

INSTALLING AND OPERATING THE KELCO D40 DISPLACEMENT LEVEL SWITCH



WARNING



Please read these installation and operating instructions fully and carefully before installing or servicing this level switch. The D40 level switch is a mains voltage device. Death or serious injury may result if this switch is not correctly installed and operated. All electrical work on this switch must be performed by a fully qualified and licensed Electrician.

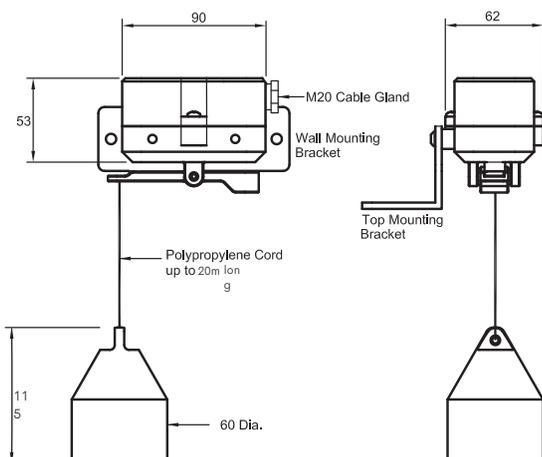
The D40 top-entry level switch operates by Archimedes principle. When an object is immersed in a liquid its weight is reduced by an amount equal to the weight of the liquid it displaces. In the D40 level switch a magnetically actuated switch detects the weight reduction that occurs when liquid submerges a solid Polypropylene displacer suspended from a cord below the switch. Since it is the change of weight sensed by the displacer as it is submerged that actuates the switch, the specific gravity of the liquid will directly effect the operation of the switch. The D40 level switch will only operate in liquids that have a specific gravity that is 0.95 or greater (water). They will not operate if used in liquids with an S.G. of less than 0.95.

OPERATING ENVIRONMENT

The D40 level switch is an extremely versatile device. It can be used to detect a liquid level in wells, tanks, pits, sumps, bores and bund areas. The inert materials of construction mean the switch can be used in water, sea water, mild acids and in many common chemical solutions. The D40 is highly tolerant of liquids containing solids, slurries or pulp. It will also work reliably in froth or foam and in applications where there is floating scum or debris of various kinds.

The electrical enclosure on the D40 level switch is sealed and separated from the switch's actuating arm by a solid metal wall. The switch is actuated magnetically through the solid wall. This means the electrical housing is totally sealed and weatherproof provided the lid is fully tightened and the cable gland is properly utilised. The Polypropylene suspension cord and the displacer are the only components in contact with the process liquid. Polypropylene is a very inert material and is well known for its resistance to many commonly encountered chemicals.

The D40 is ideal for warm liquid applications provided the electrical head is mounted well above the liquid and is protected from hot vapour. The wetted components, the cord and displacer are highly tolerant of liquids at elevated temperatures.



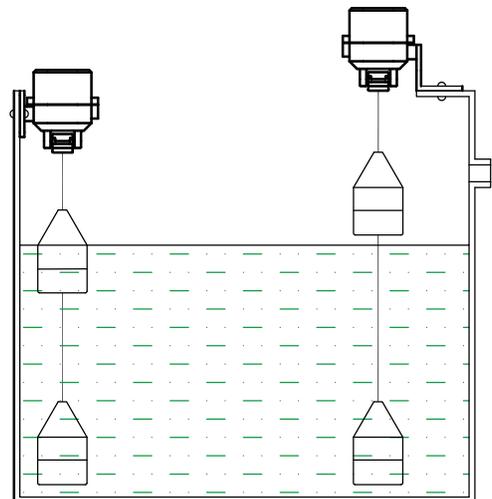
INSTALLATION

The D40 level switch is supplied with a flat mounting plate for installing the switch against the walls of pits or tanks. In addition to the flat plate, an angle bracket is also supplied. The angle bracket can be used to mount the switch on any flat horizontal surface such as tank lids or horizontal bracing. M5 threaded mounting holes are provided in the sides of the switch body so the switch can be oriented with its cable entry pointing to the right or left.

Whichever mounting bracket is used, ensure that once installed, the top face of the D40's lid is perfectly horizontal. This ensures the cord and displacer hang vertically beneath the switch and apply force to the switch arm directly downwards.

Thread the supplied cord through the hole at the end of the switch actuating arm and tie a double knot in it so the cord can't pull back through the hole. Thread the free end of the cord through the hole in the top of the displacer and tie it off securely. D40 level switch is supplied with 3 metres of cord. Cords up to 20 metres in length can be used with the D40 switch and are available from Kelco or your supplier if required.

TYPICAL INSTALLATIONS



OPERATING LIMITATIONS

Fixed switching differential	40mm +/- 5mm
Maximum distance between D40 & displacer.	20 metres (3m of cord is supplied with the switch)
Minimum distance from displacer to the floor of a tank or sump.	20mm
Minimum inside diameter of pipe housing or shroud.	70mm
Maximum liquid temperature.	90°C
Specific gravity of process liquid.	0.95 or greater

ELECTRICAL DATA

ELECTRICAL LIMITS OF THE STANDARD D40

The D40 level switch houses a S.P.D.T (Single Pole Double Throw) switch. The standard D40 is suitable for all general control circuit applications up to 500V AC. It is ideal for the control of pump starters, relay logic circuits, and for the direct control of contactors and timers.

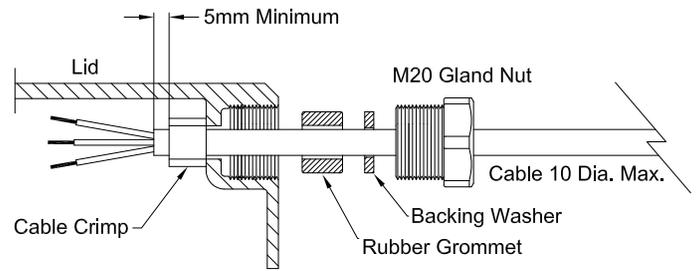
The standard D40 can operate at ANY voltage from 5 to 500VAC. It is rated to directly control motors up to 1.5kW (2HP).

RATED VOLTAGE	NON INDUCTIVE LOADS				INDUCTIVE LOADS			
	RESISTIVE LOAD		LAMP LOAD		INDUCTIVE LOAD		MOTOR LOAD	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	20 A		7.5 A		20 A		12.5 A	
250 VAC	20 A		7.5 A		15 A		8.3 A	
500 VAC	15 A		4 A		6 A		2 A	
8 VDC	20 A		3 A	1.5 A	15 A		12.5 A	
14 VDC	20 A		3 A	1.5 A	10 A		12.5 A	
30 VDC	6 A		3 A	1.5 A	5 A		5 A	
125 VDC	0.5 A		0.5 A	0.25 A	0.05 A		0.05 A	
250 VDC	0.25 A		0.5 A	0.25 A	0.03 A		0.03 A	

Maximum Switched Voltage	500VAC
Maximum Switched Current	15A
Minimum Switched Voltage	5VDC
Minimum Switched Current	160mA

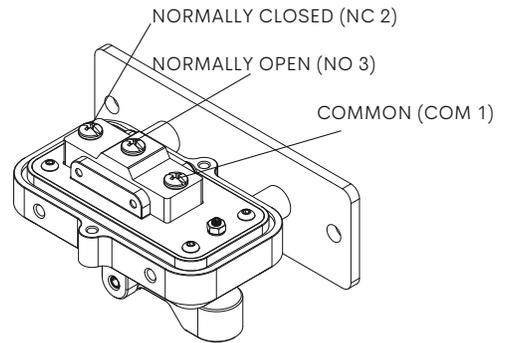
Note: Do not apply maximum voltage at maximum current across the switch contacts. See main data table for current limits at specific voltages and for specific loads.

CABLE GLAND ASSEMBLY



Crimp the ears using pliers so the ring is as tight as possible on the cable outer sheathing.

TERMINAL IDENTIFICATION



Note:

To switch ON when a rising water level covers the displacer use terminals 1 (COM) and 3 (NO)

To switch ON when a falling water level uncovers the displacer use terminals 1 (COM) and 2 (NC)

EARTHING THE D40

An M4 earth screw is provided inside the lid of the D40 level switch. In the interests of safety, all applications should be properly earthed using the earth screw.

CABLE ANCHOR

Each D40 level switch is shipped with two cable crimps to suit various cable sizes. A cable crimp should be crimped onto the outer sheathing of the cable at least 5mm back from the end of the outer sheathing. The cable should then be pulled back through the cable gland until the cable crimp rests hard up against the inner wall of the cable gland. After bedding the cable crimp into position, fully tighten the cable gland.

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PLEASE NOTE: Kelco Engineering Pty Ltd reserves the right to change the specification of this product without notice. Users will use their own judgment to determine the appropriateness of using Kelco Products in an application, any safety measures required and that the product is properly installed for that application. To the extent permitted by law Kelco Engineering Pty Ltd disclaims and excludes all and any liability for the use of this product in any particular application or for defective installation. Kelco switches are warranted against malfunction by a 12 month return to base manufacturer's warranty. Full details of our warranty and limitation of liability can be found in this document or downloaded from: <http://www.kelco.com.au/warranty>

Kelco D50 & D40 Level Switch Calibration

The Kelco D50 and D40 level switches are factory calibrated to operate with the displacer or displacers supplied with each switch. If required, the switch can be re-calibrated by adjusting the calibration screw located on the top deck of the switch. The calibration screw is an M3 Allen head stainless grub screw secured with a lock nut.

D50 Level Switch

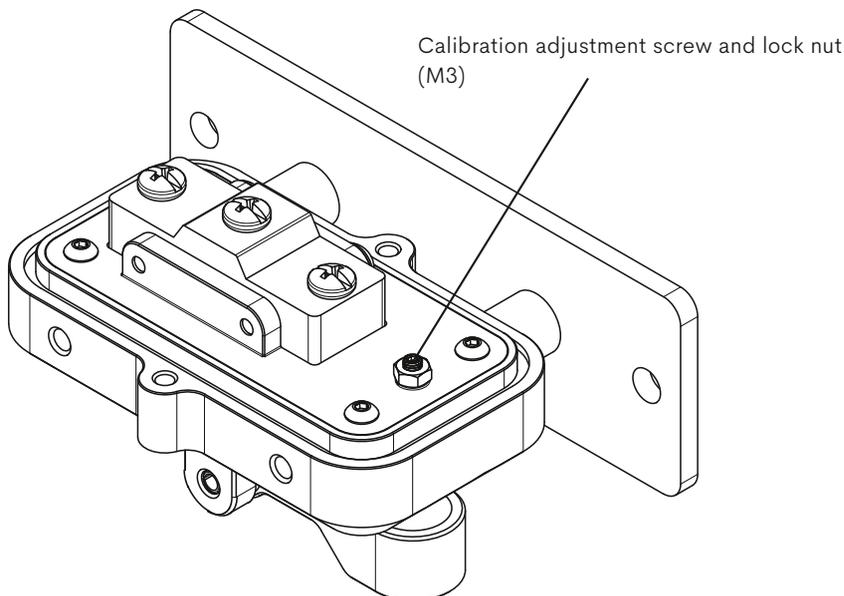
The D50 level switch is supplied with two displacers. If the D50 level switch fails to operate on a falling level, that is, fails to switch when the falling water level uncovers the bottom displacer then the switch will require re-calibration. In such a situation unlock the calibration screw lock nut and wind the calibration screw $\frac{1}{4}$ turn anti clockwise and re-lock the lock nut. Test the switch on a falling water level and ensure it operates properly. If it fails to switch, adjust the sensitivity screw a further $\frac{1}{4}$ turn anti clockwise and repeat the test.

If the switch fails to operate on a rising level, that is, fails to switch when the top most displacer is covered by water it will require re-calibrating. Unlock the calibration lock nut and turn the calibration grub screw $\frac{1}{4}$ turn clockwise and re-tighten the lock nut. Test the switch on a rising water level. If it fails to switch when the top displacer is covered by water, wind the calibration screw a further $\frac{1}{4}$ turn clockwise and repeat the test.

D40 Level Switch

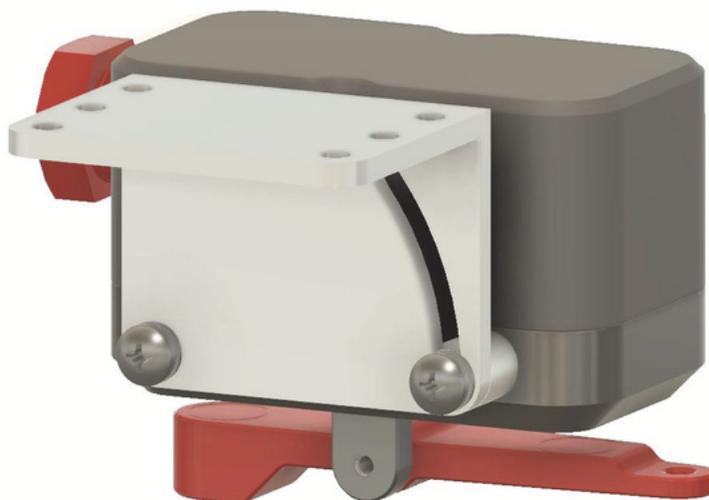
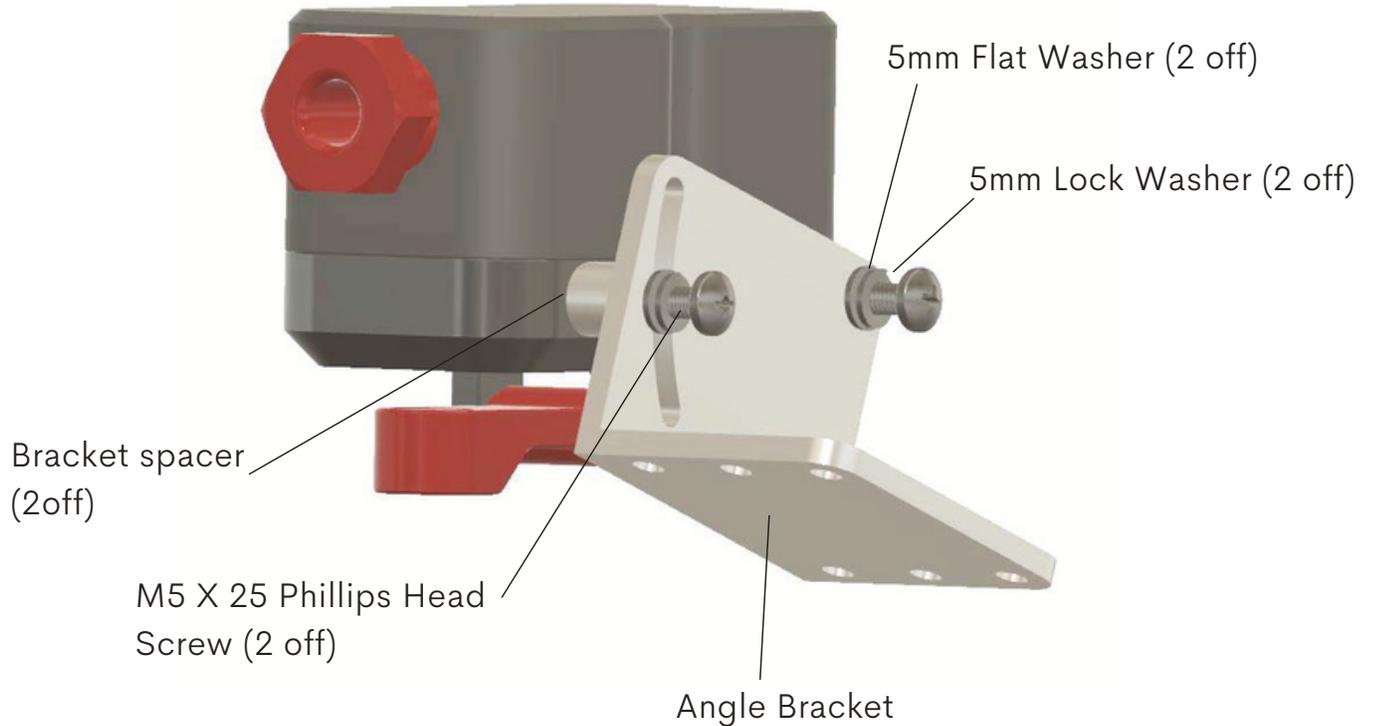
The D40 level switch has a single displacer and switching must occur within the length of the single displacer. When correctly adjusted the switch should change state at the bottom edge of the conical section on a rising level and at the seam line half way down the straight section on a falling water level. If a rising water level fails to actuate the switch when the displacer is fully submerged recalibrate the switch by adjusting the calibration screw clockwise in $\frac{1}{4}$ turn steps until the switch operates at the correct point.

If the switch fails to operate on a falling water level adjust the calibration screw anti clockwise by $\frac{1}{4}$ turn and retest it. If required repeat the adjustment until the switch operates properly.



Using The Slotted Angle Bracket

In all installations the top face of the switch lid must lay horizontal in both planes. The angle bracket can be used to install the switch on sloping beams and tank lids. Fully tighten the 2 X M5 Phillips head screws to ensure the switch is solidly mounted.



The Angle Bracket can be inverted if required

Warranty and Limitation of Liability

Thank you for purchasing Kelco Engineering Pty Ltd, (ABN 200 002 834 844) ("*Kelco*") products (*Kelco Products*). This document sets out the terms and conditions of the product warranty and Limitation of Liability for *Kelco Products*. It is an important document. Please keep it with your proof of purchase documents in a safe place for future reference should you need to lodge a claim.

This Warranty and Limitation of Liability (or any more recent version in effect when you purchase a *Kelco Product*) ("*Warranty*") applies to all *Kelco Products* regardless of where you purchased the *Kelco Products*.

When you place an order, you are deemed to agree to the *Warranty*, unless otherwise agreed in writing with *Kelco*.

Kelco is located at 9/9 Powells Road, Brookvale, NSW 2100, AUSTRALIA and may be contacted by calling 61 2 99056425 or emailing:

sales@kelco.com.au

1. Definition

The following terms used herein are defined as follows:

- (1) *Australian Consumer Law* or *ACL*: Schedule 2 to the Competition and Consumer Act 2010 (Cth).
- (2) *Brochures and Technical data sheets*: *Kelco* brochures, including, without limitation, sales brochures and technical data sheets, whether or not provided electronically.
- (3) *Customer Application*: Any application of *Kelco Products* or component parts by a you including, but not limited to, embedding and/or using *Kelco Products* in your parts/components, electronic substrates, devices, equipment and /or systems manufactured by customers.
- (4) *Non- Excludable Guarantee*: a Consumer Guarantee applicable to these *Warranty Terms* under the *Australian Consumer Law* or *New Zealand Consumer Guarantee Act 1993*.
- (5) *Fitness*: (a) fitness for a particular purpose, (b) performance, (c) compliance with laws and regulations and (d) conformity to standards of a *Kelco Product*.
- (6) *Kelco Products*: flow switches, level switches and float switches, related products and electronic/mechanical components under the *Kelco* brand.
- (7) 'You' or "Customer" means the purchaser of the *Kelco Products* not having purchased the *Kelco Products* for re-sale, and 'your' has a corresponding meaning.
- (8) *Usage Conditions*: Usage conditions, rating, performance, operating environment, handling instructions, warnings, restrictions on use, etc. of *Kelco Products* described in the *Brochures and technical data sheets*.

2. Descriptions

You are deemed to accept the following terms and conditions regarding the descriptions provided of *Kelco Products* in the *Brochures* and technical data sheets when you adopt or use a *Kelco Product* or component thereof.

- (1) Rated values and performance values are based on average performance established from batch production runs and *Kelco* does NOT warrant any rated values and performance values for multiple composite conditions.
- (2) Reference data is provided for your reference only. *Kelco* does NOT warrant that *Kelco Products* work properly at all times or continuously as provided in the reference data.
- (3) Application examples (if any) are provided for your reference only. *Kelco* does NOT warrant the *Fitness of Kelco Products* under such applications.
- (4) *Kelco* may discontinue the production of *Kelco Products* or change their specifications for the purpose of improving such products or for other reasons entirely at its own discretion and is under no obligation to notify you of any such change.

3. Precautions

You are deemed to accept the following terms and conditions when you purchase *Kelco Products*:

- (1) You will use *Kelco Products* in compliance with *Usage Conditions* including rating and performance.
- (2) You will confirm *Fitness* and use your own judgment to determine the appropriateness of using of *Kelco Products* in a *Customer Application*. *Kelco products* are unlike conventional flow and level switches and pump controllers in that they can be applied to virtually any fluid or pumping system in any manner defined by an original equipment manufacturer, a wholesaler or end user or their agents. The knowledge and experience of such parties is outside the control of *Kelco*, and their having relevant knowledge and experience is critical to the successful application and operation of the *Kelco Products*. *Kelco* does NOT warrant the *Fitness of Kelco Products* in a *Customer Application*.
- (3) You will confirm that *Kelco Products* are properly wired and installed for their intended use in your overall system. In the case of *Kelco* pump controllers, the flexibility of their operating system means it requires an extensive knowledge of pumps and their characteristics and the intended overall goal of the system in order to select the correct functions and settings. Failure to understand the ramifications of incorrect settings may result in a system that fails to perform to your expectations and or may even damage the pump or system itself. It is therefore critical that correct settings are used to achieve a stable and reliable overall system and to provide any such system with appropriate pressure and or flow protection the pump controller is intended to provide. *Kelco* does NOT warrant *Kelco Products* against defective installation, incorrect programming, incorrect wiring or electrical overload in any form.
- (4) When using *Kelco Products*, you will make sure to (i) maintain a margin of safety in relation to the published rated and performance values, (ii) design to minimize risks to any *Customer Application* in case of failure of any *Kelco Products*, such as introducing redundancy i.e. critical systems should include double redundancy of all controls, (iii) adopt system-wide safety measures to notify risks to users such as independent backup protection. Such backup may consist of a simple or complex independent alarm system to alert an operator to any issue with the system, and (iv) conduct regular maintenance on *Kelco Products* and the *Customer Application*.
- (5) It will be your sole responsibility as user to determine and use adequate measures and checkpoints to satisfy your particular requirements for (i) data input and output, (ii) maintaining a means for reconstruction of lost data, (iv) preventing *Kelco Products* installed thereon from being infected with computer viruses and (v) protecting *Kelco Products* from unauthorized access. *Kelco* shall not be responsible and/or liable for any loss, damage, or expenses directly or indirectly resulting from any third-party software or hardware not contained in the product as originally configured by the manufacturer, the infection of *Kelco products*, or any computer equipment, computer programs, networks, databases or other proprietary material connected thereto, by service attack, computer viruses, other technologically harmful material and/or unauthorized access.
- (6) *Kelco Products* are designed and manufactured as general-purpose products for use in general industrial products. They are not intended to be used in the applications described in subsection 3...(5)(a), (b), and (c). If you are using *Kelco Products* in the applications described below, *Kelco* does not provide any warranty for such *Kelco Products*, except for specific applications where *Kelco* has specified that it intends to provide a warranty or by separate written agreement between the customer and *Kelco*.
 - a. Applications with stringent safety requirements and applications that could cause physical injury to a person or result in loss of life.
 - b. Applications under severe conditions or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks.

- c. Applications under conditions or environments not described in any of the Brochures and Technical data sheets.
- d. *Kelco Products* are not intended for use in Hydrocarbons other than Dieseline.

4. Warranty

Kelco warrants that *Kelco Products* will perform in accordance with the specifications set out in the Technical data sheets, subject to and in accordance with the following:

- (1) **Warranty period:** The *Warranty* shall apply for 12 months from the date of original purchase of *Kelco Products* by the customer. .
- (2) **Sole Remedy:** Unless required to do otherwise as a result of statutory guarantees applicable under *ACL*, *Kelco* will provide, at its own discretion, either of the following two services as the sole remedy for a malfunctioning *Kelco Product*:
Repair of the malfunctioning *Kelco Product(s)* or components by *Kelco* or *Kelco* authorised dealer at no charge to the customer, or

- a. Replacement of the malfunctioning *Kelco Product(s)* or components by *Kelco* or *Kelco* authorised dealer with the same number of replacement/alternative products or components at no charge to the customer.

(3) **Exceptions:** This *Warranty* of *Kelco Products* does not apply if the cause of the malfunction falls under any of the following:

Usage in a manner other than the original intended use for the *Kelco Products* or component thereof.

- a. Usage other than as described in the *Usage Conditions*.
- b. Usage that is not in accordance with Section 2 (Descriptions) and Section 3 (Precautions) above.
- c. Modification or repair made to the *Kelco Products* by persons other than *Kelco*.
- d. Causes which could not have been foreseen with the level of science and technology at the time of shipping from *Kelco*.
- e. Replacement or repair of any (1) consumables (including cables, paddles and circuit boards), or (2) lost parts or accessories.
- f. Service of any product whilst it is outside Australia.
- g. Causes originating from other than *Kelco* or *Kelco Products* (including force majeure such as but not limited to natural disasters)
- h. Causes from any environmental factors. Such factors may include but are not limited to water or chemical ingress, fire damage, lightning damage, mechanical damage, sun damage or degradation, failure due to over-heating, freezing or vibration. Failure due to customers over tightening threads or fittings. Failure due to power supply fluctuations, surges, spikes, brown outs. or AC supplies that do not provide a pure sine wave output.
- i.

(4) If you intend to make a claim under this *Warranty* you must contact *Kelco* to register your claim by telephone on (02)99056425 and provide the following details to enable *Kelco* to assess the claim: (i) proof of purchase; (ii) evidence of the particulars of the claim that gives rise to the application of the *Warranty* ; (iii) confirmation that the cause of the malfunction was not an Exception set out above; and (iv) your phone number, email and address details.

You must provide or make the *Kelco product* available to *Kelco* for evaluation. If you are required to return the product to *Kelco* for repair replacement or evaluation, *Kelco* will provide delivery details and a return goods authorisation number to you. The *Kelco Products* will be at the owner's risk whilst in transit to and from *Kelco*, unless transported by *Kelco* or its authorised representatives.

The *Kelco Product* presented for repair may be replaced by refurbished products of the same type rather than being repaired. Refurbished parts may be used to repair the product.

To the extent permitted by law replacement of the product or a part does not extend or restart the *Warranty Term*.

Kelco may seek reimbursement of any costs incurred by them when the *Kelco* product is found to be in good working order.

5. Non-excludable Statutory Guarantees

(1) The *Warranty* is given by *Kelco* in addition to other rights and remedies which you may be entitled to under by law, nothing contained in this agreement excludes, restricts or modifies any condition, guarantee, warranty or other obligation which is applicable to or is conferred on *Kelco* pursuant to law where to exclude, restrict or modify any such condition, warranty or other obligation is unlawful. (2) **Australia:** To the extent that you are a consumer for the purposes of the *ACL*, *Kelco Products* come with guarantees that cannot be excluded under the *ACL*. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure. "Acceptable Quality" and "major failure" have the meaning they have in the *ACL*. (3) **New Zealand:** For *Kelco Products* provided by *Kelco* in New Zealand, the *Kelco Products* come with a guarantee by *Kelco* pursuant to the provisions of the Consumer Guarantees Act, section 345(1)(i) of the Contract and Commercial Law Act 2017 and the Fair Trading Act. Where the *Kelco Product* was purchased in New Zealand for commercial purposes the Consumer Guarantee Act does not apply.

6. Disclaimer and Limitation of Liability

TO THE EXTENT PERMITTED BY APPLICABLE LAW:

(1) SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, OTHER THAN AS STATED IN SECTION 4 ABOVE AND SELLER DISCLAIMS AND EXCLUDES ANY WARRANTY OF ANY OTHER KIND. (2) THE SOLE AND EXCLUSIVE REMEDY FOR MALFUNCTIONING KELCO PRODUCTS SHALL BE AS SET FORTH IN SECTION 4. ABOVE. (3) *KELCO* AND THE DISTRIBUTORS OF *KELCO PRODUCTS* ARE NOT LIABLE FOR ANY DAMAGES WHICH MAY ARISE FROM OR BE RELATED TO *KELCO PRODUCTS*.

7. Confidentiality: You accept that if you make a *Warranty* claim, *Kelco* and its agents may exchange information in relation to you to enable *Kelco* to meet its obligations under this *Warranty*.

8. Export/ Import Controls

Customers of *Kelco Products* shall comply with all applicable laws and regulations of Australia and/or other relevant countries with regard to security export/import control, when exporting/importing *Kelco Products* and/or technical documents or providing such products and/or documents to a non-resident of Australia. At its discretion *Kelco* may not provide customers with *Kelco Products* and/or technical documents should they fail to comply with such laws and regulations.

Kelco Engineering Pty Ltd

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