



APEX DYNAMICS, INC.

SMART LUBRICATION SYSTEM



Lubrication System

Main Features

CE & ATEX Certification

Support up to 40 Lubrication Positions

Lubrication Frequency Adjustable

Hand-Set and PLC Control Mode

Memory Function

Fill Level Monitoring and Electrical Self-Protection



LUG 400



LUG 2000

Order Code of Lubricator

LUG - 411 / 412 / 422 / 423 / 424

No. of Outlet	No. of Pump	No. of Lubrication Position
LUG-411 : 1	LUG-411 : 1	LUG-411 : max.4
LUG-412 : 2	LUG-412 : 1	LUG-412 : max.8
LUG-422 : 2 (1+1)	LUG-422 : 2	LUG-422 : max.8
LUG-423 : 3 (2+1)	LUG-423 : 2	LUG-423 : max.12
LUG-424 : 4 (2+2)	LUG-424 : 2	LUG-424 : max.16

LUG - 2102 / 2204 / 2306 / 2408 / 2510

No. of Outlet	No. of Pump	No. of Lubrication Position
LUG-2102 : 2	LUG-2102 : 1	LUG-2102 : max. 8
LUG-2204 : 4	LUG-2204 : 2	LUG-2204 : max. 16
LUG-2306 : 6	LUG-2306 : 3	LUG-2306 : max. 24
LUG-2408 : 8	LUG-2408 : 4	LUG-2408 : max. 32
LUG-2510 : 10	LUG-2510 : 5	LUG-2510 : max. 40



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Performance of LUG 400

Technical Specification	
Dimension (Width x Height x Depth)	167 mm x 196 mm x 94 mm
Weight (No Lubricant)	1780 g
Volume of Lubricant	400 cm ³
Lubricant Type	Grease up to NLGI 3
Pump	Piston Pump
Operating Pressure	Max. 70 bar (1,000 psi)
Delivery Volume Per Pulse / Stroke	0.15 cm ³
No. of Outlet	Max. 4 Tube Connectors ⁽¹⁾
No. of Lubrication Position	Max. 16 ⁽²⁾
Outlet Connection	PA Tube
Operating Voltage	24V DC
Current Consumption	I _{max} 500 mA
Connecting Plug	M12 X 1,5-PIN
IP Class	IP65
Operating Temperature	-25° C ~ 70° C
Control	PLC, Hand-Set Controller ⁽³⁾
Pressure Monitoring	System Pressure Measurement
Oil Fill Monitoring	Reed Switch

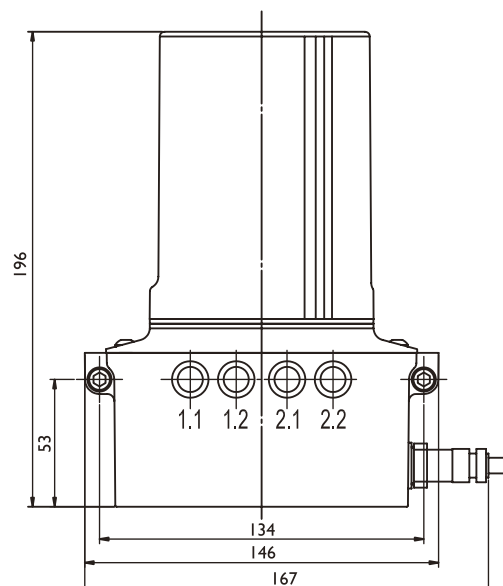
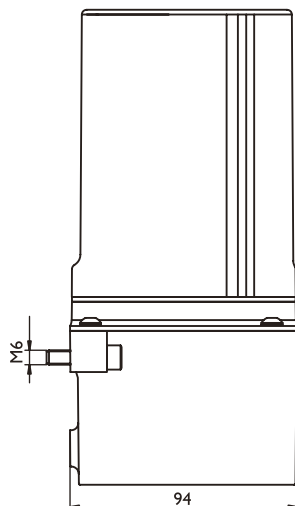
Lubricator

No. of Outlet	No. of Pump	No. of Lubrication Position ⁽²⁾	Order Code
1	1	max. 4	LUG-411
2	1	max. 8	LUG-412
2 (1 + 1)	2	max. 8	LUG-422
3 (2 + 1)	2	max. 12	LUG-423
4 (2 + 2)	2	max. 16	LUG-424

(1) Connector Dimension M10.

(2) Requiring use of a Distributor.

(3) Hand-Set is not included in lubricator and is to order separately.



Performance of LUG 2000

Technical Specification	
Dimension (Width x Height x Depth)	197 mm x 286.5 mm x 175 mm
Weight (No Lubricant)	4000 g
Volume of Lubricant	2000 cm ³
Lubricant Type	Oil
Pump	Piston Pump
Operating Pressure	Max. 70 bar (1,000 psi)
Delivery Volume Per Pulse / Stroke	0.15 cm ³
No. of Outlet	Max. 10 (In-Line Connector) ⁽¹⁾
No. of Lubrication Position	Max. 40 ⁽²⁾
Outlet Connection	PA Tube
Operating Voltage	24V DC
Current Consumption	$I_{max} \leq 500$ mA
Connecting Plug	M12 x 1, 5-PIN
IP Class	IP65
Operating Temperature	-25° C ~ 70° C
Control	PLC, Hand-Set Controller ⁽³⁾
Pressure Monitoring	System Pressure Measurement
Oil Fill Monitoring	Reed Switch

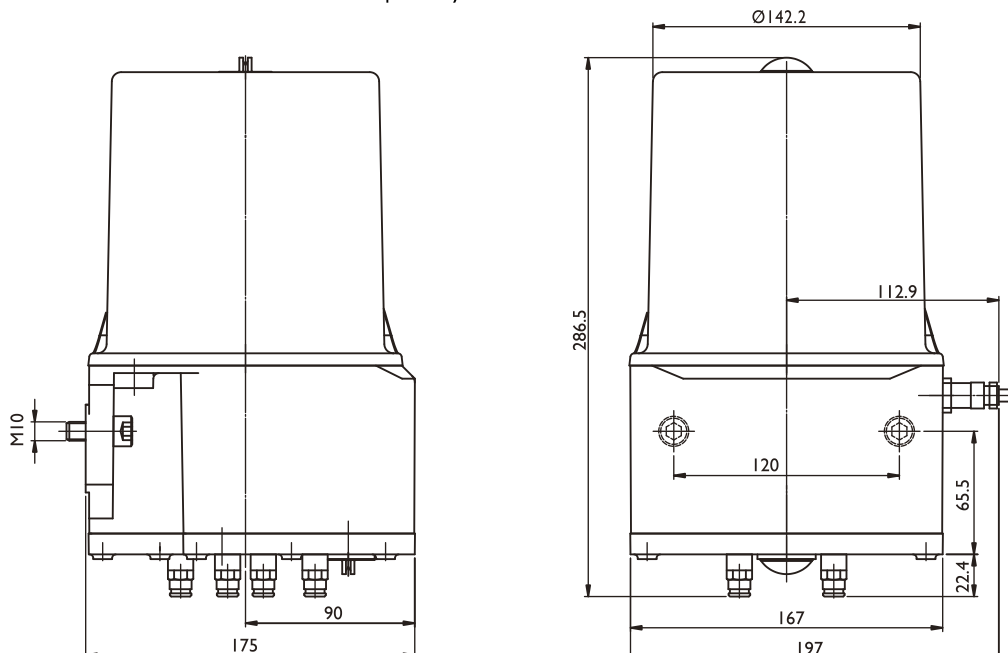
Lubricator

No. of Outlet	No. of Pump	No. of Lubrication Position ⁽²⁾	Order Code
2	1	max. 8	LUG-2102
4	2	max. 16	LUG-2204
6	3	max. 24	LUG-2306
8	4	max. 32	LUG-2408
10	5	max. 40	LUG-2510

(1) Connector Dimension M10.

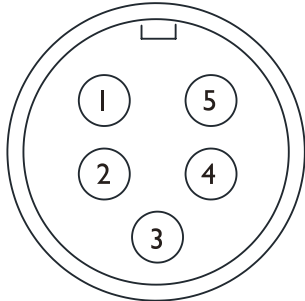
(2) Requiring use of a Distributor.

(3) Hand-Set is not included in lubricator and is to order separately.



Power System

- 24V DC is applied to the Lubricator. Any electrical interference during power connection should be avoided.



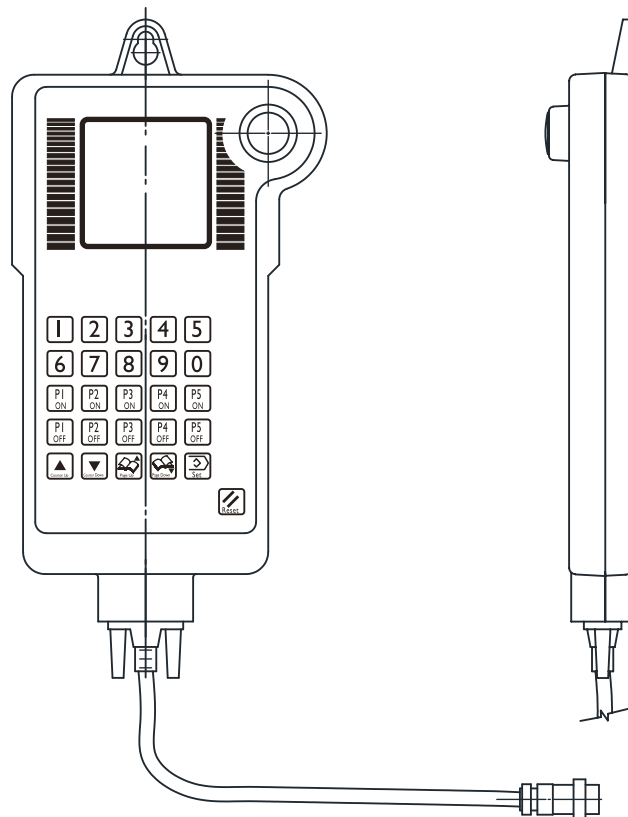
5-Pin Socket

The connection between lubricator and controller via 5-Pin Socket.

- PIN 1 : Output Signal
- PIN 2 : Input Signal
- PIN 3 : FGND
- PIN 4 : Input 24V DC
- PIN 5 : GND

- Hand-Set Controller (Order Code : EC01)

After set-up of lubricator, the Hand-Set Controller can be removed.
Please also refer to Manual of Installation.



Lubrication of Rack & Pinion

- As transmission devices, Rack and Pinion are often exposed to air and may oxidised. It's highly recommended to use APEX PU Lubrication Pinion to perform greasing and uniform distribution of lubricant on all teeth surfaces.
- Open-Cell Polyurethane Foam of PU Lubrication Pinion can absorb a certain amount of lubricant. Standard Involute Teeth Design can fit perfectly the teeth of Rack and Pinion without any loading by lubrication. Under long-time operation condition, PU Lubrication Pinion provides an automatic lubrication process on transmission devices to reduce wearing, but no over-lubrication.
- First soak PU Lubrication Pinion in lubricant to allow an immediate application. The Feeding Rate of lubricant depends on Module No. and Speed, can be adjusted by controller. Please also refer to Table I below showing Lubricant Volume vs. Module No..

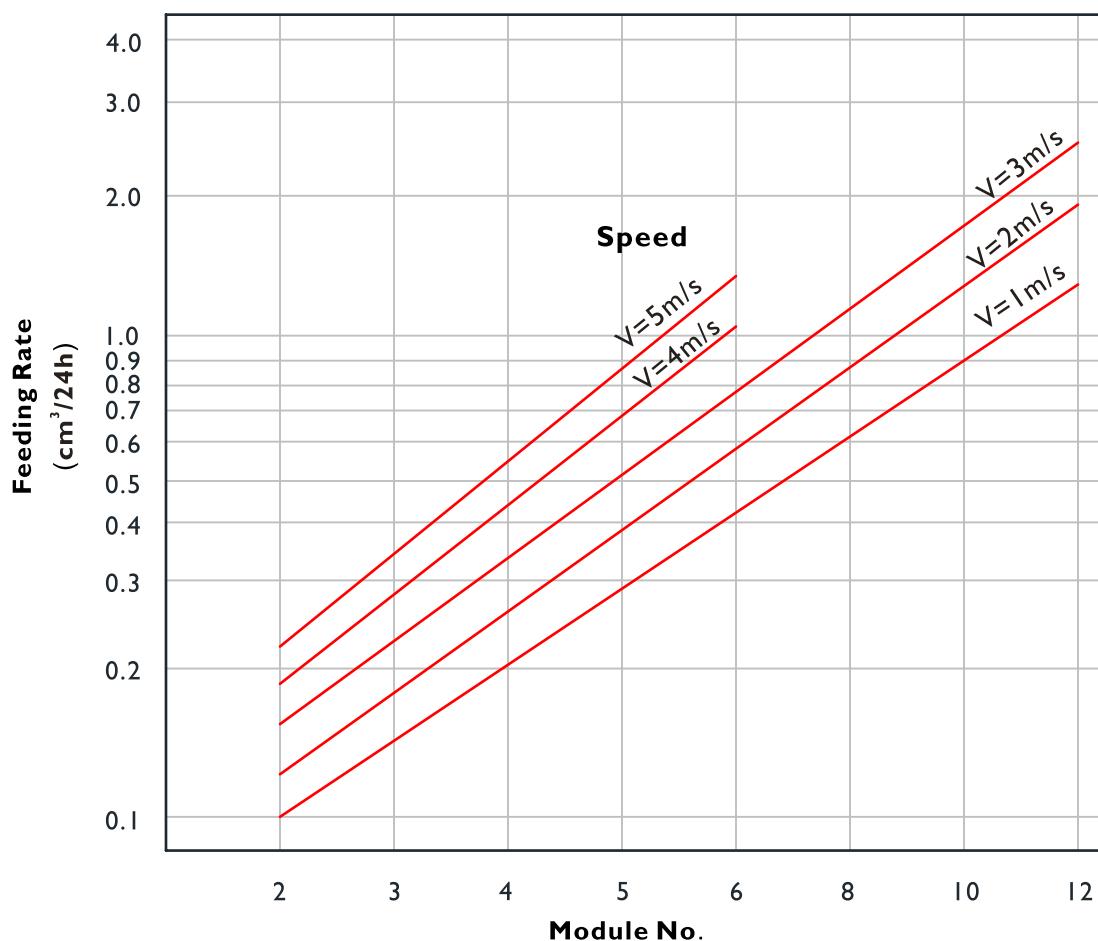
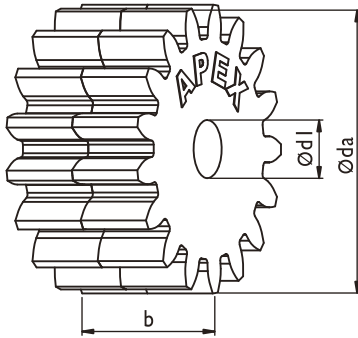


Table I

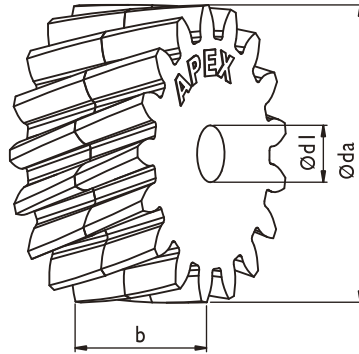
PU Lubrication Pinion

Effective Lubrication can be achieved through the use of APEX Lubrication System especially for Rack and Pinion. For uniform distribution of lubricant over rack surface, it's recommend to use a driving Pinion to allow evenly greasing.

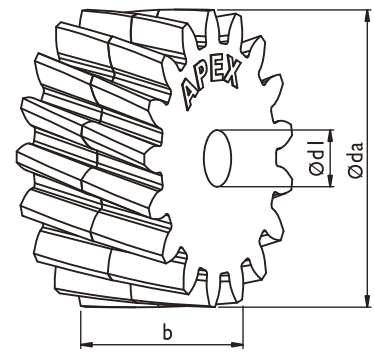
Straight Teeth



Left-Hand Helical Teeth



Right-Hand Helical Teeth



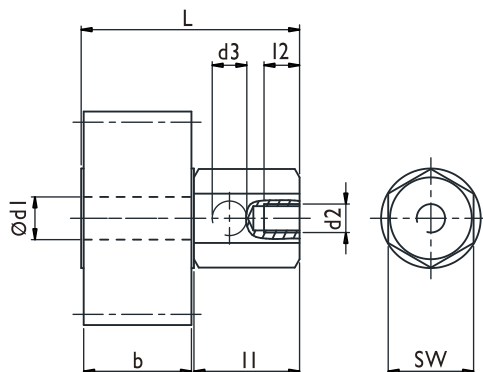
Module No.	Z ⁽¹⁾	Application	da ⁽²⁾	dF ⁽³⁾	dI	b	Order Code	Central Height a
1	36	Straight Teeth	38	36	12	15	PU-01-36S	$a = \frac{d + dF}{2} \text{ (4)}$ $A = h_o + \frac{dF}{2} \text{ (5)}$
		Rack (Left-Hand Helical)	40.2	38.2			PU-01-36L	
		Pinion (Right-Hand Helical)	40.2	38.2			PU-01-36R	
1.5	24	Straight Teeth	39	36	12	20	PU-1J-24S	
		Rack (Left-Hand Helical)	41.2	38.2			PU-1J-24L	
		Pinion (Right-Hand Helical)	41.2	38.2			PU-1J-24R	
2	17	Straight Teeth	38	34	12	25	PU-02-17S	
		Rack (Left-Hand Helical)	40.1	36.1			PU-02-17L	
		Pinion (Right-Hand Helical)	40.1	36.1			PU-02-17R	
2.5	17	Straight Teeth	47.5	42.5	12	25	PU-2J-17S	
		Rack (Left-Hand Helical)	50.1	45.1			PU-2J-17L	
		Pinion (Right-Hand Helical)	50.1	45.1			PU-2J-17R	
3	17	Straight Teeth	57	51	12	30	PU-03-17S	
		Rack (Left-Hand Helical)	60.1	54.1			PU-03-17L	
		Pinion (Right-Hand Helical)	60.1	54.1			PU-03-17R	
4	17	Straight Teeth	76	68	12	40	PU-04-17S	
		Rack (Left-Hand Helical)	80.2	72.2			PU-04-17L	
		Pinion (Right-Hand Helical)	80.2	72.2			PU-04-17R	
5	17	Straight Teeth	95	85	20	50	PU-05-17S	
		Rack (Left-Hand Helical)	100.2	90.2			PU-05-17L	
		Pinion (Right-Hand Helical)	100.2	90.2			PU-05-17R	
6	17	Straight Teeth	114	102	20	60	PU-06-17S	
		Rack (Left-Hand Helical)	120.2	108.2			PU-06-17L	
		Pinion (Right-Hand Helical)	120.2	108.2			PU-06-17R	
8	17	Straight Teeth	152	136	20	80	PU-08-17S	
		Rack (Left-Hand Helical)	160.3	144.3			PU-08-17L	
		Pinion (Right-Hand Helical)	160.3	144.3			PU-08-17R	
10	17	Straight Teeth	190	170	20	100	PU-10-17S	
		Rack (Left-Hand Helical)	200.4	180.4			PU-10-17L	
		Pinion (Right-Hand Helical)	200.4	180.4			PU-10-17R	
12	14	Straight Teeth	192	168	25	120	PU-12-14S	
		Rack (Left-Hand Helical)	202.3	178.3			PU-12-14L	
		Pinion (Right-Hand Helical)	202.3	178.3			PU-12-14R	
1.591 (Pt 5)	24	Straight Teeth	41.4	38.2	12	20	PU-1K-24S	
3.183 (Pt 10)	17	Straight Teeth	60.5	54.1	12	30	PU-3B-17S	
4.244 (Pt 13.33)	17	Straight Teeth	80.6	72.1	12	40	PU-4D-17S	

(1) No. of Teeth (2) Tip Diameter (3) Pitch Diameter (4) Central Distance between PU Pinion and Pinion (d = Pinion Pitch Diameter)

(5) Central Distance between PU Pinion and Rack Bottom (h_o = Height between Rack's pitch line to bottom)

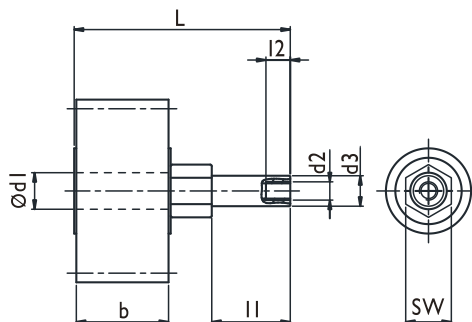
Tightening Shaft for PU Pinion

Tightening Shaft (Right-Angle)



Module No.	L	l1	l2	b	d1	d2	Hole d3	SW	Order Code
1	46.4	30	10	15	12	M8	G 1/8"	24	AUX-01-1
1.5	51.4	30	10	20	12	M8	G 1/8"	24	AUX-1J-1
2	56.4	30	10	25	12	M8	G 1/8"	24	AUX-02-1
2.5	56.4	30	10	25	12	M8	G 1/8"	24	
3	61.4	30	10	30	12	M8	G 1/8"	24	AUX-03-1
4	71.4	30	10	40	12	M8	G 1/8"	24	AUX-04-1
5	81.4	30	10	50	20	M8	G 1/8"	24	AUX-05-1
6	91.4	30	10	60	20	M8	G 1/8"	24	AUX-06-1
8	111.4	30	10	80	20	M8	G 1/8"	24	AUX-08-1
10	131.4	30	10	100	20	M8	G 1/8"	24	AUX-10-1
12	152	30	10	120	25	M8	G 1/8"	30	AUX-12-1
1.591 (Pt 5)	51.4	30	10	20	12	M8	G 1/8"	24	AUX-1J-1
3.183 (Pt 10)	61.4	30	10	30	12	M8	G 1/8"	24	AUX-03-1
4.244 (Pt 13.33)	71.4	30	10	40	12	M8	G 1/8"	24	AUX-04-1

Tightening Shaft (In-Line)



Module No.	L	l1	l2	b	d1	Hole d2	d3	SW	Order Code
1	56	30	12	15	12	M6	M10	17	AUX-01-2
1.5	61	30	12	20	12	M6	M10	17	AUX-1J-2
2	66	30	12	25	12	M6	M10	17	AUX-02-2
2.5	66	30	12	25	12	M6	M10	17	
3	71	30	12	30	12	M6	M10	17	AUX-03-2
4	81	30	12	40	12	M6	M10	17	AUX-04-2
5	116	49	12	50	20	G 1/8"	M16	24	AUX-05-2
6	126	49	12	60	20	G 1/8"	M16	24	AUX-06-2
8	146	49	12	80	20	G 1/8"	M16	24	AUX-08-2
10	166	49	12	100	20	G 1/8"	M16	24	AUX-10-2
12	186.6	49	12	120	25	G 1/8"	M16	30	AUX-12-2
1.591 (Pt 5)	61	30	12	20	12	M6	M10	17	AUX-1J-2
3.183 (Pt 10)	71	30	12	30	12	M6	M10	17	AUX-03-2
4.244 (Pt 13.33)	81	30	12	40	12	M6	M10	17	AUX-04-2

Distributor

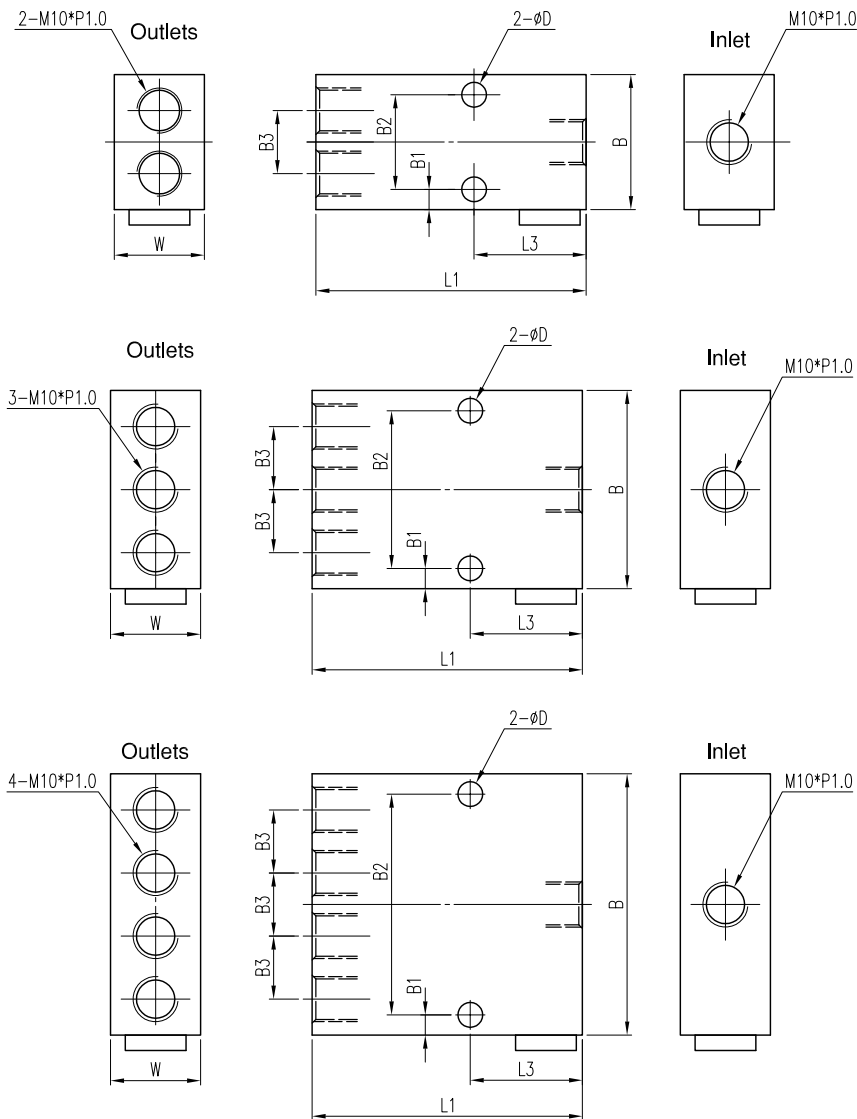
■ Distributor supports up to 4 lubrication positions. Remark for operation:

The distance between Distributor and Lubricator outlet should be kept as short as possible.

Install only one distributor at outlet, do not connect distributors in series.

The pressure difference between all lubrication outlets should not exceed 8 bar.

To use PA tube with same cross-section and similar length.



No. of Inlet	No. of Outlet	L1	L3	B	B1	B2	B3	D	W	Order Code			
										Aluminum Alloy		Stainless	
										Grease	Oil	Grease	Oil
I	2	60	24.9	30	4.5	21	14	5.5	20	SPL-602	SPL-612	SPLS-602	SPLS-612
I	3	60	24.9	44	4.5	35	14	5.5	20	SPL-603	SPL-613	SPLS-603	SPLS-613
I	4	60	24.9	58	4.5	49	14	5.5	20	SPL-604	SPL-614	SPLS-604	SPLS-614
I	2	60	24.9	32	4.5	23	16	5.5	20	SPL-802	SPL-812	SPLS-802	SPLS-812
I	3	60	24.9	48	4.5	39	16	5.5	20	SPL-803	SPL-813	SPLS-803	SPLS-813
I	4	60	24.9	64	4.5	55	16	5.5	20	SPL-804	SPL-814	SPLS-804	SPLS-814

According to required diameter, choose connector. (E.g. :SPLS-8 series is to select for Pipe diameter 8 mm.)

Supporting standard grease NLGI 2.

Temperature range : +10°C ~ +60°C

Pressure difference of outlets may result in different grease delivery volume.

Connector

In-Line Connector

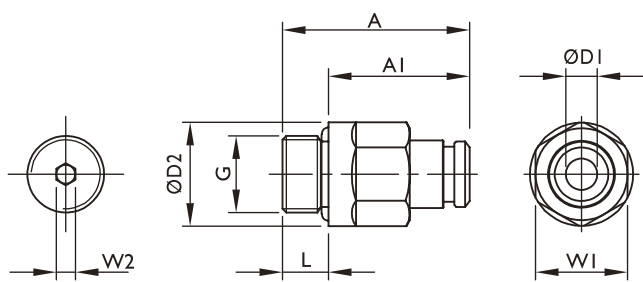


Fig A

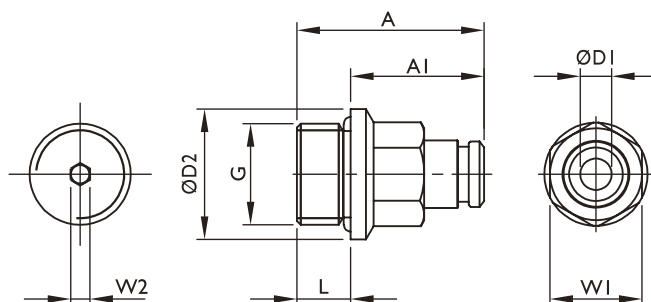


Fig B

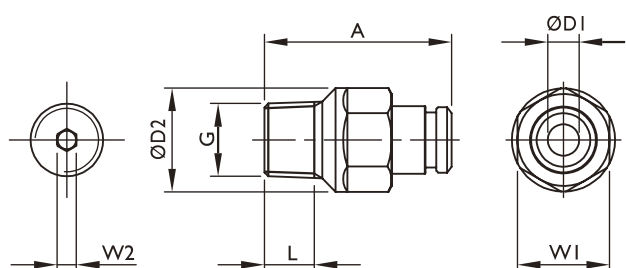


Fig C

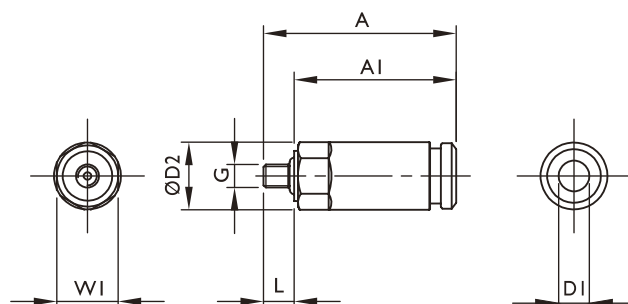


Fig D

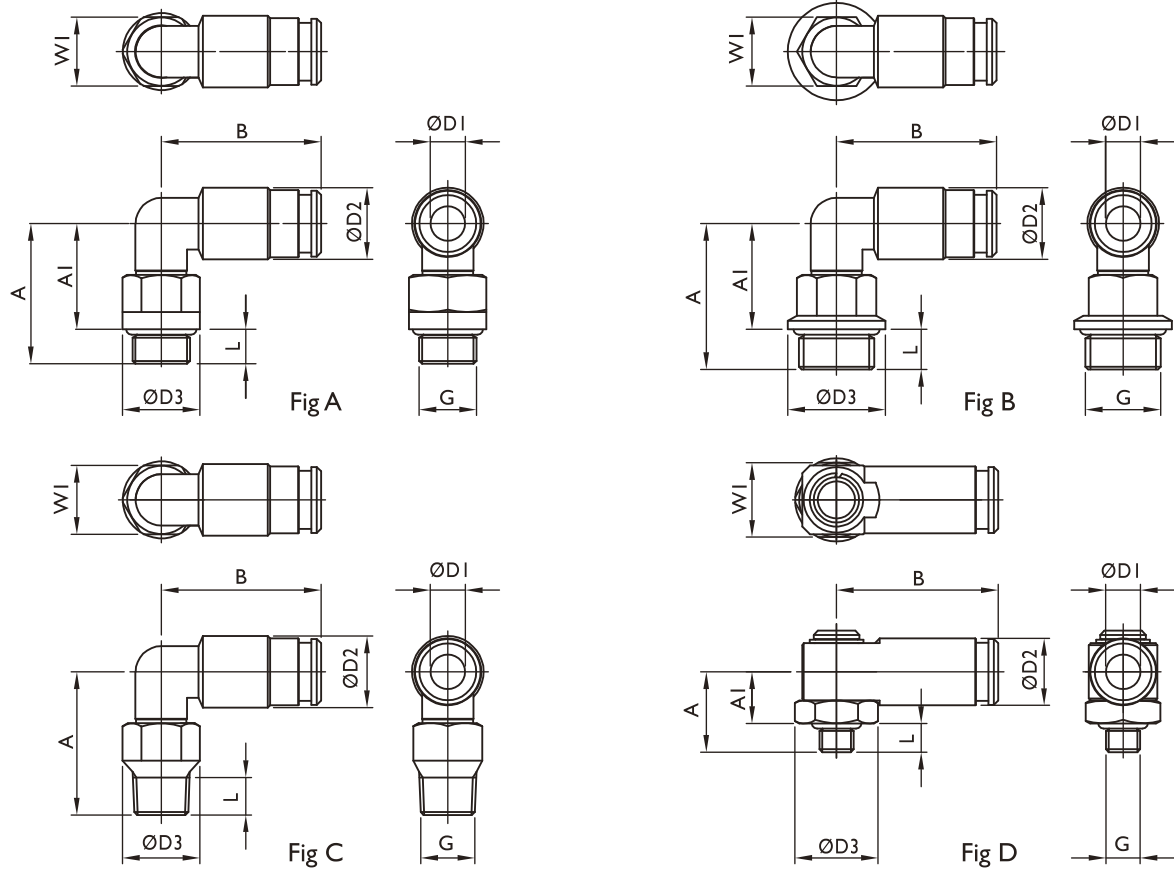
DI	D2	A	AI	G	L	WI	W2	Fig	Order Code	
									Copper	Stainless
4	8.8	25.1	21.1	M3 x 0.5	4	8	-	D	TB-401 ⁽¹⁾	TBS-401
4	11.5	26.1	21.1	M5 x 0.8	5	10	-	A	TB-402 ⁽¹⁾	TBS-402
4	11.5	26.1	21.1	M6 x 0.75	5	10	2.5	A	TB-403	TBS-403
4	11.5	26.1	21.1	M6 x 1.0	5	10	2.5	A	TB-404	TBS-404
4	11.5	24.4	18.4	M8 x 1.0	6	10	2.5	A	TB-405	TBS-405
4	13.5	24.4	18.4	M10 x 1.0	6	12	2.5	A	TB-406	TBS-406
4	13.5	24.4	18.4	G 1/8"	6	12	2.5	A	TB-407	TBS-407
6	13.5	30.1	25.1	M5 x 0.8	5	12	-	A	TB-601 ⁽¹⁾	TBS-601
6	13.5	30.1	25.1	M6 x 0.75	5	12	3	A	TB-602	TBS-602
6	13.5	30.1	25.1	M6 x 1.0	5	12	3	A	TB-603	TBS-603
6	13.5	30.9	24.9	M8 x 1.0	6	12	4	A	TB-604	TBS-604
6	13.5	28.4	22.4	M10 x 1.0	6	12	4	A	TB-605	TBS-605
6	13.5	28.4	22.4	G 1/8"	6	12	4	A	TB-606	TBS-606
6	17	29.4	22.4	G 1/4"	7	12	4	B	TB-607	TBS-607
6	13.5	29.9	-	R 1/8"	6.5	12	4	C	TB-608	TBS-608
8	15.2	33.3	27.3	M10x1.0	6	14	5	A	TB-801	TBS-801
8	15.2	33.3	27.3	G 1/8"	6	14	5	A	TB-802	TBS-802
8	17	33.3	26.3	G 1/4"	7	14	5	B	TB-803	TBS-803

(1) Material : Carbon Steel (Nickel-Plating)

Operation Pressure : max. 80 bar

Operation Temperature : -30°C ~ +100°C

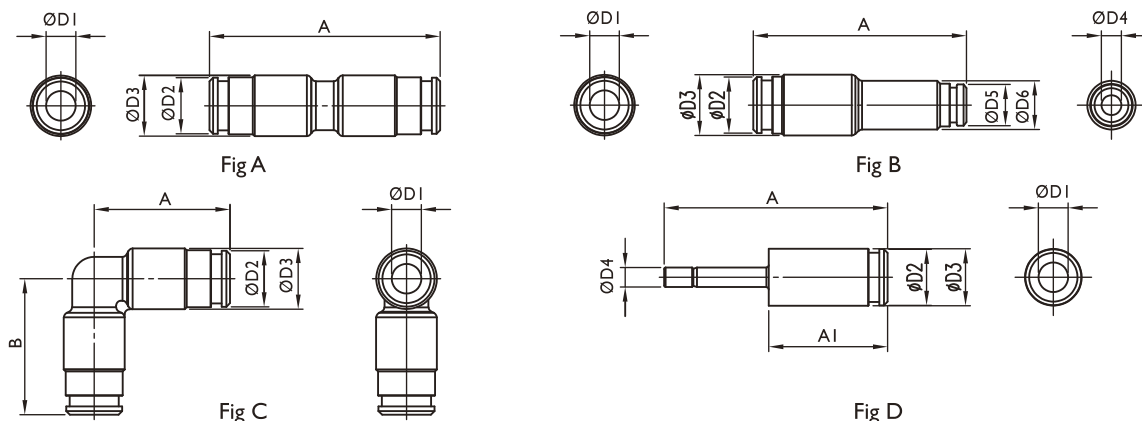
Right-Angle Connector



DI	D2	D3	A	AI	B	G	L	WI	Fig	Order Code	
										Copper	Stainless
4	10	11.5	18.7	14.7	22.4	M3 x 0.5	4	10	A	R-TB-401 ⁽¹⁾	R-TBS-401
4	10	11.5	20.7	15.7	22.4	M5 x 0.8	5	10	A	R-TB-402 ⁽¹⁾	R-TBS-402
4	10	11.5	20.7	15.7	22.4	M6 x 0.75	5	10	A	R-TB-403	R-TBS-403
4	10	11.5	20.7	15.7	22.4	M6 x 1.0	5	10	A	R-TB-404	R-TBS-404
4	10	13.5	23.2	17.2	22.4	M8 x 1.0	6	12	A	R-TB-405	R-TBS-405
4	10	13.5	24.2	18.2	22.4	M10 x 1.0	6	12	A	R-TB-406	R-TBS-406
4	10	13.5	24.2	18.2	22.4	G 1/8"	6	12	A	R-TB-407	R-TBS-407
4	8.8	14.5	14	9	24.2	M6 x 1.0	5	13	D	R-TB-408	R-TBS-408
4	8.8	14.5	15	9	24.2	M8 x 1.0	6	13	D	R-TB-409	R-TBS-409
4	8.8	14.5	17.5	9	24.2	R 1/8"	8.5	13	D	R-TB-410	R-TBS-410
6	12.5	11.5	21	16	27.9	M5 x 0.8	5	10	A	R-TB-601 ⁽¹⁾	R-TBS-601
6	12.5	11.5	21	16	27.9	M6 x 0.75	5	10	A	R-TB-602	R-TBS-602
6	12.5	11.5	21	16	27.9	M6 x 1.0	5	10	A	R-TB-603	R-TBS-603
6	12.5	13.5	23.5	17.5	27.9	M8 x 1.0	6	12	A	R-TB-604	R-TBS-604
6	12.5	13.5	24.5	18.5	27.9	M10 x 1.0	6	12	A	R-TB-605	R-TBS-605
6	12.5	13.5	24.5	18.5	27.9	G 1/8"	6	12	A	R-TB-606	R-TBS-606
6	12.5	17	25.5	18.5	27.9	G 1/4"	7	12	B	R-TB-607	R-TBS-607
6	12.5	13.5	25	-	27.9	R 1/8"	6.5	12	C	R-TB-608	R-TBS-608
6	11.7	14.5	14	9	28.2	M6 x 1.0	5	13	D	R-TB-609	R-TBS-609
6	11.7	14.5	15	9	28.2	M8 x 1.0	6	13	D	R-TB-610	R-TBS-610
6	11.7	14.5	17.5	9	28.2	R 1/8"	8.5	13	D	R-TB-611	R-TBS-611
8	14.5	14.5	25.5	19.5	29.8	M10 x 1.0	6	13	A	R-TB-801	R-TBS-801
8	14.5	14.5	25.5	19.5	29.8	G 1/8"	6	13	A	R-TB-802	R-TBS-802
8	14.5	17	25.5	19.5	29.8	G 1/4"	7	13	B	R-TB-803	R-TBS-803

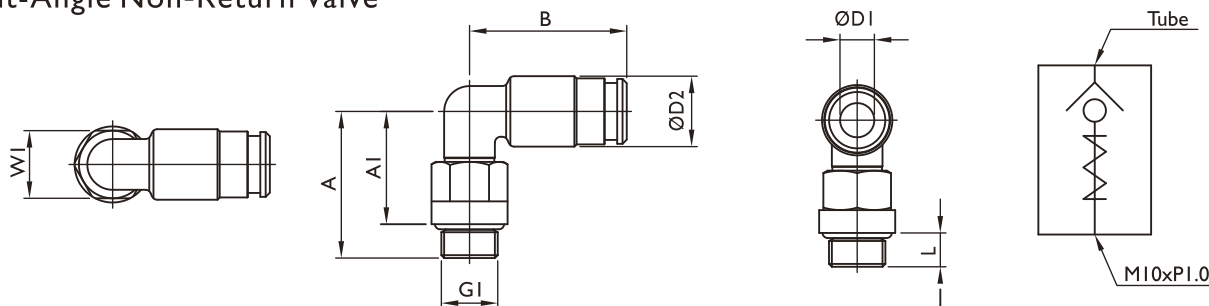
(1) Material : Carbon Steel (Nickel-Plating)
 Operation Pressure : max. 80 bar
 Operation Temperature : -30°C ~ +100°C

Tube Connector



D1	D2	D3	D4	D5	D6	A	AI	B	Fig	Order Code	
										Copper	Stainless
4	8.5	10.0	-	-	-	39.8	-	-	A	C-TB-401	C-TBS-401
4	8.5	10.0	-	-	-	22.4	-	22.4	C	C-TB-402	C-TBS-402
4	8.5	8.8	6	-	-	45.4	20.4	-	D	C-TB-403	C-TBS-403
6	11.5	12.5	-	-	-	47.8	-	-	A	C-TB-601	C-TBS-601
6	11.5	12.5	4	8.5	10	43.8	-	-	B	C-TB-602	C-TBS-602
6	11.5	12.5	-	-	-	27.9	-	27.9	C	C-TB-603	C-TBS-603
6	11.5	11.7	4	-	-	45.9	24.4	-	D	C-TB-604	C-TBS-604
8	13.5	15	6	11.5	12.5	49.2	-	-	B	C-TB-801	C-TBS-801
8	13.5	13.8	6	-	-	51.3	26.3	-	D	C-TB-802	C-TBS-802

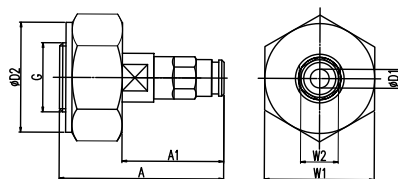
Right-Angle Non-Return Valve



D1	D2	A	AI	B	G1	L	WI	Order Code	
								Copper	Stainless
4	10	24.2	18.2	22.4	M10 x 1.0	6	12	RV-TB-401	RV-TBS-401
6	12.5	26	20	27.9	M10 x 1.0	6	12	RV-TB-601	RV-TBS-601
8	14.5	27	21	29.8	M10 x 1.0	6	13	RV-TB-801	RV-TBS-801

Function of Non-Return Valve: Avoid of backflow, Resistance of pressure.

Oil Filling Connector



D1	D2	A	AI	G	WI	W2	Order Code
4	35	48.4	28.4	M22 x 2.0	35	12	TB-4-22
6	35	52.4	32.4	M22 x 2.0	35	12	TB-6-22
8	35	57.3	37.3	M22 x 2.0	35	14	TB-8-22

The oil filling connector is to apply for refilling of lubricant.

High kinematic viscosity of lubricant will reduce the pumping distance to the device or facility.

Pay attention to kinematic viscosity by refilling of Non-APEX lubricant.

Lubricator Cartridge

■ Empty Cartridge (Order Code : G00)

For Self-Filling of grease.

Oil Filling Connector is necessary.

Supports LUG-400 lubricator

■ Standard Grease (Order Code : G01)

NLGI Grade 2

Temperature Range -30°C ~ +140°C.

Containing PTFE, good performance in high pressure and metal adhesion.

Suitable for high loading gear transmission system.

Suitable for high temperature environment.

Kinematic Viscosity 32 cSt / 40°C

Supports LUG lubricator pre-fill at 400 cm³

■ Food Grade Grease (Order Code : G02)

NLGI Grade 2

Temperature Range -35°C ~ +120°C.

NFS HI license.

Provide good wearing resistance and extend lubrication interval.

Food Grade Grease is Non-toxic, Odorless, Colorless and tasteless.

Kinematic Viscosity 50 cSt / 40°C.

Supports LUG lubricator pre-fill at 400 cm³

■ Low Temperature Grease (Order Code : G03)

NLGI Grade 2

Temperature Range -50°C ~ +120°C

Contains special additives for anti-wear, anti-oxidant, anti-corrosion and high pressure resistance.

Suitable for high loading gear transmission system.

Kinematic Viscosity 15 cSt / 40°C.

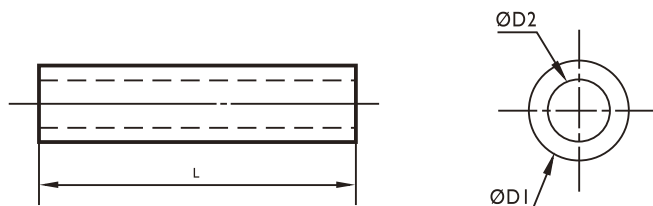
Supports LUG lubricator pre-fill at 400 cm³

Remark:

The APEX Smart Lubrication System has been optimized for the 3 greases as shown above.

Using other greases, the pumping performance of APEX Lubrication System could be different.

PA Tube



Type of Grease	D1	D2	Length in Package (meter)	Order Code
Empty Tube	4	2.5	200	T04
	6	4	200	T06
	8	5	100	T08
Standard Grease (Order Code : G01)	4	2.5	5	T04-01
	6	4	10	T06-01
	8	5	10	T08-01
Food Grade (Order Code : G02)	4	2.5	5	T04-02
	6	4	5	T06-02
	8	5	5	T08-02
Low Temperature (Order Code : G03)	4	2.5	5	T04-03
	6	4	10	T06-03
	8	5	10	T08-03

PA 12 Tube is pre-filled with grease.

Operating Pressure: 25 kg/cm² by 4 mm PA Tube; 28 kg/cm² by 6 mm & 8 mm PA Tube (Temperature 20°C)

Operating Temperature : -40°C ~ +80°C