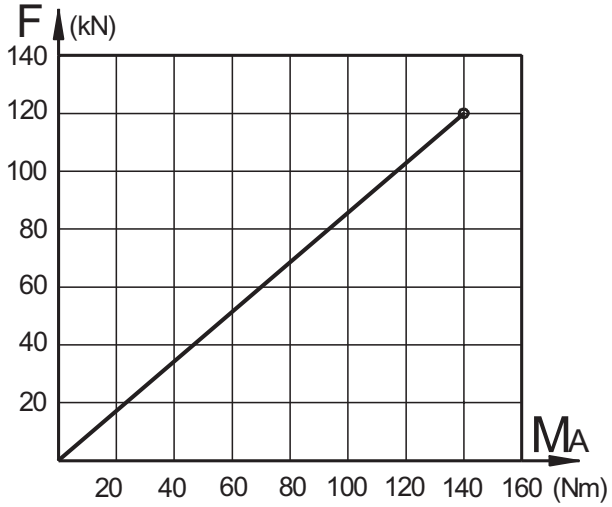
Technical data and dimensions: (mm) length dimensions according to DIN ISO 2768 mH

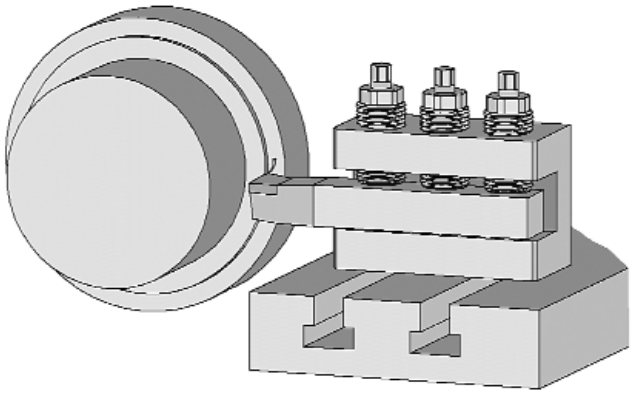
ESS Size	Nominal gripping power [kN]	max. tightening torque [Nm]	max. clamping stroke [mm]	max. static load [kN]	operation path "s" [mm]	thread D *	Ø d [mm]	L1 [mm]	L [mm]	SW1 [mm]	SW2 [mm]
36	40	45	1,5	80	5	M 36x3	19	62	73	13	30
48	80	90	2,2	160	7,5	M 48x3	28	75	90	17	41
64	120	120	2,5	240	8,5	M 64x4	39	90	110	19	55
80	160	160	2,5	320	8,5	M 80x4	39	100	160	19	65
100	250	130	3	400	17	TR 100x6	60	205	230	17**	65

* Further sizes and threads (inch threads) on request
** Hexagon socket



Gripping power diagram ESS 64





Application example:
clamping screw ESS

Ordering example: ESS 48

Slide-in clamp Type ESSE

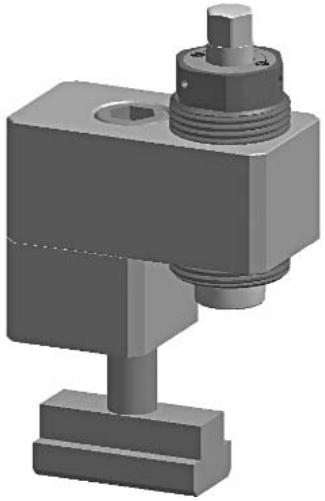
- **versatile application - flexible, rotable head piece**
- **simple manual operation - high gripping power**

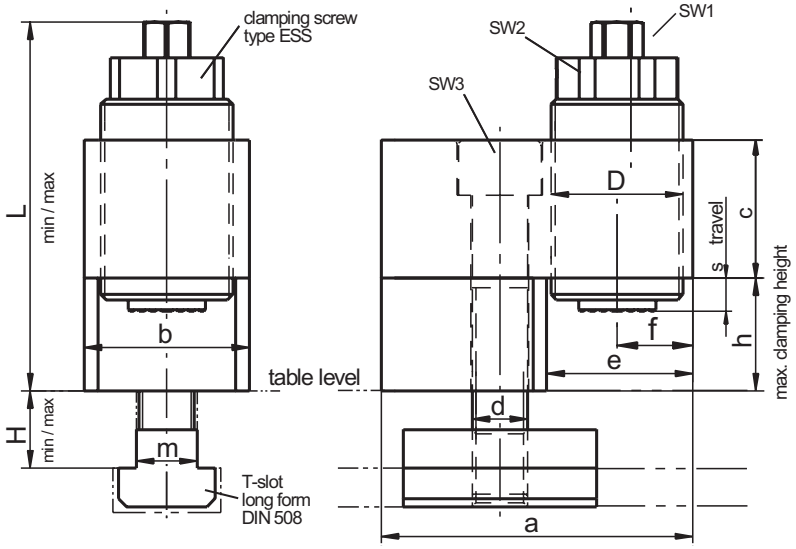
The mechanical slide-in clamp of series ESSE is a combination of a t-slot slide-in unit with a mechanical clamping screw of series ESS. This flexible and sturdy clamping element represents a cost-effective alternative to semi or fully automated clamping systems, mainly for tool clamping on presses and punches. The ESSE unit is positioned by sliding it into the t-slot and swivelling of the bracket if necessary. The quick tightening of the socket head cap bolt completes this step. The infeed of the clamping screw until solid contact of all clamping surfaces is the next step. Only the hexagon of the actuation spindle should be turned clockwise to generate the gripping power. The bracket with clamping screw and distance plate can be screwed down without t-slot fixtures directly on supporting tables. The ESSE can be used as a fixed stop too.

Technical data:

ESSE Size	Nominal gripping power [kN]	max. tightening torque [Nm]	max. Clamping stroke [mm]	max. static load [kN]	max. adjusting path "s"	weight approx. [kg]	T-slot * - DIN 650 m	H min/max
30	30	35	1,5	60	22	3	18	18/24
							22	22/29
60	60	80	2,2	120	25	5	22	22/29
							28	28/36
100	100	130	2,5	200	35	8	28	28/36
							36	36/46

* Further t-slot dimensions on request





Dimensions: (mm)

ESSE Size	a	b	c	d (Q12.9)	thread D	e	f	h+1*	L min	L max	SW1	SW2	SW3
30	90	50	40	M 16	M 36 x 3	40	21	30	100	120	13	30	14
								50	120	142			
								70	140	162			
60	113	60	50	M 20	M 48 x 3	53	28	40	125	150	17	41	17
								60	145	170			
								80	165	190			
100	150	80	60	M 24	M 64 x 4	70	37	50	145	180	19	55	19
								80	175	210			

* Standard range for clamping height "h"; special clamping heights on request

Ordering example: ESSE 60 - 40 - 22

Type

Size (nominal force 60 kN)

clamping height h (clamping range approx.15 - 40mm)

T-slot size according to DIN 650 (dimension "m" = 22mm)