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WARNING

INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED INSTALLATION PERSONNEL AND MUST CONFORM TO ALL NATIONAL AND LOCAL CODES.

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Hyundai Robot

Hi5AFF230620FMEN4

Hi5a Controller Function Manual

Automatic Grease Injection Function

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1 OVERVIEW

1. OVERVIEW

1.1. About Automatic Grease Injection Function

This function is designed to set the reference value and to perform automatic injection, based on the injection reference distance provided by individual makers of the equipment, among the grease injection elements of the individual axes of the robot, to which an automatic grease injector is mounted.

For this function, it is required to set the “Total moving distance calculation,” Periodic injection distance of each element,” “Distributor port count,” and the input and output signals “DO” and “D1” for the interface between the automatic injector and controller. Automatic grease injection will be carried out for individual elements based on these settings.

During the automatic injection, the result of any abnormal automatic grease injection will be notified as a warning to the user as follows.

W34100 (Automatic grease injection element in the order of) Automatic grease injection impossible! (Injector empty)
W34101 (Automatic grease injection element in the order of) Automatic grease injection impossible! (Injector overloaded)
W34102 Impossible to judge the injection status of the automatic grease injector!
(Model name of the automatic injector: Based on Hilub120)

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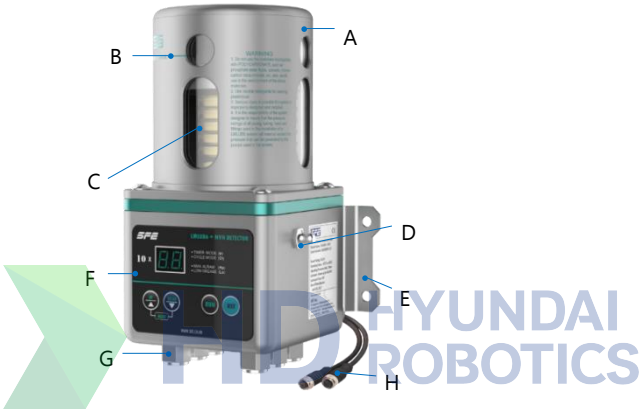
2 PRODUCT DESCRIPTION

2.1. Product Designation

The product consists of the following components:

- Grease Lubricator
- Connecting Cable
- Hydraulic hoses or Nylon Tube
- One touch male connector or Two touch
- Mounting Bracket
- Grease Service Pack (Reservoir)

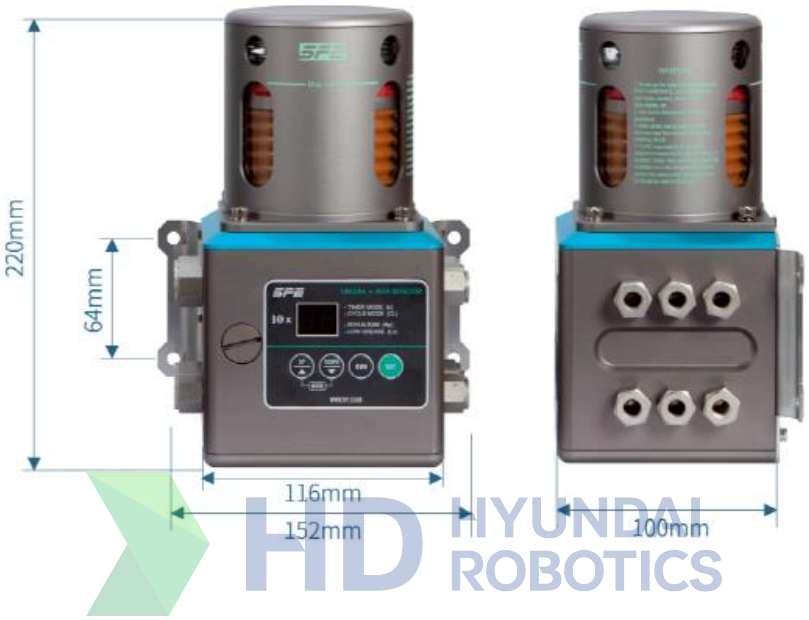


Design of LMLUB6 Lubrication System

A Protection Cover
B Maximum Grease Filling Line
C Grease Service Pack (Reservoir)
D Grease Nipple

2.2. Dimension

Hi-LUB weighs approx. 3750 g (without grease) and has the following dimension:



2.3. Technical Data

Weight	about 3,750g
Function/Principle	Plunger Pump / Positive Displacement
Volume of lubricant	250ml
Delivered volume per stroke/pulse	0.15cc
Operating Pressure	max. 200 bar
Lubricant	up to NLGI4, with solid parts possible
Operating temperature	-25 ~ 70℃
Number of outlets	max. 12 ports
Connection	N2 (6x4 / 6x3 / 4x2.5) or Hydraulic hose
Connecting Plug	M12 x 1.0 (Power)
Installation Position	Any (Include Mounting Bracket)
Control	Integrated: Loader / External: PLC
Error-Signal	Grease Low level / NVH Alarm / Overcurrent
Indicator	Status (Cycle mode or Timer mode), Error-signal

* Environment resistance is rated to at no freezing or condensation

2.4. Operating Pressure

The operating pressure is 70 bar and is monitored electronically. The maximum pressure is 200bar

2.5. Temperature Ranges

The following temperature ranges and humidity apply:

- Ambient temperature: 5~45 ranges and humidity
- Humidity: 35~85% RH

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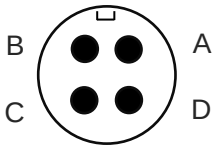
FUNCTION

3.1. Main Power

An external power source 24VDC, Maximum 0.8A



M12 Connector wiring diagram

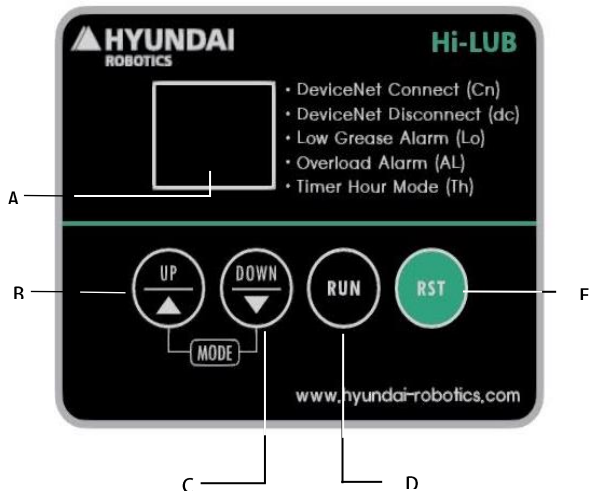
A	*DC24V + (Brown)*
B	*Cycle Signal (White)*
C	*Ground (Blue)*
D	*Alarm Out (Black)*

3.2. Communication Protocol

- Customized Pulse Signal, Protocol, If necessary
- RS485
- DeviceNet
- CC Link

3.3. Key Function

An external power source 24VDC, Maximum 0.8A



A. Value Indicating (LED: Green)
- Lights when value setting and mode setting
- Lights when power is on

B. Set Key : UP
- To increase setting value in setting value change mode change setting value in function setting mode, move up checked value in function setting check mode.
- By pressing both Run key and Up key, the motor operates infinitely

C. Set Key : DOWN
- To decrease setting value in setting value change mode change setting value in function setting mode, move down checked value in function setting check mode. By pressing this key over 3sec with UP key, **mode** progressively changes
- Change low setting value: by pressing RST key in 5 sec with Down key, FND displays “LS” and Enter to Run key

D. Run Key : Enter
- Starts to operate (1-Cycle)
- After Setting function or changing mode, press the RUN key to save

E. Reset Key
- By pressing RST Key in any status, operation will stop
- By pressing RST Key in alarm status, indicator (alarm) will clear
- By pressing RST key over 5 sec in any mode, all value changes to **factory default** value

3.4. Setting – Automatic Grease Injector

A. Station number setting
Hi-LUB setting: 03
Press the Up Key and Down Key for 3 seconds on the “DC” of the front panel display in the initial status. If the mode changes to the ID window, set the station number and then press the Run key (Enter) for the setting.

- Set in a way to ensure that there should be no station with the same station number on the network.
- There is no need to perform any other settings separately other than the station number in the injector.
- Possible to perform the setting from Number 00 to Number 63

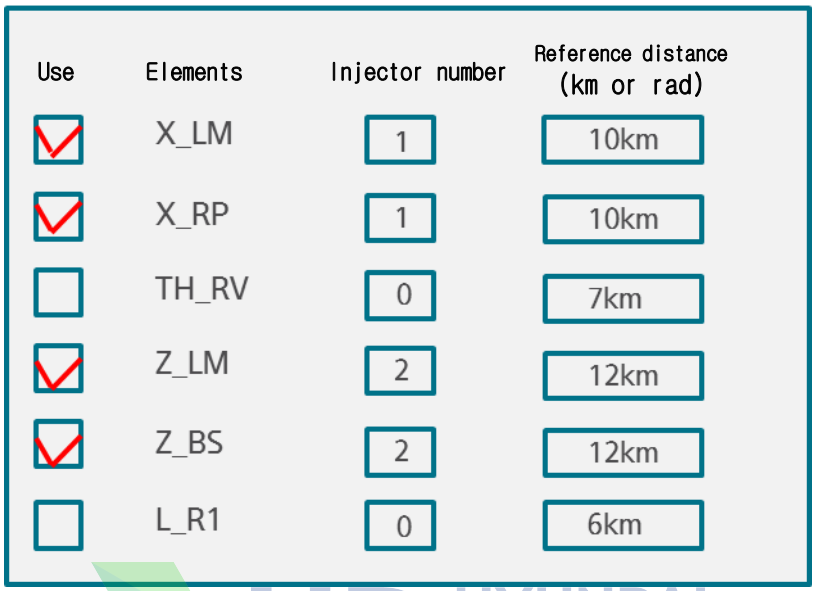
B. Status check
The status of the injector front display when the I/O communication with the master is normal.

- DC (Disconnect): To be displayed when connection to the DeviceNet is lost when the injector is powered on
- Cn (Connect): To be displayed when connection to DeviceNet is made (The dot next to the Cn mark blinks for the purpose of checking the connection.)
- Lo (Low Grease): Grease filling alarm; the motor will stop after the alarm occurs 10 times (empty signal output).
- AL (Overload): The alarm will occur when an overload occurs. The number of the blocked ports will be displayed. (Example: If P1 is displayed, it means that #1 and #7 are blocked.)
- Display of the icon of rotation: Grease lubrication indication (The motor is rotating.)

C. Fixed items in addition to the station number
- Communication speed: Auto (125K, 250K, and 500K all can be detected)
- Input Word: 2 Word (4Byte)
- Output Word: 2 Word (4Byte)

3.5. Setting - TP

[TP automatic injection setting screen]



1. **Entry path**
   - F2. System -> 3. Robot parameter -> 12. System maintenance -> 3. Setting of automatic grease injection

2. **Meaning of each item**
   A. Use
      - Automatic injection will be progressed when it is checked.

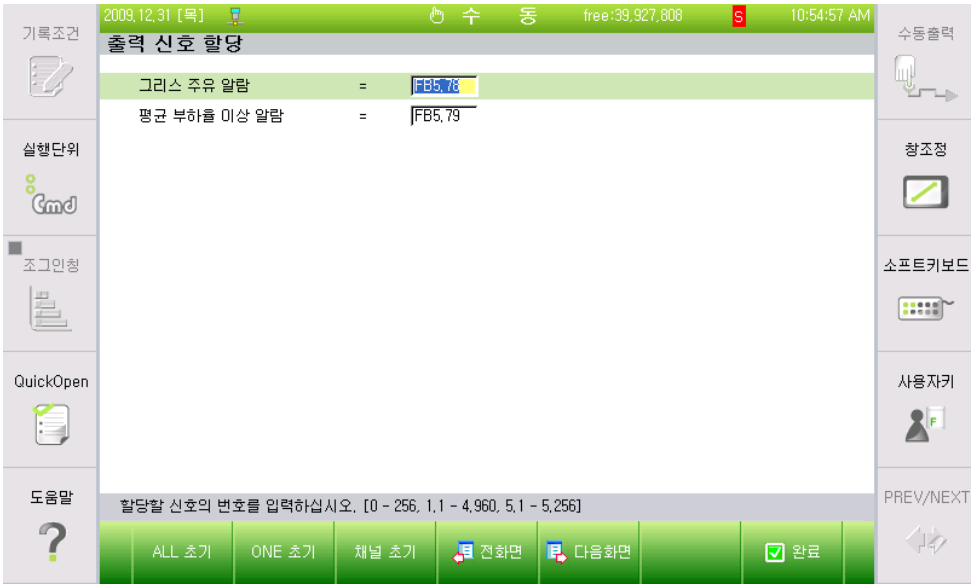
   B. Element
      - Name of the element to which an injector is installed

   C. Injector number
      - To input the injector number that matches with the relevant element (1~16)

   * The reference distance cannot be set differently for the same injector number. Will be set to the last reference distance.

   D. Reference distance (km or rad)
      - To input the reference distance for the relevant element
      - Automatic injection will progress if moving as much as the reference distance takes place.

Setting the signal for the external output of the status of the automatic grease injector.

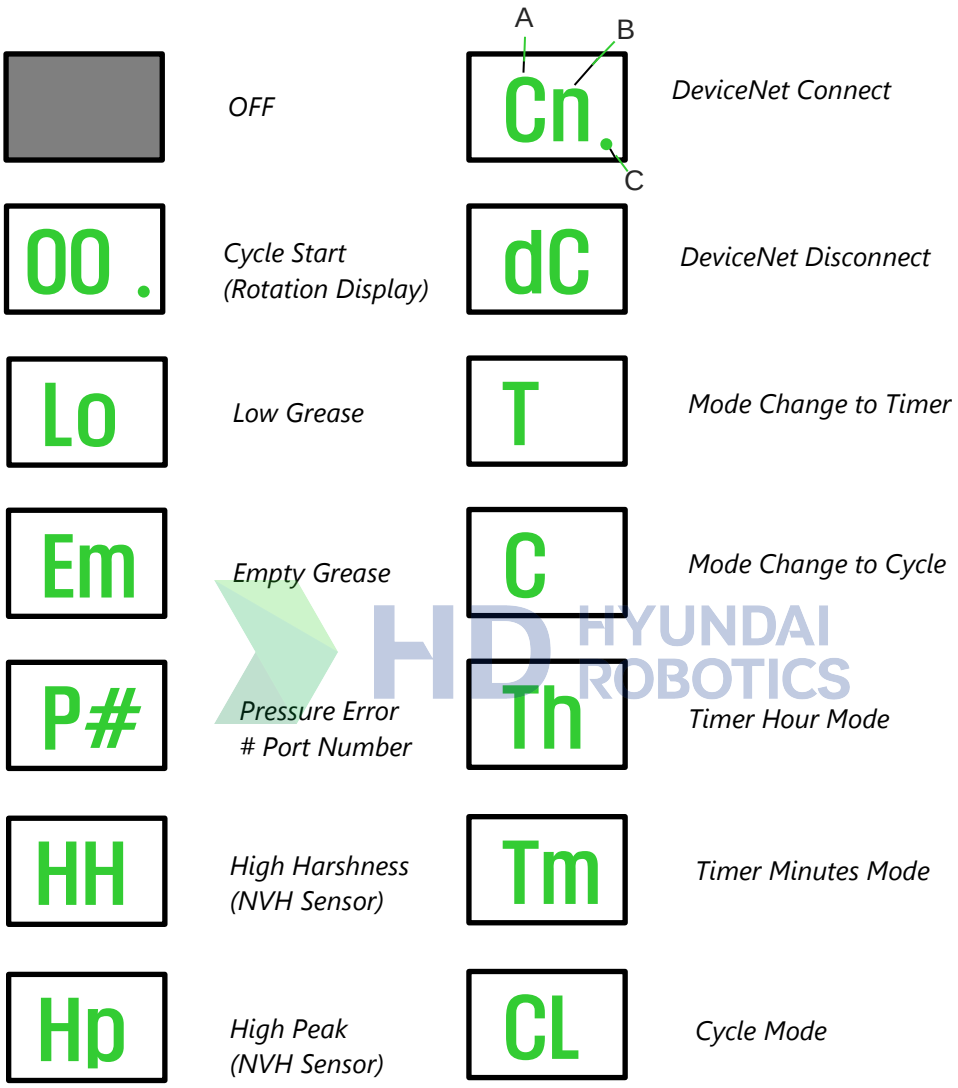


1. **Entry path**
   - F2. System -> 2: Control parameter -> 2: Setting of input and output signals -> 4. Assignment of output signal

2. **Setting values**
   - Initial value: 0
   - **Must be set for the external output of the signals**
   - The grease injection assignment signal is **FB5.DO78.**

3.6. Display Elements

The FND display indicates malfunctions and operating states of the pump types of Hi-LUB.



A FND (Seven Segment)
B Green Color
C Green Dot

* The protocol and display may vary depending on the companies.

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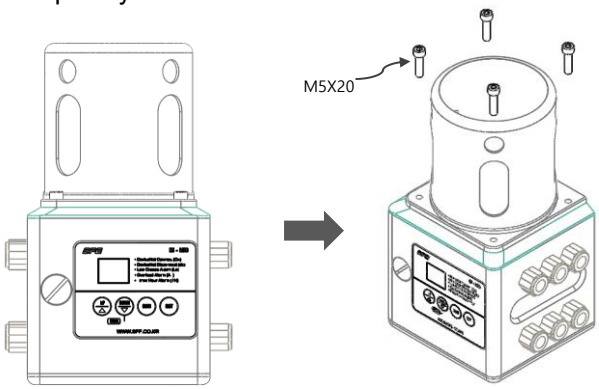
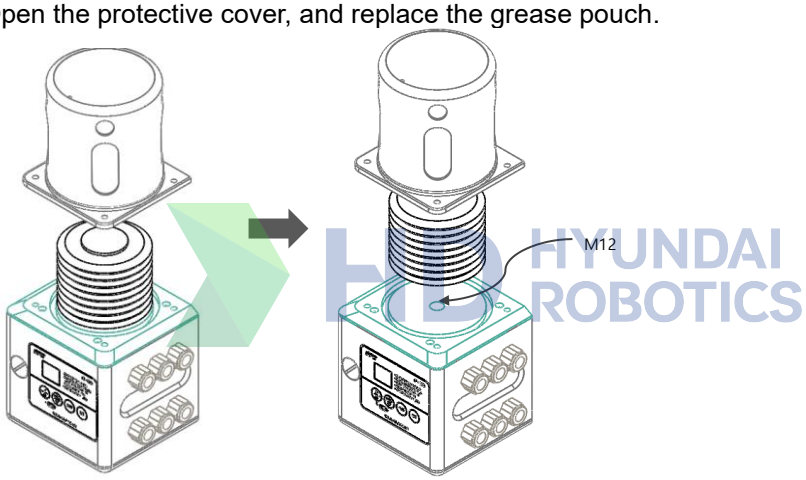
GREASE FILLING

4.1. Grease Pouch Change Type

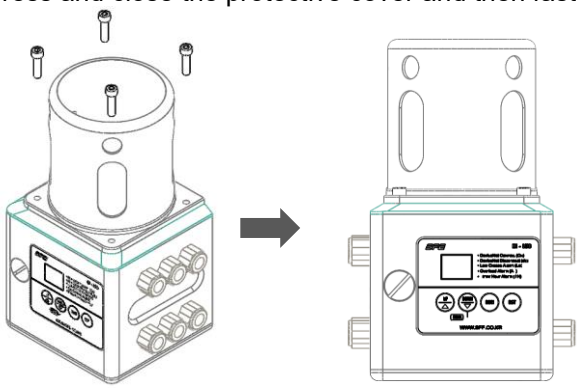
1. Completely loosen the fastened M5 wrench bolts at four locations on the protective cover.



2. Open the protective cover, and replace the grease pouch.



3. Press and close the protective cover and then fasten the M5 wrench bolts at four locations.



* The protective cover is a spring-push type. Because the spring will push the piston when replacing the protective cover, it is best to replace it with one hand pressing it.

4.2. Manual Grease Filling Type

1. Loosen the screw plug of the refilling port at the front.

Refilling Port

Screw Plug

2. Fully unscrew the screw plug first, and then fill the grease through the refill nipple by using the manual grease gun up to the level just right before the maximum warning line. Then, close the screw plug back.

Refill Nipple

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5 TROUBLES HOOTING

5.1. Error Display

If the Hi-LUB is connected to a PLC or others, it emits a signal in case of malfunction. The type of error is shown on the display.

dC	DeviceNet Disconnected
	a) Check the DeviceNet connection.
	b) Check the Hi-LUB station number. The number is 03.
	c) Check for any disconnection, and check the wiring.
Lo	Low Grease
	a) Check the grease level.
	b) Replace and refill the grease pouch.
	* Press the Reset key once after the refilling, and then the alarm will disappear.
Em	Empty Grease (Injection will be stopped after the Lo alarm occurs ten times.)
	a) Check the grease level.
	b) Replace and refill the grease pouch.
	* Press the Reset key once after the refilling, and then the alarm will disappear.
P#	Pressure Alarm (Displays the number of ports that have overpressure)
	a) Check the cause of overpressure.
	b) Resolve the cause by removing the problematic port hose and tube.
	* After resolving the problems, press the Run key for operation.

5.2. Malfunctions/Troubleshooting

Malfunction	Cause	Measure
Lubrication System does not lubricate	a) Cartridge missing/empty or air in lubricator	Insert new pouch (service pack) or vent the lubricator. If you do not replace it will continue to malfunction.
	b) Grease tube may be blocked, tube too long and/or lubricant to stiff/hard.	Switch off the power supply and find the port where it causes
	c) Various causes	Contact the service department if the problem Reoccurs
Oil Leak	a) Oil or Grease Leak	a) Apply Loctite545 or high-grade piping sealant. b) Wind the Teflon tape.
Tube cutting	a) Cut the tube by moving part	a) Remove the tube, and change into a new tube.

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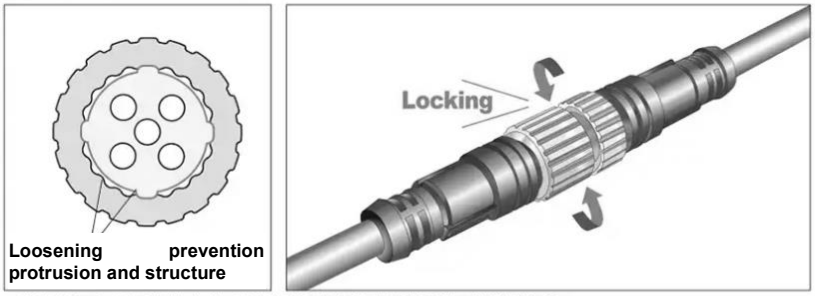
PURCHASING LIST

6.1. Accessories

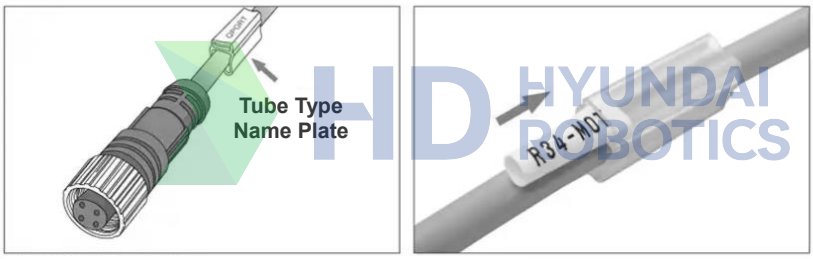
1. Power Cable
   - M12 Power Cable: M12S-A43

Locking-type M12 connector strongly resistant to vibration



*** The loosening prevention protrusion in the above structure makes it difficult for it to loosen due to vibration, providing a highly reliable connection.**

Installation of tube-type name plate



*** Number 1.25SQ tube can be used.**

2. DeviceNet Accessories
   - DeviceNet Cable: M12 Male, Straight A-Coded
   - T-Splitter without Cable: FSM-2FKM57
   - DeviceNet Terminator: RSE57-TR2

3. Tube
   - Nylon Tube: N2, OD 4mm ID 2mm

Type	Outer diameter × Inner diameter (mm)	Max. working pressure (MPa at 20°C)	Min. bending radius (mm)	Weight (g/m)	Standard color (color symbol)					
					Black	Milky white	Yellow	Blue	Green	Red
					BK	MW	YL	BU	GN	RE
N2-4-4×2	4×2	5.0	10	11	●	○	●	●	●	●
N2-4-4×2.5	4×2.5	3.3	15	8	●	○	●	●	●	●
N2-4-4×3	4×3	2.0	20	6	●	○	—	—	—	—
N2-4-6×4	6×4	3.0		17	●	○	●	●	●	●
N2-4-6×4.5	6×4.5	2.0		13	●	○	●	●	●	●
N2-4-8×6	8×6		35	23	●	○	●	●	●	●
N2-4-10×7.5	10×7.5			35	●	○	—	—	—	—
N2-4-10×8	10×8	1.6	45	29	●	○	●	●	●	●
N2-4-12×9	12×9	2.0		51	●	○	●	●	●	●
N2-4-16×13	16×13	1.6	100	70	●	○	—	—	—	—

4. One-Touch Male Connector
   - PT 1/8 x 4mm, Stainless steel

5. Grease Refile Nipple
   - M5 Grease Nipple

6. Grease Pouch (Service-Pack)
   - Pouch Capacity: 250cc

GRC: 477, Bundangsuseo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do
Daegu: 50 Technosunhwan-ro 3-gil, Yuga-eup, Dalseong-gun, Daegu-si
Ulsan: Room 201-5, Automotive and Shipbuilding Engineering Hall, Maegoksaneop-ro 21, Buk-gu, Ulsan-si
Middle Region: Song-gok-gil 161, Yeomchi-eup, Asan-si, Chungcheongnam-do
Gwangju: Room 101, Building B, Pyeongdongsandan-ro 170-3, Gwangsan-gu, Gwangju-si
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