

# Product Technical Guide

perma Automatic Lubrication Systems



The Expert in Lubrication Solutions

**perma**



**Reliable products.  
Practical lubrication solutions.**

## The Expert in Lubrication Solutions

### perma-tec GmbH & Co KG (Germany)

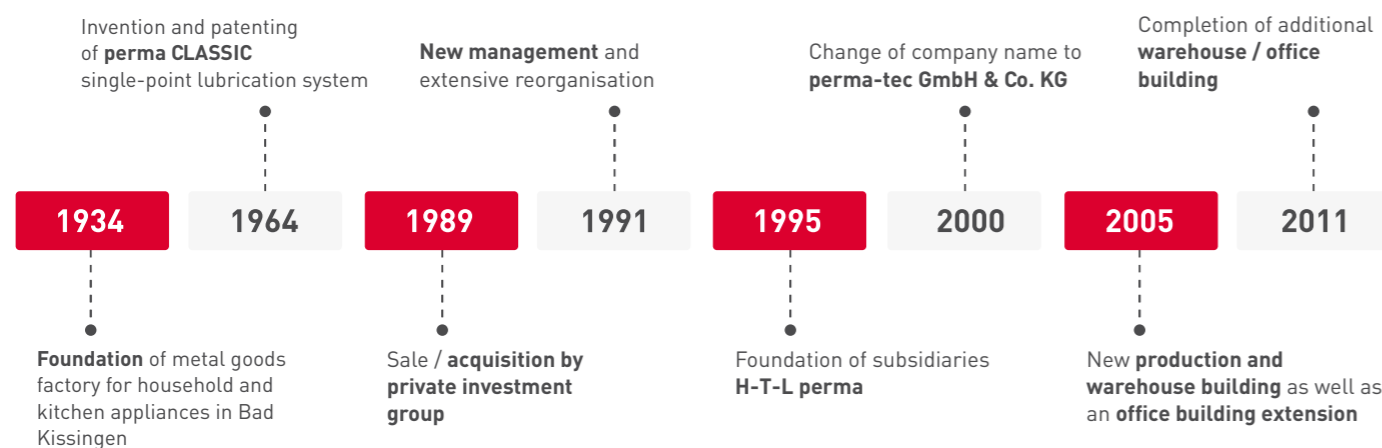
Based in Germany, perma-tec GmbH & Co KG is the global leader in the research, development and manufacturing of automatic, single-point lubricators. perma lubrication systems can be found in all types of industries and applications around the world. perma-tec has a network of subsidiaries and distribution partners in more than 60 countries. perma lubrication systems are manufactured in Germany in state-of-the-art facilities. In order to conform to globally accepted manufacturing standards, perma products are continuously tested and inspected. perma-tec has been certified according to DIN EN ISO 9001 since 1997.

### HTL perma Australia Pty Ltd

As a wholly owned subsidiary of perma-tec GmbH & Co, HTL perma Australia Pty Ltd has direct access to the Research & Development Centre and Engineering Group in Germany.

HTL perma Australia Pty Ltd responds to the demands of preventative maintenance programs by focusing on service, customised solutions and knowledge sharing. We understand that our products deliver maximum value when combined with robust installation systems, a practical approach to maintenance scheduling and ongoing technical support.

## Milestones in company history



The information provided in this document is of a general nature only. Potential users of perma Automatic Lubricators should seek advice tailored to their particular circumstances and, for this purpose, are welcome to contact HTL perma Australia Pty Ltd on the contact number provided. HTL perma Australia Pty Ltd is not liable for any costs, losses or damages, whether direct or indirect, arising from any reliance upon this document. Details relating to product designs and specifications may be subject change without prior notice.

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# 1

## Benefits of Automated Lubrication

### 1.1. Bearing life extension



Lubrication systems which deliver small volumes of lubricant at short time intervals extend bearing service life and deliver a reliability advantage.

The example below provides a statistical demonstration of a single point lubricator program at work:

A site with 500 perma single-point lubricators\*, with an average setting of 3 months, reveals the following statistics.

- 1,946 injections of grease per year to each point.
- An injection of grease, somewhere on site, every 32 seconds.
- 2,667 individual injections per day.
- Almost 1 million individual injections each year.

\*For this example perma STAR VARIO L250



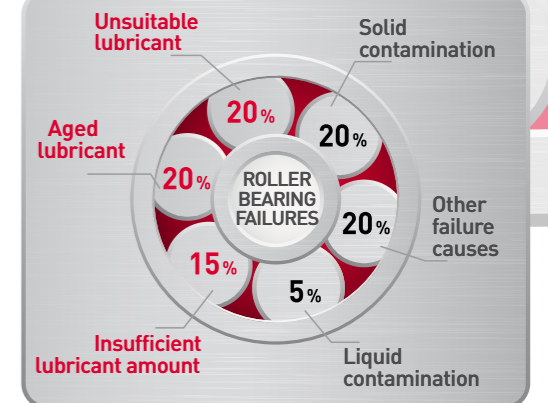
## Introduction

To be competitive manufacturing, mineral processing and mining operations must maximise production output while minimising long term operating costs. A key component to achieving this is the implementation of preventative maintenance strategies which extend equipment service life and minimise the downtime required for maintenance, repair and overhaul. Success in this area reduces the total cost of ownership of production assets and ultimately improves business performance.

Cost and downtime due to premature wear is significant. For grease lubricated bearings, well considered lubrication strategies have a dramatic affect on extending bearing service life and therefore reducing costs and improving equipment reliability. The chart opposite provides estimates of the causes of premature bearing failures. Poor lubrication practices and contamination are the major causes.

In recognition of this, industry leading businesses invest in automatic lubrication systems for the purpose of bearing relubrication and contaminant exclusion because they deliver superior reliability results compared to manual lubrication.

Bearing damage



## Benefits of short relubrication intervals

Bearing relubrication must maintain sufficient fresh grease around the working components of bearings as they rotate. Insufficient or infrequent relubrication leads to the deterioration of lubrication conditions, lubricant starvation and to premature wear. For high speed bearings, the rapid supply of excessive amounts of grease can cause over-lubrication which leads to degradation of grease condition and therefore also threatens the service life of bearings.

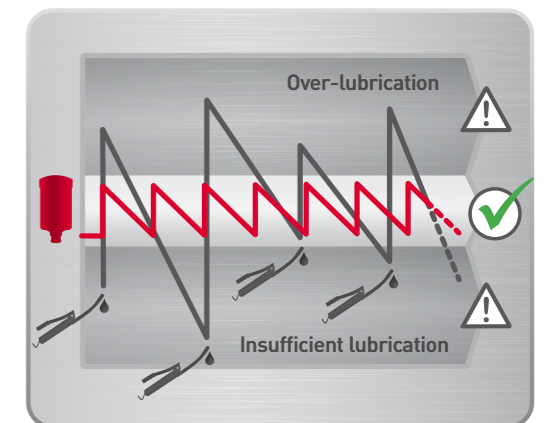
The longest bearing service life is achieved when grease is added in small amounts at short time intervals. When implemented correctly, this regime of grease delivery maintains a steady-state of lubrication protection where over-lubrication and lubricant starvation do not occur.

Factors which reduce the service life of the grease include high speeds, elevated operating temperatures, vibration and high loads. When operating conditions such as these prevail, the benefits of delivering small amounts of grease at short time intervals are at their greatest.

The diagram opposite demonstrates the differences between relubrication methods which deliver small amounts of grease at short time intervals and those which deliver large amounts at extended time intervals.

Source:

Statistical data for causes of failure varies depending on the source. It is generally accepted that more than half of premature bearing failures are lubrication or contamination related. This data is from the Noria Corporation's "Machinery Lubrication" magazine, 4/2012.



### Too much grease

- Potential for elevated operating temperature and rapid degradation of grease for high speed bearings
- Less efficient use of fresh grease
- Potential to damage contact type seals

### Too little grease

- Starvation causing premature wear
- Under-lubrication leads to accelerated degradation of remaining grease
- Increased potential for contamination entry due to lack of lubricant purge

# 1

## Benefits of Automated Lubrication

### 1.2. Contamination prevention

The contamination of bearings by water and solid particles causes accelerated wear and dramatically reduces bearing service life. Industries which involve the handling of abrasive material suffer the greatest losses as a result of inadequate contamination control procedures and systems. perma automatic lubricators provide a means to achieving a purge of clean grease through bearing seals in order to prevent the entry of water, dirt and dust, and in doing so extend bearing service life.

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#### Preventing contamination in harsh operating environments

When solid or liquid contaminants enter a bearing they cause accelerated wear and the early onset of fatigue. For solid contaminants the rate of wear increases with the size, concentration and hardness of contaminants. Smaller particles lead to abrasive wear whilst larger particles can cause indentation of bearing raceways which later become sites of fatigue related wear. Greasing practices which prevent the ingress of contaminants provide long term financial return by means of longer bearing service life and reduced downtime.

Strategies for preventing contamination vary depending on bearing housing and seal configurations. For bearings with free-purging labyrinth or taconite seals, contamination prevention is achieved by delivering a consistent purge of clean grease through the seals. In simple terms, if clean grease is purging out of the seal, contaminants, whether they be solid or liquid, are prevented from entering the bearing.

Bearings which operate in harsh environments, including high humidity and high levels of liquid or particulate contaminants, demand the strictest attention to regular seal purging. Under such conditions automated purging of seals provides the greatest benefits.

#### Strategies to prevent contaminant entry to bearings:

##### Slurry pump seal purging

Automated purging of labyrinth seals provides constant protection against ingress of solids and liquids. For pumps where the wet-end seal is subjected to water spray a higher rate of automated purging is commonly applied to compensate for the elevated rate of grease washout.



##### Conveyor pulley bearing relubrication & seal purging

Automated purging of taconite or labyrinth type seals provides constant protection against the ingress of contaminants. For the example shown bearing relubrication is provided by a separate automatic lubricator.



##### Conveyor pulley bearing seal purging (hybrid solution)

Automated purging of taconite or labyrinth type seals provides constant protection against the ingress of contaminants. Meanwhile, for this solution, bearing relubrication is provided manually on a period maintenance cycle. This type of hybrid system can provide a practical balance between automated and manual greasing for large pulley bearings.



# 1

## Benefits of Automated Lubrication

### 1.3. Safer lubrication

Workplace safety is of ultimate importance. Reliable systems which reduce the interface between people and operating equipment are a key element to reducing the likelihood of workplace accidents.

Automated systems provide a valuable contribution to reducing the likelihood of workplace accidents by significantly reducing the time required to lubricate equipment.

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## Workplace safety and efficiency improvements

Automated lubrication systems are maintenance tools which make a positive contribution to work place safety and efficiency. This is particularly the case for large operations in hot climates, where the physical demands of performing regular manual greasing increase the risk of fatigue and heat exhaustion compared to automated alternatives.

The implementation of automatic lubrication systems does not mean that the frequency of equipment inspections should be reduced. Automated systems save time which can be invested into other tasks such as mechanical inspections, condition monitoring data collection, breather maintenance and oil cleanliness management activities such as a filtration and clarification.

## Strategies to improve safety and efficiency:

**Strategy 1** – Remote mount lubricators for large electric motors, fans and pumps, which would otherwise be difficult to reach, at safe and easy to reach locations at ground level.

**Safety gain** – Improve safety via the remote installation of lubricators at safe to access locations to remove the temptation for personnel to step up onto, or climb onto, equipment structures.

**Efficiency gain** – Save time which would otherwise be required to locate and use safety steps.

**Example** - Direct mounting of lubricators to the fan bearings shown would require personnel to climb onto the fan structure or use a safety step for lubricator inspection and servicing. The remote mounting solution allows lubricators to be safely handled from ground level.



**Strategy 2** – Remote mount lubricators used for conveyor pulley bearings which are located behind cages and avoid unnecessary manual handling of cages.

**Safety gain** – Improve safety by avoiding the need to lift and handle cages and guards.

**Efficiency gain** – Save time which would otherwise be required during shuts for permits, isolations, cage removal and cage reinstatement.

**Example** - The perma STAR VARIO lubricators shown are delivering grease to the bearing relubrication point and seal purge point of a conveyor pulley bearing.



**Strategy 3** – Automatically lubricate equipment which would otherwise require working at heights or confined space permits.

**Safety gain** – Improve safety by reducing the need to perform work at heights or within confined spaces.

**Efficiency gain** – Save time which would otherwise be required during shuts for permits, isolations, equipment preparation and other time consuming requirements.

**Example** - The perma STAR VARIO lubricator shown is lubricating the bearing of a gravity take-up pulley on a conveyor via a 5 meter long remote grease line.



# 2

## Products 2.1. perma CLASSIC



### Simple, robust, reliable

By tightening the activating screw the gas generator drops into the electrolyte fluid where it starts an electrochemical reaction that generates gas. The accumulation of gas forces the piston forward in a controlled manner, gradually expelling the lubricant under pressure. The lubricant is continuously injected into the lubrication point. The lubricant cartridge is empty when the piston has reached then end of its allowable travel and becomes visible at the end of the clear cone.

The lubrication period is determined by colour-coded activator screws (type 1, type 3, type 6, or type 12) and the average ambient temperature.



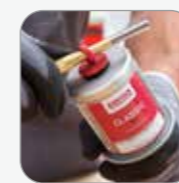
### Applications

perma CLASSIC is a single-point lubricator which is suited to a broad range of bearing and chain applications. perma CLASSIC is particularly well suited to low to medium speed bearings in harsh operating environments. For example, the steel body and flexible base make the perma CLASSIC ideal for conveyor pulley bearing lubrication in arduous operating environments such as can be found in the quarry industry.



### Product characteristics

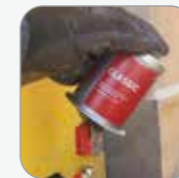
### Benefits



#### Colour coded activation system

Settings:  
1, 3, 6 or 12 months

- Simple and low cost to implement a no-fuss solution.
- Colour coded system to identify time setting which cannot be tampered with or altered once activated.
- Quick start technology which reduces the delay time between activation and the delivery of first grease.



#### Robust metal body

#### Impact resistant flexible end cone

- Metal body can withstand knocks and impacts to provide reliable lubrication under the harshest conditions.
- End cone can be flexed approximately 45 degrees and will recover to its original position without damage.
- Additional accessories for lubricator protection is not required.



#### Pressure build-up to 4 bar allows remote mounting with lines up to 1 meter\*

- Provides options for simple remote mounting.
- Can be installed on any angle and is fully dust proof and water proof.

\* This is a guide. Limits depend on variables such as line ID, grease type, temperature and the resistance of the lubrication point itself. Extending line lengths delays the delivery of first grease to the lubrication point. Excessive lengths may prevent lubricant delivery altogether.

### Technical data

Housing  
Metal

Drive

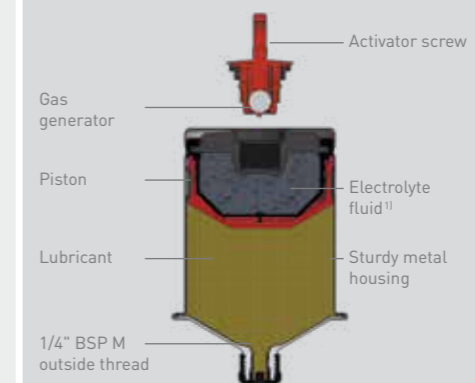
#### Gas generating unit

Discharge period at +20 °C with SF01  
1, 3, 6 or 12 months

Lubricant volume  
120 cm<sup>3</sup>

Operating temperature  
0 °C to +40 °C

Remote installations\*  
1 meter of 3/8" ID line (grease)



<sup>1)</sup>User friendly citric acid.

Refer to the product Safety Data Sheet for further details on contents. The SDS can be downloaded from [www.perma.com.au](http://www.perma.com.au)

#### Discharge period in months

	1	3	6	12
120 cm <sup>3</sup>				
Time period**	1	3	6	12
cc per day	4	1.4	0.7	0.3

\*\* Grease discharge rates are temperature dependent. Rates shown are for an average temperature of 20°C.



### For high corrosion, high humidity and high contamination environments

By tightening the activating screw the gas generator drops into the electrolyte fluid where it starts an electrochemical reaction that generates gas. The accumulation of gas forces the piston forward in a controlled manner, gradually expelling the lubricant under pressure. The lubricant is continuously injected into the lubrication point. The progression of the piston can be observed through the transparent body of the lubricator.

The lubrication period is determined by colour-coded activator screws (type 1, type 3, type 6, or type 12) and the average ambient temperature.



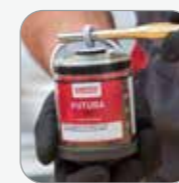
### Applications

perma FUTURA is a single-point lubricator which is suited to a range of rolling element and plane bearing applications. perma FUTURA is particularly well suited to low to medium speed bearings in wet operating environments. The transparent body of the perma FUTURA allows inspection of the piston position while the integrated support flange provides protection against damage in the event of accidental impacts.



### Product characteristics

### Benefits



**Colour coded activation system**  
**Settings:**  
**1, 3, 6 or 12 months**

- Simple and low cost to implement a no-fuss solution.
- Colour coded system to identify time setting which cannot be tampered with or altered once activated.
- Quick start technology which reduces the delay time between activation and the delivery of first grease.



**Transparent body**  
**Impact resistant integrated support flange**

- Transparent lubricator body is perfectly clear allowing the position of the lubricant piston to be easily inspected.
- Integrated support flange is reinforced with glass and rubber fibres to provide strength while reducing brittleness.
- Additional accessories for lubricator protection are not required.



**Pressure build-up to 4 bar allows remote mounting with lines up to 1 meter\***

- Provides simple options for remote mounting including beam and cage attachment options.
- Can be installed on any angle and is fully dust proof, corrosion proof and water proof.

\* This is a guide. Limits depend on variables such as line ID, grease type, temperature and the resistance of the lubrication point itself. Extending line lengths delays the delivery of first grease to the lubrication point. Excessive lengths may prevent lubricant delivery altogether.

### Technical data

Housing  
Transparent plastics

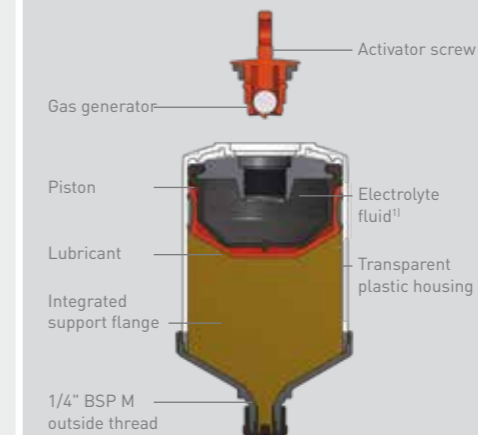
Drive  
Gas generating unit

Discharge period at 20 °C with SF01  
**1, 3, 6 or 12 months**

Lubricant volume  
**120 cm<sup>3</sup>**

Operating temperature  
**0 °C to +40 °C**

Remote installations\*  
**1 meter of 3/8" ID line (grease)**



### Discharge period in months

120 cm <sup>3</sup>				
Time period**	1	3	6	12
cc per day	4	1.4	0.7	0.3

<sup>1</sup>User friendly citric acid.  
Refer to the product Safety Data Sheet for further details on contents. The SDS can be downloaded from [www.perma.com.au](http://www.perma.com.au)

\*\* Grease discharge rates are temperature dependent. Rates shown are for an average temperature of 20°C.

# 2

## Products

### 2.3. perma FLEX



#### Single part unit with dial type time setting

The automatic lubrication system perma FLEX is available in two convenient sizes (60 cm<sup>3</sup> / 125 cm<sup>3</sup>).

It can be used for inside or outside applications at temperatures ranging from -20 °C to +60 °C. Discharge period setting is flexible and can be adjusted from 1 to 12 months using the dial on top of the lubricator.

perma FLEX comes fully assembled and ready-to-use. Simply turn the dial to the desired discharge period and the system is activated. The electronically controlled chemical reaction will build up the pressure that is necessary to continually supply the lubrication point with fresh lubricant.

**Intrinsically safe lubricator**



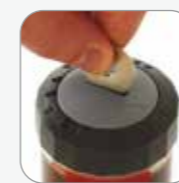
#### Applications

perma FLEX is suited to a broad range of rolling element and plane bearing applications and can also be filled with oil for the purpose of chain lubrication. The dial activation system is simple to use and allows a single product to be used where multiple products might otherwise be required. The dial system also allows the time setting to be adjusted during operation if necessary. If required the lubricator can be turned off during extended periods of downtime. perma FLEX is IP68 rated meaning that it is dust tight and water proof.



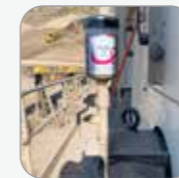
#### Product characteristics

#### Benefits



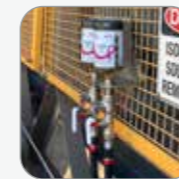
**Dial activation system**  
**Settings:**  
**1, 2, 3, ...12 months for 60 & 125 cm<sup>3</sup> sizes**

- Variable time setting options reduces compromise relating to selection of lubricant dispensing rates.
- If required, the time setting can be altered during service and the lubricator can be stopped and started again.



**Transparent body**  
**Slimline design**

- Transparent lubricator body is perfectly clear allowing the position of the lubricant piston to be easily inspected.
- Slimline design minimises the space required for installation.



**Pressure build-up to 5 bar allows remote mounting with lines up to 1 meter\***  
**Intrinsically safe**

- Provides simple options for remote mounting including beam and cage attachment options.
- Certified under IECEx for use in Zone I areas. Contact perma for further information.

\* This is a guide. Limits depend on variables such as line ID, grease type, temperature and the resistance of the lubrication point itself. Extending line lengths delays the delivery of first grease to the lubrication point. Excessive lengths may prevent lubricant delivery altogether.

#### Technical data

Housing  
**Transparent plastics**

Drive  
**Gas generating unit**

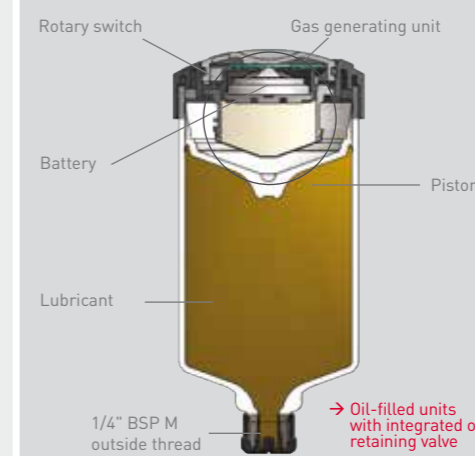
Discharge period at 20 °C with SF01  
**1, 2, 3, ..., 12 months**

Lubricant volume  
**60 cm<sup>3</sup> and 125 cm<sup>3</sup>**

Operating temperature range  
**-20 °C to +60 °C**

Protection class  
**IP 68**

Remote installations\*  
**1 meter of 3/8" ID line (grease)**



Rotary switch for discharge period setting



Refer to the product Safety Data Sheet for further details on contents. The SDS can be downloaded from [www.perma.com.au](http://www.perma.com.au)





Intrinsically safe lubricator



#### For applications with high variations in temperature

perma NOVA can be used for applications that are within a temperature range of -20 °C up to +60 °C. A discharge period of 1 to 12 months can be easily programmed by pushing the selection button on the NOVA control unit. A temperature sensor regularly measures the ambient temperature and the control unit calculates the required gas generation based on this data. This ensures a continuous and controlled discharge. perma NOVA consists of a reusable control unit, a lubricant canister and a light weight protection cover.



#### Applications

perma NOVA is especially well suited to the lubrication of bearings on equipment where there is considerable variation in ambient temperature or where intrinsic safety is required, such is often the case in the oil and gas industries. The re-usable Control unit contains a temperature sensor which allows the behaviour of the lubricator to automatically adjust to the operating conditions. The perma NOVA is IP65 rated meaning that it is dust tight and protected against water jets.



#### Product characteristics

#### Benefits



**LCD display with push button**  
**Settings:**  
**1, 2, 3, ...12 months for**  
**65 & 125 cm³ sizes**  
 with automatic temperature compensation

- Variable time setting options reduces compromise relating to selection of lubricant dispensing rates.
- Control unit constantly monitors temperature. Temperature measurements are used to alter gas generation rates in order to provide accurate lubricant dispensing across a broad range of temperatures.



**Transparent body**  
**Slimline design**

- Transparent lubricator body is perfectly clear allowing the position of the lubricant piston to be easily inspected.
- Slimline design minimises the space required for installation.



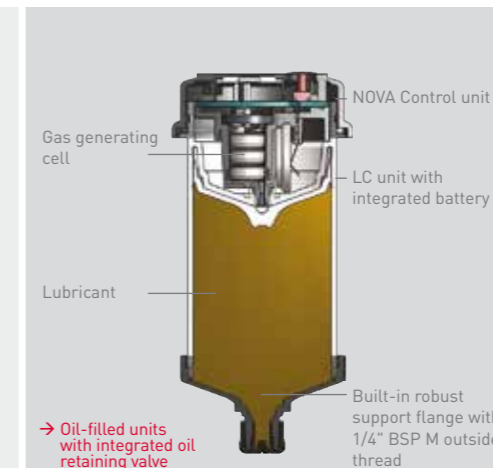
**Pressure build-up to 6 bar allows**  
**remote mounting with lines up to**  
**1 meter\***  
**Intrinsically safe**

- Provides simple options for remote mounting including beam and cage attachment options.
- Certified under IECEx and ANZEx for use in Zone I areas. Contact perma for further information.

\* This is a guide. Limits depend on variables such as line ID, grease type, temperature and the resistance of the lubrication point itself. Extending line lengths delays the delivery of first grease to the lubrication point. Excessive lengths may prevent lubricant delivery altogether.

#### Technical data

Housing  
 Transparent plastic  
 Drive - reusable  
**Gas generating unit**  
 Discharge period  
**1, 2, 3... through to 12 months**  
 Lubricant volume  
**65 cm³ or 125 cm³**  
 Operating temperature  
**-20 °C to +60 °C**  
 Protection class  
**IP 65**  
 Remote installations\*  
**1 meter of 3/8" ID line (grease)**



→ Oil-filled units with integrated oil retaining valve





### Electro-mechanical, variable time settings, temperature independent

perma STAR VARIO consists of a reusable electro-mechanical drive unit and a single-use lubricant cartridge. Because the lubricator is mechanically driven the dispensing rate is independent of ambient temperature and back pressure\*. Inspection of the perma STAR VARIO is made easy via the combination of the transparent lubricant cartridge, a flashing LED alert system and an LCD display screen which communicates the status of the lubricator to maintenance personnel.

\*Total resistance to grease flow must be less than the pressure delivery capability of the lubricator. Note that for the previous model of the perma STAR VARIO the guideline for maximum grease line length was 3 meters.



### Applications

perma STAR VARIO is a single-point, automatic lubricator which is suited to a broad range of bearing and chain applications. perma STAR VARIO is ideal for applications which demand precise grease delivery or for operating environments which include significant temperature fluctuations. The remote installation kits for perma STAR VARIO provide practical solutions for lubricators to be installed at safe and easy to reach locations.



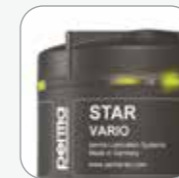
### Product characteristics

### Benefits



**LCD display with push button** shows discharge period, LC size and operating status  
**Setting:** 1, 2, 3, ...12 months & LC three sizes

- Simple to navigate menu with LCD display makes the system easy to set.
- Broad range of setting options reduces compromise when selecting lubricant dispensing rates and provides greater flexibility for service planning.
- System can be turned off for extended equipment shut downs.



**Electromechanical, reusable drive unit**  
**All around visible LED lights** signal function and errors

- Precise lubricant dispensing which is independent of temperature and back pressure\*.
- Simple to inspect via the combination of the flashing LED system, LCD display and transparent lubricant cartridge.

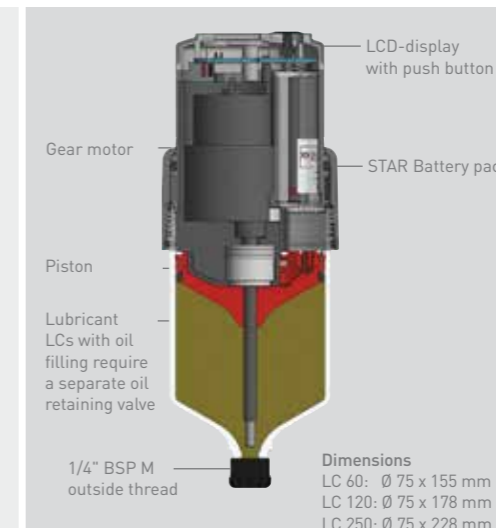


**Pressure build-up to 6 bar** allows remote mounting with lines up to 5 meters\*  
**Purge function**

- Extensive options for remote mounting lubricators at safe to access locations.
- Remote mounting reduces the dependence on time during maintenance shutdowns for lubricator servicing and reduces the requirement to perform time consuming equipment isolations.

### Technical data

Drive – reusable  
**Electromechanical**  
Power supply  
**STAR VARIO Battery pack 4.5 V**  
Discharge period  
**1, 2, 3, ... 12 months**  
Lubricant volume  
**60 cm<sup>3</sup>, 120 cm<sup>3</sup> or 250 cm<sup>3</sup>**  
Operating temperature  
**-10 °C to +60 °C**  
Protection class  
**IP 65**  
Standard & special lubricants  
**Oil / Grease up to NLG12**  
Remote installations\*  
**5 meters of 3/8" ID line (grease)**



## Dispensing rate options




The table below provides the lubricant dispensing rates for each of the available time settings and lubricant cartridge sizes (60 cm<sup>3</sup>, 120 cm<sup>3</sup> or 250 cm<sup>3</sup>). The data shows the rates in "cm<sup>3</sup> per day" and "cm<sup>3</sup> per week".

The table for each lubricator size also show the amount of lubricant which is delivered during each run cycle. The bottom table provides the time between each lubricant delivery cycle for each available setting.

**Example** – A 250 cm<sup>3</sup> lubricator set to 4 months will deliver 0.53 cm<sup>3</sup> of grease every 6 hours and 6 minutes to deliver a total daily amount of 2.1 cm<sup>3</sup> and a total weekly amount of 15 cm<sup>3</sup>. Note that 1 cm<sup>3</sup> = 1 centimeter cubed (1 cc).

Note that a special program offering weekly time settings from 1 to 24 weeks is also available from the same drive system. Contact your perma supplier for more details.

Refer to the perma STAR VARIO Operators Guide for full details on how to set dispensing rates.







	<b>Canister Size</b> 250 cm <sup>3</sup>	Setting, months	1	2	3	4	5	6	7	8	9	10	11	12
	<b>Volume per cycle</b> 0.53 cm <sup>3</sup>	cm <sup>3</sup> per day	8.3	4.2	2.8	2.1	1.7	1.4	1.2	1.0	0.93	0.83	0.76	0.69
		cm <sup>3</sup> per week	58	29	19	15	12	9.7	8.3	7.3	6.5	5.8	5.3	4.9
	<b>Canister Size</b> 120 cm <sup>3</sup>	Setting, months	1	2	3	4	5	6	7	8	9	10	11	12
	<b>Volume per cycle</b> 0.26 cm <sup>3</sup>	cm <sup>3</sup> per day	4.0	2.0	1.3	1.0	0.80	0.67	0.57	0.50	0.44	0.40	0.36	0.33
		cm <sup>3</sup> per week	28	14	9.3	7.0	5.6	4.7	4.0	3.5	3.1	2.8	2.5	2.3
	<b>Canister Size</b> 60 cm <sup>3</sup>	Setting, months	1	2	3	4	5	6	7	8	9	10	11	12
	<b>Volume per cycle</b> 0.13 cm <sup>3</sup>	cm <sup>3</sup> per day	2.0	1.0	0.67	0.50	0.40	0.33	0.29	0.25	0.22	0.20	0.18	0.17
		cm <sup>3</sup> per week	14	7.0	4.7	3.5	2.8	2.3	2.0	1.8	1.6	1.4	1.3	1.2
<b>Time between lubricant delivery cycles</b>	Setting, months	1	2	3	4	5	6	7	8	9	10	11	12	
	Hrs : Mins	1h : 30m	3h : 00m	4h : 36m	6h : 06m	7h : 36m	9h : 06m	10h : 36m	12h : 12m	13h : 42m	15h : 12m	16h : 42m	18h : 12m	

## Display screen and flashing light status indicators

The perma STAR VARIO combines flashing LED's and an LCD display screen to provide a system which can be inspected quickly to confirm the lubricators operational status.

The 4-way LED system provides particular advantage when inspecting lubricators which are located in areas of low light or when lubricators are inspected during night shift.

- LCD screen shows lubricator operational status and setting
- Green and red LED lights indicate lubricator operational status

Lights & Display Screen	Lubricator Status	Action
	<b>DISPLAY SCREEN</b> Shows the time setting and a flashing line above the allocated lubricant canister size.  <b>LIGHTS</b> Green with 7 second flash cycle	<b>DWELL</b> Lubricator is between dispensing cycles, waiting to commence the next programmed lubricant delivery cycle.
	<b>DISPLAY SCREEN</b> <b>RU</b> = run  <b>LIGHTS</b> Green with 1 second flash cycle.	<b>DISPENSING</b> Lubricator is dispensing lubricant.
	<b>DISPLAY SCREEN</b> <b>PU</b> = purge  <b>LIGHTS</b> Green with 1 second flash cycle	<b>PURGE</b> Lubricator purge mode has been activated and lubricant is being dispensed.  The purge cycle can be interrupted at any time by pressing the SET button. once.
	<b>DISPLAY SCREEN</b> <b>LC</b> = lubricant canister  <b>LIGHTS</b> Red with 2 second double flash cycle	<b>CANISTER EMPTY</b> Based on the programmed setting the canister should be empty.  <b>To reset the lubricator for the next canister a new battery set must be inserted.</b>
	<b>DISPLAY SCREEN</b> <b>OL</b> = overload  <b>LIGHTS</b> Red with 7 second double flash cycle	<b>OVERLOAD</b> The lubricator has experienced the high resistance from the lubrication point and has been unable to deliver the lubricant.  Manually purge the point to clear the blockage. The lubricator can be restarted by turning it on and off again. If the overload condition persists the systemic cause of the blockage must be addressed.
	<b>DISPLAY SCREEN</b> <b>Lo</b> = low battery  <b>LIGHTS</b> Red with 2 second double flash cycle	<b>LOW BATTERY</b> The inserted battery set is either already depleted or damaged.  Replace with a new battery set.



**Information from empty lubricators**

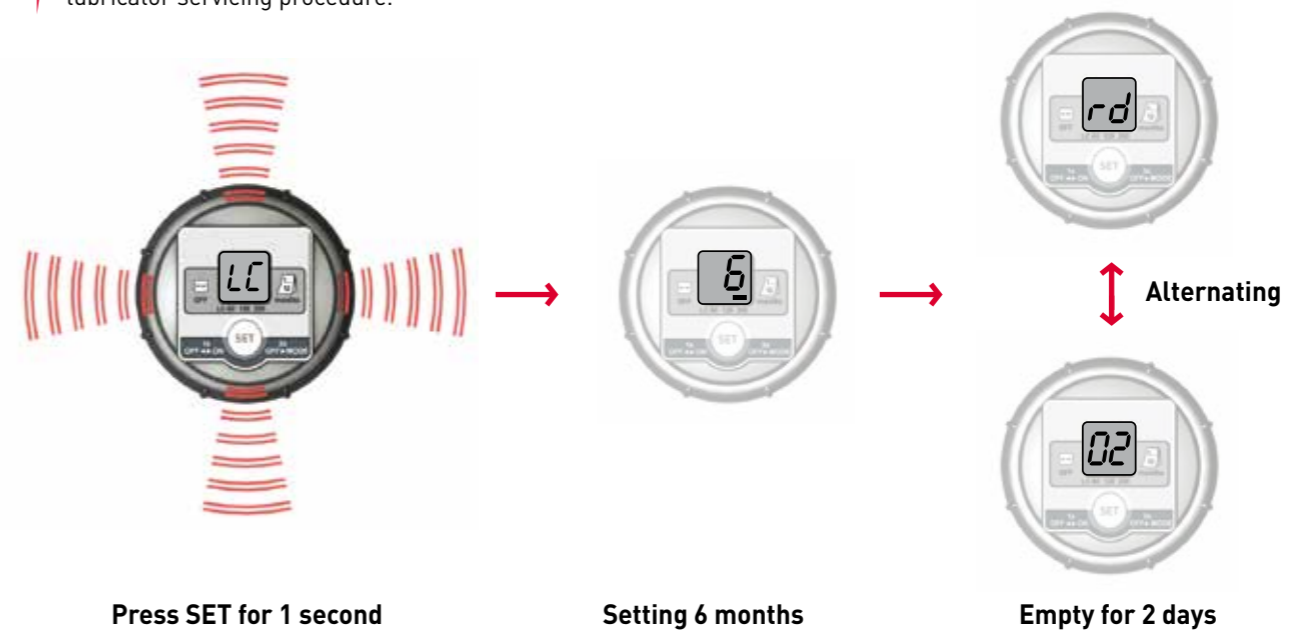
As shown in the table on page 13 the lubricator display screen shows LC when the lubricant cartridge is empty and the LEDs flash red every 2 seconds.

When LC is displayed the time setting and a count of the number of days that the cartridge has been empty can be obtained. This information assists equipment maintainers to make informed decisions about the most appropriate action when lubricators are found to be empty, especially when lubricant cartridges have not been clearly marked with the installation date.

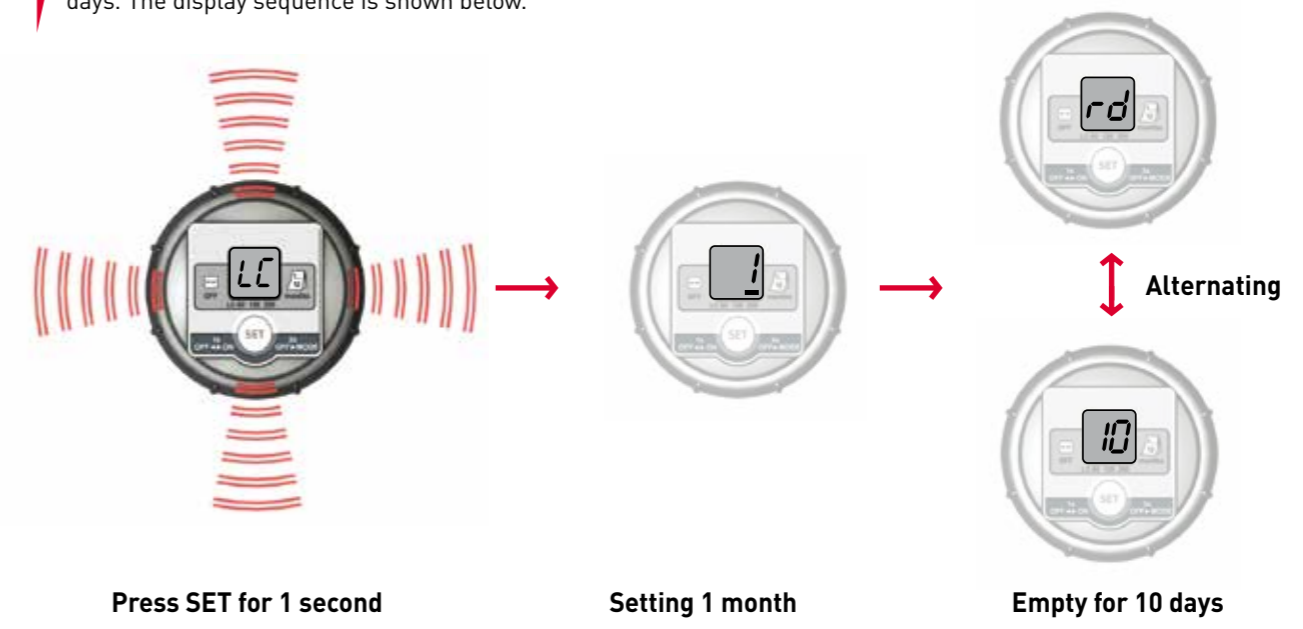
To confirm the lubricator time setting press and hold the SET button, then release the SET button to confirm the number of days since empty. The display will automatically alternate between "rd" and the day count, up to a maximum of 99 days. After alternating between "rd" and the day count eight times the display will return to "LC". rd = days count since red.

**Example** - A 250cc lubricator on a slow moving conveyor pulley bearing is found to be empty, displaying LC, with no date markings on the lubricant cartridge. By holding the SET button down for 1 second it is confirmed that the time setting is 6 months and that the lubricator has been empty for 2 days. The display sequence is shown below.

This information would indicate to the equipment maintainer that no special action is required other than the normal lubricator servicing procedure.



**Example** - A 250cc lubricator is found to be empty, displaying LC, with no date markings on the lubricant cartridge. By holding the SET button down for 1 second it is confirmed that the time setting is 1 month and that the lubricator has been empty for 10 days. The display sequence is shown below.



**Days since empty count**

It is good practice to always write the installation date on the cartridge of perma STAR VARIO lubricators. This provides valuable information to personnel involved in lubricator inspections. In particular, if a lubricator is found to be empty, the recorded date allows the period for which lubricant has not been delivered to be determined, which in turn allows the equipment maintainer to determine the appropriate maintenance action.

However, on occasions the installation date may have been written illegibly or may not have been noted at all. On such occasions the perma STAR VARIO\* provides a count of the number of days for which the cartridge has been empty.

\*This feature is only available for perma STAR VARIO drive units with software version 3.4 onwards. Contact your supplier of perma products for more information.





### PLC / machine controlled lubricant delivery

Similar to the perma STAR VARIO, the perma STAR CONTROL delivers precise amounts of lubricant and its operation is temperature independent. The unique feature of the perma STAR CONTROL is its connection to machine control. This feature makes the perma STAR CONTROL ideally suited to equipment where re-lubrication is to take place only when the machine is in operation, for critical equipment which has low utilisation or for standby equipment.

The perma STAR CONTROL consists of an electromechanical drive and a lubricant canister with 60, 120 or 250 cm<sup>3</sup> of lubricant. The perma STAR CONTROL has two integrated modes: TIME and IMPULSE.

**perma**

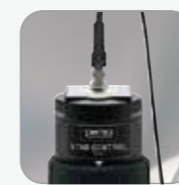
### Applications

perma STAR CONTROL is a PLC controlled single-point, automatic lubricator which is suited to a range of bearing and chain applications. There are two modes of operation which are available via SET button controlled menu – TIME and IMPULSE. For the IMPULSE version the lubricator discharges a set volume of lubricant as soon as voltage is applied. Before it will discharge again, voltage must be interrupted for at least 5 seconds and then reapplied. Meanwhile the TIME version dispenses lubricant at a set rate of cm<sup>3</sup> per 100 hours of machine operation, stopping and starting at preset intervals.



### Product characteristics

### Benefits



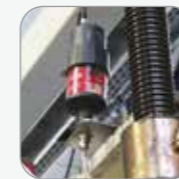
**LCD display with push button** shows discharge period, LC size and operating status  
**Machine controlled:** LED indicator lights (green and red) and operating status

→ Cable connection allows control of lubricant dispensing and the capability to provide operational status details of the lubrication system via PLC interface.  
→ LED lights provide indication of lubrication system operational status in areas of poor light.



**Electromechanical, reusable drive unit**  
**LCD display and single set button menu interface**

→ Simple handling and programming via intuitive menu.  
→ Broad range of setting options for both TIME and IMPULSE modes.  
→ LCD display provides immediate confirmation of lubrication system operational status.



**Pressure build-up to 6 bar allows remote mounting with lines up to 5 meters\***  
**Purge function**

→ Extensive options for remote mounting lubricators at safe to access locations.  
→ Remote mounting reduces the dependence on time during maintenance shutdowns for lubricator servicing and reduces the requirement to perform time consuming equipment isolations.

### Technical data

Drive – reusable  
**Electromechanical function by external voltage: 9-30 V DC, I<sub>max</sub> 0.5 A**

Discharge period  
**Timed (TIME mode)**  
**Pulse (IMPULSE mode)**

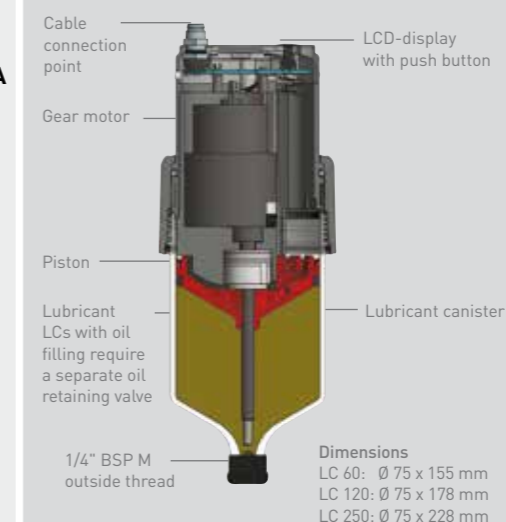
Lubricant volume  
**60 cm<sup>3</sup>, 120 cm<sup>3</sup> or 250 cm<sup>3</sup>**

Operating temperature  
**-10 °C to +60 °C**

Protection class  
**IP 65**

Standard & special lubricants  
**Oil / Grease up to NLG12**

Remote installations\*  
**5 meters of 3/8" ID line (grease)**



# 3

## Remote Installation Kits for Gas Type Lubricators



### A. Stainless steel bracket

Compact stainless steel brackets are available which can be easily attached to square cage mesh using a hook attachment design or to beam sections using beam clamps.

### B. Manual purge point

Used for convenient additions of supplementary grease, line purging and grease blockage clearing.

### C. Elbows

Elbow fittings are full bore with 1/4" BSP threads.

### D. Heavy duty hose

Quality Duffield brand manufactured in Germany. Supplied with 3/8" internal diameter and easy to use push-lock type swivel hose ends.

Quality installations are essential to the implementation of lubrication programs which will stand the test of time. Care taken to "get it right" during implementation will ensure long-term lubricator reliability and sets the foundation for a robust maintenance solution.

## Introduction

Direct mounting of gas type lubricators is preferred as this presents maximum grease pressure to the lubrication point. However, where safe access requirements dictate that lubricators be remote mounted the 1 and 2 point kits detailed below provide simple and robust installation options.

## What is included in installation kits for gas type lubricators?

The list below summarises the components included in remote installation kits for gas type lubricators. Meanwhile, the images opposite provide diagrammatic examples of the components – the examples shown are for K1CHS50 and K130S50.

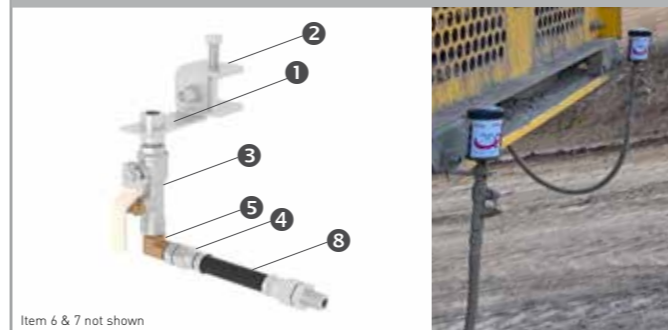
- Stainless steel bracket & attachment option
- Manual purge points (one per point)
- Grease line (1 meter per point)
- Push lock, swivel hose ends 1/4" BSP male (2 per point)
- Elbows 90°C full bore 1/4" BSP (one per point)
- Adaptors 1/4" BSP female to 1/4" BSP male (one per point)
- Reducers 1/4" BSP female to 1/8" BSP male (one per point)
- Spiral wrap (0.5 meter per kit)

## Kit options

Kit Part #	Description
<b>K130S50</b>	Kit SS 1 point BC30 0.5m hose with fittings
<b>K130S100</b>	Kit SS 1 point BC30 1.0m hose with fittings
<b>K230G</b>	Kit SS 2 point BC30 1.0m hose per point with fittings

Kit Part #	Description
<b>K1CHS50</b>	Kit SS 1 point cage 0.5m hose with fittings
<b>K1CHS100</b>	Kit SS 1 point cage 1.0m hose with fittings
<b>K2CHG</b>	Kit SS 2 point cage 1.0m hose per point with fittings

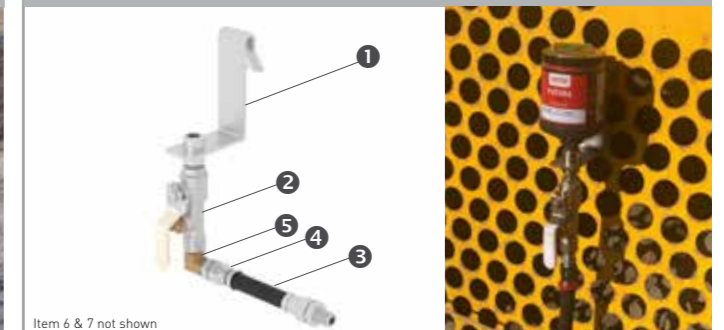
### Example installation kit contents – K130S100



Item 6 & 7 not shown

Bill of Materials	
1	1 x 1 point bracket
2	1 x 30mm S/S beam clamp
3	1 x manual purge kit
4	2 x Female swivel hose ends
5	1 x 90 degree elbow
6	1 x 1/4" BSPF-1/8" BSPM reducer
7	1 x 1/4" BSPF -1/4" BSPM extension
8	1m of 3/8" ID grease line

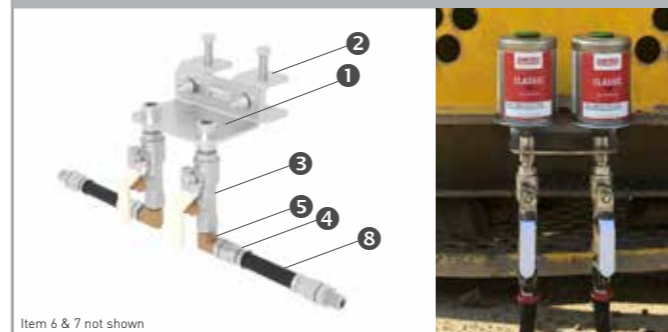
### Example installation kit contents – K1CHS100



Item 6 & 7 not shown

Bill of Materials	
1	1 x 1 point cage bracket
2	1 x Manual purge kit
3	1m of 3/8" ID grease line
4	2 x Female swivel hose ends
5	1 x 90 degree elbow
6	1 x 1/4" BSPF-1/8" BSPM reducer
7	1 x 1/4" BSPF -1/4" BSPM extension

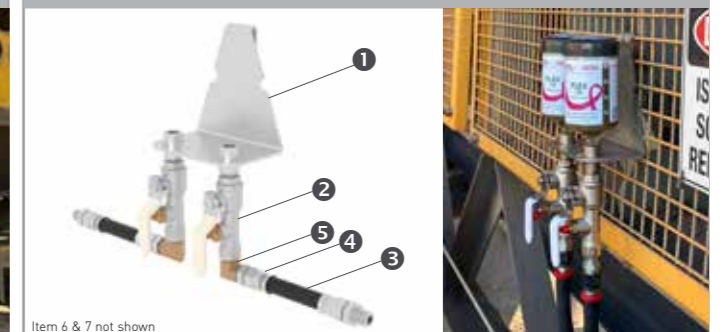
### Example installation kit contents – K230G



Item 6 & 7 not shown

Bill of Materials	
1	1 x 2 point bracket
2	2 x 30mm S/S beam clamps
3	2 x manual purge kits
4	4 x Female swivel hose ends
5	2 x 90 degree elbows
6	2 x 1/4" BSPF-1/8" BSPM reducers
7	2 x 1/4" BSPF -1/4" BSPM extensions
8	2m of 3/8" ID grease line

### Example installation kit contents – K2CHG



Item 6 & 7 not shown

Bill of Materials	
1	1 x 2 point cage bracket
2	2 x Manual purge kits
3	2m of 3/8" ID grease line
4	4 x Female swivel hose ends
5	2 x 90 degree elbows
6	2 x 1/4" BSPF-1/8" BSPM reducers
7	2 x 1/4" BSPF -1/4" BSPM extensions

# 4

## perma STAR VARIO Installation Kits

### 4.1. Introduction

#### A. Full length protection covers

Covers to protect lubricators from solid and liquid contaminants.

Used for convenient additions of supplementary grease, line purging and grease blockage clearing.

#### C. Elbows

Elbow fittings are full bore with 1/4" BSP threads.



#### D. Stainless steel bracket

There are two main categories of brackets – Standard Duty and Heavy Duty. The example shown here is the Heavy Duty C-section design which provides complete protection to lubricators.

#### E. Stainless steel beam clamps

Simple to use beam clamps supplied with case hardened cup head set screws and stainless steel assembly screws.

#### F. Support flanges & cover clips

Support flanges provide robust support against damage due to impacts or vibration. Cover clips improve contamination control and retain full length covers.

#### G. Heavy duty hose

Quality Duffield brand manufactured in Germany. Supplied with 3/8" internal diameter and easy to use push-lock type swivel hose ends.

Remote installation kits are designed to be installed with maximum efficiency. Kit brackets and covers have been designed to provide suitable protection to the lubricator against accidental damage and contamination build-up. Grease line type and fittings have been carefully selected to minimise resistance to grease flow.

## Introduction

A comprehensive range of remote installation kits is available for the perma STAR VARIO. Available in 1, 2, 3 and 4 point configurations, the kits are designed to be simple to implement and to provide long term durability.

The brackets included in the kits are fabricated from stainless steel and are secured to beam sections, cage mesh or round rails using simple attachment methods. Installations can be completed quickly, without the need for power tools or hot work.

## What is included in installation kits for perma STAR VARIO?

The list below summarises the components included in perma STAR VARIO remote installation kits. Meanwhile, the image opposite provides a diagrammatic example of the components – the example shown has the part number K265C.

- Stainless steel bracket
- Attachment option (beam clamps, cage hooks or U-bolts)
- Manual purge points (one per point)
- Lubricator support flanges (one per point)
- Full length covers (one per point)
- Grease line (2 meters per point)
- Push lock, swivel hose ends with adaptor to 1/4" BSP male (2 per point)
- Spiral wrap (0.5 meter per kit)
- Adaptors 1/4" BSP female to 1/4" BSP male (one per point)
- Reducers 1/4" BSP female to 1/8" BSP male (one per point)
- Elbows 90°C full bore 1/4" BSP (one per point)

## Bracket types – Standard Duty & Heavy Duty

There are two main categories of brackets: Standard Duty and Heavy Duty. Both categories include stainless steel construction, 1/4" BSP female sockets and laser cut profiles to minimise contamination build-up. Heavy Duty brackets also feature a C-section design which provides a robust holding system for the lubricator covers.

The C-section design is especially suited to installations which are to be subjected to water wash down, as would be anticipated for applications such as slurry pumps in coal preparation plants. This design also provides greater mounting flexibility due to the 4-slot design of the bracket mounting face.

The images of 2-point brackets shown demonstrate the differences between Standard Duty and Heavy Duty designs.

Standard Duty	Heavy Duty
Suited to operating environments with high levels of dry contaminants such as ore, dirt and dust.	Suited to operating environments with high levels of wet and dry contaminants and where regular wash down is likely.

## Custom designs

Brackets and installation kits can be customised to meet the specific needs of different equipment configurations, lubrication strategies and mounting requirements. Customised solutions include manifold brackets, customised brackets to suit specific equipment or mounting needs, inclusion of pre-assembled & pre-filled grease lines and the inclusion of specific fittings.

### Manifold design example

For applications where higher grease rates are required or when the rationalisation of lubricator time settings is important.

Example: K230J



# 4

## perma STAR VARIO Installation Kits

### 4.2. Standard Duty kits



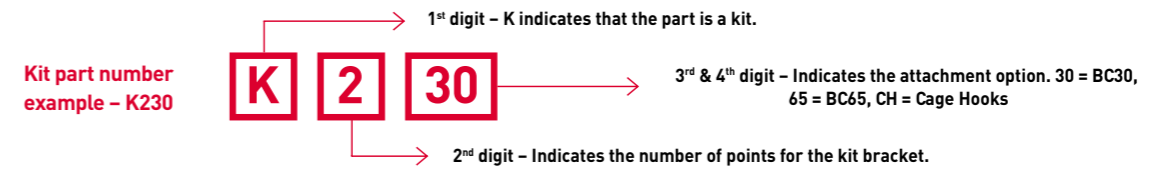
Standard Duty installation kits are highly versatile and can be adapted for attachment to beam sections or square mesh safety cages. The brackets included in Standard Duty kits are fabricated in Australia from stainless steel.

Standard Duty kits include lubricator covers and manual purge kits for each lubrication point along with a range of commonly required fittings, push-lock swivel hose ends and high quality Duffield brand hose with 3/8" internal diameter.



### Standard Duty beam mount

The range of Standard Duty kits with beam clamps includes options for 1, 2, 3 or 4 points. Beam clamp options include 30mm and 65mm sizes, as indicated by the 3rd and 4th digits of the product part number – **30** for 30mm clamps and **65** for 65mm clamps.



Example installation kit contents – K230

Bill of Materials	
1	1 x 2 point standard duty bracket
2	2 x 30mm S/S beam clamps
3	2 x lubricator support flanges
4	2 x full length cover 250mm long
5	2 x manual purge kits
6	4m of 3/8" ID grease line
7	4 x female swivel hose ends
8	2 x 90 degree elbows
9	2 x 1/4" BSPF-1/8" BSPM reducers
10	2 x 1/4" BSPF -1/4" BSPM extension

### Standard Duty cage mount

The range of Standard Duty installation kits with cage hooks are suited to square cage down to a mesh size of 25 x 25mm. Installation kits are available for 1, 2, 3 or 4 points as summarised below. **CH** as the 3rd and 4th digits of the product part number indicates the inclusion of cage hook.



Example installation kit contents – K2CH

Bill of Materials	
1	1 x 2 point standard duty cage bracket
2	2 x Lubricator support flanges
3	2 x full length cover 250mm long
4	2 x Manual purge kits
5	4m of 3/8" ID grease line
6	4 x Female swivel hose ends
7	2 x 90 degree elbows
8	2 x 1/4" BSPF-1/8" BSPM reducers
9	2 x 1/4" BSPF -1/4" BSPM extension



# 4

## perma STAR VARIO Installation Kits

### 4.3. Heavy Duty kits



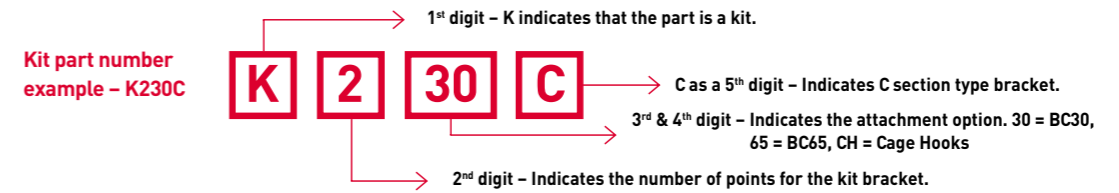
Heavy Duty installation kits have been specifically designed for use in operational areas which are subject to regular wash down and water impact, such as the conditions found in coal handling preparation plants. The installation kits are highly versatile and can be adapted for attachment to beam sections and square mesh safety cages. The bracket systems included in Heavy Duty installation kits are fabricated in Australia from stainless steel.

Heavy Duty installation kits include lubricator covers and manual purge kits for each lubrication point along with a range of commonly required fittings, push-lock swivel hose ends and high quality Duffield brand hose with 3/8" internal diameter.



### Heavy Duty beam mount

The range of Heavy Duty kits with beam clamps includes options for 1, 2, 3 or 4 points. Beam clamp options include 30mm and 65mm sizes, as indicated by the 3rd and 4th digits of the product part number – **30** for 30mm clamps and **65** for 65mm clamps. The inclusion of **C** at the end of the part number indicates the use of C-section brackets.

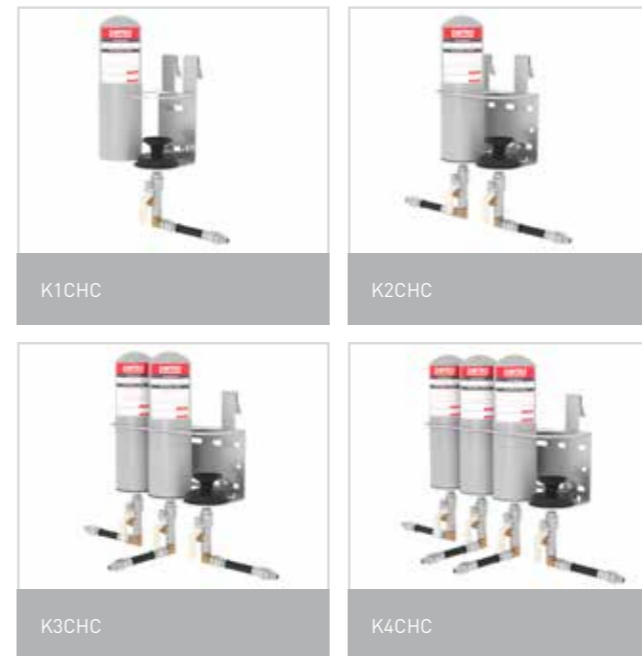


Example Installation Kit Contents – K230C

Bill of Materials			
1	1 x 2 point heavy duty bracket	6	4m of 3/8" ID grease line
2	2 x 30mm S/S beam clamps	7	4 x female swivel hose ends
3	2 x lubricator support flanges	8	2 x 90 degree elbows
4	2 x full length cover 250mm long	9	2 x 1/4" BSPF-1/8" BSPM reducers
5	2 x manual purge kits	10	2 x 1/4" BSPF -1/4" BSPM extension

### Heavy Duty cage mount

The range of Heavy Duty installation kits with cage hooks are suited to square cage down to a mesh size of 25 x 25mm. Installation kits are available for 1, 2, 3 or 4 points. **CH** as the 3rd and 4th digits of the product part number indicates the inclusion of cage hook. The inclusion of **C** at the end of the part number indicates the use of C-section brackets.



Example Installation Kit Contents – K2CHC

Bill of Materials			
1	1 x 2 point heavy duty bracket	6	4m of 3/8" ID grease line
2	1 x cage hook arm set	7	4 x female swivel hose ends
3	2 x lubricator support flanges	8	2 x 90 degree elbows
4	2 x full length cover 250mm long	9	2 x 1/4" BSPF-1/8" BSPM reducers
5	2 x manual purge kits	10	2 x 1/4" BSPF -1/4" BSPM extension

# 4

## perma STAR VARIO Installation Kits

### 4.4. Manifold kits



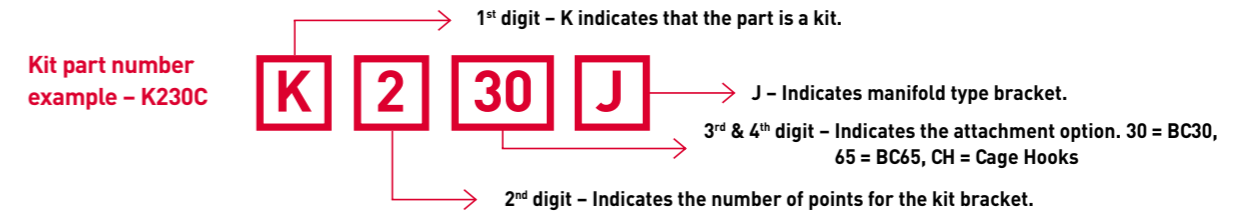
Installation kits which incorporate two and three point manifolds are available with combinations of standard duty and heavy duty bracket designs, plus the option of beam or cage mount. Manifold installation kits should be considered for use where an elevated grease dispensing rate is required or where a particular service period is to be targeted.

For example, if a lubrication point requires a grease application rate equivalent to a 1 month setting, but the target minimum service period for the equipment is 2 months, a 2-point manifold arrangement can be utilised with a two month time setting.



### Manifold beam mount

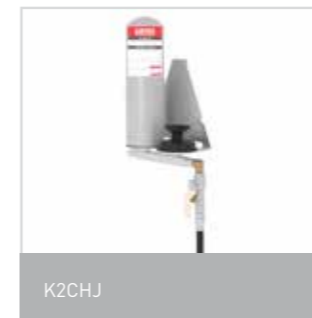
Beam clamp options include 30mm and 65mm sizes, as indicated by the 3rd and 4th digits of the product part number - 30 for 30mm clamps and 65 for 65mm clamps. The inclusion of a C in the part number indicates a heavy duty C-section brackets and the inclusion of a J indicates that the bracket is a manifold design ( J = joined ).



Bill of Materials	
1	1 x 2 point manifold bracket
2	2 x 30mm S/S beam clamps
3	2 x lubricator support flanges
4	2 x full length cover 250mm long
5	2 x manual purge kits
6	4m of 3/8" ID grease line
7	4 x female swivel hose ends
8	2 x 90 degree elbows
9	2 x 1/4" BSPF-1/8" BSPM reducers
10	2 x 1/4" BSPF -1/4" BSPM ext.

### Manifold cage mount

Cage mount options are suited to square cage mesh down to a size of 25mm x 25mm. The inclusion of a C in the part number indicates a heavy duty C-section brackets and the inclusion of a J indicates that the bracket is a manifold design ( J = joined ).



Bill of Materials	
1	1 x 2 point manifold bracket
2	1 x cage hook arm set
3	2 x lubricator support flanges
4	2 x full length cover 250mm long
5	2 x manual purge kits
6	4m of 3/8" ID grease line
7	4 x female swivel hose ends
8	2 x 90 degree elbows
9	2 x 1/4" BSPF-1/8" BSPM reducers
10	2 x 1/4" BSPF -1/4" BSPM ext.

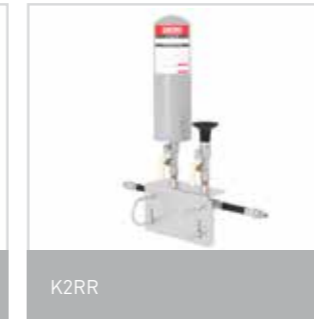
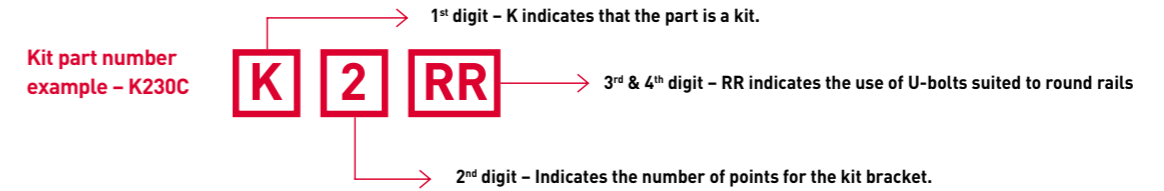
## perma STAR VARIO Installation Kits

### 4.5. Direct mount and rail mount kits

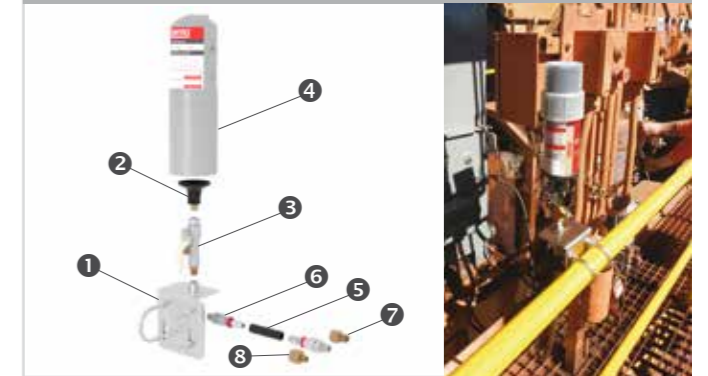


### Rail mount installation Kits

The range of Rail mount kits includes options for 1, 2, 3 or 4 points. Rail mount brackets are secured using U-bolts which are suited to round rails with outer diameters between 30 and 50mm. The rail mount design is indicated by RR as the 3rd and 4th digits of the product part number.



#### Example Installation Kit Contents - K1RR



#### Bill of Materials

1	1 x 1 point rail bracket	5	2m of 3/8" ID grease line
2	1 x lubricator support flanges	6	2 x female swivel hose ends
3	1 x manual purge kits	7	1 x 1/4" BSPF-1/8" BSPM reducers
4	1 x full length cover 250mm long	8	1 x 1/4" BSPF -1/4" BSPM extension

### Direct mount installation kits

Direct mount kits are for single point installations and include a full length cover, cover clip, stainless steel support disc with 1/4" BSP socket, a manual purge kit and various adaptors. The combination of the cover, cover clip and stainless steel disc provides protection from contamination build-up on the lubricator.

Customised direct mount installation kits, including different reducer and elbow fitting combinations, are available upon request.



#### Kit Contents - KD250-708V



#### Bill of Materials

1	1 x full length cover 250mm long
2	1 x support flange 1/4" BSP
3	1 x stainless steel disc & cover clip
4	1 x manual purge kit
5	1 x stainless steel reducer 1/4" BSPF to 1/8" BSPM

#### Kit Contents - KD250-708V45



#### Bill of Materials

1	1 x full length cover 250mm long
2	1 x support flange 1/4" BSP
3	1 x stainless steel disc & cover clip
4	1 x manual purge kit
5	1 x elbow 45° 1/4" BSP
6	1 x stainless steel reducer 1/4" BSPF to 1/8" BSPM

#### Direct mount

Where there is safe, direct access to the lubrication point while plant is operating direct mount installations should be considered. Direct mounting presents maximum grease pressure to the lubrication point and is the lowest cost form of installation. Direct mounting should not be implemented where doing so presents a safety or access compromise or where the risk of damage to the lubrication system is increased due to the likelihood of accidental knocks or impact from process material.

#### Rail mount

Rail mount installation kits utilise u-bolts for attachment to round rails with the size range of 30 to 50mm diameter. Rail mount installation kits should only be used on intermediate rails and must not be installed at locations where the bracket will interfere with access and function of hand rails.

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# 5

## Remote Installation Guidelines



Year by year, improvements to safe work practices and increased production demands lead to an increasing requirement to remote mount automatic lubricators. Correct remote mounting practices require that simple, yet important guidelines be followed:

- Locate lubricators where they can be safely and easily accessed while equipment is operating
- Select stainless steel brackets which can be easily removed if required for maintenance access
- Include manual purge points to provide an efficient means of occasional manual purging
- Use only full bore elbow fittings
- Use 3/8" internal diameter grease line and run lines under or around cages



### Remote installation decision making

For many lubrication points it is advantageous to remote mount lubricators at locations which are safe to access while machinery is operating. The questions in the table below can be used to help guide remote mounting decisions. An answer of "yes" to any of the questions indicates that remote mounting is likely to be required.

Question	Answer
1. Is it necessary to remove protective guards or safety cages to access the lubrication point?	Yes – remote mount No – direct mount
2. Is it difficult or unsafe to access the lubrication point while equipment is running?	Yes – remote mount No – direct mount
3. Is the lubrication point subject to severe vibration or high temperatures which may damage the lubricator?	Yes – remote mount No – direct mount
4. Is it necessary to get permits to access lubrication points such as those in confined spaces or located at heights?	Yes – remote mount No – direct mount
5. Is the lubrication point exposed to excessive amounts of water, process materials or impact from solid material?	Yes – remote mount No – direct mount



- Select grease line with **3/8" internal diameter**
- Restrict the maximum grease line to a length of **5 meters\*\***
- Select full bore hose end fittings and elbows
- Select stainless steel bracket and locate at a safe point of access
- Route grease lines under or around cage mesh, not through
- Prime grease lines and fittings
- Test the grease delivery path to the lubrication point after priming to ensure that back pressure is not excessive

\*\* This is a guide. Limits depend on variables such as line ID, grease type, temperature and the resistance of the lubrication point itself. Contact your perma supplier for further information.

### General guidelines for remote installations

Remote installation kits are designed to be simple to install. The minimum tools required to complete a typical installation include: 2 x shifters, 5/16" Allen key, hose cutters and grease gun.

The following installation tips should be followed:

1. Use a grease gun to test that lubrication points can receive grease freely. Use this opportunity to pre-grease the points if practical to do so. Do not use a powered grease gun because it will not be possible to detect high back pressure.
2. Identify a suitable bracket mounting position which is safe to access for lubricator servicing:
  - Ensure that there is space above the lubricators for covers to be removed.
  - Avoid interference with inspection hatches, frequently removed guards and emergency stop cords.
3. Plan grease line routes carefully:
  - Run grease lines under, over or around cages. Not through.
  - Secure and protect grease lines using cable ties and spiral wrap.
4. Apply grease to hose end barbs for easy fitting. Cold hose may need to be warmed. Push the hose on using two hands with a firm downwards motion.
5. Fill grease lines with fresh grease.
6. Where the threat of corrosion is high, use Denso wrap to protect hose ends.
7. Use a thread locking and sealing product to ensure that fittings are secure and to prevent oil weep.

# 6

## Common Equipment & Applications

### 6.1. Slurry pumps



Slurry pumps used in operations such as coal preparation plants and other wet-plant operations must endure harsh conditions. Efforts to prevent the entry of water and solid contaminants to pump barrels will extend bearing service lives.

The use of automatic lubrication systems to provide a regular purge of fresh grease through the labyrinth seals of pump barrels is a common and proven method of preventing contaminant entry. As the harshness of the operating conditions increases, so too does the importance of the automatic purging.

Pumps which are subjected to regular wash down or which have water impingement to the wet-end labyrinth demand higher labyrinth purge rates.

In addition to seal purging, automatic systems can also be implemented for bearing relubrication in order to provide precise and controlled grease delivery, thereby avoiding grease starvation and over lubrication.



### Lubrication assessment criteria

For slurry pump lubrication the following factors are generally assessed in order to develop the lubrication solution:

- Pump manufacturer's recommendations
- Seal types
- Bearing types, grease entry points and grease migration directions
- Characteristics of proposed lubricant
- Typical bearing operating temperatures
- Duty cycle
- Historical lubrication practices
- Desired service schedule
- Operating conditions
- Wash down procedures
- Requirements for safe access

### Installation examples



**Application** Horizontal slurry pump labyrinth seals  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K265C



**Application** Horizontal slurry pump labyrinth seals and impeller mechanical seal  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230C & direct mount



**Application** Slurry pump labyrinth seals & bearings  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230C



**Application** Horizontal slurry pump labyrinth seals and gland seal  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K365C

# 6

## Common Equipment & Applications

### 6.2. Conveyor pulley bearings



Pulley bearing configurations can vary considerably and as such lubrication programs must be designed to take the specific requirements of different bearing and seal combinations into account. Overall, for typical spherical roller bearings with labyrinth or taconite seals, the lubrication strategy must address two requirements:

- 1) The relubrication of the bearing rolling elements to prevent lubricant starvation and;
- 2) The regular purging of seals to prevent the entry of contaminants.

When installing perma STAR VARIO to conveyor pulley bearings the following points should be observed:

- Pre-lubricate the bearing to ensure that it is not in a state of grease starvation from the outset. The aim of the automatic lubrication is to maintain a state of optimal lubrication thereafter.
- For bearings with free purging seals, manually purge the seals until fresh grease is observed around the full circumference of the seal. The aim of the automatic lubrication is to maintain a consistent purge thereafter.
- Select the optimal grease entry point on the housing for bearing relubrication in order to achieve an effective grease flow path. Also, ensure that bearings have been pre-packed in a way which is compatible with the selected grease entry point.



### Lubrication assessment criteria

For conveyor pulley bearing lubrication the following factors are generally assessed in order to develop the lubrication solution:

- Bearing types & speeds
- Seal types
- Location of grease entry points on bearing housings
- Characteristics of proposed lubricant
- Operating conditions
- Historical lubrication practices
- Requirements for safe access
- Desired service schedule

### Installation examples



**Application** Conveyor pulley seals – this is a hybrid solution where the relubrication of the bearings is performed manually

**Lubricator** perma STAR VARIO L250 x 2

**Installation kit** K2CHCJ



**Application** Conveyor pulley bearing and seal

**Lubricator** perma STAR VARIO L250

**Installation kit** K230C



**Application** Conveyor pulley bearing and seal

**Lubricator** perma STAR VARIO L250

**Installation kit** K330



**Application** Conveyor pulley bearing and seal

**Lubricator** perma STAR VARIO L250

**Installation kit** K2CH

# 6

## Common Equipment & Applications

### 6.3. Electric Motors



#### Lubrication assessment criteria

For electric motor lubrication the following factors are generally assessed in order to develop the lubrication solution:

- Motor manufacturer's recommendations
- Motor speed
- Grease trap / escape port design, access and condition
- Bearing types
- Characteristics of proposed lubricant
- Historical lubrication practices
- Duty cycle
- Motor orientation (vertical or horizontal)

#### Installation examples



**Application** Electric motor with reverse overhead configuration driving a horizontal slurry pump  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230C



**Application** Electric motor  
**Lubricator** perma STAR VARIO M120  
**Installation kit** Direct mount



**Application** Electric motor  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230C



**Application** Electric motor  
**Lubricator** perma STAR VARIO L250  
**Installation kit** Direct mount

Electric motor bearing relubrication is a critical aspect of maintenance. As with other high speed bearing applications, it is important for relubrication practices to take the risks associated with over-lubrication into account while providing sufficient relubrication to deliver long bearing service life.

The combination of the following practices can provide a lubrication program which avoids over-lubrication and lubricant starvation:

- Add small amounts of grease at short time intervals using an automatic lubricator which provides accurate dispensing rates, independent of temperature.
- Re-lubricate when the motor is in operation.
- Always ensure that spent grease can escape the bearing housing via well maintained grease escape holes or collection traps.
- Do not use powered grease guns.





Fan support bearings require particular attention when devising a lubrication strategy. Because a broad range of bearing types can be employed it is important to understand the bearing and seal types before proceeding. This information is critical in order to understand the optimal grease delivery points, grease flow paths, the requirements for efficient grease exchange and the point(s) of grease exit from bearing housings.

During the implementation of perma STAR VARIO it is important to address the following items:

- Ensure that the bearing housing is correctly packed with grease in order to ensure efficient grease exchange. This is especially important for bearing types which must be re-lubricated from the side, rather than via a central relubrication groove.
- Where contact seals which are not free purging are in use, such as double lip seals, ensure that a suitable point for grease relief is introduced to the housing in order to avoid over-lubrication.
- Consider the use of high performance greases which can withstand the high rate of mechanical work which is applied by high speed rolling element bearings such as spherical roller bearings.

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### Lubrication assessment criteria

For fan lubrication the following factors are generally assessed in order to develop the lubrication solution:

- Bearing types & speeds
- Seal types
- Grease entry points and grease migration directions
- Typical bearing operating temperatures
- Characteristics of proposed lubricant
- Historical lubrication practices
- Operating conditions
- Requirements for safe access
- Desired service schedule

### Installation examples



**Application** Fan support bearings  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230



**Application** Fan support bearings  
**Lubricator** perma STAR VARIO M120  
**Installation kit** Direct mount



**Application** Fan support bearings  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K230



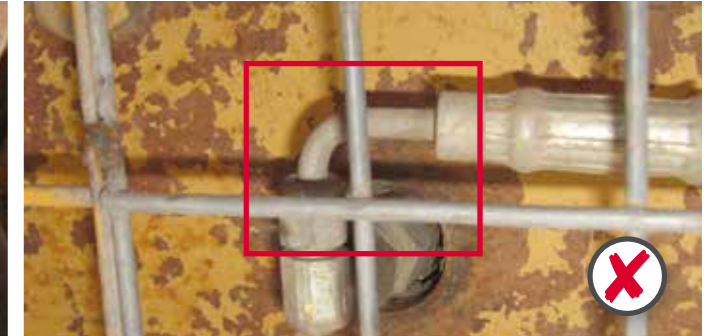
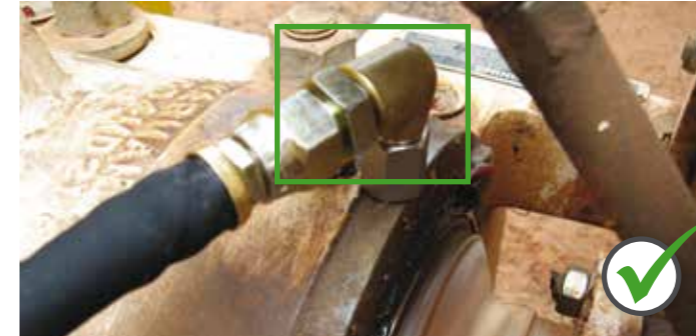
**Application** Fan support bearings  
**Lubricator** perma STAR VARIO L250  
**Installation kit** K330



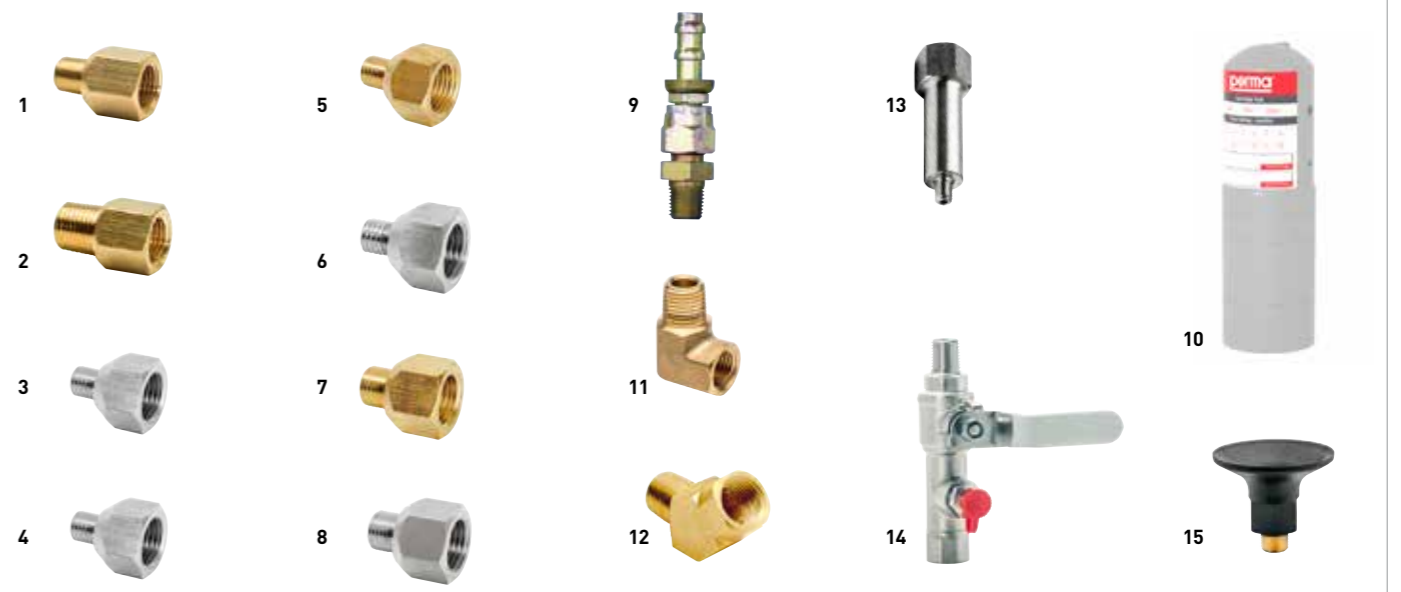
### Adaptors, elbows, extensions, grease lines & general

perma STAR VARIO lubricators have a 1/4" BSP male thread at the grease outlet. Where reducers, elbows or extension are required to facilitate installation it is important to adhere to the following guidelines:

- When using reducing adaptors down to fine threads such as 6mm metric or 1/4" UNF select stainless steel to avoid breakage.
- Minimise the number of elbow fittings.
- Always select full bore elbows.



Part #	Description	Pic.	Part #	Description	Pic.
2461/8	Straight adaptor brass 1/4" BSPP F - 1/8" BSPT M	1	92JSS	Elbow stainless steel 90 degree 1/4" BSPT M - 9/16" JIC M	-
2461/4	Straight adaptor brass 1/4" BSPP F - 1/8" BSPT M	2	921/8JSS	Elbow stainless steel 90 degree 1/8" BSPT M - 9/16" JIC M	-
2461/4UNFSS	Straight adaptor stainless steel 1/4" BSPP F - 1/4" UNF M	3	92	Elbow brass 90 degree 1/4" BSPP F - 1/4" BSPT M	11
2463/8	1/4" BSPP F - 3/8" BSPM Brass Straight Adaptor	-	1216SS	Elbow brass 45 degree 1/4" BSPP F - M6x1.0 M	-
2466SS	Straight adaptor stainless steel 1/4" BSPP F - M6x1.0 M	4	1211/8	Elbow brass 45 degree 1/4" BSPP F - 1/8" BSPT M	-
2468	Straight adaptor brass 1/4" BSPP F - M8x1.0 M	5	1211/4	Elbow brass 45 degree 1/4" BSPP F - 1/4" BSPT M	12
2468SS	Straight adaptor stainless steel 1/4" BSPP F - M8x1.0M	6	52740	Extension brass 40mm 1/4" BSPP F - 1/4" BSPT M	-
24610	Straight adaptor brass 1/4" BSPP F - M10x1.0 M	7	5270501/8	Extension brass 50mm 1/4" BSPP F - 1/8" BSPT M	-
24610SS	Straight adaptor stainless steel 1/4" BSPP F - M10x1.0M	8	52750M6SS	Extension stainless steel 50mm 1/4" BSPP F - M6x1.0 M	13
88HDJ	Hose end swivel 3/8" hose to 1/4" BSP M	9	52785	Extension brass 85mm 1/4" BSPP F - 1/4" BSPT M	-
90HD	Hose baryon fibre reinforced internal diameter 3/8"	-	527125	Extension brass 125mm 1/4" BSPP F - 1/4" BSPT M	-
HDC120	Full length cover heavy duty for M120 STAR VARIO	-	708V	Manual greasing kit 1/4" BSP	14
HDC250	Full length cover heavy duty for L250 STAR VARIO	10	A620P	Support flange 1/4" BSP	15



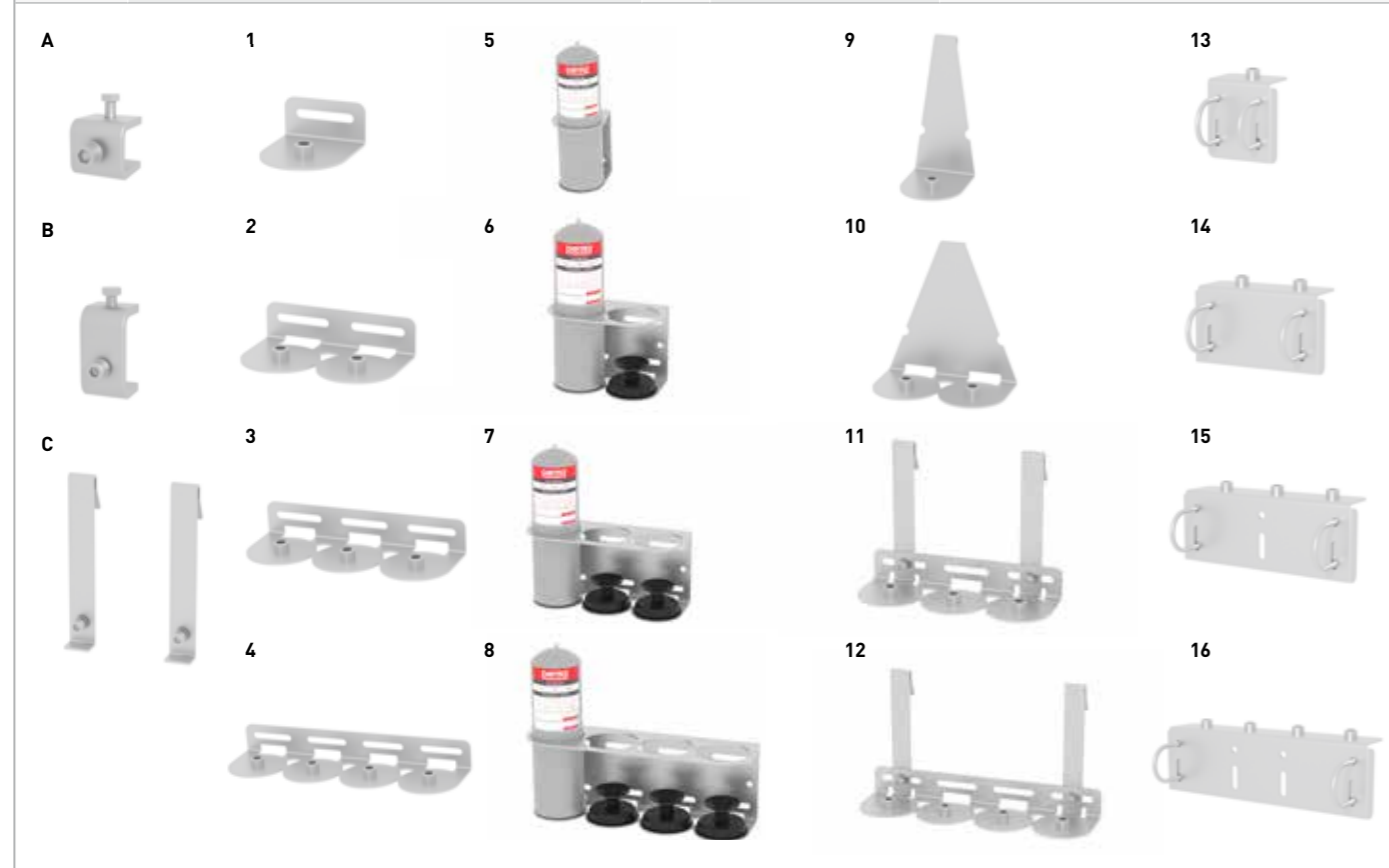
Minimising the pressure loss between single point lubricators and lubrication points is an important factor for achieving long term, reliable lubricant delivery. The range of accessories available from perma have been carefully selected to ensure that pressure losses are minimised and that installations will stand the test of time in harsh operating environments.



## Stainless steel brackets & attachment options

The range of stainless steel brackets and attachment options included in remote installation kits can be purchased as separate components. Brackets are available bare or complete with A620P support flanges. The A620P reinforces perma STAR VARIO lubricators to protect against accidental breakage. The table below includes bare brackets and brackets with A620P's. Note that Heavy Duty C-Section brackets always include A620P's and full length covers. With the exception of Heavy Duty brackets, only bare brackets are pictured below.

Part # (bare)	Description	Pic.	Part # (with A620P)	Compatible attachment options
BC30	Beam clamp 30mm	A	-	This is an attachment option
BC65	Beam clamp 65mm	B	-	This is an attachment option
CH-ARMS	Cage hanger twin arm set	C	-	This is an attachment option
MB01	Standard duty 1 point bracket	1	MB01A620P	Select from BC30 or BC65
MB02	Standard duty 2 points bracket	2	MB02A620P	Select from BC30 or BC65
MB03	Standard duty 3 points bracket	3	MB03A620P	Select from BC30 or BC65
MB04	Standard duty 4 points bracket	4	MB04A620P	Select from BC30 or BC65
-	Heavy duty C-section 1 point bracket	5	MB01C	Select from BC30 or BC65 or CH-ARMS
-	Heavy duty C-section 2 points bracket	6	MB02C	Select from BC30 or BC65 or CH-ARMS
-	Heavy duty C-section 3 points bracket	7	MB03C	Select from BC30 or BC65 or CH-ARMS
-	Heavy duty C-section 4 points bracket	8	MB04C	Select from BC30 or BC65 or CH-ARMS
CH01	Cage hanger 1 point bracket	9	CH01A620P	Cage hooks supplied with bracket
CH02	Cage hanger 2 points bracket	10	CH02A620P	Cage hooks supplied with bracket
CH03	Cage hanger 3 points bracket	11	CH03A620P	Cage hooks supplied with bracket
CH04	Cage hanger 4 points bracket	12	CH04A620P	Cage hooks supplied with bracket
MB01R	Rail mount 1 point bracket	13	MB01RA620P	U-bolts supplied with bracket
MB02R	Rail mount 2 points bracket	14	MB02RA620P	U-bolts supplied with bracket
MB03R	Rail mount 3 points bracket	15	MB03RA620P	U-bolts supplied with bracket
MB04R	Rail mount 4 points bracket	16	MB04RA620P	U-bolts supplied with bracket



## Pre-assemble & pre-filled lubricator grease lines

Pre-assembled, pre-filled grease lines are supplied ready to use. They save time, ensure against the accidental inclusion of contaminants when making grease lines on site and remove the need for laborious manual filling. The range of grease lines from perma come in pre-set lengths.

- 3/8" internal diameter with single, synthetic fibre braid.
- Full bore female swivel, push-lock fittings at each end of hose for convenient fitting with adaptors to 1/4" BSP male
- Minimum burst pressure = 84 bar
- Complies with FRAS AS2660
- Minimum bend radius 76mm



Line Length	0.5m	0.75m	1.0m	1.5m	2.0m	2.5m	3.0m
Generic Part #	PSFXXX90HD0.5	PSFXXX90HD.75	PSFXXX90HD1.0	PSFXXX90HD1.5	PSFXXX90HD2.0	PSFXXX90HD2.5	PSFXXX90HD3.0

The table above provides generic part numbers for different length hose assemblies. The first 6 digits of each part number identifies the grease type. Specific part numbers for preferred grease types are created by replacing the first six digits of the generic part number with the relevant perma lubricant code.

**For example, a pre-assembled grease line with a length of 1.5 meters which is filled with BP Energrease LC 2 grease:**

- Generic part number for 1.5 meter line is PSFXXX90HD1.5
- 6 digit reference code for BP Energrease LC 2 grease is PSF826
- Hence, part number for required line is PSF82690HD1.5

## Chain, open gear and crane wheel lubrication accessories

Part #	Description	Pic.	Part #	Description	Pic.
A400	Brush 20cm round 1/4" BSP for oil	1	OGL	Open Gear Lubricator applicator	10
A410*	Brush 3 x 4cm rectangular 1/4" BSP for oil	2	8630	Tube assembly complete flexible reinforced nylon 30cm	-
A411*	Brush 3 x 6cm rectangular 1/4" BSP for oil	3	8645	Tube assembly complete flexible reinforced nylon 45cm	-
A412*	Brush 3 x 10cm rectangular 1/4" BSP for oil	4	8660	Tube assembly complete flexible reinforced nylon 60cm	-
A810	Throttle one-way valve 1/4" BSP for oil	5	8690	Tube assembly complete flexible reinforced nylon 90cm	-
A100	Metal bracket standard duty	6	86150	Tube assembly flexible reinforced nylon 150cm	-
A105	Universal plastic bracket	7	90	Reinforced nylon hose 3/8" internal diameter (per meter)	-
A150	T-piece bracket with 1/4" BSP insert	8	87	Male barbed brass fitting for type 90 nylon hose	-
CWL	Crane Wheel Lubricator applicator	9	88	Female barbed brass fitting for type 90 nylon hose	-



# 8

## Fittings Cases



Various fittings cases are available to provide a convenient and economical option for on-site spares. The themed cases include carefully selected reducing adaptors, extensions and elbows. The cases have a heavy duty plastic construction with an integrated water seal, removable compartments, impact resistant lid and heavy duty latches. The tables below list the parts included in each fittings case option. If different combinations are required please contact your supply of perma products to investigate the supply of a customised option.

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### Fittings case contents

**Part # FCGEN220** – Includes the most commonly used fittings for STAR VARIO users.

Part #	Count	Description
A620P	20	Support flange suits STAR 1/4" BSPT M
708V	10	Manual greasing kit 1/4" BSP
88HDJ	20	Hose end swivel 3/8" hose to 1/4" BSP M
92	20	Elbow brass 90 degree 1/4" BSPP F – 1/4" BSPT M
1211/4	20	Elbow brass 45 degree 1/4" BSPP F – 1/4" BSPT M
2461/8	30	Straight adaptor brass 1/4" BSPP F – 1/8" BSPT M
527501/8	20	Extension brass 50mm 1/4" BSPP F – 1/8" BSPT M
52750M6SS	20	Extension stainless steel 50mm 1/4" BSPP F – M6x1.0 M
2466SS	30	Straight adaptor stainless steel 1/4" BSPP F – M6x1.0 M
2461/4UNFSS-C	30	Straight adaptor stainless steel 1/4" BSPP F – 1/4" UNF M

**Part # FCBSP240** – Primarily brass BSP fittings plus stainless reduces to M6X1.0 and 1/4" UNF.

Part #	Count	Description
2461/4	30	Straight adaptor brass 1/4" BSPP F – 1/4" BSPT M
2461/8	30	Straight adaptor brass 1/4" BSPP F – 1/8" BSPT M
92	40	Elbow brass 90 degree 1/4" BSPP F – 1/4" BSPT M
1211/4	40	Elbow brass 45 degree 1/4" BSPP F – 1/4" BSPT M
1211/8	20	Elbow brass 45 degree 1/4" BSPP F – 1/8" BSPT M
527501/8	15	Extension brass 50mm 1/4" BSPP F – 1/8" BSPT M
52740	15	Extension brass 40mm 1/4" BSPP F – 1/4" BSPT M
52750M6SS	10	Extension stainless steel 50mm 1/4" BSPP F – M6x1.0 M
2466SS	20	Straight adaptor stainless steel 1/4" BSPP F – M6x1.0 M
2461/4UNFSS	20	Straight adaptor stainless steel 1/4" BSPP F – 1/4" UNF M

**Part # FCMETRIC230** – Primarily adaptors from metric to 1/4" BSPP F plus BSP elbows and extensions.

Part #	Count	Description
2466SS	30	Straight adaptor stainless steel 1/4" BSPP F – M6x1.0 M
1216SS	20	Elbow brass 45 degree 1/4" BSPP F – M6x1.0 M
52750M6SS	15	Extension stainless steel 50mm 1/4" BSPP F – M6x1.0 M
2468	25	Straight adaptor brass 1/4" BSPP F – M8x1.0 M
2468X1.25	20	Straight adaptor brass 1/4" BSPP F – M8x1.25 M
24610	20	Straight adaptor brass 1/4" BSPP F – M10x1.0 M
246810X1.25	20	Straight adaptor brass 1/4" BSPP F – M10x1.25 M
246810X1.5	20	Straight adaptor brass 1/4" BSPP F – M10x1.5 M
52740	20	Extension brass 40mm 1/4" BSPP F – 1/4" BSPT M
92	40	Elbow brass 90 degree 1/4" BSPP F – 1/4" BSPT M

**Part # FCSS250** – Includes a range of stainless steel fittings.

Part #	Count	Description
2466SS	20	Straight adaptor stainless steel 1/4" BSPP F – M6x1.0 M
1216SS	20	Elbow stainless steel 45 degree 1/4" BSPP F – M6x1.0 M
52750M6SS	10	Extension stainless steel 50mm 1/4" BSPP F – M6x1.0 M
2468SS	20	Straight adaptor stainless steel 1/4" BSPP F – M8x1.0 M
24610SS	20	Straight adaptor stainless steel 1/4" BSPP F – M10x1.0 M
2461/4UNFSS	30	Straight adaptor stainless steel 1/4" BSPP F – 1/4" UNF M
2461/8SS	20	Straight adaptor stainless steel 1/4" BSPP F – 1/8" BSPT M
48SS	30	Grease nipple stainless steel 1/4" BSPT M
280SS	40	Nipple 1/4" BSPT M – 1/4" BSPT M
26SS	40	Socket round 1/4" BSP



The frequent addition of small volumes of lubricant provides the longest bearing service life and therefore reduces maintenance costs. Lubricant selection is also an important factor for achieving extended bearing service life.

To fulfill this requirement perma lubricators are filled standard with a range of high quality German manufactured lubricants.

HTL perma Australia also has the capability to custom fill greases and oils. This ensures that users of perma lubricators are not forced to make compromises when it comes to choice of lubricant.



### Custom fill lubricants

HTL perma Australia is equipped with lubricator filling machines from Germany and has the capability to custom fill lubricators with any suitable grease or oil. Custom filling can generally be completed within three business days.

The demand for custom filled lubricants is increasing. Typical reasons for choosing custom filled lubricants are:

- Where lubricant rationalisation programs have been implemented and it is preferred that the lubricants in automatic lubricators conform to the rationalisation decisions.
- Where certain applications demand specialty lubricants.
- Where the mixing of different lubricants presents a real risk of incompatibility problems.
- Where specific lubricants are required in order to satisfy warranty requirements.
- Where specific lubricant brands must be used in order to adhere to contractual obligations.

### Standard fill lubricants

The basic characteristics of the Standard Fill lubricants are provided below. For more detailed information visit [www.perma.com.au](http://www.perma.com.au) to download the Technical Data Sheets and Material Safety Data Sheets.

perma Code Description	NLGI-class	Thickener	Base oil	Operating temperature range (°C)	Viscosity at +40 °C	Roller bearings	Sliding bearings / guides	Linear guides	Open gears / gear racks	Spindles	Shaft seals (I)	Chains
<b>Grease</b>												
<b>SF01</b> Multipurpose grease	2	Li / Ca	Mineral oil	-30 to +130	220	✓	✓	✓	-	✓	✓	-
<b>PSF721</b> Multipurpose blue grease	2	Li / Ca	Mineral oil	-30 to +130	220	✓	✓	✓	-	✓	✓	-
<b>SF02</b> Extreme pressure grease	2	Li + MoS2	Mineral oil	-30 to +120	105	-	✓	-	✓	-	-	-
<b>SF10</b> Food grade grease	1	Al-Com,	PAO	-45 to +120	150	✓	✓	✓	✓	-	-	-
<b>Oil</b>												
<b>S014</b> High temperature chain oil	Oil	-	PAO + Ester	-20 to +250	320	-	-	-	-	-	-	✓
<b>S032</b> Multipurpose oil	Oil	-	Mineral oil	-5 to +100	100	-	✓	-	✓	✓	-	✓
<b>S070</b> Food grade oil	Oil	-	PAO + Ester	-30 to +120	220	-	✓	-	✓	✓	-	✓

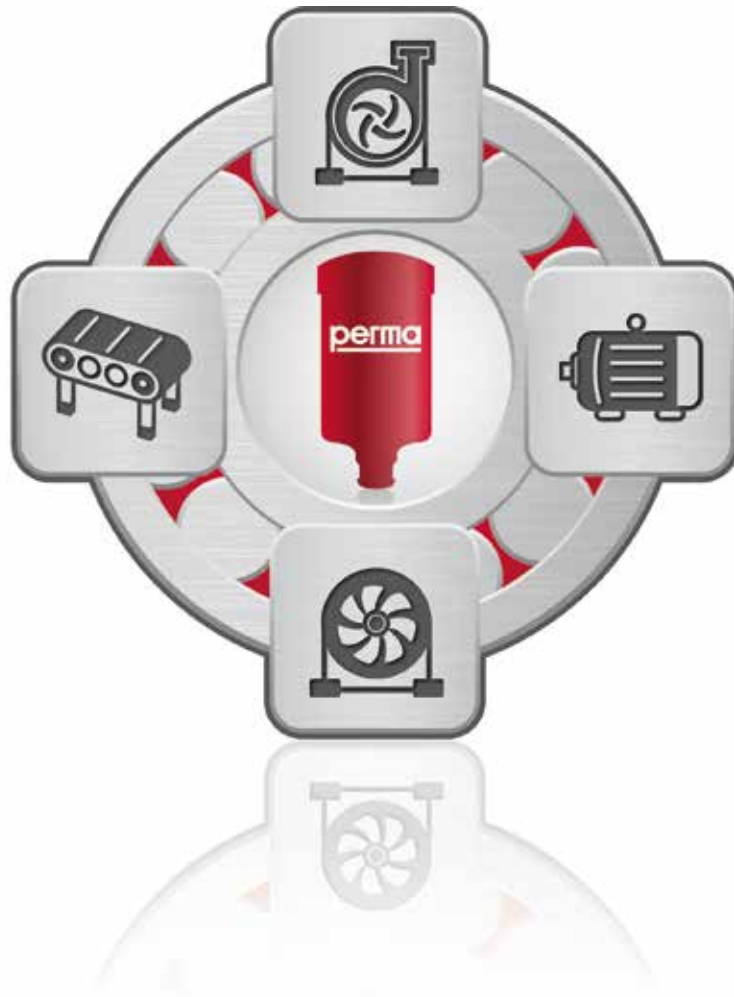
### Grease pumpability

The pumpability of grease depends on a range of factors, the most influential being the grease type, temperature and the internal dimensions of delivery lines and fittings.

**Grease type** - The lower the NLGI rating the easier grease is to pump. NLGI 2 greases are easier to pump than NLGI 3 greases and so on. Grease thickener type, base fluid viscosity and manufacturing methods also have an effect on grease pumpability.

**Temperature** - Grease is easier to pump in warmer environments than in cold environments. However, the relationship between pumpability and temperature is not linear, so as temperature drops it is difficult to predict the point at which grease will become substantially more difficult to pump.

**Grease line dimensions and fittings** - The nature of grease flow through lines and fittings is different to that of liquid lubricants such that pressure drops cannot be calculated on the basis of "pipe friction loss" style calculations. In general it is best to minimise grease line length, use generous sized grease line (perma recommends 3/8" ID) and eliminate restrictive elbow fittings.



**HTL perma Australia Pty Ltd**  
150 Highbury Road  
BURWOOD VIC 3125  
AUSTRALIA

[technical@perma.com.au](mailto:technical@perma.com.au)  
[www.perma.com.au](http://www.perma.com.au)