③ Combinations of accuracy grade and preload

• Combinations of accuracy grade and preload are shown in Table 4.6.

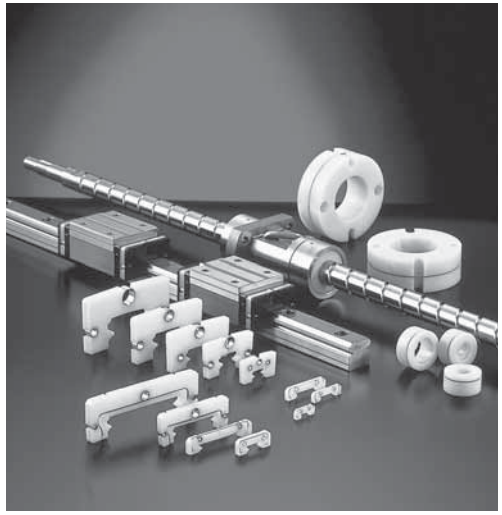
Table 4.6 Combinations of accuracy grade and preload type

	Accuracy grade	Preload
Preloaded assembly	P3 – P6	Z4 – Z0
	PN	Z1 – Z0
Random-matching type	PC, P6*)	ZZ – ZT

*) P6 grade is only for RA 25 to 65, and its preload is Z3. (Preload code is ZZ)

A-3-5 Lubrication

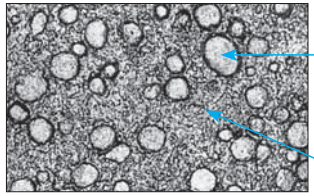
(1) NSK Linear Guides Equipped with "NSK K1™" Lubrication Unit.



"NSK K1™" lowers machine operation cost, and reduces impact on the environment.

What is "long-term, maintenance-free" operation?
Ball screws and linear guides which are equipped with "NSK K1™" do not require maintenance for five years or up to 10,000 km operational distance.

What is "NSK K1™" Lubrication Unit?
"NSK K1™" is a lubrication device which combines oil and resin in a single unit. The porous resin contains a large amount of lubrication oil. Equipped closely to the rail, "NSK K1™" constantly supplies fresh oil which seeps from the resin, lubricating the rail surface.



Enlarged surface of "NSK K1" Lubrication Unit

Polyolefin
Unlike vinyl chloride products, polyolefin does not produce dioxin. Polyolefin is also gaining use at supermarkets for food wrapping.

Lubrication oil
It is mineral oil-based. The oil has a viscosity of 100 cSt.

Remarkable capacity with new material: NSK K1™ Lubrication Unit information

- NSK K1 lubrication unit (referred to NSK K1 hereafter) to be equipped with NSK linear guide is outstanding new lubrication material.
- Newly developed "porous synthetic resin" contains large volume of lubricant oil, and it seeps out enhancing lubricating function.
- Simply install NSK K1 inside the standard end seal (rubber).
- We also provide NSK K1 lubrication unit for sanitary environments suited for food processing machinery, medical equipment and their ancillaries for the environment where hygiene control is essential. For details, refer to A-3-8 (3).

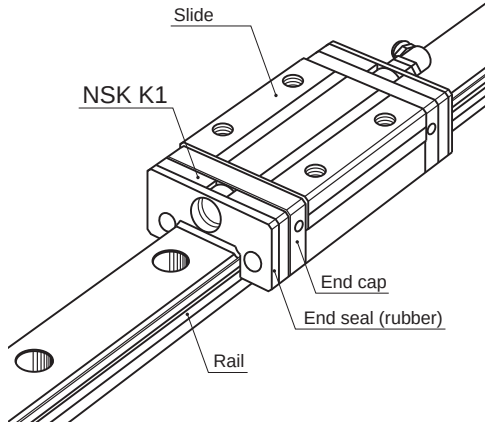


Fig. 5.1

1) Features

NSK K1 comprises a part of the compact and efficient lubrication unit.

① Maintenance is required only infrequently

Used with grease, and maintaining lubrication function for a long period of time. Ideal for systems/environments which make replenishment difficult.

▼

For automotive component processing lines, etc.

② Does not pollute the environment

A very small volume of grease combined with NSK K1 can provide sufficient lubrication in the environment where grease is undesirable as well as in the environment where high cleanliness is required.

▼

Food processing/medical equipment, liquid crystal display/semiconductor manufacturing equipment, etc.

We also provide NSK K1 lubrication unit for sanitary environment suited for food processing machinery, medical equipment and their ancillaries for the environment where hygiene control is essential. For details, refer to A-3-8 (3).

③ Good for environments where lubricant is washed away

Used with grease, life of the machine is prolonged even when the machine is washed entirely by water, or in an environment where the machine is exposed to rain or wind.

▼

Food processing equipment, housing/construction machines, etc.

④ Maintains efficiency in dusty environment

In environment where oil- and grease-absorbing dust is produced, long-term efficiency in lubrication and prevention from foreign inclusions are maintained by using the "NSK K1™" in combination with grease.

▼

Woodworking machines, etc.

*Stainless steel linear guides are available for use in corrosive environments or other environments where rusting is a potential problem.

2) Functions

NSK K1 has various superb functions. NSK's ample test data and field performances confirm NSK K1 abilities.

① Durability test at high speed, with no other lubrication

Figure 5.2 shows test results under these conditions. The linear guide operated with no lubricant is unable to travel after a short period because breakage occurs. Equipped with NSK K1, the linear guide easily travels 25000 km.

Conditions: Sample ; LH30AN (preload Z1)
Travel speed ; 200 m/min
Stroke ; 1800 mm
No lubricant: Completely degreased, no lubrication
NSK K1: Completely degreased, no lubrication + NSK K1

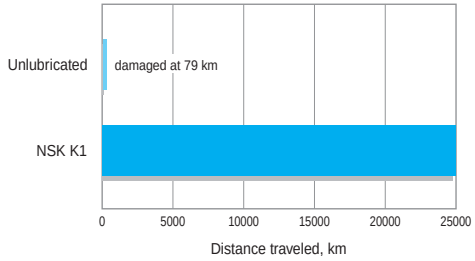


Fig. 5.2 Durability test at high speed, with no lubrication (lubricated by NSK K1 only)

② Durability test immersed in water

Figure 5.3 shows test results after the linear guide is immersed in water once per week for 24 hours at a time, then traveled for 2700 km. Without NSK K1, the ball groove sufrace wore out at an early stage and broke. With NSK K1, the wear was reduced to about 1/3 (Table 5.1). This test proves the effect of NSK K1.

Conditions: Sample ; LS30 Stainless (preload Z1)
Travel speed ; 24 m/min
Stroke ; 400 mm
Load ; 4700 N/Slide
Lubricant ; Fully packed with dedicated grease (*) for food machines

Immersing condition:
Immersed and traveled once per week for 24 hours at a time.

* Grease made in U.S.A.
Characteristic
Consistency: 280
Base oil viscosity: 580 (cSt)

Table 5.1 Comparison in wear of grooves and steel balls (2700 km)

(Unit: µm)

Lubricating condition	Ball slide groove	Rail groove	Steel balls
With NSK K1	16 – 18	2 – 3	6 – 8
Without NSK K1	30 – 45	9 – 11	17 – 25

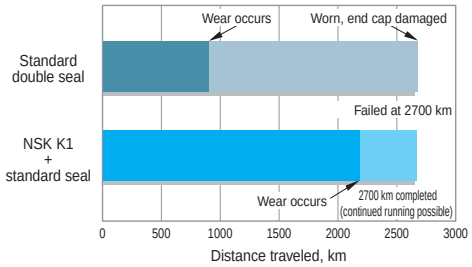


Fig. 5.3 Durability test immersed in water

④ Dust emission

Figure 5.5 is a comparison of NSK K1 dust emissions. The combination of NSK K1 and NSK Clean Grease LG2 (low dust grease) generates as little dust as fluorine grease.

Conditions: Sample ; LS20
Travel speed ; 36 m/min

③ Durability test with wood chips

Wood chips absorb lubricant. Maintaining lubrication in such environment is extremely difficult. Figure 5.4 shows that the life when NSK K1 is added to a standard seal is two times longer than the life when two seals are combined (Standard double seal).

Conditions: Sample ; LH30AN (preload Z1)
Travel speed ; 24 m/min
Stroke ; 400 mm
Load ; 490 N/Slide

Seal specifications/lubricant:
Standard double Seal···Standard double Seal + AS2 Grease
NSK K1·····NSK K1 + Standard seal + AS2 Grease

Wood chip conditions:
1·····Large volume of wood chips
2·····Medium volume of wood chips

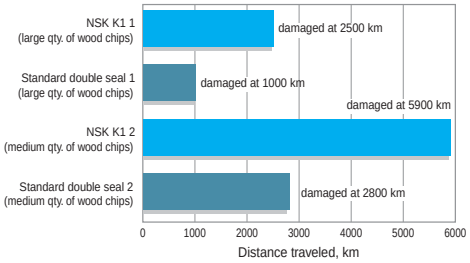


Fig. 5.4 Durability test with wood chips

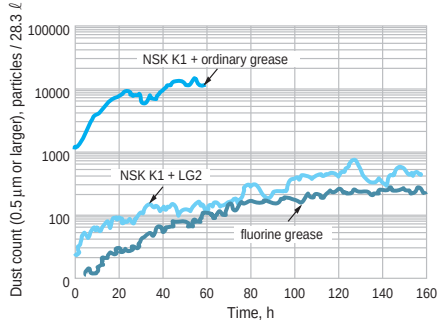


Fig. 5.5 Comparison of dust emission

3) Specifications

① Applicable series and sizes

1 Can be installed in SH, SS, LH, LS, LW, RA, LA, PU, PE, LU, LE, HA, and HS series. For VH and TS series, NSK K1 is equipped as a standard specification.

2 Can be used with stainless steel materials and surface-treated items.

② Standard specifications

1 Install NSK K1 between the end seal and end cap. For TS series, it is installed inside end cap. (Double-seal specification, and specification with protector are also available on request.)

2 NSK standard grease is packed inside the slide. (Volume of grease, type of grease on request.)

3 Accuracy and preload are the same as standard items. (Dynamic friction increases slightly due to NSK K1.)

③ Number of installed NSK K1

Normally, one NSK K1 should be installed on both sides of slides. (two K1s for one slide)

However, more NSK K1 may be required under more stringent drive and environment. Please consult NSK for details.

Precautions for handling

To extend high functions of NSK K1, please observe the following precautions.

1. Temperature range for use: Maximum temperature for use: 50°C
   Momentary maximum temperature in use: 80°C

2. Chemicals that should not come to contact with NSK K1:
   Do not leave NSK K1 in organic solvent, white kerosene such as hexane, thinner which removes oil, and rust preventive oil which contains white kerosene.

Note: Water-type cutting oil, oil-type cutting oil, grease such as mineral-type AS2 and ester-type PS2 do not damage NSK K1.

(2) Lubrication

There are two types of lubricating method, grease and oil, for linear guides.
Use a lubricant agent and method most suitable to condition requirements and purpose to optimize functions of linear guides.
In general, lubricants with low base oil kinematic viscosity are used for high speed operation, in which thermal expansion has large impact, and in low temperatures.
Lubrication with high base oil kinematic viscosity is used for oscillating operations, low speed and high temperature.
The following are lubrication methods by grease and by oil.

1) Grease Lubrication

Grease lubrication is widely used because it does not require special oil supply system or piping. Grease lubricants made by NSK are:

- Various types of grease in bellowed container which can be instantly attached to the grease pump;
- NSK Grease Unit which comprise a hand grease pump and various nozzles. They are compact and easy to use.

1. NSK grease lubricants

Table 5.2 shows the marketed general grease widely used for linear guides, in specific uses, conditions and purposes.

Table 5.2 Grease lubricant for linear guides

Type	Thickener	Base oil	Base oil kinematic viscosity mm^2/s (40°C)	Range of use temperature (°C)	Purpose
AS2*1)	Lithium type	Mineral oil	130	–10 – 110	For general use at high load
PS2*2)	Lithium type	Synthetic oil + mineral oil	15	–50 – 110	For low temperature and high frequency operation
LG2	Lithium type	Mineral oil + synthetic hydrocarbon oil	30	–20 – 70	For clean environment
LGU	Diurea	Synthetic hydrocarbon oil	100	–30 – 120	For clean environment
NF2	Urea composite type	Synthetic oil + mineral oil	27	–40 – 100	For fretting resistant

*1) Standard grease of SH, SS, LH, LS, VH, LW, TS, RA, LA, HA, and HS Series.
*2) Standard grease of PU, PE, LU, and LE Series.

① NSK Grease AS2

● Features

It is an environmentally friendly and widely used grease for high load application. It is mineral oil based grease containing lithium thickener and several additives. It is superb in load resistance as well as stability in oxidization. It not only maintains good lubrication over a long period of time, but also demonstrates superb capability in retaining water. Even containing a large amount of water, it does not lose grease when it is softened.

● Application

It is a standard grease for general NSK linear guides. It is prevalently used in many applications because of its high base oil viscosity, high load resistance, and stability in oxidization.

● Nature

Thickener	Lithium soap base
Base oil	Mineral oil
Consistency	275
Dropping point	185°C
Volume of evaporation	0.24% (99°C, 22 hr)
Copper plate corrosion test	Satisfactory (Method B, 100°C, 24 hr)
Oil separation	2.8% (100°C, 24 hr)
Base oil kinematic viscosity	130 mm^2/s (40°C)

② NSK Grease PS2

● Features

The major base oil component is synthetic oil with mineral oil. It is an excellent lubrication especially for low temperature operation. It is for high speed and light load.

● Application

It is a standard grease for NSK miniature linear guides. It is especially superb for low temperature operation, but also functions well in normal temperatures, making it ideal for small equipment with light load.

● Nature

Thickener	Lithium soap base
Base oil	Synthetic oil + mineral oil
Consistency	275
Dropping point	190°C
Volume of evaporation	0.60% (99°C, 22 hr)
Copper plate corrosion test	Satisfactory (Method B, 100°C, 24 hr)
Oil separation	3.6% (100°C, 24 hr)
Base oil kinematic viscosity	15 mm^2/s (40°C)

③ NSK Grease LG2

● Features

This grease was developed by NSK to be exclusively used for linear guides in clean room. Compared to the fluorine grease which are commonly used in clean room, LG2 has several advantages such as:

- Higher in lubrication function
- Longer lubrication life
- More stable torque (resistant to wear)
- Higher rust prevention.

In dust generation, LG2 is more than equal to fluorine grease in keeping dust volume low. Since the base oil is not a special oil but a mineral oil, LG2 can be handled in the same manner as general greases.

● Application

LG2 is a lubrication grease for linear guides for semiconductor and liquid crystal display (LCD) processing equipment which require a highly clean environment. Because LG2 is exclusively for a clean environment at normal temperatures, however, it cannot be used in a vacuum environment.

Refer to "Special environment" in Page A60 for detailed data on superb characteristics of NSK Grease LG2.

● Nature

Thickener	Lithium soap base
Base oil	Mineral oil + Synthetic hydrocarbon oil
Consistency	207
Dropping point	200°C
Volume of evaporation	1.40% (99°C, 22 hr)
Copper plate corrosion test	Satisfactory (Method B, 100°C, 24 hr)
Oil separation	0.8% (100°C, 24 hr)
Base oil kinematic viscosity	30 mm^2/s (40°C)

④ NSK Grease LGU

● Features

This is a proprietary urea base grease of NSK featuring low dust emission exclusively for linear guides which are used in clean rooms.

In comparison with fluorine base grease, which has been used commonly in clean rooms, LGU has better lubricating property, longer duration of lubricant, better torque variation, much better anti-rust property, and equivalent or better dust emission. In addition, this grease can be handled in the same way as the other common grease because high-grade synthetic oil is used as the base oil.

LGU grease contains much less metallic elements compared to LG2 grease. It can be used in high temperature environment.

● Application

This is exclusive lubrication grease for linear guides that are installed in equipment that requires cleanliness, as same as LG2 grease, and it can be used in high temperature range of –30° to 180°C.

This cannot be used in vacuum.

● Nature

Thickener	Diurea
Base oil	Synthetic hydrocarbon oil
Consistency	209
Dropping point	260°C
Volume of evaporation	0.09% (99°C, 22 hr)
Copper plate corrosion test	Satisfactory (Method B, 100°C, 24 hr)
Oil separation	0.6% (100°C, 24 hr)
Base oil kinematic viscosity	100 mm^2/s (40°C)

⑤ NSK Grease NF2

● Features

It uses high-grade synthetic oil as the base oil and urea base organic compound as the thickener. It has remarkable anti-fretting corrosion property. It can be used in wide temperature range, from low to high, and has superior lubrication life.

● Application

This grease is suitable for linear guides of which application include oscillating operations. Allowable temperature range is –40° to 130°C.

● Nature

Thickener	Diurea
Base oil	Synthetic hydrocarbon oil
Consistency	288
Dropping point	269°C
Volume of evaporation	7.9% (177°C, 22 hr)
Copper plate corrosion test	Satisfactory (Method B, 100°C, 24 hr)
Oil separation	0.6% (100°C, 24 hr)
Base oil kinematic viscosity	27 mm^2/s (40°C)

● Precautions for handling

- Wash the linear guides to remove oil prior to applying Clean Grease LG2 or LGU, so the grease functions are fully utilized.
- Clean grease is exclusively used for clean environments at normal pressure.

2. How to replenish grease

Use grease fitting to linear guide slide if exclusive grease supply component is not used. Supply required amount to grease fitting by a grease gun (pump).
Wipe off old grease and accumulated dust before supplying new grease. If grease fitting is not used, apply grease directly to the rail. Remove the seal if possible, and move a slide few strokes so the grease permeates into the slide. A hand grease pump, an exclusive and easy lubrication device to linear guides, is available at NSK.

3. Volume of grease to be replenished

Once grease is replenished, another supply is not required for a long period of time. But under some operational conditions, it is necessary to periodically replenish grease. The following are replenishing methods.

• When there is an exclusive grease supply system and the volume from the spout can be controlled, the criterion is:
All at once, replenish the amount which fills about 50% of the internal space of the slide. This method eliminates waste of grease, and is efficient.
Page A46 shows internal spaces of slide of each series for refenence.

• When replenishing using a grease gun:
Use a grease gun and fill the inside of slide with grease. Supply grease until it comes out from the slide area. Move the slide by hand while filling them with grease, so the grease permeates all areas. Do not operate the machine immediately after replenishing. Always try the system a few times to spread the grease throughout the system and to remove excess grease from inside. Trial operations are necessary because the resistance to sliding force of linear guide greatly increase immediately after replenishment (full-pack state) and may cause problems. Grease's agitating resistance is accountable for this phenomenon. Wipe off excess grease that accumulates at the end of the rail after trial runs, so the grease does not scatter to other areas.

4. Intervals of checks and replenishments

Although the grease is of high quality, it gradually deteriorates and its lubrication function diminishes. Also, the grease in the slide is gradually removed by stroke movement. In some environments, the grease becomes dirty, and foreign objects may enter. New grease should be replenished depending on frequency of use. The following is a guide of intervals of grease replenishments to linear guides.

Table 5.3 Intervals of checks and replenishments for grease lubrication

Intervals of checks	Items to check	Intervals of replenishments
3-6 months	Dirt, foreign matters such as cutting chip	Usually once per year. Every 3000 km for material handling system which travels more than 3000 km per year. Replenish if checking results warrant it necessary.

Note: 1) As a general rule, do not mix greases of different brands. Grease structure may be destroyed if greases of different thickeners are mixed. Even when greases have the same thickener, different additives in them may have an adverse effect on each other.

2) Grease viscosity varies by temperature. Viscosity is particular high in winter due to low temperature. Pay attention to increase in linear guide's sliding resistance in such occasion.

Table 5.4 Inside space of the slide

SH, SS Series

Unit: cm³

Model No. \ Series	SH		SS	
	High-load type	Ultra-high-load type	Medium-load type	High-load type
15	2	3	1.5	2
20	5	7	3	4
25	9	12	5	7
30	11	17	7	11
35	20	27	11	17
45	42	53	–	–
55	73	93	–	–

LH, LS Series

Unit: cm³

Model No. \ Series	LH		LS	
	High-load type	Ultra-high-load type	Medium-load type	High-load type
08	0.2	–	–	–
10	0.4	–	–	–
12	1.2	–	–	–
15	3	4	2	3
20	6	8	3	4
25	9	13	5	8
30	13	20	8	12
35	22	30	12	19
45	47	59	–	–
55	80	100	–	–
65	139	186	–	–
85	–	336	–	–

VH Series

Unit: cm³

Model No. \ Series	VH	
	High-load type	Ultra-high-load type
15	3	4
20	6	8
25	9	13
30	13	20
35	22	30
45	47	59
55	80	100

RA Series

Unit: cm³

Model No. \ Series	RA	
	High-load type	Ultra-high-load type
15	1	1.5
20	2	2.5
25	3	3.5
30	5	6
35	6	8
45	10	13
55	15	20
65	33	42

LA Series

Unit: cm³

Model No. \ Series	LA	
	High-load type	Ultra-high-load type
25	8	12
30	14	18
35	21	29
45	38	48
55	68	86
65	130	177

HA, HS Series

Unit: cm³

Model No. \ Series	HA	HS
15	–	5
20	–	9
25	16	16
30	27	25
35	42	40
45	67	–
55	122	–

PE, PU Series

Unit: cm³

Model No. \ Series	PE		PU	
	Standard type	High-load type	Standard type	High-load type
05	0.1	–	0.1	–
07	0.2	–	0.1	–
09	0.4	0.5	0.2	0.3
12	0.5	0.7	0.3	0.4
15	1.2	1.6	0.8	1.1

LW Series

Unit: cm³

Model No. \ Series	LW
17	3
21	3
27	7
35	24
50	52

LE, LU Series

Unit: cm³

Model No. \ Series	LE			LU	
	Medium-load type	Standard type	High-load type	Standard type	High-load type
05	0.1	0.1	–	0.1	–
07	0.1	0.2	0.3	0.1	–
09	0.2	0.4	0.5	0.2	0.3
12	0.3	0.5	0.7	0.3	0.4
15	0.8	1.2	1.6	0.8	1.1

TS Series

Unit: cm³

Model No. \ Series	TS
15	2
20	3
25	6
30	9
35	15

5. NSK Grease Unit

Supply grease to NSK linear guides by a manual type hand grease pump. Install the grease in bellows tube to the pump. Several types of grease (80 g) are available.

Grease in a bellows tube

① Composition of NSK Grease Unit

Components and grease types are shown below.

	Name	(Tube type)	Reference number
NSK Grease Unit			
NSK Grease (80 g in a bellows tube)	NSK Grease AS2	(Brown)	NSK GRS AS2
	NSK Grease PS2	(Orange)	NSK GRS PS2
	NSK Grease LG2	(Blue)	NSK GRS LG2
	NSK Grease LGU	(Yellow)	NSK GRS LGU
	NSK Grease NF2	(Gray)	NSK GRS NF2
NSK Hand Grease Pump Unit			
NSK Hand Grease Pump (Straight nozzle NSK HGP NZ1 -- One nozzle is provided with the hand pump.)			NSK HGP
Grease nozzle (used with the hand grease pump)			
	NSK straight nozzle		NSK HGP NZ1
	NSK chuck nozzle		NSK HGP NZ2
	NSK drive fitting nozzle		NSK HGP NZ3
	NSK point nozzle		NSK HGP NZ4
	NSK flexible nozzle		NSK HGP NZ5
	NSK flexible extension pipe		NSK HGP NZ6
	NSK straight extension pipe		NSK HGP NZ7

② NSK Greases (80 g in a bellows tube)

Refer to Pages A43 and D14 for their natures and details.

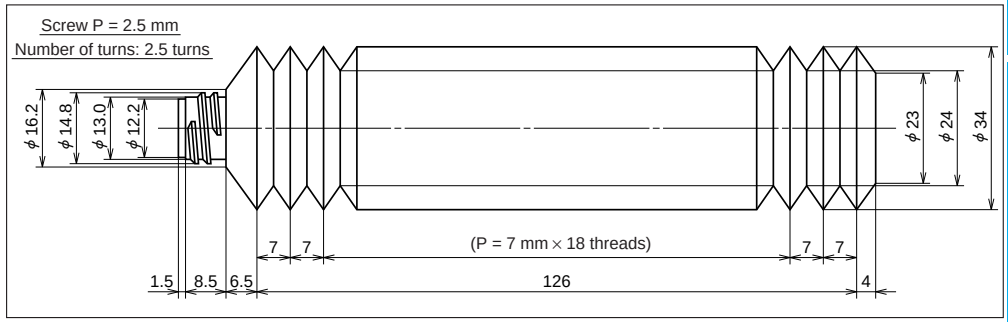


Fig. 5.6 Bellows tube

③ NSK manual Grease Pump Unit

a. NSK Hand Grease Pump Unit
(Reference number: NSK HGP)

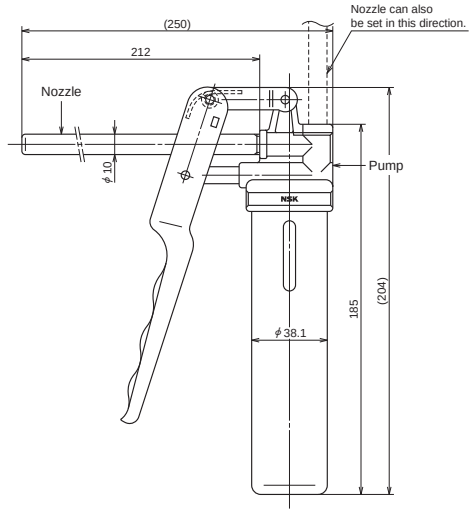


Fig. 5.7 NSK Hand Grease Pump with NSK straight nozzle

●Features

- Light-weight ····· Can be operated by one hand, yet there is no worry to making a mistake.
- Inserting by high pressure···· Insert at 15 Mpa.
- No leaking ····· Does not leak when held upside down.
- Easy to change grease···· Simply attach the grease in bellows tube.
- Remaining grease ····· Can be confirmed through slit on the tube.
- Several nozzles ····· Five types of nozzles to choose from.

●Specifications

- Spout volume ····· 0.35 g/stroke
- Mass of main body ··· 393 g
- Overall length ····· About 200 mm
- Overall width ····· About 200 mm
- Grease tube outer diameter ·· φ 38.1
- Accessory····· Several nozzles for a unique application can be attached

b. Nozzles

Table 5.5 Nozzles that can be attached to NSK Hand Grease Pump

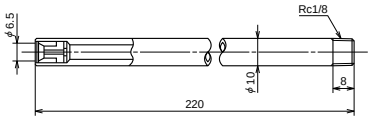
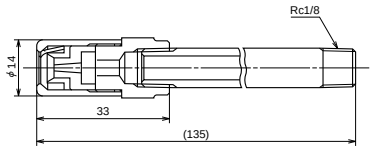
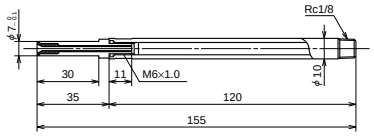
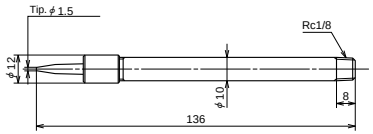
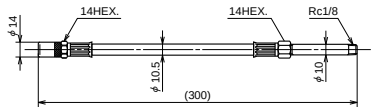
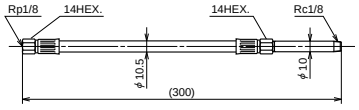
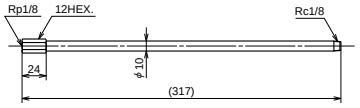
Name	Designation code	Use	Dimensions
NSK straight nozzle	NSK HGP NZ1	Can be used with grease fitting A, B, and C under JIS B1575 standard.	
NSK chuck nozzle	NSK HGP NZ2	Same as above. However, there is no need to press the hand pump because the grease fitting and the nozzle come to contact due to the chucking mechanism at the tip.	
NSK fitting nozzle	NSK HGP NZ3	Dedicated for the -ϕ3 drive-in grease fitting.	
NSK point nozzle	NSK HGP NZ4	Used for linear guides which do not have grease fitting. Supplies grease directly to the ball grooves, or through the opening of slide or slide to inside.	
NSK flexible nozzle	NSK HGP NZ5	The tip of the flexible nozzle is chuck nozzle. Used to supply grease to the area where hand cannot reach.	
NSK flexible extension pipe	NSK HGP NZ6	Flexible extension pipe connects the grease pump and the nozzle	
NSK straight extension pipe	NSK HGP NZ7	Straight extension pipe connects the grease pump and the nozzle.	

Table 5.6 Grease fittings used for NSK linear guide

Series	Model No.	Tap hole for grease fitting	Standard grease fitting	Straight nozzle NZ1	Chuck nozzles NZ2	Drive-in fitting nozzle NZ3	Point nozzle NZ4	Flexible nozzle NZ5
SH Series	SH15	ϕ3	Drive-in type			○		
	SH20, 25, 30, 35*)	M6×0.75	B type	○	○			○
	SH45, 55	Rc1/8	B type	○	○			○
SS Series	SS15	ϕ3	Drive-in type			○		
	SS20, 25, 30, 35*)	M6×0.75	B type	○	○			○
LH Series	LH08, 10	–	–				○	
	LH12, 15	ϕ3	Drive-in type			○		
	LH20, 25, 30, 35*)	M6×0.75	B type	○	○			○
	LH45, 55, 65	Rc1/8	B type	○	○			○
LS Series	LS15	ϕ3	Drive-in type			○		
	LS20, 25, 30, 35*)	M6×0.75	B type	○	○			○
VH Series	VH15	ϕ3	Drive-in type			○		
	LH20, 25, 30, 35*)	M6×0.75	B type	○	○			○
	VH45, 55	Rc1/8	B type	○	○			○
LW Series	LW17	ϕ3	Drive-in type			○		
	LW21, 27, 35*)	M6×0.75	B type	○	○			○
	LW50	Rc1/8	B type	○	○			○
TS Series	TS15	ϕ3	Drive-in type			○		
	TS20, 25, 30, 35*)	M6×0.75	B type	○	○			○
RA Series	RA15, 20	ϕ3	Drive-in type			○		
	RA25, 30, 35*)	M6×0.75	B type	○	○			○
	RA45, 55, 65	Rc1/8	B type	○	○			○
LA Series	LA25, 30, 35*)	M6×0.75	B type	○	○			○
	LA45, 55, 65	Rc1/8	B type	○	○			○
PU Series	PU05, 07, 09, 12	–	–				○	
	PU15	ϕ3	Drive-in type			○		
PE Series	PE05, 07, 09, 12	–	–				○	
	PE15	ϕ3	Drive-in type			○		
LU Series	LU05, 07, 09, 12, 15	–	–				○	
LE Series	LE05, 07, 09, 12, 15	–	–				○	
HA Series	HA25, 30, 35*)	M6×0.75	B type	○	○			○
	HA45, 55	Rc1/8	B type	○	○			○
HS Series	HS15	ϕ3	Drive-in type			○		
	HS20, 25, 30, 35*)	M6×0.75	B type	○	○			○

*) When using a chuck nozzle, make sure that it does not interfere with the table on linear guides.

Note: PU, PE, LU, and LE Series: Apply grease directly to ball groove, etc. using a point nozzle.

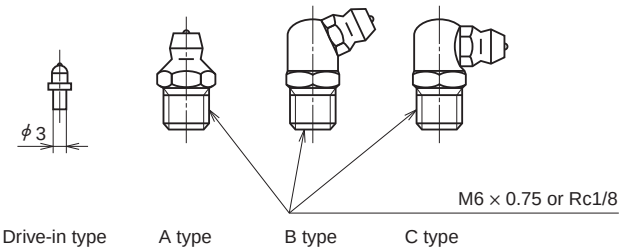


Fig. 5.8 Grease fittings

A long threaded grease fitting is required because of dust proof parts. Please refer to the sections pertaining to the lubrication and dust proof parts of each series.

2) Oil Lubrication

Required amount of new oil is regularly supplied by:

- Manual or automatic intermittent supply system;
- Oil mist lubricating system via piping.

Equipment for oil lubrication is more costly than one for grease lubrication. However, oil mist lubricating system supplies air as well as oil, raising the inner pressure of the slide. This prevents foreign matters from entering, and the air cools the system. Use an oil of high atomizing rate such as ISO VG 32-68 for the oil mist lubrication system.

ISO VG 68-220 are recommended for common intermittent replenishment system. Approximate volume of oil Q for a slide of linear guide per hour can be obtained by the following formula.

In case of ball type linear guide except for LA series

$Q \geq n/150$ (cm^3/hr)

In case of LA and RA series

$Q \geq n/100$ (cm^3/hr)

n: Linear guide code

e.g. When LH45 is used,

$n = 45$,

Therefore,

$Q = 45/150 = 0.3$ cm^3/hr

For oil lubrication by gravity drip, the oil supply position and installation position of the slide are crucial. In case of linear guide, unless it is installed to a horizontal position, the oil flows only on the down side, and does not spread to all race way surface. This may cause insufficient lubrication. Please consult NSK to correct such situations prior to use. NSK has internal design which allows oil lubricant to flow throughout the system.

Table 5.7 shows the criterion of intervals of oil checks and replenishments.

Table 5.7 Intervals of checks and replenishments

Method	Intervals of checks	Items to check	Replenishment or intervals of changes
Automatic intermittent supply	Weekly	Volume of oil, dirt, etc.	Replenish at each check. Suitable volume for tank capacity.
Oil bath	Daily before operation	Oil surface	Make a suitable criterion based on consumption

Note: 1) As with grease lubrication, do not mix oil lubricant with different types.

2) Some components of the linear guide are made of plastic. Avoid using an oil that adversely affects synthetic resin.

3) When using oil mist lubricating system, please confirm an oil supply amount at the each outlet port.