PRECISION SPINDLE UNIT

SIGMA SERIES

TNC
Techno Nakanishi Co., Ltd.

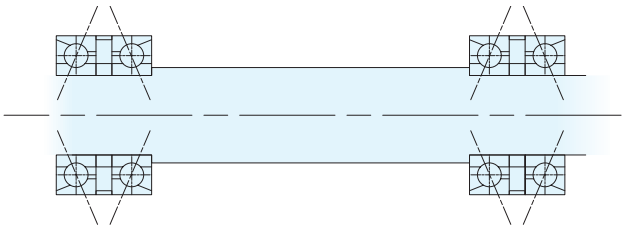
Precision Spindle Unit SIGMA Series Product Features

● Precision Spindle Unit SIGMA Series has following product line-up, according to the application.
- Milling Spindle Unit of Collet Chuck type
- Grinding Spindle Unit of Wheel Flange type
- Internal Grinding Spindle Unit of Exchangeable Shaft type
- Internal Grinding Spindle Unit of Collet Chuck type
- Work Spindle Unit for Turning of Scroll Chuck type

With the basic specification, Japanese precision angular bearing is used for the Spindle Unit.
In case that higher speed is needed, please contact us for consult.

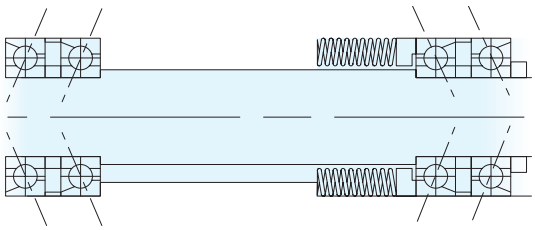
● Stainless steel material is basically used for anti-rusting. For spindle shaft, hardened SUS-420J2 is used and finished by grinding. For the housing and the components, SUS-416 is used as a base material and finished by grinding.

For Cutting Spindle Unit, the ball bearings are assembled with 2 rows DB (Double Back-to-Back) combination. This method is appropriate for obtaining high speed with thrust or axial load, and it is suitable for Drilling or Milling.



< Ball Bearings of Cutting Spindle Unit >

For Grinding Spindle Unit, the ball bearings are assembled with 2 rows DT (Double Tandem) combination and also with constant preload method by the appropriate spring pressurization. This method is appropriate for obtaining stable precise rotation accuracy, and suitable for grinding to obtain high-accuracy roundness and surface roughness.



< Ball Bearings of Grinding Spindle Unit >

● Balance Adjustment of Spindle

In machine work, vibration of spindle causes various negative effects on the work, such as lowering the operational precision or worsening surface roughness. In an effort of minimizing spindle vibration, we measure the spindle balance, and adjust it ; so that the vibration is minimized.

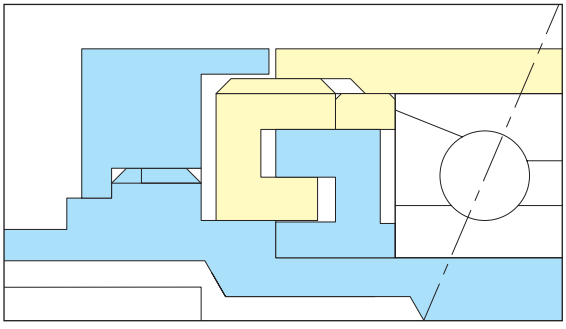
< Balancing Machine >

● Lubricating Grease

For lubrication, the grease made in Germany is selected and implemented after durability examination. By implementing this grease, the product's life has been doubled and the speed has been increase by about 10%. (in-house comparison).

● Protection Measure against Dust

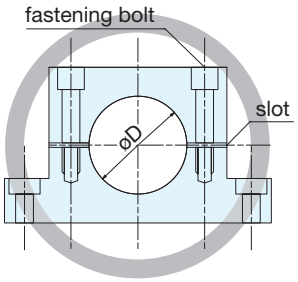
In order to increase the spindle unit's durability, the labyrinth structure mechanical seals are implemented in head and tail of the spindle unit, so that it prevents contamination by the foreign substance, such as cutting chips, grinding powder or coolant. This seal structure is contactless with a tiny opening between the rotating part and the un-rotating part. While the spindle is spinning, the extremely low air pressure field occurs due to centrifugal force and it prevents contamination by the foreign substance by creating the air pressure difference.
Besides, applying coolant or air blow onto the spindle unit, when the spindle is not rotated, may cause early failure.
When not in rotation, there is no air pressure difference, and therefore, it is easy for the foreign substance to get into the mechanical seal.



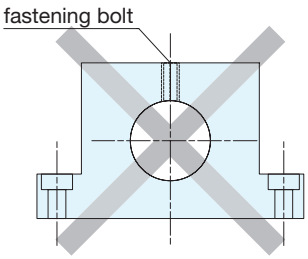
< Enlarged picture of the protection against dust mechanism >

● Attentions of Installation

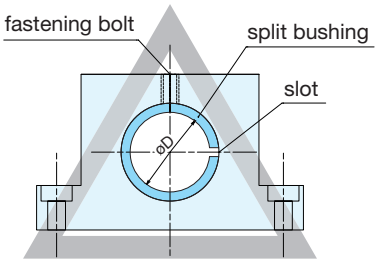
Our recommended method of installation is to hold the outside periphery of the spindle unit by the spindle holder with slots (see Fig.1). When creating this kind of spindle holders, insert shims into slots, tighten the bolts and complete the spindle holding section within 5 micron of roundness and cylindricity. In order to hold the spindle unit, you should insert the spindle unit without shims, and tighten the bolt. In addition, the position of installing by the spindle holder should not be close to the ball bearings. In case of holding near the ball bearings, even very little torque of tightening the bolt can deform the ball bearings. Deform of the ball bearing could cause various problems, such as trouble of rotation, generating noises and early failure. If you need to hold it near the ball bearings, with your own judgment and responsibility, tighten the bolts with minimum torque and make sure that the influence of ball bearing deform does not cause any problem for your usage.
Do not implement like Fig.2, where you thread the bolt hole through the spindle holder and tighten the outer periphery of the spindle unit by the bolt. In case that you cannot avoid tightening the spindle unit by the bolt from the side, like Fig.3, tightening by the bolt through the split bushing. In this case, NEVER tighten by the bolt close to the ball bearings.
TNC does not recommend this method; therefore, if you choose this method, please implement with your own judgment and responsibility.
In case of high speed operation, the centrifugal force becomes greater ; therefore, it would be necessary to tighten the belt with high tension. However, if the tension is unnecessarily strong, a high load is unnecessarily applied to the ball bearing close to the belt side.



(Fig.1)



(Fig.2)



(Fig.3)

● Warm-Up

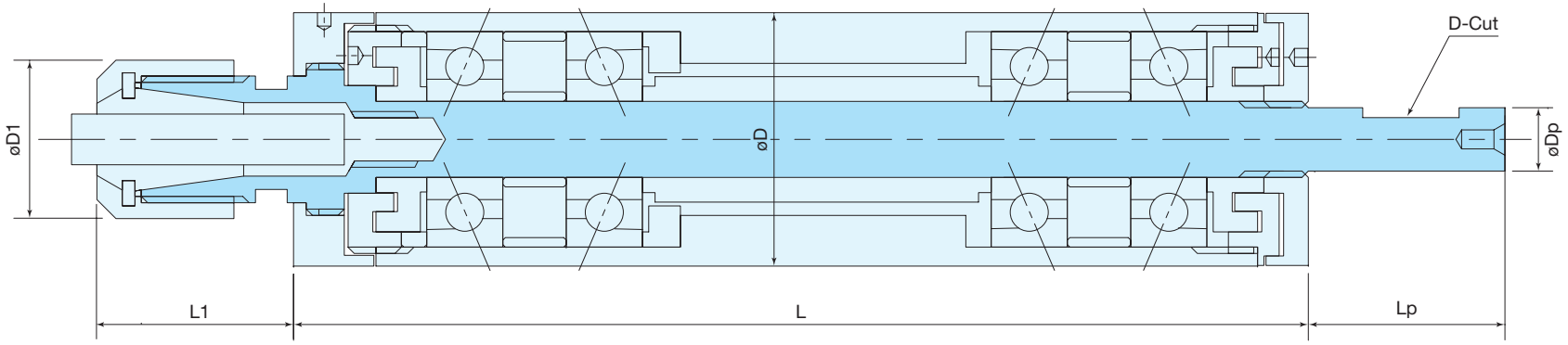
When the spindle unit is used for the first time or when the spindle unit has not been used for long time, it is possible that the grease in the ball bearing is not balanced. Under this condition, if the spindle speed is raised to maximum speed, it can heat the bearing rapidly due to resistance from the grease, and it could damage the ball bearing. In order to avoid this kind of problem, increase the spindle speed little by little with checking the surface temperature of the spindle unit, and gradually increase the spindle speed up to desired speed.

● Special Order

Our company will meet customized order in need of the customers from the catalogue specification of spindle units, such as changing the length or the diameter of the spindle unit or changing the shape of the spindle shaft. Also it is possible for us to design and make the spindle unit, according to the customer's requirement. In case that there is no spindle unit matching your required specification in this catalog, please feel free to contact us. We will examine whether we can match your request.

SCC Series, Ultra-Slim Milling Spindle Unit of Collet Chuck type

<Product Feature> The Spindle Unit specially designed for assembled with small-scale special purpose machine.
This Spindle Unit is used for holding the cutting tools (such as drill or end-mill) or mounted wheel, and used for cutting or grinding.
High-precision angular bearings are used in 2 rows DB (Double Back-to-Back) combination; therefore, even though small diameter spindle unit, this can perform under thrust or axial loading.
REGO Collet Chuck is used. Collet Chuck is not included in the package, so please order separately.
Please specify the product number of Collet Chuck as the following example.
(Example) ER8 type Collet Chuck, clamping diameter ø3 mm → ER8-3.0

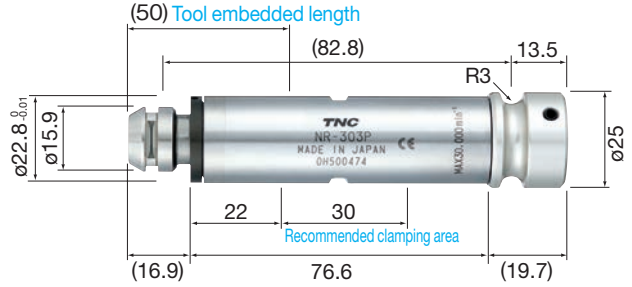


Standard Accessories: Chuck Nut and Spanner

Product Number	Maximum speed min^{-1} *1	Static run-out accuracy of chuck mounting tapered surface (mm)	øD	L	øD1	L1	øDp	Lp	Collet Chuck made by REGO-FIX		Bearing
									Product Number	Holding diameter	
SCC020080	45,000	0.001	20	80	12	16.3	5	15	ER 8	0.5-5.0	706C
SCC023080	40,000	0.001	23	80	12	16.3	6	18	ER 8	0.5-5.0	707C
SCC025100	32,500	0.001	25	100	19	19	8	24	ER11	0.5-7.0	7900C
SCC030100	29,000	0.001	30	100	19	19	10	25	ER11	0.5-7.0	7901C
SCC030120			30	120							

*1 Maximum speed will be influenced by the external factors, such as the tools or the pulley used or the tension of belt.

NP-303P Pulley Spindle Unit



Standard Accessories: Chuck Nut and Spanner
(Collet Chuck is not included in the package.)

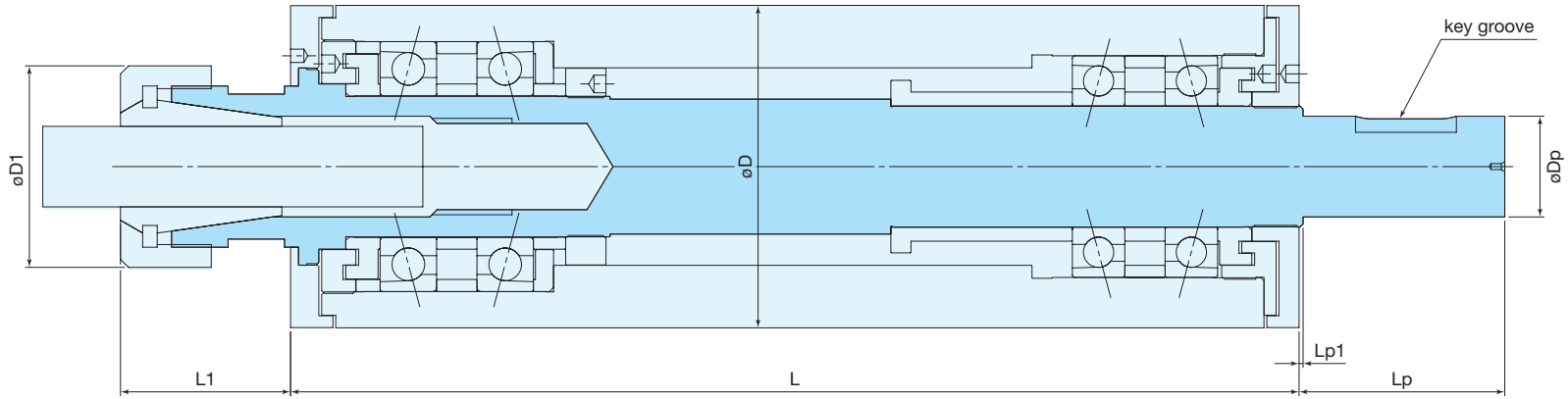
Product Number	Maximum speed min^{-1} *1	Static run-out accuracy of chuck mounting tapered surface (mm)	Collet Chuck made by NAKANISHI INC.	
			Product Number	Holding diameter
NR-303P	30,000	0.002	CHK	0.5-6.0

*1 Maximum speed will be influenced by the external factors, such as the tools or the pulley used or the tension of belt.

<Optional accessories>
- Metal Saw Shaft (KCH-03 by NAKANISHI INC.): for Inner diameter ø6.0 x outer diameter ø30 mm
- Grinding stone Shaft (AGM-03 by NAKANISHI INC.): for Inner diameter ø5.0 mm
- Grinding Wheel Flange (EGF-19 by NAKANISHI INC.): for grinding wheel of ø19.05 x ø40 x 7 mm

SCC Series, Milling Spindle Unit of Collet Chuck type

<Product Feature> The Spindle Unit is used for holding the cutting tool (such as drill or end-mill) with Collet Chuck.
High-precision angular bearings are used in 2 rows DB (Double Back-to-Back) combination, and this spindle unit is suitable for drilling or end-milling under thrust or axial loading.
REGO-FIX Collet Chuck is used. Collet Chuck is not included in the package, so please order separately.
Please specify the product number of Collet Chuck as the following example.
(Example) ER11 type Collet Chuck, clamping diameter ø3 mm → ER11-3.0



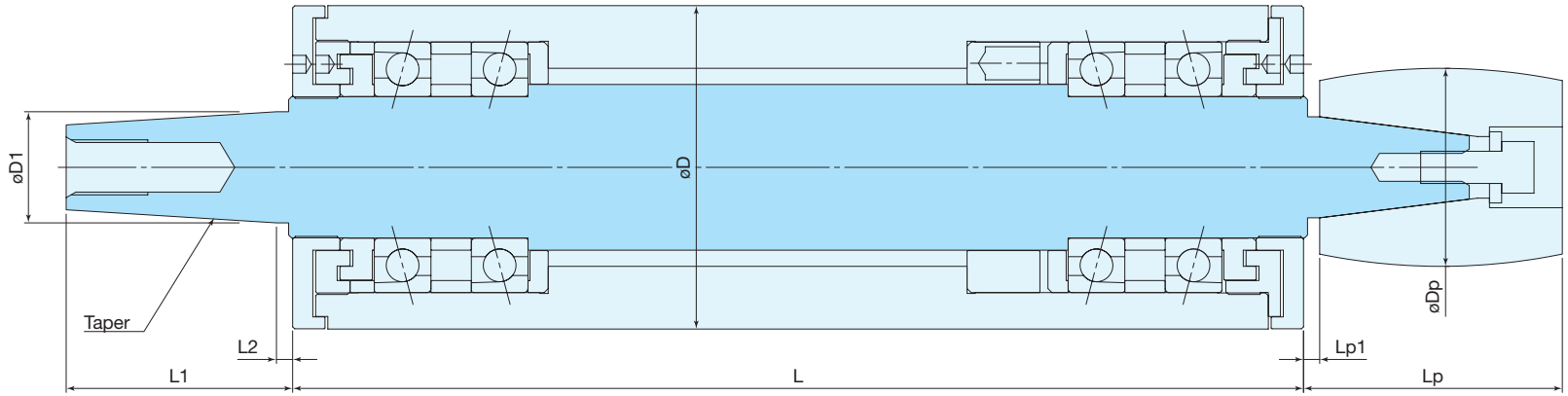
Standard Accessories: Chuck Nut and Spanner

Product Number	Maximum speed min^{-1} ∗1	Static run-out accuracy of chuck mounting tapered surface (mm)	øD	L	øD1	L1	øDp	Lp	Lp1	Collet Chuck made by REGO-FIX		Bearing	
										Product Number	Holding diameter	Chuck Side	Pulley Side
SCC040120	29,500	0.001	40	120	28	28.3	12	25	1	ER16	0.5-10	7903C	7902C
SCC040160			40	160									
SCC050160	20,500	0.001	50	160	34	30.7	15	31	1	ER20	1.0-13	7905C	7904C
SCC050200			50	200									
SCC060160	18,000	0.001	60	160	42	31.7	16	33	1	ER25	1.0-16	7906C	7905C
SCC060200			60	200									
SCC070200	15,500	0.001	70	200	42	31.7	20	41	1	ER25	1.0-16	7907C	7906C
SCC070250			70	250									
SCC080200	13,000	0.001	80	200	50	44.7	25	51	1	ER32	2.0-20	7008C	7007C
SCC080250			80	250									
SCC090200	11,500	0.001	90	200	63	51.7	32	65	1	ER40	2.0-20	7009C	7008C
SCC090250			90	250									
SCC100250	10,500	0.001	100	250	63	51.7	35	71	1	ER40	2.0-20	7010C	7009C
SCC110300	9,500	0.001	110	300	78	69.1	40	81	1	ER50	3.0-26	7011C	7010C
SCC120300	9,000	0.001	120	300	78	69.1	45	91	1	ER50	4.0-34	7012C	7011C

∗1 Maximum speed will be influenced by the external factors, such as the tools or the pulley used or the tension of belt.

SGS Series, Grinding Spindle Unit of Wheel Flange type

<Product Feature> This Spindle Unit is used for external grinding, surface grinding, and internal grinding for relatively large diameter.
High-precision angular bearings are used in 2 rows DT (Double Tandem) combination, and with the appropriate spring pressurization, this spindle unit enables the stable high speed operation.
Please adjust the motor speed and pulley size, in order to obtain the appropriate peripheral wheel speed.
For pulley shaft side, it is possible to make a straight shaft. In case that you require a straight shaft, please contact us for further information.

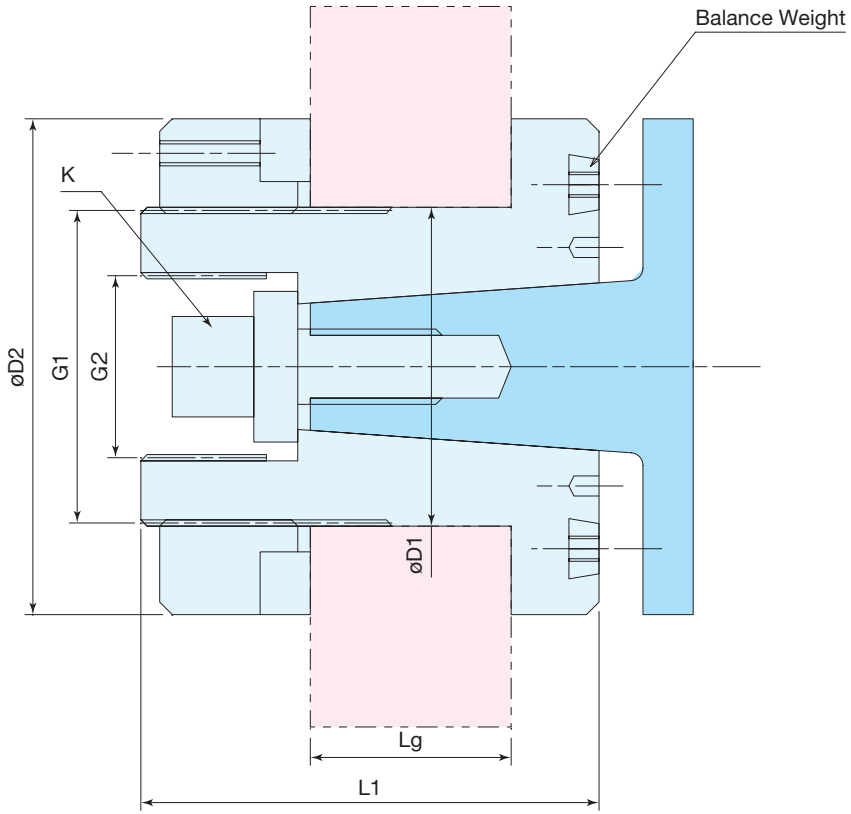


Standard Accessories: Pulley

Product Number	Maximum speed min^{-1} ✻3	Static run-out accuracy of flange mounting tapered surface (mm)	øD	L	øD1	L1	L2	Taper	øDp	Lp	Lp1	Grinding Stone Flange for Internal grinding	Grinding Stone Flange for Outer grinding Grinding Stone Flange for Surface grinding	Bearing
SGS050160	15,000	0.002	50	160	13.5	28	2	1/5	48	41	6	SGF050A	SGF050B	7905C
SGS050200			50	200										
SGS060160	13,000	0.002	60	160	15.5	33	2	1/8	54	51	6	SGF060A	SGF060B	7906C
SGS060200			60	200										
SGS070200	12,000	0.002	70	200	23.5	47	3	1/8	63	62	7	SGF070A	SGF070B	7006C
SGS070250			70	250										
SGS080200	10,500	0.003	80	200	27.5	55	3	1/8	72	87	7	SGF080A	SGF080B	7007C
SGS080250			80	250										
SGS090200	9,500	0.003	90	200	32	62	5	1/8	72	87	7	SGF090A	SGF090B	7008C
SGS090250			90	250										
SGS100250	8,500	0.003	100	250	37	65	8	1/5	80	113	8	SGF100A	SGF100B	7009C
SGS110300	7,500	0.003	110	300	47	67	10	1/4	80	113	8	SGF110A	SGF110B	7010C

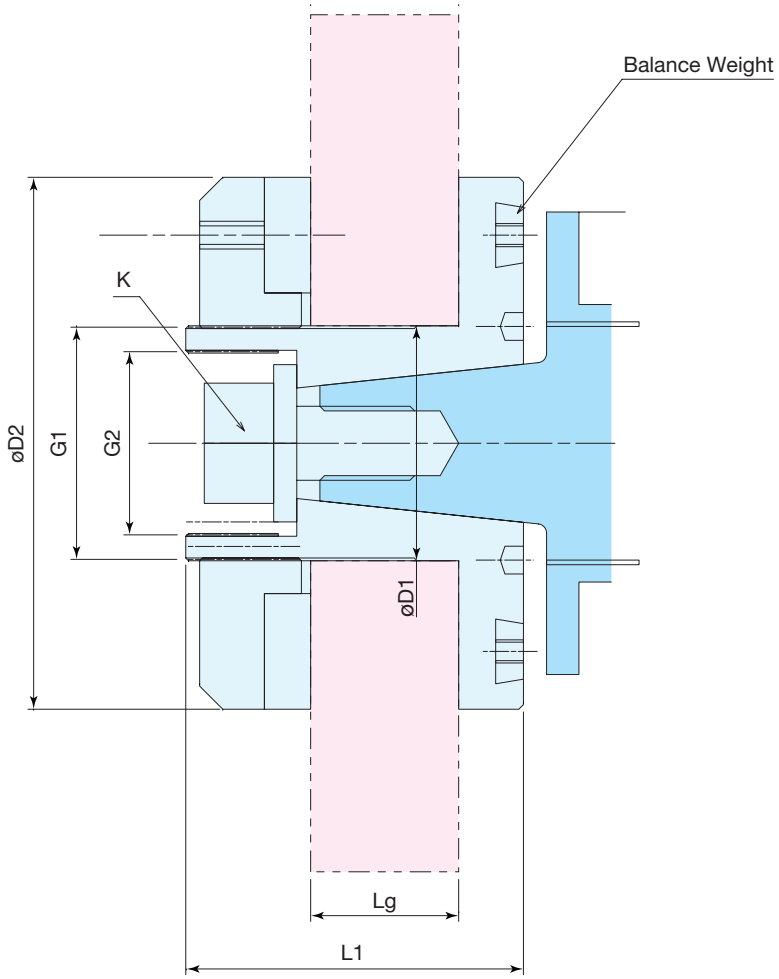
✻1 The standard rotation is left (counter-clockwise) seen from the pulley side. Right direction rotation product can also be made, so if you require this, please contact us for further information.
✻2 About the dimensions around the grinding stone, please refer to the page for the flanges.
✻3 Maximum speed will be influenced by the external factors, such as the grinding wheel or the tension of the belt used.

SGS Series Flange for Internal Grinding



Product Number	L1	Lg (MAX)	øD1	øD2	G1	G2	K
SGF050A	36	13	19.05	49	M18 x 1.5	M13 x 1	M5
SGF060A	47	19	31.75	59	M30 x 1.5	M20 x 1.5	M6
SGF070A	60	25	38.1	69	M38 x 1.5	M26 x 1.5	M10
SGF080A	73	32	50.8	79	M50 x 2.0	M30 x 1.5	M12
SGF090A	83	38	50.8	89	M50 x 2.0	M38 x 1.5	M12
SGF100A	84	38	50.8	98	M50 x 2.0	M38 x 1.5	M12
SGF110A	87	38	76.2	108	M75 x 2.0	M60 x 1.5	M12

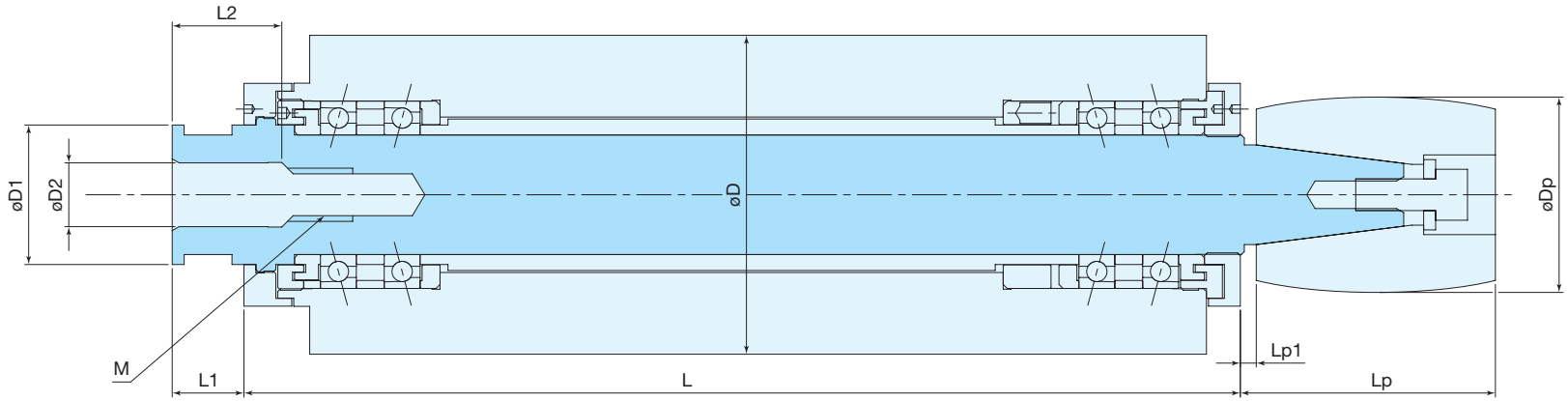
SGS Series Flange for External Grinding



Product Number	L1	Lg (MAX)	øD1	øD2	G1	G2	K
SGF050B	36	13	19.05	59	M18 x 1.5	M13 x 1	M5
SGF060B	47	19	31.75	68	M30 x 1.5	M20 x 1.5	M6
SGF070B	60	25	38.1	89	M38 x 1.5	M26 x 1.5	M10
SGF080B	73	32	50.8	115	M50 x 2.0	M40 x 1.5	M12
SGF090B	83	38	50.8	129	M50 x 2.0	M40 x 1.5	M12
SGF100B	84	38	50.8	139	M50 x 2.0	M40 x 1.5	M12
SGF110B	87	38	76.2	159	M75 x 2.0	M60 x 1.5	M12

SGE Series, Internal Grinding Spindle Unit of Exchangeable Shaft type

<Product Feature> This spindle unit is used for internal grinding, attaching the grinding wheel without shaft onto exchangeable quill shaft.
High-precision angular bearings are used in 2 rows DT (Double Tandem) combination, and with the appropriate spring pressurization, this spindle unit enables the stable high speed operation. For pulley shaft side, it is possible to make a straight shaft.
In case that you require a straight shaft, please contact us for further information.



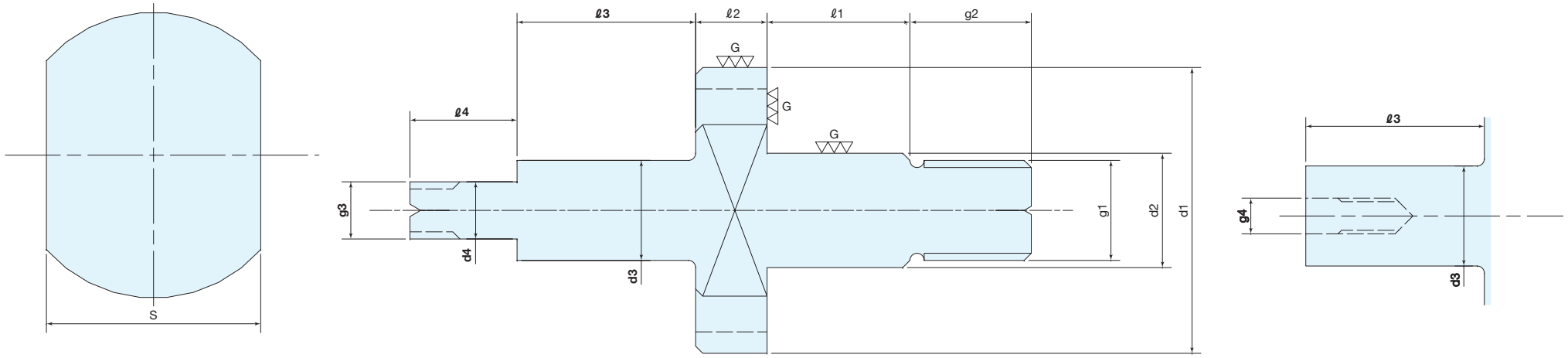
Standard Accessories: Pulley and Spanner

Product Number	Maximum speed min^{-1} ∗1	Static run-out accuracy of quill shaft mounting surface (mm)	øD	L	øD1	øD2	L1	L2	M	øDp	Lp	Lp1	Bearing
SGE040120	44,500	0.001	40	120	15	6	9	9	M5x0.8	20	27	3	7901C
SGE040160			40	160									
SGE050160	37,500	0.001	50	160	19	8	9.5	12	M6x1	25	33	3	7902C
SGE050200			50	200									
SGE060160	34,500	0.001	60	160	22	10	9.5	15	M8x1.25	32	39	4	7903C
SGE060200			60	200									
SGE070200	24,000	0.001	70	200	30	12	10	18	M10x1.5	40	49	4	7905C
SGE070250			70	250									
SGE080200	21,000	0.001	80	200	35	16	18	24	M12x1.75	45	60	5	7906C
SGE080250			80	250									
SGE090200	16,500	0.001	90	200	41	20	20	30	M16x2	60	85	5	7007C
SGE090250			90	250									
SGE100250	15,000	0.001	100	250	47	20	22	30	M16x2	60	85	5	7008C
SGE110300	13,500	0.001	110	300	53	25	24	37.5	M20x2.5	72	111	6	7009C

∗1 Maximum speed will be influenced by the external factors, such as the quill shaft or grinding wheel used or the tension of belt.

SGE Series Grinding Wheel Shaft (Quill Shaft) for SGE Spindle Unit

<Product Feature> The Grinding Wheel Shaft (Quill Shaft) for SGE Spindle Unit is to be made by the user, referring to the drawing below.
It is also possible for us to manufacture special Grinding Wheel Shaft upon your request.
In that case, please specify the dimensions of **d3, d4, ℓ3, ℓ4, g3** (or **d3, ℓ3, g4**) and contact us for further details.
The grinding shaft produced by us would be made of SKS, and it would be grinded after being hardened.



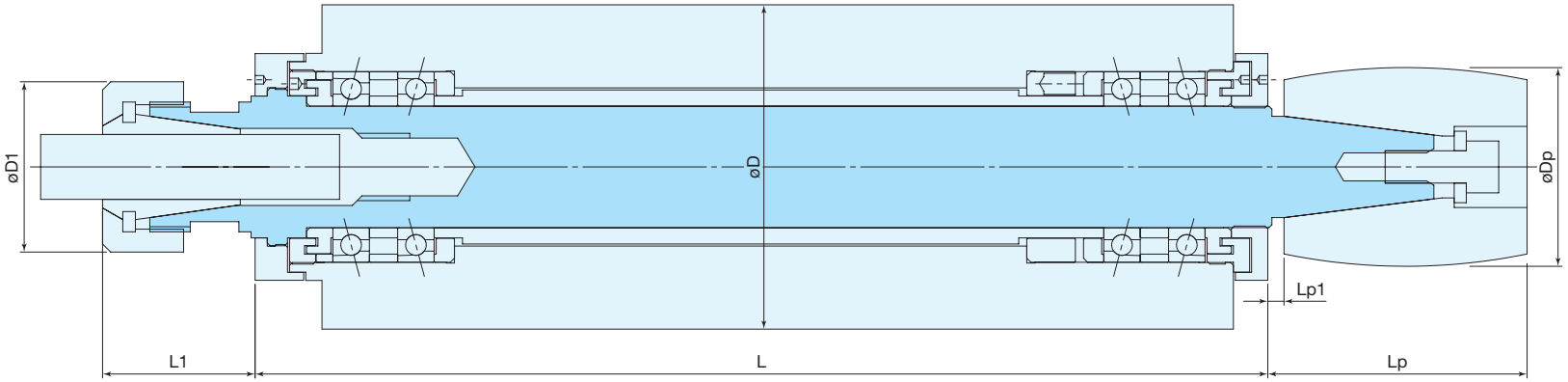
Suitable Spindle unit Product Number	d1	d2	g1	g2	ℓ1	ℓ2	S
SGE040□□□	15	6	M5 x 0.8	8	8	5	13
SGE050□□□	19	8	M6 x 1	10	10	5	14
SGE060□□□	21	10	M8 x 1.25	11	13	6	17
SGE070□□□	30	12	M10 x 1.5	14	15	7	24
SGE080□□□	35	16	M12 x 1.75	18	21	7	30
SGE090□□□	41	20	M16 x 2.0	18	27	8	36
SGE100□□□	47	20	M16 x 2.0	18	27	8	41
SGE110□□□	53	25	M20 x 2.5	20	33	9	46

Outer Diameter of main part d3	5	6	8	10	12	14	16	18	21	24	29
Maximum Length ℓ3	25	30	35	40	50	60	65	70	80	90	100

∗This size is just for your reference.

SGC Series, Internal Grinding Spindle Unit of Collet Chuck type

<Product Feature> The Spindle Unit is used with the grinding wheel held on Collet Chuck and used for internal grinding.
High-precision angular bearings are used in 2 rows DT (Double Tandem) combination, and with the appropriate spring pressurization, this spindle unit enables the stable high speed operation.
For pulley shaft side, it is possible to make a straight shaft. In case that you require a straight shaft, please contact us for further information.
Collet Chuck made by REGO is equipped. Collet Chuck is not included in the package, so please order separately.
Please specify the product number of Collet Chuck as the example below.
(Example) ER11 type Collet Chuck, clamping diameter ø3 mm → ER11-3.0



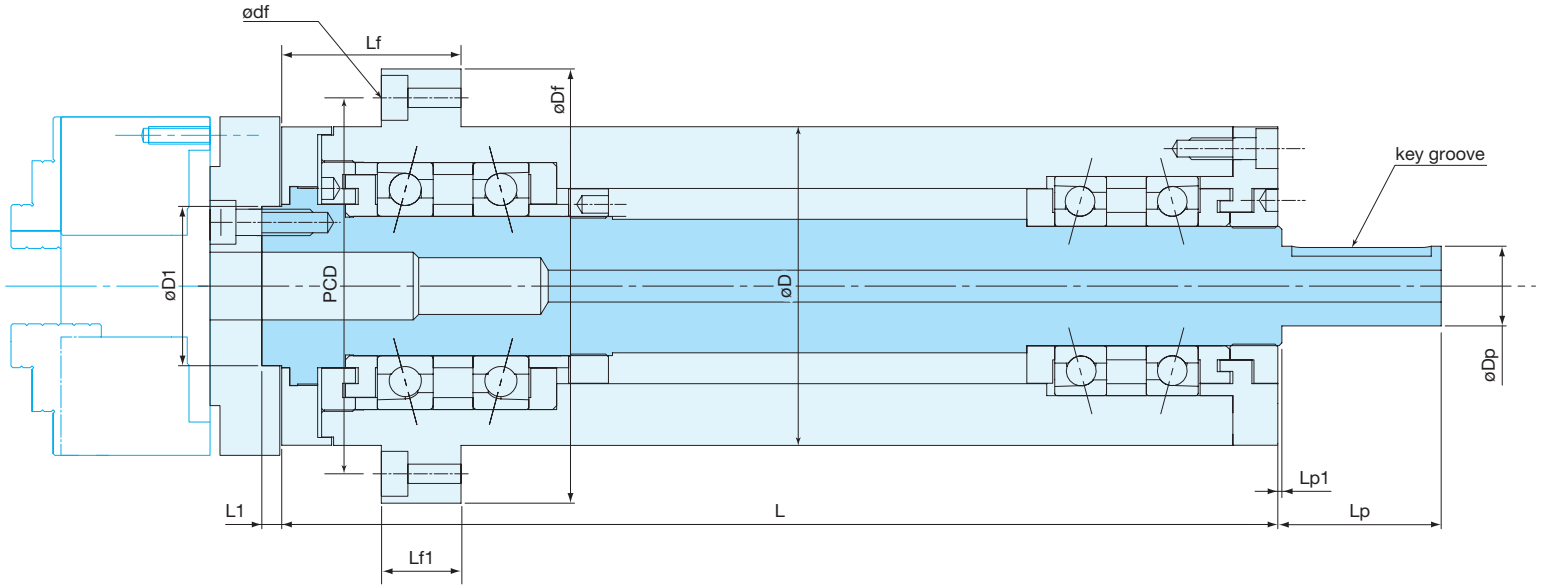
Standard Accessories: Pulley, Chuck Nut, Spanner

Product Number	Maximum speed min^{-1} ∗1	Static run-out accuracy of chuck mounting tapered surface (mm)	øD	L	øD1	L1	øDp	Lp	Lp1	Collet Chuck made by REGO-FIX		Bearing
										Product Number	Holding diameter	
SGC030100	50,500	0.001	30	100	16	19.8	16	23	3	ER11	0.5-7.0	7900C
SGC030120			30	120								
SGC040120	44,500	0.001	40	120	19	21.1	20	27	3	ER11	0.5-7.0	7901C
SGC040160			40	160								
SGC050160	37,500	0.001	50	160	22	28.3	25	33	3	ER16	0.5-10	7902C
SGC050200			50	200								
SGC060160	34,500	0.001	60	160	28	28.3	32	39	4	ER16	0.5-10	7903C
SGC060200			60	200								
SGC070200	24,000	0.001	70	200	34	30.7	40	49	4	ER20	1.0-13	7905C
SGC070250			70	250								
SGC080200	21,000	0.001	80	200	42	31.7	45	60	5	ER25	1.0-16	7906C
SGC080250			80	250								

∗1 Maximum speed will be influenced by the external factors, such as the grinding wheel used or the tension of belt.

SCF Series Work Spindle Unit for turning of Scroll Chuck type

<Product Feature> The Spindle Unit is used for the lathe for precise, high-speed and light turning.
High-precision angular bearings are used in 2 rows DB (Double Back-to-Back) combination and this spindle unit is suitable for turning under thrust loading or axial loading.
For holding side, the flange which can attach a scroll chuck will be assembled.
When placing an order, please specify the scroll chuck specification. We will make the appropriate flange according to your specified scroll chuck.



Product Number	Maximum speed min^{-1} ※2	Static run-out accuracy of chuck mounting end surface (mm)	øD	L	øDf	Lf	Lf1	ødf	PCD	øD1	L1	øDp	Lp	Lp1	Bearing	
															Chuck side	Pulley side
SCF080250	13,000	0.001	80	250	118	45	20	6 x M8 Counter bore	100	40	5	25	51	1	7008C	7007C
SCF080300			80	300												
SCF090250	11,500	0.001	90	250	128	45	20	6 x M8 Counter bore	110	43	5	32	65	1	7009C	7008C
SCF090300			90	300												
SCF100300	10,500	0.001	100	300	138	50	25	6 x M10 Counter bore	120	46	5	35	71	1	7010C	7009C
SCF110300	9,500	0.001	110	300	148	50	25	6 x M10 Counter bore	130	50	5	40	81	1	7011C	7010C
SCF120300	9,000	0.001	120	300	168	55	30	6 x M12 Counter bore	145	64	5	45	91	1	7012C	7011C

※1 The dimensions around grinding wheel, please refer the page for the flanges.
※2 Maximum speed will be influenced by the external factors, such as the chuck or the pulley used or the tension of belt.

Some of our Spindle Manufacturing Equipments

Our company is committed to create the higher precision spindle unit and makes every effort for that purpose. We have invented and created special purpose machineries added our daily unique idea and we use these machineries for our own production.

◀ **Center Grinding Machine (In-house made machine)**

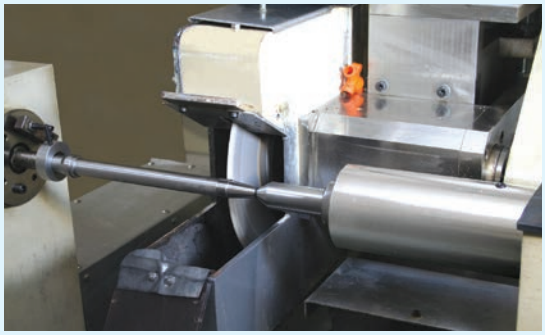
We do grinding the center hole, which becomes reference point when finishing the spindle shaft.
Thanks to this grinding process, we can improve the circularity, the cylindricity, and the coaxiality of grinding surface or thread grinding surface.

Cylindrical Grinder ▶

We use the external grinder GOP32X500 made by TOYODA (now it is by JTEKT), which is well-known for its high rigidity and high precision. Grinding wheel spindle enables high rigidity and high attenuation, by implementing hybrid type bearings, which are combining static pressure bearing with dynamic pressure bearing. This machine contributes for finishing the spindle unit with high precision.

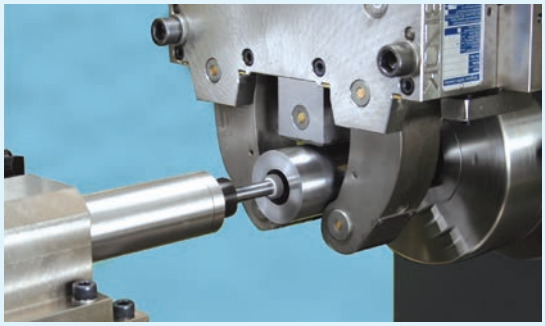
▲ **Circularity Measuring machine**

We periodically examine the circularity and the coaxiality of grinding works, and improve in-house grinding skills.



▲ **Thread Grinder (In-house Production)**

By improving the coaxiality of the thread part tightening bearing inner ring and the fitting face of bearing, this machine minimizes that the bearing clamping nut bends the spindle shaft.



▲ **Machine for Spindle Housing Finishing (In-House Production)**

This machine can finish the internal surface for bearing fitting by grinding and the thread for tightening bearing by turning in one process. Because of this machine, the coaxiality between bearing fitting part and thread part becomes nearly zero. In addition, by putting German-made chuck and high-precision anti-swing device together, it can reduce the run-out at two points (near the chuck and near the anti-swing device). Therefore, it can improve the coaxiality of the front and rear fitting parts, which are separated in two processes.

＊Specifications may be changed without notice.

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