ETP-EXPRESS®

ETP Transmission AB

Mounting and dismounting with one screw
Mounting and dismounting can be easily and quickly done with only one pressure screw.

Economy of workspace
The pressure screw can be tightened from the radial direction that a workspace for mounting can be saved.

No key processing
Any trouble caused by keys such as a keyway processing can be resolved. Furthermore, the processing tolerance of the shaft · hub is general tolerance that special finish is not required.

Zero thrust load
Only the radial load acts on the shaft and hub that the thrust load becomes zero.

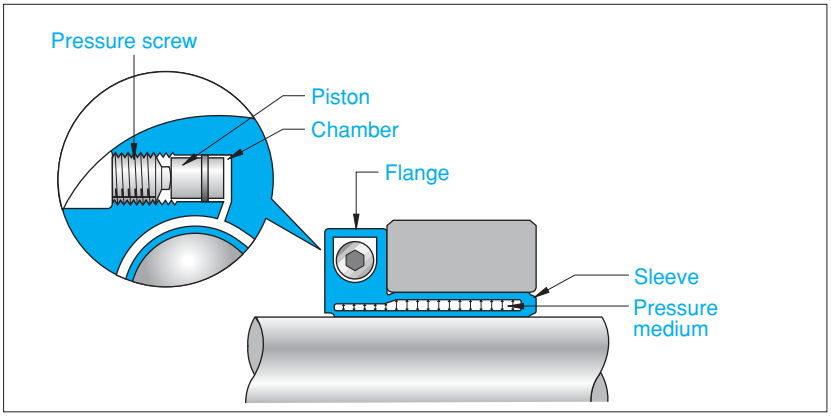
Adapted to the RoHS
Adapted to the Restriction of Hazardous Substances defined by EU that bans the use of 6 substances such as mercury or lead.

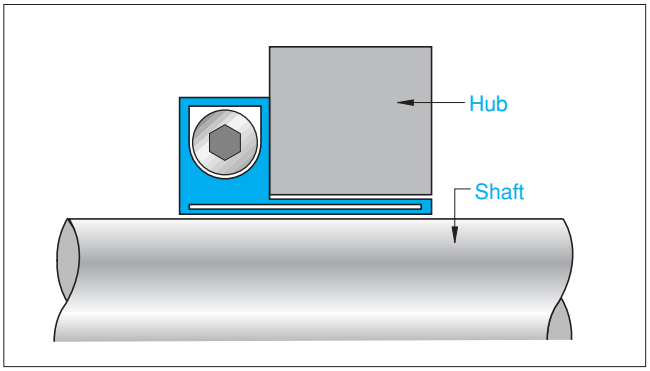
Max. permissible torque [N·m]	34～17000
Max. permissible thrust power [N]	3800～280000
Bore diameter [mm]	ϕ15～100
Operating temp. limit [℃]	−30～+85
Backlash	Zero
Concentricity [mm]	0.02

Principle of Operation

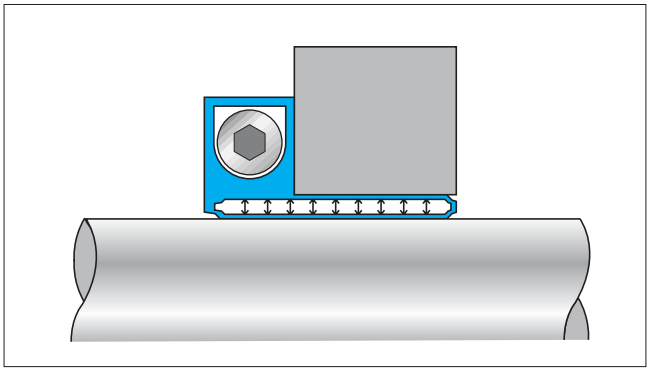
ETP-EXPRESS

- The pressure medium contained in the chamber is pressurized by fastening the pressure screw, and it moves into the sleeve. Due to the pressurization of the pressure medium, the sleeve is pressured from inside. This makes the shaft-side sleeve expand and the hub-side sleeve enlarge that the shaft and hub are fastened through the sleeve.





- Set the ETP-EXPRESS between the shaft and hub.

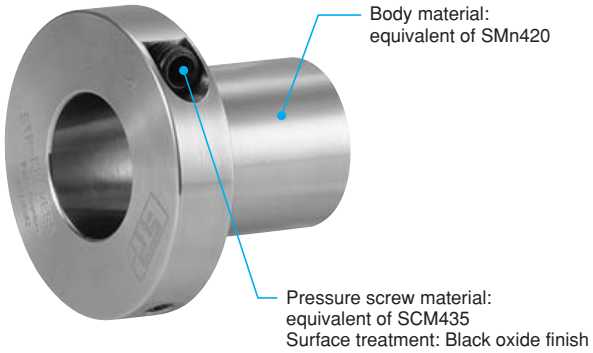


- By fastening the pressure screw, equalize the surface pressure against the shaft and hub.

Structure and Material

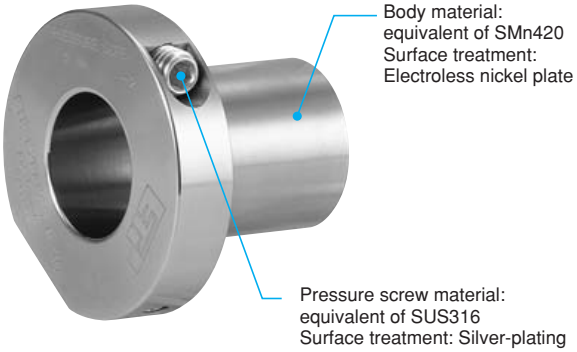
■ETP-E

The ETP-E can be easily fixed by tightening one bolt. It can be fastened from the radial direction that a workspace for a torque wrench, etc. can be saved.



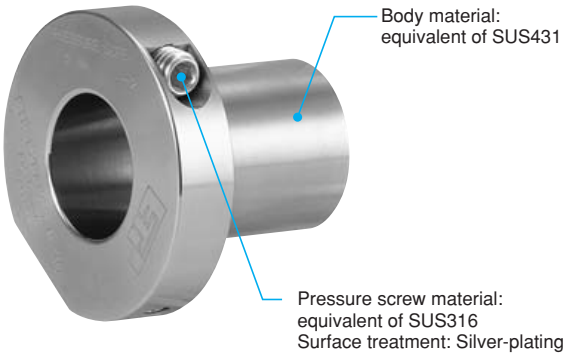
■ETP-E-C (Basic antirust specification)

A Basic antirust specification with electroless nickel plating coated on the body.



■ETP-E-R (Stainless specification)

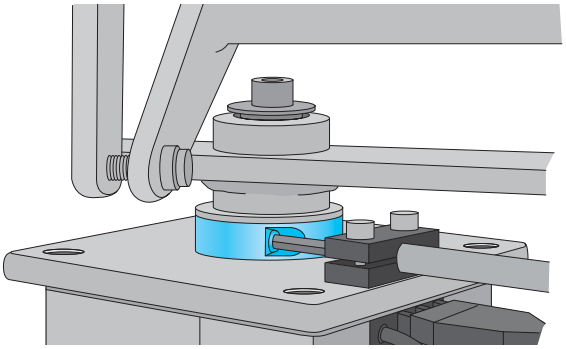
Stainless steel is used as its body material. Antirust treated.



Adoption Example

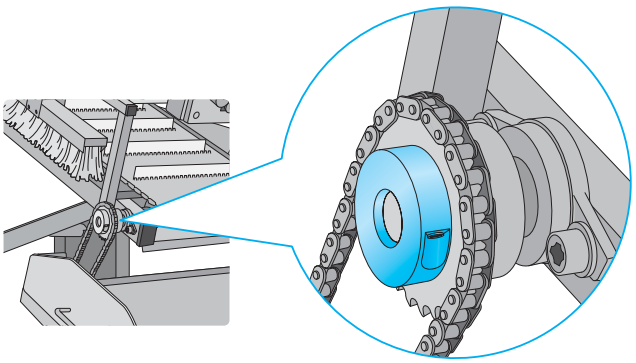
Fixation apparatus for an examination table

The ETP-EXPRESS can be fastened from the radial direction that to design in a limited space such as flange contact is possible. The illustration below shows the ETP-EXPRESS to be used as a fixation apparatus of an examination table. The fixed position can be optionally changed by fastening the pressure screw.



Food-processing Machinery

The ETP Business also corresponds to the stainless specification (ETP-E-R) as standard. It is treated as antirust that there is no problem to be used in the food-processing machinery which may be required to be washed.



ETP-E

Single bolt tightening | Center ring | No axial direction displacement | Basic antirust | Stain less

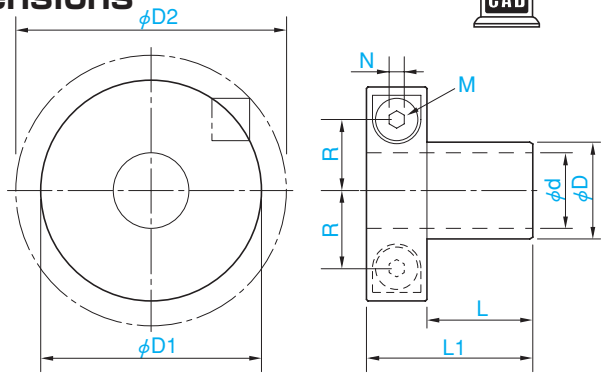
Specification

Model	Max. permissible torque [N·m]	Max. permissible thrust power [N]	Max. permissible radial load [N]	Shaft-side surface pressure [N/mm²]	Hub-side surface pressure [N/mm²]	Bolt tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]	Price
ETP-E-15	46	5100	500	90	70	5	0.043×10^{-3}	0.16	—
ETP-E-19	85	7300	1000	90	70	5	0.064×10^{-3}	0.20	—
ETP-E-20	110	9100	1000	90	70	5	0.070×10^{-3}	0.21	—
ETP-E-22	130	9600	1200	90	70	5	0.097×10^{-3}	0.25	—
ETP-E-24	190	13000	1400	90	70	5	0.112×10^{-3}	0.27	—
ETP-E-25	230	15000	1500	90	70	5	0.117×10^{-3}	0.27	—
ETP-E-28	280	16000	1800	90	70	5	0.170×10^{-3}	0.34	—
ETP-E-30	380	21000	2000	90	70	5	0.189×10^{-3}	0.35	—
ETP-E-32	440	22000	2200	90	70	5	0.249×10^{-3}	0.42	—
ETP-E-35	640	30000	2500	90	70	5	0.325×10^{-3}	0.48	—
ETP-E-38	890	38000	2800	90	70	21	0.761×10^{-3}	0.84	—
ETP-E-40	1100	45000	3000	90	70	21	0.844×10^{-3}	0.88	—
ETP-E-42	1100	43000	3200	90	70	21	0.971×10^{-3}	0.96	—
ETP-E-45	1400	51000	3500	90	70	21	1.170×10^{-3}	1.05	—
ETP-E-48	1700	57000	4000	90	70	21	1.458×10^{-3}	1.21	—
ETP-E-50	1900	63000	4500	90	70	21	1.524×10^{-3}	1.20	—
ETP-E-55	2400	71000	5000	90	70	21	2.182×10^{-3}	1.50	—
ETP-E-60	3300	90000	5300	90	70	21	3.167×10^{-3}	1.85	—
ETP-E-70	5600	130000	6400	90	70	39	7.125×10^{-3}	3.04	—
ETP-E-80	8700	180000	7500	90	70	39	10.350×10^{-3}	3.75	—
ETP-E-90	12000	230000	8600	90	70	39	15.2×10^{-3}	4.80	—
ETP-E-100	17000	280000	9700	90	70	39	21.9×10^{-3}	5.90	—

* The ETP-E-55, 60, 70, 80, 90, 100 are order products.
* The maximum permissible torque is the value when the thrust power is zero, and the maximum permissible thrust power is the value when the torque is zero.
* The maximum permissible torque, the maximum permissible thrust power, the shaft-side surface pressure and the hub-side surface pressure are the values when the temperature is 20℃.

Dimensions

CAD



Ordering Information

ETP - E - □

Size

Unit [mm]

Model	d	D	D1	D2	L	L1	R	N	M	CAD file No.
ETP-E-15	15	18	46	48.9	25	39	15.1	5	M10	ETP-E01
ETP-E-19	19	23	50.5	53	28	42	17.4	5	M10	ETP-E02
ETP-E-20	20	24	51.5	54.1	30	44	18	5	M10	ETP-E03
ETP-E-22	22	27	55.5	60.5	32	46	19.3	5	M10	ETP-E04
ETP-E-24	24	29	57.5	62.3	33	47	20.3	5	M10	ETP-E05
ETP-E-25	25	30	58	62.9	35	49	20.8	5	M10	ETP-E06
ETP-E-28	28	34	63	69.6	38	52	22.6	5	M10	ETP-E07
ETP-E-30	30	36	64.5	71	40	54	23.6	5	M10	ETP-E08
ETP-E-32	32	39	68.5	77.7	42	56	24.8	5	M10	ETP-E09
ETP-E-35	35	42	73	85.1	45	59	26.4	5	M10	ETP-E10
ETP-E-38	38	46	84.5	89.5	52	72	31	8	M16	ETP-E11
ETP-E-40	40	48	86.5	91.2	55	75	32	8	M16	ETP-E12
ETP-E-42	42	51	89	93.5	56	76	33.2	8	M16	ETP-E13
ETP-E-45	45	54	93	100.3	58	78	34.8	8	M16	ETP-E14
ETP-E-48	48	59	97	103.8	59	79	36.8	8	M16	ETP-E15
ETP-E-50	50	60	98.5	105.1	60	80	37.5	8	M16	ETP-E16
ETP-E-55	55	67	106	115.9	65	85	40.5	8	M16	ETP-E17
ETP-E-60	60	73	115.5	132.7	70	90	43.3	8	M16	ETP-E18
ETP-E-70	70	85	135.5	153.9	85	109	50.8	10	M20	ETP-E19
ETP-E-80	80	97	145.5	162.6	95	119	56.3	10	M20	ETP-E20
ETP-E-90	90	109	155.5	171.7	105	129	61.8	10	2-M20	ETP-E21
ETP-E-100	100	121	166	181	115	139	67.3	10	2-M20	ETP-E22

* φD2 Dimension is the dimension before tightening ETP-EXPRESS.
* ETP-E-90 and 100 have two locations for pressure screw.

ETP-E-C

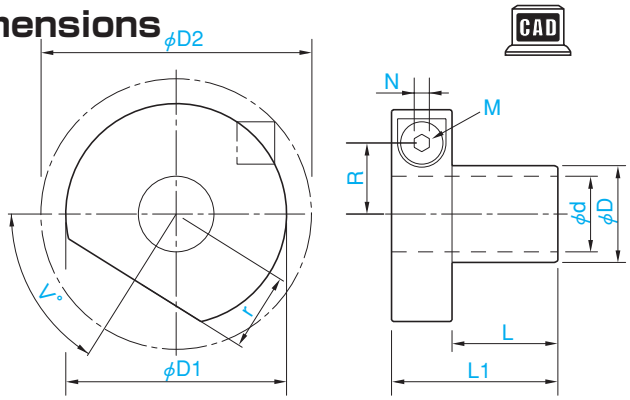
Single bolt tightening | Center ring | No axial direction displace-ment | Basic antirust | Stain less

Specification

Model	Max. permissible torque [N·m]	Max. permissible thrust power [N]	Max. permissible radial load [N]	Shaft-side surface pressure [N/mm²]	Hub-side surface pressure [N/mm²]	Bolt tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]	Price
ETP-E-15-C	34	3800	500	90	70	5	0.043×10^{-3}	0.16	—
ETP-E-20-C	82	6800	1000	90	70	5	0.070×10^{-3}	0.21	—
ETP-E-25-C	172	11000	1500	90	70	5	0.117×10^{-3}	0.27	—
ETP-E-30-C	285	15000	2000	90	70	5	0.189×10^{-3}	0.35	—
ETP-E-40-C	825	33000	3000	90	70	21	0.844×10^{-3}	0.88	—
ETP-E-50-C	1425	47000	4500	90	70	21	1.524×10^{-3}	1.20	—

* The maximum permissible torque is the value when the thrust power is zero, and the maximum permissible thrust power is the value when the torque is zero.
* The maximum permissible torque, the maximum permissible thrust power, the shaft-side surface pressure and the hub-side surface pressure are the values when the temperature is 20℃.

Dimensions



Ordering Information

ETP - E - □ - C

Size

Type (C: Basic antirust specification)

Unit [mm]

Model	d	D	D1	D2	L	L1	R	N	M	r	V [°]	CAD file No.
ETP-E-15-C	15	18	46	48.9	25	39	15.1	5	M10	19.9	53	ETP-ER01
ETP-E-20-C	20	24	51.5	54.1	30	44	18	5	M10	22.6	56	ETP-ER02
ETP-E-25-C	25	30	58	62.9	35	49	20.8	5	M10	25.8	58	ETP-ER03
ETP-E-30-C	30	36	64.5	71	40	54	23.6	5	M10	29.1	59	ETP-ER04
ETP-E-40-C	40	48	86.5	91.2	55	75	32	8	M16	37.7	59	ETP-ER06
ETP-E-50-C	50	60	98.5	105.1	60	80	37.5	8	M16	43.1	60	ETP-ER08

* φD2 Dimension is the dimension before tightening ETP-EXPRESS.

ETP-E-R

Single bolt tightening | Center ring | No axial direction displace-ment | Basic antirust | Stain less

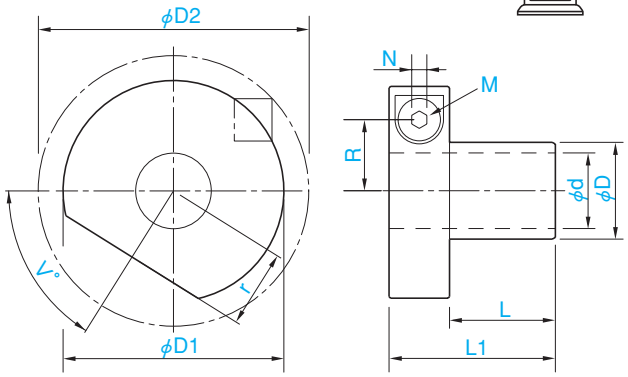
Specification

Model	Max. permissible torque [N·m]	Max. permissible thrust power [N]	Max. permissible radial load [N]	Shaft-side surface pressure [N/mm²]	Hub-side surface pressure [N/mm²]	Bolt tightening torque [N·m]	Moment of inertia [kg·m²]	Mass [kg]	Price
ETP-E-15-R	46	5100	500	90	70	5	0.043×10^{-3}	0.16	—
ETP-E-20-R	110	9100	1000	90	70	5	0.070×10^{-3}	0.21	—
ETP-E-25-R	230	15000	1500	90	70	5	0.117×10^{-3}	0.27	—
ETP-E-30-R	380	21000	2000	90	70	5	0.189×10^{-3}	0.35	—
ETP-E-35-R	640	30000	2500	90	70	5	0.325×10^{-3}	0.48	—
ETP-E-40-R	1100	45000	3000	90	70	21	0.844×10^{-3}	0.88	—
ETP-E-45-R	1400	51000	3500	90	70	21	1.170×10^{-3}	1.05	—
ETP-E-50-R	1900	63000	4500	90	70	21	1.524×10^{-3}	1.20	—
ETP-E-60-R	3300	90000	5300	90	70	21	3.167×10^{-3}	1.85	—

* The ETP-E-60-R is order product.
* The maximum permissible torque is the value when the thrust power is zero, and the maximum permissible thrust power is the value when the torque is zero.
* The maximum permissible torque, the maximum permissible thrust power, the shaft-side surface pressure and the hub-side surface pressure are the values when the temperature is 20℃.

Dimensions

CAD



Ordering Information

ETP - E - □ - R

Size

Type (R: Stainless steel specification)

Unit [mm]

Model	d	D	D1	D2	L	L1	R	N	M	r	V [°]	CAD file No.
ETP-E-15-R	15	18	46	48.9	25	39	15.1	5	M10	19.9	53	ETP-ER01
ETP-E-20-R	20	24	51.5	54.1	30	44	18	5	M10	22.6	56	ETP-ER02
ETP-E-25-R	25	30	58	62.9	35	49	20.8	5	M10	25.8	58	ETP-ER03
ETP-E-30-R	30	36	64.5	71	40	54	23.6	5	M10	29.1	59	ETP-ER04
ETP-E-35-R	35	42	73	85.1	45	59	26.4	5	M10	33.7	58	ETP-ER05
ETP-E-40-R	40	48	86.5	91.2	55	75	32	8	M16	37.7	59	ETP-ER06
ETP-E-45-R	45	54	93	100.3	58	78	34.8	8	M16	41.1	59	ETP-ER07
ETP-E-50-R	50	60	98.5	105.1	60	80	37.5	8	M16	43.7	60	ETP-ER08
ETP-E-60-R	60	73	115.5	132.7	70	90	43.3	8	M16	53.3	59	ETP-ER09

* ϕD2 Dimension is the dimension before tightening ETP-EXPRESS.

Selection

Selection Procedure

❶ The torque Ta is determined by the shaft diameter to be used, however, evaluate the torque Ta basically from the output of the power driver P and the revolution speed of the fastening element n.

$$Ta\ [N\cdot m] = \frac{9550 \times P[kW]}{n[min^{-1}]}$$

Ta: Torque added to the fastening element [N·m]
P: Output of the power driver [kW]
n: Revolution speed of the fastening element [min^{-1}]
Fa: Thrust power added to the fastening element [N]

Evaluate the thrust power Fa.

❷ Determine the service factor K1 from the loading character, and evaluate the corrective torque Td and the corrective thrust power Fd that are added to the fastening element.

$Td = Ta \times K1$
$Fd = Fa \times K1$

Td: Corrective torque added to the fastening element [N·m]
Fd: Corrective thrust power added to the fastening element [N]
K1: Service factor by loading character

❸ Perform the corrections by loading type.

(1) In the case of torque only
Compare the maximum permissible torque T of the fastening element and the evaluated corrective torque Td, by the shaft diameter to be used.

$T \geqq Td$ T: Max. permissible torque of fastening element [N·m]

(2) In the case of thrust power only
Compare the maximum permissible thrust power F of the fastening element and the evaluated corrective thrust power Fd, by the shaft diameter to be used.

$F \geqq Fd$ F: Max. permissible thrust power of fastening element [N]

(3) In case that both torque and thrust power are applied.
Evaluate the combined load Mr to compare with the maximum permissible torque T.

$$Mr = \sqrt{Td^2 + (Fd \times \frac{d}{2})^2}$$

$T \geqq Mr$

Mr: Combined load added to the fastening element [N·m]
d: shaft diameter [N]

❹ Evaluate the minimum outside diameter of the hub and the maximum inside diameter of the quill.

(1) Evaluate the minimum outside diameter of the hub by the material strength of the hub to be used.

$$DO \geqq D\sqrt{\frac{\delta_{0.2N} + CP_2}{\delta_{0.2N} - CP_2}}$$

C=1 B=L
C=0.8 L<B<2L
C=0.6 B≧2L

DO : Min. hub outside dia. [mm]
D : Hub inside dia. [mm]
P_2 : Hub side surface pressure [N/mm^2]
$\delta_{0.2N}$: Yield point stress of the hub material [N/mm^2]
B: Hub length [mm]
L: Effective contact length [mm]
C: Coefficient

If yield point stress of the hub material is high, the ratio of the min. hub outside dia. and the hub inside dia. must be 1.3 times bigger or more, concerning the deformation of hub.

(2) Evaluate the maximum inside diameter of the quill by the material strength of the quill to be used.

$$di \leqq d\sqrt{\frac{\delta_{0.2N} - 2P_1C}{\delta_{0.2N}}}$$

C=0.6 when singular number is used
C=0.8 When plural number is used

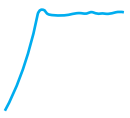
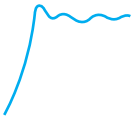
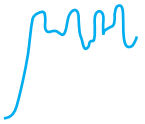
di: Max. inside dia. of the quill [mm]
$\delta_{0.2N}$: Yield point stress of the quill material [N/mm^2]
d : Shaft dia. [mm]
P_1: Shaft side surface pressure [N/mm^2]
C: Coefficient

Since the shaft-side surface pressure and hub-side surface pressure is changed by the environmental temperature, temperature conditioning is necessary. Also, all the surface pressure values are based on the temperature of 20℃, therefore, if the environmental temperature is over 20℃, evaluate the minimum outside diameter of the hub and the maximum inside diameter of the quill from the formula below.

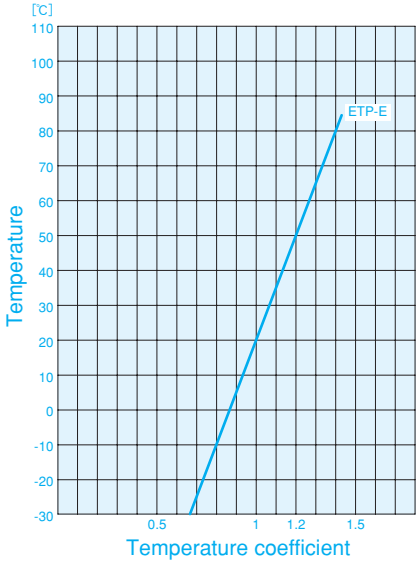
$P_1 \cdot P_2$=Surface pressure when the temperature is 20℃× Temperature coefficient K2
Operating temperature limit is: -30℃~ +85℃

Service Factor

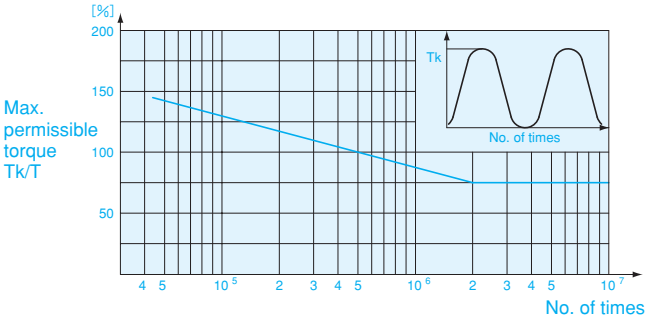
Use factor of the loading character: K1

Loading character			
Constant	Variation: small	Variation: medium	Variation: large
			
1.0	1.25	1.75	2.25

Coefficient by the applied environmental temperature:K2



Fatigue of periodical fluctuation torque



Above chart shows the fatigue when applying the static periodical fluctuation torque Tk to the ETP-EXPRESS. The vertical line indicates the percentage of the maximum permissible torque, and the horizontal line indicates the number of times of static periodical fluctuation torque.

If the maximum permissible torque is periodically applied to the ETP-EXPRESS, its fatigue becomes 500,000 times. And if 75% of the maximum permissible torque is periodically applied, the above chart indicates that its fatigue becomes semipermanent.

Points to be checked in design

Mating shaft tolerance, mating hub tolerance and surface roughness

Model	Mating shaft tolerance	Mating hub tolerance	Surface roughness
ETP-E-15	h 7	H7	25S (Ave. roughness of center line 6.3a) or less
ETP-E-20.25.30.35.40.45.50.60.70.80.90.100	h8		
ETP-E-19.22.24.28.32.38.42.48.55	k6～h7		
ETP-E-15-R	h7		
ETP-E-R (other than above)	h8		
ETP-E-15.20.25.30.40.50-C	h8		

Operating temperature limit

Model	Operating temp. limit [℃]
ETP-E	−30～+85
ETP-E-C	
ETP-E-R	

The No. of mounting and dismounting

Model	Mounting/dismounting [times]
ETP-E	1000
ETP-E-C	200
ETP-E-R	

Concentricity and balance

Model	Cencentricity [mm]	Balance [gmm/kg]
ETP-E	0.02	75
ETP-E-C		
ETP-E-R		

Torque • Thrust power coefficient

When torque and thrust power are simultaneously applied to the ETP-EXPRESS, their maximum permissible values are both reduced. The value can be evaluated by the coefficient in the chart below.

Calculation Example: When the ETP-E-30 is used at 20℃ in temperature.

The maximum permissible torque T and thrust power F at 20℃ are; T= 380 [N·m] , F=25000 [N]

The max. permissible torque Tmax when the thrust power is maximally (Fmax=15000 [N]) applied can be evaluated by the formula below.

Thrust factor Kf
= Fmax/F×Temperature coefficient K2
=15000/25000×1.0=0.6

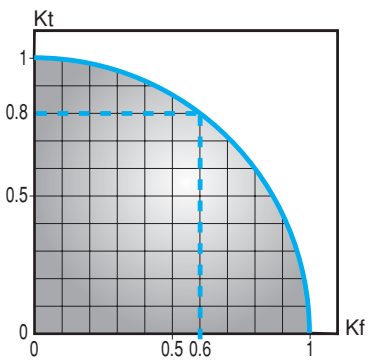
The torque coefficient Kt when Kf = 0.6 is approximately 0.8 by the chart below.

It is, therefore, the maximum permissible torque Tmax in this case is;

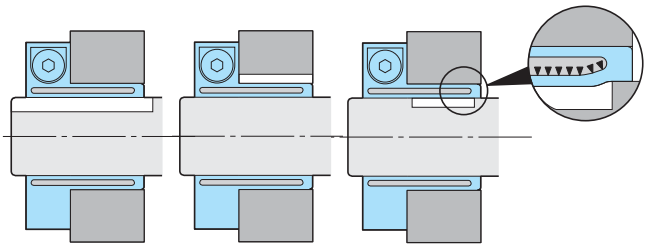
Tmax=T×K2×Kt=380×1.0×0.8=304 [N·m]

Relation between Kt and Kf can be evaluated by the formula below.

$$\sqrt{(Kt)^2+(Kf)^2=1}$$



Keyway shape that may become unable to disconnect by the sleeve deformation

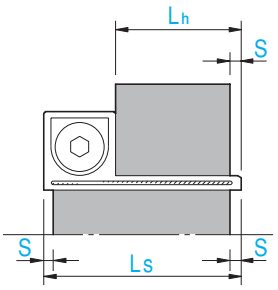


In case there is a keyway in the shaft and hub as illustrated above, ETP-EXPRESS cannot be used. However, ETP-EXPRESS can be used if the keyway is completely filled, and formed with epoxy putty (Recommendation: Bond-all AB).

Tolerance of the edge

The performance of the ETP-EXPRESS is defined when the shaft and hub act over the entire length for the shaft-side basic dimension Ls and the hub-side basic dimension Ln. Therefore, set out the shaft and hub to act over the entire length for the basic dimension. If the length of shaft • hub is limited in design, set the size in order that it becomes under the S sizes indicated in the chart below. In case the size is over the S size, the stress becomes concentrated at the edge of sleeve, which causes deformation of the sleeve. In that case, the ETP-EXPRESS becomes unable to disconnect.

■ ETP-E
ETP-E-C
ETP-E-R



ETP-E、ETP-E-C、ETP-E-R size	S [mm]
15	3
19	4
20	4
22	5
24	5
25	5
28	5
30	5
32	6
35	6
38	7
40	7
42	7
45	7
48	7
50	7
55	8
60	8
70	9
80	9
90	10
100	10

Mounting and Dismounting

Mounting the ETP-EXPRESS

1 Cleaning the shaft and hub

Wipe off the rust, dust and oil content sit on the surface of the shaft and hub with cloth or an alcohols solvent. If any grease is attached, remove the grease completely. Meanwhile, the oil content attached on the surface of the ETP-EXPRESS should be also removed.

Notice

Do not use the molybdenum-containing oil. It effects a change in the coefficient of friction.

2 Mounting on the shaft and hub

Place the ETP-EXPRESS by the hub and mount in the shaft. If a correct positioning for the shaft and hub is necessary, adjust their positions before fastening the pressure screw.

Notice

Do not fasten the pressure screw until the ETP-EXPRESS is completely set to the shaft and hub.

3 Fastening the pressure screw

By using a torque wrench, fasten the pressure screw with the specified torque.

Dismounting the ETP-EXPRESS

1 Confirming safe conditions

Confirm whether any torque or thrust power does not act on the ETP-EXPRESS before to start dismounting. Also, make sure if there is any danger of fall due to the empty weight of the shaft and hub. There is no self-locking mechanism for the ETP-EXPRESS. By loosening the pressure screw, its fastening power is quickly released.

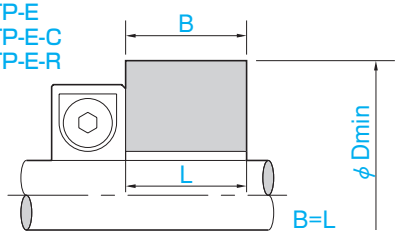
2 Dismounting

Loosen the pressure screw until the fastening power is released. The pressure screw should be just slackened, not to be removed.

A list of the minimum outside diameter for a hub

A hub may be deformed if the stress value applied to it is high. Refer to the list below to find the appropriate outside diameter.

■ ETP-E
ETP-E-C
ETP-E-R



ϕ Dmin Unit [mm]

ETP-E ETP-E-C ETP-E-R Size	Hub side surface pressure [N/mm²]	Yield point stress of the material $\delta_{0.2}$ [N/mm²]									
		150	180	210	230	250	280	300	350	400	450
		FC250	FC300 SS330 SC360 FCMB310	FC350 SS400 SC410 FCMB360 SUS304	SC450 S15C SF440	FCD400 SS490 SC480 S20C SF490	S30C SF540 SUS201	FCD450 S35C SF590	FCD500 S45C SUS410	FCD600 S55C SUS403	FCD700 SUS420
15	70	30	28	26	25	24	24	24	24	24	24
19	70	39	35	33	32	31	30	30	30	30	30
20	70	40	37	34	33	32	32	32	32	32	32
22	70	45	41	39	37	36	36	36	36	36	36
24	70	49	44	42	40	39	38	38	38	38	38
25	70	50	46	43	42	40	39	39	39	39	39
28	70	57	52	49	47	46	45	45	45	45	45
30	70	60	55	51	50	48	47	47	47	47	47
32	70	65	59	56	54	52	51	51	51	51	51
35	70	70	64	60	58	56	55	55	55	55	55
38	70	77	70	66	63	62	60	60	60	60	60
40	70	80	73	68	66	64	63	63	63	63	63
42	70	85	77	73	70	68	67	67	67	67	67
45	70	90	82	77	74	72	71	71	71	71	71
48	70	98	89	84	81	79	77	77	77	77	77
50	70	100	91	85	83	80	78	78	78	78	78
55	70	112	102	95	92	90	88	88	88	88	88
60	70	122	111	104	100	98	95	95	95	95	95
70	70	141	129	121	117	114	111	111	111	111	111
80	70	161	147	138	133	130	127	127	127	127	127
90	70	181	165	155	150	146	141	142	142	142	142
100	70	201	183	172	166	162	157	158	158	158	158

* The hub-side surface pressure shown in the list is when the applied environmental temperature is 20℃. The surface pressure is changed by increased temperature.
* If the applied environmental temperature is over 20℃, evaluate the minimum outside diameter by the selection procedure on page 13.
* The minimum outside diameter of the hub is evaluated by C=1 of the selection procedure on page 13.
* The above SUS values indicate their bearing force [N/mm²] after thermal refining (quenched and tempered).