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TFM Engineering Australia Product Catalogue



ABOUT TFM ENGINEERING AUSTRALIA

Creator and Director - Stephen Fordyce

TFM Engineering Australia is based in the eastern suburbs of Melbourne Australia, and is the creation of director Stephen Fordyce - engineer, inventor and technical diver. Steve is an active cave diver, sump diver and caver frequently at the pointy end of exploration projects in multiple Australian states and on occasion further afield.

He is also an experienced small boat driver and trip organiser active in technical and recreational wreck and reef diving, mostly in Victoria but with interstate roadtrips most years. With a background in design and manufacture for the industrial gas sector, TFM Engineering is the combination of Steve's passion for diving with his lifelong love of "making cool stuff".



Flexibility and Versatility

TFM Engineering designs and creates innovative and useful products for SCUBA, marine and high pressure gas applications among other things. As we are small, we have low overheads, are extremely flexible and can help customers achieve their goals at low cost as a result - whether it be design, prototyping or production.

With many products made locally in small production runs, there is usually no problem with making changes or completely new parts to suit your application. We make use of our network of other industry partners to achieve volume savings while keeping overheads low.

Our capabilities and resources include:

- Lasercutting and folding
- Stainless steel fabrication
- Machining and welding
- Custom electronics and system integration
- High pressure air/oxygen/inert gas equipment
- SCUBA compressor accessories

Stay in Touch!

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HOW TO ORDER

Prices in this catalogue are in Australian Dollars and exclude GST.

Until the online store (a work in progress) is up and running, the best way to make an order is to send an email to sales@tfmengineering.com.au. We will get back to you as soon as possible.

Cover Photo: Staying ahead of the silt in Umbu's Shaft (Dead Cat Extension), West Timor, Indonesia (July 2016 Expedition). Photo by Liz Rogers (reproduced with permission) <http://lizrogersphotography.com>

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WHAT'S NEW?!

It's been a while since the last catalogue revision, and there is a whole swag of new and awesome stuff added. Here are just a few examples:

- Even more GAS MIXING ADAPTORS for even more situations
- Monitoring systems - OXYGEN WATCHDOG and PRESSURE WATCHDOG
- 300BAR CARBON FIBRE CYLINDERS - for breathing apparatus and other applications
- Stainless steel hand tools - now in 316 MARINE GRADE
- COMPLETE BOOSTER HOSE KITS - and complete case-mounted booster kits
- Go the distance with EPIC TFM LITHIUM SCOOTER BATTERIES AND ACCESSORIES
- 5-minute DIY INSTALL HUMIDITY EYEBALL KITS - always know when your filter needs changing
- Improved pricing on FILTER TOWERS AND FILTRATION SYSTEMS
- AQUASKETCH scrolling underwater wrist slate
- Awesome HELMET GOPRO MOUNT just like what Steve uses
- All the SS316 HOSE CLAMPS ever



Just look for this graphic to easily find the new products.



RECENT AND ONGOING RESEARCH AND DEVELOPMENT

SCUBA COMPRESSOR AUTODUMPING SYSTEM

Autodumps are nice if you are lazy, because you don't have to remember to dump the condensate every 15 min. With work on a commercial air-powered style complete, the current focus is on an electrically actuated version which can easily be retrofitted to smaller compressors. If you are keen on this let us know!



ELKLIGHT MK V ("THE PADEMELON") CAVING/DIVING LIGHT



After a thorough redesign and a few hiccups with some new technology, 5 prototype MkV ElkLights have been abused through caves all over Australia and overseas. Soon it will be time to make a few more design changes and do a Mk VI version. Key features of the latest version include a tighter spot beam, 3D printed (and very sexy), 100m-rated battery case and bluetooth/smartphone user interface for configuration of settings/battery voltage checking/sweet party tricks while kitting up at the car. Most caving trip photos on the TFM Engineering Australia Facebook page are lit by the ElkLight alone, and it's been on a 2-day camping trip to the bottom of the deepest cave in Australia.

UNDERWATER BATTERY-POWERED HAMMER DRILL

After some concerted messing about, a couple of test holes were successfully drilled in a BYO rock at 30m depth (fresh water). This is not going to be production quality, but will do the job for occasional use for installing safety lines or bolt climbing beyond sumps. The drill is free-flooding, but has been modified to remove any bits which would not handle a bit of corrosion.



EPIC LITHIUM SCOOTER/DPV BATTERY



We were approached by a fellow cave diver seeking a long-range lithium battery for his Halcyon T16 scooter, and thus began a long journey of development which resulted in a unique battery design that has already been fitted to a variety of scooters (Hollis, Silent Submersion, and Gavin). It has also taken us on a 7km underwater return trip to Toad Hall, in Cocklebidy Cave. The battery is unique because all the cells are individually protected and controlled, and they are also all user replaceable. The T16 battery has a huge 54Ah giving a range easily exceeding 12km - you can find more information later in the catalogue. Development is underway on more batteries to suit other scooters (DiveX Cuda and Sierra), and the range of scooter-related accessories is quickly growing.

OXYGEN AND PRESSURE WATCHDOG

Considerable innovation has gone into these latest electronic/automation systems. Both the oxygen and pressure watchdogs monitor these variables and act if an alarm condition is triggered - shutting off oxygen supply and/or the compressor, or actuating valves, etc. The pressure watchdog is useful for accurate topping off of gas mixes and for helping prevent accidental overfilling of low pressure cylinders on a high pressure system.

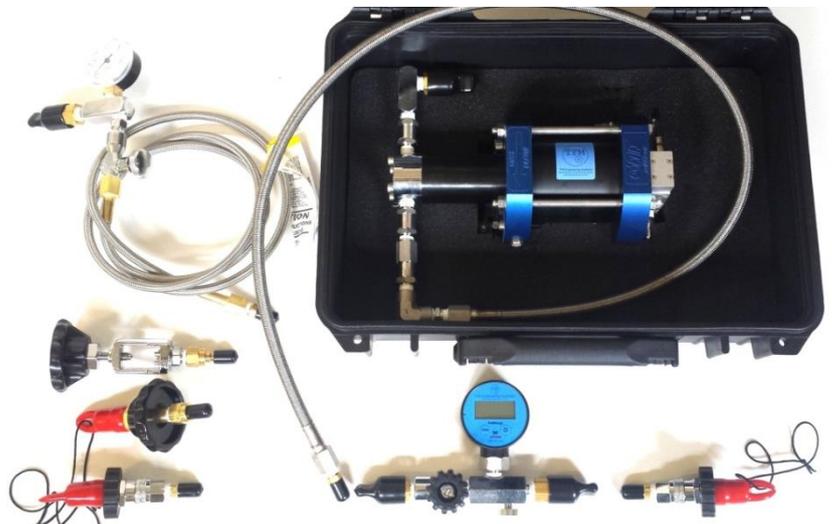


The brains of these are standard industrial controllers, helping to keep the cost of developing custom electronics to a minimum.

BOOSTERS

If you're mixing gas, a booster is going to be on your wishlist. They are (usually) driven by compressed air and allow you to increase the pressure of oxygen (or helium) from your storage bank into a mix tank or rebreather bottle.

While there are plenty of different boosters available on the market, they are usually supplied "bare" and the buyer is expected to add hoses and fittings themselves - this is where TFM Engineering comes in. We specialise in everything around the booster, including fully packaged booster systems. There are a number of standard TFM hose kits, or you can design your own from the ground up using high-spec oxygen compatible fittings from this catalogue.



If you're in the market for a booster, feel free to get in touch to discuss the different manufacturers and what they can offer.

BUYING A COMPRESSOR?

TFM Engineering has an extensive knowledge of the various compressor brands (and how our aftermarket systems fit them!). We can help you get your research started.



HIGH PRESSURE STORAGE CYLINDERS

300BAR 50L STORAGE CYLINDER WITH TYPE 61 VALVE

Part# 41-001: Contact us to discuss the best options for cylinder and shipping



Bank your own air, pre-mixed gas, leftover trimix or pure oxygen/helium for future blending without paying rental on cylinders just sitting around. These cylinders are clean and ready for oxygen service, with quality Mueller "Type 61" valve, and also have a removable travel cap to protect it. The cylinder and cap are grey.

Meeting all required standards for use in Australia, they have recent Australian hydro test stamps (hydro testing only required every 10 years).



200BAR 50L STORAGE CYLINDER WITH TYPE 10 (BULLNOSE) VALVE

Part# 41-002: Contact us to discuss the best options for cylinder and shipping



Bank your own air, pre-mixed gas, leftover trimix or pure oxygen/helium for future blending without paying rental on cylinders just sitting around. Note that this cylinder is only rated to 200bar and so is intended as a cheaper option for banking oxygen or helium as both of these start to have issues with higher pressure storage. These cylinders are clean and ready for oxygen service, with quality Mueller "Type 10" valve, and also have a removable travel cap to protect it. The cylinder is white and cap is grey.

Meeting all required standards for use in Australia, they have recent Australian hydro test stamps (hydro testing only required every 10 years).



LIGHTWEIGHT CARBON FIBRE CYLINDERS (300BAR) **NEW!**

TFM has successfully sourced high quality carbon fibre gas cylinders from a reputable factory in China. These are manufactured to EN12445 and design registered with Worksafe Victoria (full documentation can be provided). They can be supplied untested, or with an Australian "first test"/examination completed and marked. They have M18x1.5 thread.

These are less than half the weight of a steel or aluminium SCUBA tank so are idea for firefighting and other breathing apparatus applications. They are extremely buoyant so for this reason (and others) they are not very suitable for SCUBA diving. They can be useful for when it is a major effort to get SCUBA cylinders to the water (ie. sump diving) - contact us to discuss.



Part #	Description	Price
20-301	6.8L 300bar Carbon Fibre Cylinder only (no first test mark)	\$618
20-301-1	6.8L 300bar Carbon Fibre Cylinder with valve & first test/inspection	\$773
20-302	9L 300bar Carbon Fibre Cylinder only (no first test mark)	\$721
20-302-1	9L 300bar Carbon Fibre Cylinder with valve & first test/inspection	\$875
20-303	300bar DIN (SCBA/SCUBA) Valve to suit M18x1.5 thread	\$62

OXYGEN TRANSFILL EQUIPMENT AND PARTS

WARNING: messing with high pressure oxygen can result in injury, death and/or generally vast amounts of damage to property and people. You need to be prepared to accept the risk, design and use your system properly and be aware of the consequences of failure. The "*Oxygen Hacker's Companion*" (see separate listing) is an excellent resource to help avoid blowing yourself up.

(That said – there are plenty of people out there messing about and surprisingly few incidents that occur)

Why 200bar? The short answer is: it's much cheaper, more practical and safer. If you absolutely must have a 300bar system, it can be done and feel free to get in touch to discuss it further.

GAS MIXING ADAPTORS

Any assembly of listed fittings (and some unlisted ones) can be provided - these are some common ones.



Part #	Description	Price
40-650-1	Pin Index to bullnose adaptor (standard)	\$146
40-650-2	Pin Index to bullnose adaptor (hand-tight)	\$168
40-651-1	Pin Index to DIN (300bar) adaptor (standard)	\$146
40-651-2	Pin Index to DIN (300bar) adaptor (hand-tight)	\$168
40-629	Bullnose (male) to DIN 200bar (female)	\$64
40-631	DIN 200/300bar (male) to bullnose (female)	\$64



PRE-ASSEMBLED QC ADAPTORS

If you already have a TFM transfiller whip with quick connects, you may need a few extra cylinder connectors - here are some of the common ones.

Part #	Description	Price	Picture
40-620	Assembled DIN with male QC	\$80	
40-621	Assembled pin index with male QC	\$89	
40-621-1	Assembled pin index (handtight) with male QC	\$107	
40-622	Assembled bullnose with male QC	\$59	
40-622-1	Assembled bullnose (handtight) with male QC	\$69	
40-619	Assembled female DIN with female QC	\$132	-
40-619-1	Assembled female bullnose with female QC	\$132	-
40-619-2	Assembled female bullnose with female QC	\$139	-



OXYGEN/HELIUM TRANSFILL WHIPS

The fittings and kits below are everything required to custom make almost any kind of oxygen or helium transfill whip you need. If you specify what you're after, TFM Engineering can assemble with oxygen Teflon tape and test for you. Hoses are Teflon-lined stainless steel braided, fittings are brass, chromed brass or stainless steel, and everything is cleaned for and compatible with high pressure oxygen.

Standard Transfill and Booster Kits (read further for parts and custom options):

Kit Name	Description	Price	Picture
12-001 (200bar) Budget DIN transfiller	2 DIN fittings, a 1.2m hose and needle valve. (Ideal rebreather decanter, use to top off a low pressure 3L oxygen bottle from a larger SCUBA or storage tank)	\$275	
12-002 (200bar) DIN transfiller with fill gauge	As above but with gauge on downstream side	\$330	
12-003 (200bar) Ultimate transfiller (no tank connectors)	Upstream & downstream indicator gauges, female quick connects each end, and needle valve. Optionally add a digital gauge with quick connects for accurate mixing. Can be used for transfilling and can double as one of your booster hoses. NO TANK CONNECTORS INCLUDED	\$480	
12-008 Ultimate booster/trans filler (no tank connectors)	Similar to the ultimate transfill whip, but with a line valve at the downstream end for local isolation and easy changeover. Breaks with a quick connect which is where the booster would be located (only requires 1 extra hose and 2 QCs on the booster). The downstream manifold is 300bar rated (the upstream side and hose are still 200bar), so can be used with a 300bar-capable booster. NO TANK CONNECTORS INCLUDED	\$649	
12-004 Tank connectors kit	2x DIN, 1x pin index (medical oxygen), 1x bullnose (helium), with male quick connects	\$305	

12-004-1 Tank connectors kit (with hand-tight bullnose & pin index)	2x DIN, 1x hand-tight pin index (medical oxygen), 1x hand-tight bullnose (helium), with male quick connects	\$335	
12-005 Upgrade to digital gauge	Upgrade any budget analog gauge to a digital gauge	\$206	
40-501-2 Removable digital gauge	Digital gauge on a SS tee with M/F quick connects so you can move it around and put it inline wherever you need to get accurate readings for tight control of mixes.	\$350	
12-006 Budget DIN 200bar booster kit	Budget DIN Booster 200bar Hose Kit - 1.2m/1.8m hoses, 1/4" NPT M or F ends, outlet analog gauge only, DIN fittings with bleeds, needle valve on inlet	\$495	-
12-006-1 Budget DIN 300bar booster kit	Budget DIN Booster 300bar (200bar inlet) Hose Kit	\$665	-
12-007 Ultimate DIN 200bar booster kit	Ultimate 200bar Booster Hose Kit - ultimate whip upgraded to digital gauge, handtight connectors kit, outlet hose/QCs, 1/4" M or F NPT ends. Drive gas adaptors available separately	\$1,465	
12-007-1 Ultimate DIN 300bar booster kit	Ultimate 300bar (200bar inlet) Booster Hose Kit - ultimate whip upgraded to digital gauge, handtight connectors kit, outlet hose/QCs, 1/4" M or F NPT ends. Drive gas adaptors available separately	\$1,635	 <p style="text-align: center;">(Booster & case not included!)</p>
12-009 200bar booster outlet	200bar booster outlet hose & QCs to upgrade ultimate kit - 1/4" NPT M or F ends	\$169	
12-010 300bar booster outlet	300bar booster outlet hose & QCs to upgrade ultimate kit - 1/4" NPT M or F ends	\$340	



Most of these will be made to order, so if you want something a bit different, then just get in touch.



HIGH PRESSURE OXYGEN COMPATIBLE PARTS

ELECTRONIC/DIGITAL MIXING GAUGE

These are TFM Engineering custom spec high precision digital pressure gauges for accurate partial pressure gas mixing and they come clean and ready for oxygen service.

Specifications:

- 0-400bar range (units selectable)
- 1/4" NPT process connection to match all the TFM mixing whips and gear
- Power: Standard 9V battery (included)
- Case: black plastic
- Other features: backlight, auto-off, pressure units selectable

Part #	Description	Price	Picture
40-501-1	Bottom entry gauge for standalone install into a transfill hose or fill whip end.	\$245	
40-501-2	Bottom entry gauge installed on a tee with quick connects for moving around your system. 300bar rated.	\$350	
40-501-3	Panel mount back entry gauge for use on fill panels	\$275	
17-001	Pressure transmitter, 0-400bar, 4-20mA output (24V loop powered), 1/4" NPT, suitable for oxygen service	\$185	
17-001-1	Pressure transmitter kit, 0-400bar, 0-5-12V supply, 0-5V out, 1/4" NPT, suitable for oxygen service. Arduino compatible.	\$235	
-	Other ranges of gauges and pressure transmitters can be supplied on request	-	

BUDGET INDICATOR GAUGE 1/4" MNPT

Part# 40-614-1 (0-300bar): \$41

Part# 40-614-2 (0- 400bar): \$41

1/4" 300bar (dual PSI/kPa scale) brass wetted parts, plastic case oxygen pressure gauge. It's small but will do the job for giving you an indication of pressure at various points in your system.



HIGH-SPEC STAINLESS STEEL/OXYGEN COMPATIBLE PANEL MOUNT GAUGE 1/4" MNPT

When building panels, pressure gauges are required - these are high quality pressure gauges that can meet even the most stringent of standards, although at unavoidable price. The TFM digital panel mount gauge is an attractive alternative option! Contact us for an in-depth discussion on gauges and Australian Standards before you go and buy a cheap hydraulic gauge.



Part #	Description	Price	Picture
40-502	63mm panel mount S2 safety pattern pressure gauge, 0-400bar, 1/4" NPT	\$75	
40-503	63mm panel mount S3 safety pattern pressure gauge, 0-400bar, 1/4" NPT	\$245	
40-504	100mm panel mount S3 safety pattern pressure gauge, 0-400bar, 1/4" NPT	\$295	
-	Other gauge options can be supplied on request	-	-

OXYGEN CHECK (NON-RETURN) VALVES AND MICRON FILTERS

Sometimes you only want gas flow to go in one direction and when it's critical, a check valve is a good option - and TFM Engineering provides custom-spec, oxygen compatible options. There are several seat types to choose from depending on the working conditions - a viton seat has a higher working pressure and will seal better but has a lower ignition temperature than a teflon seat. The teflon seat is intended for use after a booster, where the chance of seal wear particles is quite high. It's also a very good insurance policy to put a micron filter after your booster to catch said particles! Cracking pressures are optimised according to use.



Part #	Description	Price	Picture
40-638	276bar SS oxygen check valve 1/4" MNPT, teflon seat for boosters, 5PSI(TBC) cracking pressure	\$149	
40-639	400bar SS oxygen check valve 1/4" MNPT, viton seat for panels, 1/3PSI cracking pressure	\$149	
40-638-1	Teflon seat/spring kit to suit 276bar check valve	\$31	-
40-639-1	Viton seat/spring kit to suit 400bar check valve	\$31	-
40-640	400bar SS oxygen inline micron filter, 1/4" FNPT in, 1/4" MNPT out	\$149	

NEEDLE VALVE 1/4" NPT MALE/FEMALE

Part# 40-601 (Male Inlet to Female Outlet): \$70

Part# 40-601-1 (Female Inlet to Male Outlet): \$80



Handy little 200bar valve which can be used for throttling your oxygen supply on a transfill whip or similar. The chromed brass body/handle and PCTFE (Kel-F) seat mean you can feel slightly better about the choked flow of oxygen running through at sonic speeds. It's not technically a needle valve in the sense of having a needle seat for ultra-fine and repeatable control for laboratory applications, but neither are most so-called "needle valves" out there and it will do the job no worries. The flow direction is important to get right for proper operation.



TFM ENGINEERING CUSTOM-SPEC OXYGEN LINE & PANEL SCUBA VALVES

These valves were custom made to TFM Engineering specifications - they are chromed brass with 400bar working pressure, 1/4" NPT female inlet and male outlet but with standard SCUBA valve parts. They are oxygen clean and lubricant free, with the seat assembly having teflon coated threads and carbon fibre filled Kel-F soft seat. This is about as good as it gets in oxygen service - MUCH less scary than the nylon seats typical in most SCUBA valves.

Part #	Description	Price	Picture
40-624	Standard line valve 1/4" NPT in, 1/4" NPT out	\$89	
40-625	Panel mount line valve (26mm hole) 1/4" NPT in, 1/4" NPT out	\$99	
40-626	Green knob to suit line valves	\$7	
40-627	Custom spec seat (for oxygen) - teflon coated threads, carbon fibre filled Kel-F soft seat (FITS MOST SCUBA VALVES)	\$7	

CYLINDER CONNECTIONS TO 1/4" NPT

All the good bits to go on the ends of your transfill whip or booster inlet/outlets. DIN, pin index and bullnose adaptors. All are oxygen compatible and clean, and ready to be installed.

Part #	Description	Price	Picture
40-616	DIN fitting to 1/4" FNPT with bleed, oxygen cleaned and with oxygen-compatible soft parts.	\$52	
40-602	Medical Oxygen Pin Index (CGA-870) to 1/4" MNPT - this is the hard-to-find key to getting oxygen out of those new pin index medical oxygen bottles. Chromed brass, 200bar pressure rating, with seal included. Note there is no swivel.	\$59	
40-602-1	Same as the standard medical oxygen pin index, but much easier to get a good deal and get it off again without resorting to tools - as is often the case with the T-bar handle on the standard yoke	\$81	
40-606	Spare seal for medical oxygen yoke	\$3	
40-617	Basic Bullnose To 1/4" MNPT - to suit Australian helium/argon, and also industrial oxygen valves. Thanks to the O ring, it will seal when hand-tight, and you can usually get it undone by hand also	\$30	

40-617-1	Up-market version of the bullnose fitting which makes it a lot easier to connect/disconnect from the cylinder by hand	\$40	
40-617-2	Type 61 nut and nipple adaptor for use with 300bar cylinders (ie. in this catalogue!). No O ring, so will need to be tightened with a large shifter or spanner	\$67	
40-617-3	Type 11 nut and nipple adaptor for use with 300bar cylinders.	\$67	
40-850	Custom spec CGA-590 with minimal dead space - used for atmospheric sampling	\$51	
40-852	CGA-580 nut and nipple - for American cylinders or adaptors	\$32	

HIGH PRESSURE OXYGEN SERVICE QUICK CONNECTS

These quick connects are similar to the low pressure hose BCD fitting on SCUBA regulators, except they are rated to a whopping 350bar. Handy for quick swapping of fittings on your gas mixing equipment for your supply bottle with different valves, or for quickly changing between yoke and DIN. They are supplied clean for oxygen service.

Specifications:

- Material: brass
- Thread: 1/4" NPT
- Pressure rating: 350bar
- O ring: Viton

Note that unlike BCD quick connects, these don't seal when you disconnect (and can't be disconnected under pressure) – this helps to avoid potential impingement sites in oxygen service. The shutoff sort exists (like the QC6 used for rebreathers), but is much more expensive and not usually justified for SCUBA systems.

Part #	Description	Price	Picture
40-001	MNPT to MQC	\$19	
40-002	MNPT to FQC	\$34	
40-003	FNPT to MQC	\$19	
40-004	FNPT to FQC	\$34	
40-005	Dustcap for MQC	\$2	
40-006	Dustcap for FQC	\$3.50	

FEMALE FITTINGS AND OTHER BLOCKS

A couple of useful fittings for gas mixing - all oxygen clean and compatible.

Part #	Description	Price	Picture
40-618	Bleeder block (M/F 1/4" NPT with gauge port) - 300bar	\$125	
40-628	Female DIN 300bar to 1/4" FNPT	\$72	
40-628-2	Female Bullnose to 1/4" FNPT	\$72	
40-628-1	Female DIN 300bar to 1/4" MNPT	\$72	
40-628-3	Female Bullnose to 1/4" MNPT	\$72	
40-652-1	Pin index block to 1/4" FNPT	\$79	
40-652-1	Pin index block to 1/4" MNPT	\$79	
40-634	200/300bar DIN (male) to 1/4" FNPT	\$31	
40-620-3	Machined brass manifold block - 1/4" NPT. Holes on each of the 6 faces of the hexagon and one on the top. This is seriously useful component if you're building a large oxygen system. 200bar pressure rating for the brass version.	\$98	
-	More manifold blocks! Higher pressures, oxygen/air service, many options. Contact us with your exact requirement.	-	-



TEFLON-LINED OXYGEN HOSE 1/4" FNPT



Putting oxygen through regular rubber or even nylon-lined fill hoses is not a great idea – they are much more likely to catch fire than these Teflon lined, stainless steel braided hoses. Available in 200bar or 300bar pressure rating (4 times this for burst rating) in a variety of lengths, with 1/4" FNPT ends.

Part #	Description	Price
40-605-1	30cm, 200bar	\$52
40-605-2	1.2m, 200bar	\$72
40-605-3	1.8m, 200bar	\$108
40-605-4	1.2m, 300bar	\$245
40-605-5	1.8m, 300bar	\$295



200BAR OXYGEN FITTINGS

Fittings to help make your gas mixing dreams a reality. Chromed brass maintains oxygen compatibility while preventing tarnishing.

Part #	Description	Price	Picture
40-603 40-604	12mm Oxygen Thread Tape 6mm Oxygen Thread Tape	\$6 \$6	
40-607	200bar Chromed Brass Female Tee, 1/4" FNPT	\$23	
40-612	200bar Chromed Brass M/F/F Elbow Tee, 1/4" FNPT	\$22	
40-611	200 bar Chromed Brass Female Elbow, 1/4" FNPT	\$22	
40-608	200bar Chromed Brass Coupling, 1/4" FNPT	\$12.50	
40-609	200bar Chromed Brass Nipple, 1/4" FNPT	\$8.50	
40-610	200bar Chromed Brass Hex Plug, 1/4" FNPT	\$14.50	



The dive crew of our September 2016 Cocklebiddy Cave expedition after a major haul-out effort. We are in the state of Western Australia, standing on the flat Nullarbor Plain, 1000km from the nearest major city, and 80m above the water table. We spent a week on site but made it to Toad Hall (a round trip of 7km underwater, with 2 major air chambers) through flooded tunnels big enough to fly a light plane through, and collected a bunch of awesome footage as well.



HIGH PRESSURE AIR EQUIPMENT AND PARTS

WARNING: messing with high pressure air can result in injury, death and/or general damage to surrounding property and people. You need to be prepared to accept the risk, design and use your system properly and be aware of the consequences of failure. Although there is not so much risk of fire as there is with oxygen, there is an enormous amount of stored energy involved. The parts in this section are generally not suitable for use with oxygen!

LONG AND FLEXIBLE AIR TRANSFILLER/TANK EQUALISER

Lightweight and flexible high pressure air hose with 300bar DIN fittings and ring bleed BOTH(!) ends. Suitable for air up to 300bar, but not for high oxygen mixtures, and a variety of lengths is available, from 1.5m right up to 7.5m.



Comes with push-on dustcaps (or black screw on if you prefer). Combine this with P/N 40-415 to make a second fill whip for your compressor.

Part #	Description	Price
40-416	Budget Transfiller/Tank Equaliser, 0.7m length	\$155
40-419	Flexible Transfiller/Tank Equaliser, 1.5m length	\$211
40-417-3	Flexible Transfiller/Tank Equaliser, 3.6m length	\$237
40-417-4	Flexible Transfiller/Tank Equaliser, 7.5m length	\$330
40-418	Analogue gauge installed one end	\$92

"SUMP SAVER" SCUBA TANK MINI PRESSURE EQUALISER/TRANSFILL WHIP

Part# 10-001-2: \$99



This is the MkII version of the "Sump Saver" - called that because it's small and light enough to carry with you in your sump diving kit and let you equalise tanks in a dry section of cave beyond the help of dry support. This can save your dive or maybe more... Being small and light it's handy for travel as well.

It does the same thing as a transfill whip, allowing you to connect 2 tanks together and equalise the pressure but with absolute minimum size, few failure points, and no tools required.

SILENCER FOR TANK EMPTYING

Part# 12-100: \$67

When you need to empty a tank, you usually need to do it quickly and without blowing your eardrums too. This device will help get the job done, although if you crank the valve fully open, "silencer" is a relative term. There are holes all the way around, so the force is evenly spread and your tank won't fall over. The DIN fitting is chromed brass, and the silencer part is stainless steel - and it's compact enough to put in with your gas mixing gear.



SCUBA TANK PRESSURE CHECKERS

These are surprisingly useful, saving having to dig around for a set of regs when you want to check tank pressures, and with less bits hanging off it. The DIN version has a bleed and red push-on dustcap and is rated to 300bar.

The yoke versions are rated to 232bar, and there are different options depending on your budget and how cool you like your gadgets. The pneumatic let you connect/disconnect in literally a snap - they are available separately for your tank filling hoses.

Part #	Description	Price	Picture
40-409	DIN pressure checker with ring bleed	\$71	
40-409-3	Basic yoke pressure checker with ring bleed	\$78	
40-409-1	Pneumatic "pneumo" quick connect yoke pressure checker with ring bleed	\$159	
40-409-2	Pneumatic "pneumo" quick connect yoke pressure checker with super quick button bleed	\$205	

DIN AND YOKE ADAPTORS

Sometimes you need to fill DIN tanks with your yoke fill whip, put your DIN regs on a yoke tank, or make up a custom connection to a tank. At times like these, having the right adaptors on hand makes an otherwise impossible job easy.

Part #	Description	Price	Picture
40-401	DIN tank to yoke filler adaptor	\$46	
40-410	Yoke tank to DIN regulator adaptor	\$41	
40-415	DIN double adaptor - handy fitting to let you use a standard air transfill whip to fill 2 tanks from a single compressor hose	\$115	

VALVES AND FITTINGS

DIN AND YOKE 1/4" NPT FILL WHIP ENDS

The right end on your compressor hose is important, and can save frequent messing about with adaptors (or maybe help you fill a second tank at the same time). If you're filling a lot of yoke tanks, the pneumatic connectors are amazingly quick and easy to use - well worth the premium price they dictate.

Part #	Description	Price	Picture
40-402	DIN fitting to 1/4" FNPT (with ring bleed)	\$46	
40-403	Yoke to 1/4" FNPT (with ring bleed)	\$57	
40-403-1	Pneumatic Yoke (with ring bleed) to 1/4" FNPT	\$108	
40-403-2	PTF-1 Pneumo Yoke (with pushbutton bleed) to 1/4" FNPT	\$160	

ANODISED ALUMINIUM HIGH PRESSURE AIR VALVES

All are 1/4" NPT and 300bar rated unless otherwise specified. Brass versions are often available by special order, as are other Aqua Environment valves, high pressure regulators, etc. These are NOT suitable for oxygen service unless specifically mentioned.

Part #	Description	Price	Picture
40-301	Back pressure regulator/priority valve/pressure maintaining valve (adjustable) - recommended for your compressor filter to work effectively, and useful for compressor overflow systems.	\$110	
40-302	Flow Fuse – shuts off the flow if it is above a certain level (ie. to shut off if a hose ruptures).	\$48	
40-303	Relief valve 0-400bar adjustable – useful for higher compressor stages or incorporating into filling systems with multiple pressure settings.	\$109	
40-304	Repair Kit for 504 relief valve	\$27	-

40-305	Moisture & CO indicator ("Eyeball") – a disc/element (not included) inside changes colour in the presence of moisture or carbon monoxide allowing you to get a better idea of your air quality than just smelling it, and much earlier warning it is time to change the filter. See our kits for easy DIY install on your compressor of choice.	\$92	
40-306	Humidity Element	\$11	
40-307	CO/Humidity Element	\$22	
40-308	Inline Hand operated bleed valve – useful for adding bleed points on custom hose assemblies or other HP systems.	\$40	
40-309	Open/close valve, air operated – to fulfil just about all of your high pressure automation dreams.	\$216	
40-310	Pressure switch – can be used to get your compressor to shut off at a certain pressure	\$149	
17-001	Pressure transmitter, 0-400bar, 4-20mA output (24V loop powered), 1/4" NPT, suitable for oxygen service (SS316)	\$185	
17-001-1	Pressure transmitter kit, 0-400bar, 0-5-12V supply, 0-5V out, 1/4" NPT, suitable for oxygen service (SS316). Arduino-compatible!	\$235	
40-312	Check valve M to F flow	\$59	
40-313	Check valve F to M flow		
40-315	Separator bleed valve - useful for adding bleed points on custom hose assemblies or other HP systems.	\$30	
40-317	High pressure air regulator - up to 400bar in, up to 400bar out. Use this on a fill panel between high pressure banks and a regular 232bar tanks. There are 2x HP and 2x LP ports (1/4" NPT)	\$458	
40-317-1	Regulator bracket/panel mount kit to suit regulator above.	\$57	

FLEXIBLE BRAIDED HIGH PRESSURE FILL HOSES

Lightweight and flexible high pressure air hose with 1/4" male NPT ends. Suitable for air up to 300bar, but not for high oxygen mixtures, and a variety of lengths is available, from 1.2m right up to 7.5m.



Part #	Description	Price
14-206-1	Flexible HP Compressor Hose, 1.5m length	\$110
14-205-3	Flexible HP Compressor Hose, 3.6m length	\$132
14-205-4	Flexible HP Compressor Hose, 7.5m length	\$225

STAINLESS NPT FITTINGS

A nice selection of 300bar-rated SS316 fittings.



Part #	Description	Price
40-701-1	SS316 1/4" NPT Street Tee	\$40
40-701-2	SS316 1/4" NPT Female Tee	\$35
40-703-1	SS316 1/4" NPT Street Elbow	\$22
40-703-2	SS316 1/4" NPT Female Elbow	\$22
40-703-3	SS316 1/4" NPT Male Elbow	\$22
40-704	SS316 1/4" NPT Hex Nipple	\$9
40-705	SS316 1/4" NPT Hex Coupling	\$11
40-706-1	SS316 1/4" NPT Hex Plug	\$7.50
40-706-2	SS316 1/8" NPT Hex Plug	\$7.50
40-707	SS316 Adaptor: 1/4" FNPT, 1/4" MBSPT	\$13.50
40-708	SS316 Adaptor: 1/4" FBSPT, 1/4" MNPT	\$13.50

M16X 1.5 TO NPT STAINLESS STEEL ADAPTORS

Custom fittings to allow all our other 1/4" NPT fittings to be used with the connection used on Bauer and L&W hoses.

Part #	Description	Price	Picture
14-105	Bauer/L&W M16x1.5 male to 1/4" MNPT	\$26	
14-106-1	Bauer/L&W M16x1.5 nut (female) & nipple to 1/4" MNPT (kit)	\$51	
14-106-2	Bauer/L&W M16x1.5 nut (female) & nipple to 1/4" FNPT (kit)	\$51	

STAINLESS JIC FITTINGS

A common connection for compressor (especially Colitri) hoses is a 1/4" (#4) JIC connection. Fittings to suit these (especially in stainless steel) are hard to find, but very useful if you're adapting away.



14-101 14-101-1 14-101-2 14-103-1 14-103-2 14-104-1 14-104-2

Part #	Description	Price
14-101	SS316 Straight Adaptor: 1/4" MJIC, 1/4" MJIC (union)	\$10.50
14-101-1	SS316 Straight Adaptor: 1/4" MNPT, 1/4" MJIC	\$9 .50
14-101-2	SS316 Straight Adaptor: 1/4" FNPT, 1/4" MJIC	\$16.50
14-102-1	SS316 Straight Adaptor: 1/4" MNPT, 1/4" FJIC	\$42
14-102-2	SS316 Straight Adaptor: 1/4" FNPT, 1/4" FJIC	\$42
14-103-1	SS316 Tee Adaptor: 1/4" MJIC, branch 1/4" MJIC, 1/4" FJIC	\$40
14-103-2	SS316 Tee Adaptor: 1/4" MJIC, branch 1/4" FJIC, 1/4" MJIC	\$40
14-104-1	SS316 plug, 1/4" JIC	\$6.50
14-104-2	SS316 cap, 1/4" JIC	\$8.50

SCUBA VALVE DUSTCAPS AND PLUGS

Keeping dust, water and insects out of your high pressure fittings is always a good idea. We have a wide variety of options for different applications - and highly recommend not using threaded plastic dustcaps for equipment which may become pressurised. I.e. a threaded black plastic dustcap on a compressor fill line or transfiller WILL blow out with a lot of force (it's been done!).



Part #	Description	Price	Picture
40-402-1	Black threaded DIN/bullnose dustcap (not recommended for compressors or transfillers)	\$3.50	
40-402-2	Red push-on DIN/bullnose dustcap (not suitable for immersion)	\$2.50	
40-402-4	Black rubber yoke dustcap	\$2.50	
40-402-3	Black threaded DIN/bullnose plug (not recommended for cylinders)	\$3.50	
40-402-5	Chromed brass solid DIN plug (suitable for cylinders)	\$15	
40-402-6	Chromed brass DIN plug with pressure releasebutton	\$49	

LOW PRESSURE SCUBA TO NPT ADAPTORS

Adaptors that can make your air-powered project run off low pressure air from a SCUBA regulator. NPT one end, a variety of useful connections the other, they are chromed brass just like most SCUBA regs.



Part #	Description	Price
40-820-1	LP adaptor - MNPT to M BCD	\$10.50
40-820-2	LP adaptor - MNPT to F LP Port	\$12.50
40-820-3	LP adaptor - MNPT to M LP Port	\$21.00
40-820-4	LP adaptor - MNPT to M reg hose	\$21.00
40-820-5	LP adaptor - M reg hose to F BCD	\$36.00
40-820-6	LP adaptor - M reg hose to F LP Port	\$15.50
40-820-7	LP adaptor - FNPT to M LP Port	\$17.50

SWAGELOK QC6 FITTINGS FOR REBREATHERS

TFM Engineering can help source these and provide or assemble the adaptors (40-820-2 - 1/4" MNPT to F LP port, and 40-820-4 - 1/4" MNPT to M reg hose) that need to go with them to connect to your reg hoses.



Dive buddy James swimming through Tank Cave on an enjoyable dive in Mount Gambier, South Australia

SCUBA COMPRESSOR SYSTEMS, PARTS & ACCESSORIES

SCUBA COMPRESSOR AFTERMARKET SYSTEMS

Drawing on experience from working the field of industrial gas, pressure equipment and SCUBA compressor accessories are something we take a strong interest in. From repackable filters, to gauge and valve panels, there are plenty of ways to improve your compressor.



"PRESSURE WATCHDOG" MONITORING SYSTEM

In addition to the "Oxygen Watchdog" continuous monitoring system, TFM Engineering Australia can also provide a pressure monitoring system. With a high accuracy pressure transmitter (similar to our digital gauges) coupled with a high-functioning reader and controller, the system displays pressure to within 0.1bar (or 1PSI) and will trigger a remote relay (included) when the user-adjustable high setpoint is reached. Instructions are provided for using this relay to shut off a compressor, and it can also be used to open a bypass valve, drive a buzzer/warning light, or control your booster via a drive gas solenoid.



Part #	Description	Price
17-001	Pressure transmitter, 0-400bar, 4-20mA output (24V loop powered), 1/4" NPT, suitable for oxygen service	\$185
17-001-1	Pressure transmitter kit, 0-400bar, 0-5-12V supply, 0-5V out, 1/4" NPT, suitable for oxygen service	\$235
17-100	Pressure watchdog kit (bare panel), pressure transmitter 1/4" MNPT	\$640
17-100-1	Pressure watchdog kit (box mounted), pressure transmitter 1/4" MNPT	\$710
17-101-1	Upgrade pressure transmitter for inline install on Bauer M16x1.5 hose	\$132
17-101-2	Upgrade pressure transmitter for inline install on Coltri JIC hose	\$107
17-102	Compressor relay mounted in enclosure (ie. for petrol compressor)	\$55
17-103	12V supply adaptor kit (ie. For portable versions)	\$45

This system is highly useful if you are frequently filling tanks with different working pressures from the same outlet - not only is it very easy to adjust, but it has a "low" or standard setpoint, and a "high" setpoint. It's also great for topping off mixes. If the "high" setpoint is reached, the relay cannot be reset until the device has been switched back to "low". This makes it that much harder to accidentally overfill your low pressure cylinders.

The basic kit includes the pressure transmitter (1/4" MNPT connection, suitable for oxygen service), watchdog kit in a bare panel (for addition to your current fill panel), remote relay and wiring.

The relay installs in your compressor and the control wires are low voltage DC only. Options are provided for adaptors to ease the high pressure site of the install, and for use on portable compressors.

COMPRESSOR CONDENSATE TRAP KIT

Part# 15-001: \$140

Condensate trap kits suitable for small (and large) compressors are now finished and available. Rather than spraying all over the ground/floor/bench/ute-bed/nearby dive gear, the condensate is collected in the bottom of the trap and there is a visual level indicator which also doubles as drain hose. A lot of testing and tweaking went into them to reduce escaping moisture to pretty much zero.

They are 350mm overall length and nominally 100mm in diameter, designed to be strapped or otherwise attached to your Bauer Junior or similar. All the tubes (clear, so you can see what's going on) and push-in fittings are included to attach to the dump valves on your compressor, so it's a snap to install.



INDICATOR "EYEBALL" KITS

Most methods of knowing when to change your compressor filter are based on number of hours. Unfortunately the number of hours you can get from a filter depends quite a bit on ambient temperature, fill pressure and other factors - so the hour-counting method is usually quite conservative, and occasionally fails (like if you lost count!). An "eyeball" contains a small piece of paper that changes colour when it detects a rise in humidity that indicates your filter is just about expended - this means you can rely on getting maximum capacity but also have a warning in case something is wrong. There are indicator elements for CO/humidity as well (they do both), if you are concerned about engine fumes getting into your compressor suction line.



The TFM eyeball kits are designed to allow easy DIY install of eyeballs next to your fill gauge for easy monitoring of filter state. There is also a panel mount version complete with bracketing and 1/4" compression fittings.

Part #	Description	Price	Picture
40-305	"Naked" eyeball, 1/4" FNPT threads, no element	\$92	
40-306	Humidity element	\$11	-
40-307	Humidity/CO element	\$22	-
15-011	Eyeball (electric) install kit for Bauer Capitano	\$255	-
15-012	Eyeball (electric) install kit for Bauer Junior II/L&W LW100/Poseidon PE100	\$215	
15-013	Eyeball (electric) install kit for Coltri MCH6	\$185	
15-014	Eyeball (electric) install kit (panel mount) - ends in 1/4" compression fittings	\$185	
15-015	Upgrade electric eyeball kit to petrol	\$11	-

CUSTOM FILL WHIP ASSEMBLIES



Any configuration of components listed in this catalogue (and some which are not) can be assembled to order as required, for example:

- Fill hose assemblies
- Fill hose extensions (with quick connects)
- Filling manifolds
- Filling adaptors

Please contact us to discuss your requirements.



300BAR DIN PERSONAL/BACKUP FILTER

Part# 10-030: \$237 (basic TFM-spec filter)

Part# 10-032: \$485 (TFM-spec filter with check valve kit)

Part# 10-032-1: \$247 (check valve kit to retrofit on your existing filter)



Expecting to get reliable oxygen clean air out of a single compressor filter is a risky business - there is often (ie. in the P21 filters common on Bauer Junior compressors) only an O ring or two separating oily condensate from the clean end of the filter, and getting a drop on the tip of the filter could easily happen during installation. Plus any malfunction of the filter cartridge or just simple overrunning will result in unclean air getting through, which could really spoil your day if you're topping off a tank of pure oxygen (or you just put in a nice new squeaky clean system).

The answer is a second filter - and this personal filter is a much cheaper way of doing it than setting up a whole new filter tower. You could also use it if the air you get is not always to your liking, or to make sure your remote dive holiday isn't spoiled by bad air.

This filter is supplied oxygen cleaned, all the O rings are Viton and it is pre-packed and ready to go with the right combination of molecular sieve and carbon - also dust cap and plug. Most other filters available are NOT guaranteed oxygen clean and are only packed with carbon. This is likely to make the filtration much less effective and oil vapour and odours could still get through - pretty easy to see if it doesn't duplicate the media in your main filter it's not an effective backup.

The optional check valve kit is some good insurance against opening the cylinder valve first and sending oxygen shooting backwards through the filter and into your compressor hoses. It includes a bleed so you can get it off again!

Felt pads and full repack kits (including media and 1 felt pad) are also available:

Felt Pads 5-pack - Part# 10-030-1: \$12.50

Electric repack kit - Part#10-030-2: \$14

Petrol repack kit - Part#10-030-3: \$18



FILL PANELS, FILL PANEL KITS AND CUSTOM FILLING SETUPS

Yes, we can help with this! Contact TFM Engineering to discuss your requirements. Whether it's a full-blown lasercut and engraved commercial panel, or a parts kit for something basic for DIY assembly, we have all the components and expertise to make this happen.



SCUBA COMPRESSOR FILTRATION SYSTEMS

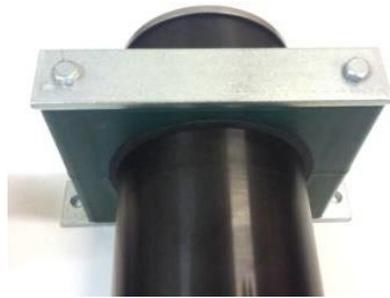


HIGH CAPACITY/COMMERCIAL FILTER TOWERS

High capacity commercial filtration systems can be yours! These have 1/4" NPT fittings and will filter a LOT of gas (cartridge sold separately). Don't forget you'll need a back pressure regulator (pressure maintaining valve) and probably various other fittings., which we can help with if required.



Part #	Description	Price
13-100	Tall Filter Tower (approx. 750,000L of filtration) - 840mm long x 95mm diameter	\$1,390
13-101	Short Filter Tower (approx. 350,000L of filtration - 405mm long x 95mm diameter	\$1,185
13-100-1	Short Separator Tower	\$1,185
13-100-2	Combination Tall Separator/Filter Tower (approx 600,000L of filtration) - 840mm long x 95mm diameter	\$1,495
13-108	Clamp/mounting kit for tower (2 clamps & rubber) - zinc plated	\$79



HIGH CAPACITY FILTER TOWER KITS AND SYSTEMS

Using the building blocks which are (mostly) listed in the catalogue, we can work with you to engineer any custom filtration system that's required for any application. Whether it's backups for oxygen compatible air, upgrades to your existing puny filtration or a replacement system for an older compressor block, it can be done.

A standardised small compressor upgrade kit is in the works - **ask us about upgrading your small electric compressor filter.**



HIGH CAPACITY/COMMERCIAL FILTER CARTRIDGES



These high quality vacuum-sealed disposable filter cartridges from Lawrence Factor are some excellent bang for your filtration buck, but there are also repackable options which will pay for themselves in the long run.

Part #	Description	Price
13-102	SS repackable filter (tall)	\$360
13-103-1	SS repackable filter (combination)	\$385
13-103	SS repackable filter (short)	\$385
13-106	Disposable filter (tall) - mol sieve, carbon & hopcalite	\$149
13-109	Disposable filter (combo) - mol sieve, carbon & hopcalite	\$165
13-107	Disposable filter (short) - mol sieve, carbon & hopcalite	\$97

REPACKABLE FILTERS AND MEDIA

REPACKABLE SCUBA COMPRESSOR FILTERS

Using repackable filters can lower your running cost significantly. The P21 (also known as P0 in the USA) is most commonly used - in most small 3-6cfm compressors such as the PE100, Junior, etc. MCH6 filters are also relatively common on small compressors ie. by Coltri. P31/41/61 is used in older larger Bauer compressors. You'll want to double check this before buying! Other types are less common, but we can make to order for you.



P21/P0 (Bauer/Poseidon)



P31 (Bauer)

With fully welded stainless steel construction, supplied packed and ready to go (electric motor type), this repackable cartridge is designed to last as long your compressor. There are many people around the world repacking their own filters and it's not rocket science – it just requires some care and acceptance of a slightly increased risk that the air will be substandard if you get it wrong.



MCH6 (Coltri)

A comprehensive user manual including repacking instructions is supplied with each filter. Repacking kits are available if you don't want to get bulk repacking media or mess about with measuring, as are spare felt pads.

Bauer P21 Repackable Filter - Part# 10-012: \$205 (pre-packed for electric)/\$210 (pre-packed for petrol)

Bauer P31 Repackable Filter - Part#10-013: \$305

Coltri MCH6 Repackable Filter – Part# 10-014: \$195

Bauer 04852 Repackable Filter - Part#10-015: \$185

Others on request



04852 (older Bauer compressors)



Securus (Bauer)



HOOKAH STAINLESS STEEL LOW PRESSURE AIR DRYER/PURIFIER - DESSICANT HOLDER

Part# 10-020: \$258



Stainless steel media holder - fill it with dessicant to dry your low pressure air beyond what a mechanical separator/dryer can do. Useful if you need very dry air for fine paintwork, on a hookah unit or in other applications.

The internal volume is about 450mL, and one end easily comes off. Fittings are standard 1/4" BSPT. Comes with felt pads and stainless steel discs inside to retain media (and prevent dust), and various media to absorb water vapor, oil/hydrocarbon vapor, and carbon monoxide can be supplied as extra. Professionally welded, pressure-tested, and pressure-rated to 10bar/150PSI.

REPACKABLE FILTERS – FELT PADS AND REPACK KITS

Felt pads are an essential item and at least one needs replacing with each repack. Felt pads are available in packs of 5, and repack kits are also available to avoid having to buy and measure out bulk media.

P21 Felt Pads 5-pack - Part# 10-012-1: \$12.50

P21 Electric repack kit – Part#10-012-2: \$15.50

P21 Petrol repack kit – Part#10-012-3: \$21

MCH6 Felt Pads 5-pack - Part# 10-014-1:

\$12.50

MCH6 Electric repack kit – Part#10-014-2: \$14

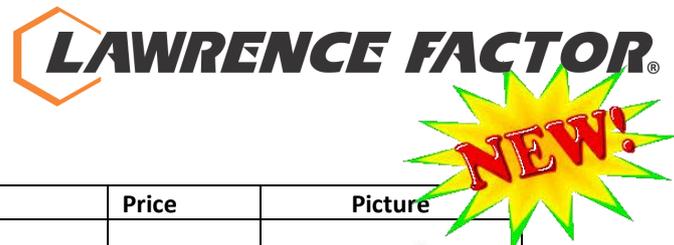
MCH6 Petrol repack kit – Part#10-014-3: \$18

Other parts & kits on request (Ask us about pricing)



BULK FILTER MEDIA

If you want to economise more on your repackable filters then bulk media is also available. Media is sourced in sealed containers directly from Lawrence Factor in the USA (the world leader in high pressure filtration) to ensure the highest quality and freshness.



Part #	Description	Price	Picture
10-101	Molecular sieve (1L)	\$65	
10-102	Molecular sieve (4L)	\$135	
10-103	Activated carbon (1L)	\$60	
10-104	Activated carbon (4L)	\$125	
10-105	Hopcalite (500mL)	\$145	

SCUBA COMPRESSOR PARTS

SCUBA COMPRESSOR AIR INTAKE FILTERS

An often-neglected part of a DIY annual compressor service is replacing the air intake filter - these can get a bit "interesting" after a while if not changed.



Part #	Description	Price	Picture
16-001	N70 intake filter to suit Bauer Purus/Capitano/Mariner	\$28	
16-002	N4823 intake filter to suit Bauer Junior II	\$28	
16-003	MCH6 intake filter	\$28	

LAWRENCE FACTOR PRODUCTS

TFM Engineering Australia is a Lawrence Factor dealer and can help you get access to the whole range of useful gas purification cartridges and compressor-related products – many being difficult and/or very expensive to source in Australia.

See all the products available at:

www.lawrence-factor.com/Library/LFcatalog.pdf



AFTERMARKET COMPRESSOR PARTS



Lawrence Factor also manufactures an excellent range of high quality parts to suit Bauer compressors in particular, and they are very well priced. If you're inclined to work on your own compressor, make a list of the part numbers you need and TFM Engineering can help you get the parts you need. Heads, gaskets, pre-formed tube, valves, piston rings and all the finicky stuff!



CONTINUOUS MIXING SYSTEMS (NITROX & TRIMIX)

WARNING: messing with high pressure oxygen AND ATTEMPTING CONTINUOUS MIXING can result in injury, death and/or generally vast amounts of damage to property and people. You need to be prepared to accept the risk, design and use your system properly and be aware of the consequences of failure. The "Oxygen Hacker's Companion" (see separate listing) is an excellent resource to help avoid blowing yourself up.

(That said – there are plenty of people out there messing about and surprisingly few incidents that occur)

BASIC MODULAR CONTINUOUS MIXER

This simple and modular continuous mixing system can provide a relatively cheap and easy way to get nitrox (or trimix) through your compressor and into your tanks. It's highly modular so if you wish you can DIY whatever parts you prefer yourself. Be aware that you will need to apply some basic maths/look up tables for the budget analysers that go with these - and this will be more complicated for trimix.



Complete nitrox kit

Remember you will need to independently analyse your tank after mixing.

Part #	Description	Price
11-002-1	Continuous Mixer - Nitrox kit (complete with reg/DIN/bullnose/pin index, budget analyser & cells)	\$1,230
11-002-2	Continuous Mixer - Trimix kit (complete with reg/DIN/bullnose/pin index, budget analyser & cells)	\$2,215
11-002-3	Continuous Mixer - Nitrox kit (no gas supply, analyser or cells)	\$395
11-002-4	Continuous Mixer - Trimix kit (no gas supply, analyser or cells)	\$715



Dual mixing chambers for trimix

Individual parts and systems are available further on in the catalogue.

"OXYGEN WATCHDOG" MONITORING SYSTEM



Following the success of our basic continuous mixing system, TFM Engineering Australia is glad to be able offer the addition of an "Oxygen Watchdog". The Watchdog reads and displays in % units the oxygen concentration in the mixer, and is able to do basic tasks - shutting off the oxygen supply and cutting out the compressor with the relay supplied, providing a valuable additional layer of security if the operator is not paying attention. The Watchdog does not control the oxygen flow - this must be done manually, but it can be set once and left as-is for the duration of filling. The watchdog kits are intended to be supplied with a TFM continuous mixing system, so do not include oxygen tubing or sensors.

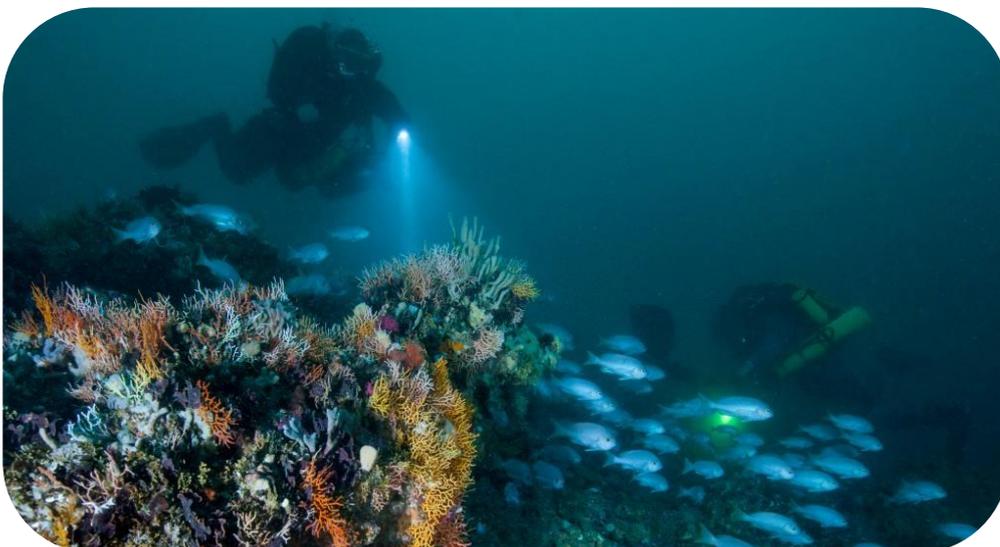


Part #	Description	Price
11-100-2	Oxygen watchdog kit (box mounted)	\$765
11-100-4	Solenoid upgrade for 10+cfm compressor	\$145

FULLY AUTOMATIC GAS MIXING

Much time is spent by dive shops and individuals in mixing custom SCUBA gases for recreational and technical SCUBA diving. A fully automated system with plenty of bells and whistles has been an ongoing R&D project of TFM Engineering, resulting in a successful prototype continuous nitrox and trimix mixer to date, and preliminary designs for a partial pressure version underway.

The prototype "Extravaganza" Continuous mixer – complete with capacitive colour touchscreen (and legacy QnD analyser).



In early 2016, we were the first ever visitors to the drowned "apostles" in 60m water depth near the iconic 12 Apostles of the Victorian coastline.

*Photo by Liz Rogers - <http://lizrogersphotography.com>
Reproduced with permission*



MEDICAL OXYGEN REGULATOR – EMERGENCY/MIXER SUPPLY REG



The contents gauge is in PSI as that's how it comes at present, but can be optionally upgraded to a dual kPa (bar x 100)/PSI if needed. The flowmeter reads correctly at an outlet pressure of 50PSI (factory set), and reads up to 15LPM, but will control oxygen flows up to 100LPM. This means if you're mixing nitrox 32% (adding 11% oxygen) 15LPM corresponds to a 3.9cfm compressor, and 30LPM to 7.8cfm. Even 77LPM for a 20cfm dive shop compressor.

The reg will also work for helium if you're doing continuous trimix. It will put out up to about 400LPM of helium, which is plenty for most applications, even with big compressors.

Bullnose adaptors are available separately, see earlier on in the catalogue. CHEAPER: if you really don't want the quick connect, feel free get in touch for a cheaper price.

Continuous Mixer Supply Reg: If you're making a continuous nitrox mixing system, one of the most critical bits is the pure oxygen system. This kit is everything you need to safely get oxygen out of a rental tank or deco bottle, drop the pressure, and (manually) control how much oxygen gets injected into your mixing chamber. A quality chromed brass medical oxygen regulator (with contents gauge and inbuilt relief valve), flow meter and control, with quick connects to allow you to use whatever supply tank is at hand. Don't lie awake at night wondering if your hand-me-down dirty argon reg has an oxygen compatible diaphragm!

Emergency Oxygen Kit: Also included is a mask with non-rebreather bag (rated for single use only) and hose, which allows you to use the kit as an emergency oxygen kit – that's what the reg was designed for after all!

Part #	Description	Price
11-001	Medical oxygen regulator with HP QC fitting, DIN & pin index QC adaptors (as shown)	\$615
11-001-1	As above, but DIN only (still with QC connector for future expansion)	\$555
11-001-2	As above, but pin index only (still with QC connector for future expansion)	\$555
11-001-3	As above, with female QC only (no tank adaptors)	\$495
11-001-6	As above, with fixed single type inlet (choose DIN, standard pin index, standard bullnose)	\$493
11-001-5	Upgrade contents gauge to dual kPa (bar x 100)/PSI	\$50

BUDGET SCUBA OXYGEN/NITROX ANALYSER

Part# 20-005: \$30

There's no denying it - this is a quick and dirty oxygen analyser without any bells and whistles. (It's not actually dirty, all components are new with connections soldered, crimped and covered with heatshrink)

Note that the oxygen sensor is NOT included. There is NO calibration knob - tables and a simple formula come with it to convert the reading into percent oxygen. There is NO restrictor or tank connection.

But it works fine and is just as accurate as any other analyser if used correctly. Ideal for a backup analyser or if you want something cheap to get started (you can use the same sensor with a more fancy analyser later). Very useful if you have rebreather friends that will give you partially-used cells!

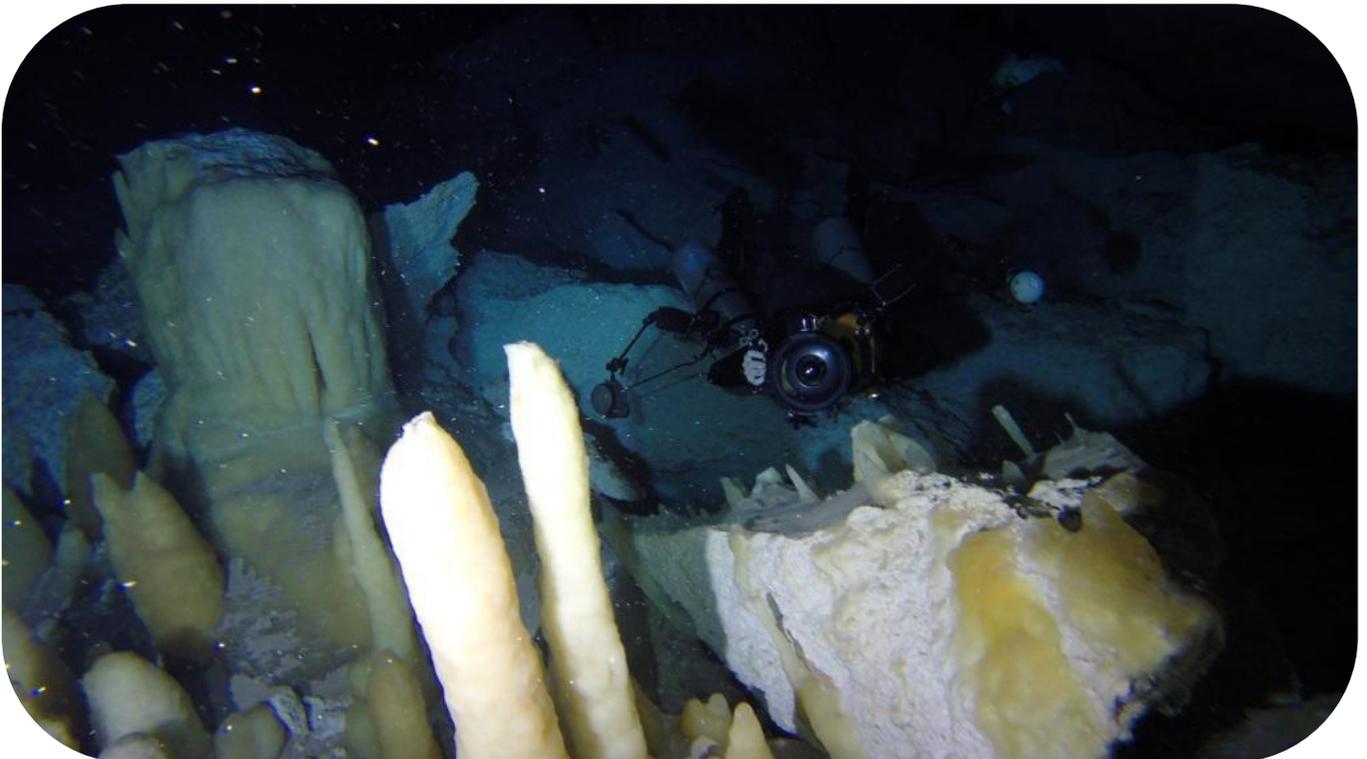


MIXER PARTS

Making your own continuous mixer is easy enough if you don't want a full TFM Engineering system, but the finicky bits are the sensor holder, gas injection point and a mixing chamber that you can rely on. These parts will help if you're making your own or altering an existing system.

Warning: improper placement of oxygen sensors may result in an acceptably high level of oxygen going into your compressor. Don't use them unless you are prepared to properly design, build and test your system, and take responsibility for any and all catastrophes that result!

Part #	Description	Price	Picture
11-003	Mixing chamber, 25BSPT threaded - will work for compressors up to 10cfm. It's neat and compact, and very effective at mixing the gas stream.	\$185	
40-201	Oxygen sensor - All type (Molex connection), suitable for analysers but not rebreathers. Budget sensor that will get the job done. (all oxygen cells are consumable and will last 1-2 years if looked after)	\$130	
11-004	Oxygen sensor holder, 25BSPT threaded (sensor NOT included) - drilled and tapped to suit sensor thread. Recommended install at a right angle bend in the flow path to promote turbulence and washing of gas over the sensor.	\$29	
11-005	Gas injection port, 25BSPT threaded - oxygen clean brass 6mm push-in fitting with diffuser. Recommended install on one end of tee so gas flows straight into the mixer.	\$49	



Liz taking photos of formations in the M Bisi end of Oehani Cave - 2016 Timor Expedition.

SCOOTER (DPV) BATTERIES & ACCESSORIES



TFM Engineering has developed a modular lithium ion battery system to be used for upgrade of DPVs.

The battery system has been designed from the ground up, specifically for the technical diver, and provides a 3 to 5 times increase in capacity/range over NiMH and lead acid technologies. While we were there, we couldn't help making a few other products to improve scooters around the world.

200MM 24V PACK (HALCYON T16, GAVIN, SILENT SUBMERSION) 54AH/1400WH

Designed as a drop-in replacement for the Halcyon T16, this battery will also suit most Gavins, Silent Submersion, and other larger body scooters with 24V motors (with minor modifications). With the same weight (7.4kg) and weight distribution as the stock T16 battery, the changes to scooter trim and buoyancy are minimal.

Key features and specifications include:

- A huge 54Ah/1400Wh of capacity (a P3 Piranha has only 1150Wh) - with approx. 12km practical range
- Assembled batteries are balanced and fully burn-tested
- 112x high-capacity Panasonic 18650 cells (the same as used in laptop batteries and the Tesla electric cars), giving:
 - o 7 cells in series, 16 cells in parallel
 - o Access to cheaper, widely available and mass-produced cells
 - o Less capacity reduction if there are problems with one cell, compared with using larger cells
 - o Smaller and more manageable energy release if a cell fails catastrophically
- Individual/cell-level:
 - o Protection circuitry
 - o Isolation (switching)
 - o Fusing
- Yes, there are 112 switches, 112 protection circuits, and 112 fuses! As well as increasing safety, this allows for cell-level diagnostics without disassembly (even for cells which are in parallel with each other)
- There is also an overall battery management system with balancing circuitry
- Cells are evenly spread to fill the space available and separated from each other by air gaps, which help maintain even temperatures and prevent chain reactions in the event of catastrophic cell failure.
- Cells are user-replaceable using only basic tools
- Battery is modular and configurable, allowing for cost saving where a full cell count is not required
- A wattmeter is built in, or can be supplied as inline pluggable
- A dedicated charger is included with each battery/kit as standard



Completed standard 2-layer battery

INTERNATIONAL SHIPPING? NO PROBLEM!

While international shipping of assembled lithium ion battery packs is difficult and expensive, the pack is simple enough to assemble yourself. Rather than shipping cells to Australia and then an assembled pack to you, the cells can be shipped to you direct from the factory, and everything else will be sent by TFM. You can also source your own cells if you wish.

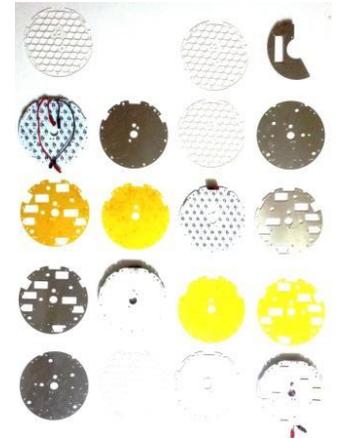
200MM 24V PACK (HALCYON T16) PRICING

As well as the standard high-capacity battery, there is a single layer option for those requiring less epic burntimes, as well as kits for those on a budget and with a modest amount of hands-on capability to assemble themselves. The layers are modular, so a pack with 3 or more layers would be ridiculously epic, but easy to make. Another advantage to this is that cells can be sent directly from the factory to you anywhere in the world, saving an expensive lithium ion shipping exercise. You can also source your own cells if preferred.

If you're targeting a specific capacity it's just a matter of leaving out cells, which you can specify when ordering.

Part#	Description	Price
32-101-2	200mm/24V battery & charger, 54AH (ie. Halycon T16*)	\$2,650
32-101-1	200mm/24V battery & charger, 27AH single layer (ie. Halycon T16*)	\$1,550
32-102-2	Kit - 200mm/24V battery, 54AH (ie. Halycon T16*) PARTS & CHARGER KIT ONLY, NO CELLS	\$1,278
32-102-1	Kit - 200mm/24V battery, 27AH single layer (ie. Halycon T16*) PARTS & CHARGER KIT ONLY, NO CELLS	\$859
32-103	18650 Protected Li Ion Cell, 3400mAh Panasonic (bulk price, 25+)	\$10.50

*Minor extra costs may be required to set up your battery for mounting in scooters other than the T16.



The main parts in the 2-layer kit



170MM 24V PACK (DIVE-X SIERRA)

A 1200Wh Sierra-compatible pack is not far away - contact us if you're interested!

170MM 41V PACK (DIVE-X CUDA)

A 1200Wh dedicated Cuda lithium pack is not far away - contact us if you're interested!

DPV ACCESSORIES AND OPTIONAL EXTRAS

BURNTTESTING AND BATTERY ACCESSORIES

TFM Engineering is committed to providing a full range of everything you need to assemble, look after or monitor your battery. Some useful extras are listed below - many of these are easy to put together yourself, so feel free to do so and save a bit. **The wattmeters can be used while you're running underwater, while charging or while burnttesting, so are very useful!** Where there are connectors included, you can have your choice of Anderson connectors, and probably others at no extra charge. If there's something not listed, chances are good it can be made for you or may already exist!



24V Burnttester

Part#	Description	Price
32-001-1	Barebones budget Wattmeter - bare wire ends, install yourself!	\$21
32-001-2	Inline Wattmeter inc. backup battery (for data) & connectors	\$114
32-001-3	Deluxe inline Wattmeter with datalogging	Ask us
Classified	Top Secret in-water readable wattmeter, retrofittable to any scooter	Who cares!!
32-002-1	24V burnttester	\$145
32-002-2	41V burnttester	\$165
32-002-3	Deluxe variable burnttester (24V or 41V, variable resistance)	Ask us
32-003	Battery transport/charging steel case with smoke alarm	\$124



BATTERY CHARGERS/PROTECTION CIRCUITS/CONNECTORS/ADAPTORS AND O RINGS

A TFM battery fitment usually comes with a complimentary set of body O rings, so there are a variety in stock. Likewise if you need any Anderson or other battery connectors/adaptors or protection circuits (BMS), feel free to ask, and we will probably have something to help you out.

DPV CAMERA/LIGHT MOUNTS

We have been experimenting with super lightweight 3D printed mounts for GoPros, lights and larger cameras, and the results are great. If you're interested get in touch, otherwise they will eventually hit production.



UNDERWATER ELECTRONICS SERVICING & REPAIR

PRESSURE POT TESTING TO 200M



If you have something that's meant to go underwater and you're not sure if it will flood at the depth you're doing to go, or you've just put a deep spring kit on your camera housing and hope you did it right, why not test it before doing the big dive. The TFM pressure pot is filled with fresh water to avoid damage from leaks, and has dimensions:

- 260mm Inside Diameter
- 800mm long
- 200m depth rating

This will fit caving helmets, canister lights, and probably even scooters with the shroud/prop removed.

UNDERWATER PHOTOGRAPHY STROBE REPAIR

A typical charge of \$150 includes replacement of both flash-tubes, bucket o' water leak testing and a trip to 50m in the pressure pot on reassembly. Other repairs can also be made depending on circuitry, etc.



GENERAL UNDERWATER ELECTRONICS REPAIR

TFM Engineering has successfully revived various flooded lights and other underwater electronics. If you flooded with fresh water and dried it out fairly quickly, chances are good it can be revived. Most important is to remove batteries and disassembling/drying as much and as soon as possible after the flooding. If you send or bring it in, we will assess it for free!

We have the expertise and experience to create small, simple and programmable electronic and electrical systems. Often these are standalone, powered by lithium ion batteries and can be supplied in an underwater housing or micro pelican case.



LITHIUM ION (18650) BATTERIES & ACCESSORIES

The 18650 is the most commonly used lithium battery by far, and it's used in both TFM scooter batteries and the TFM helmet mounted ElLight. It's also used in many backup lights, but the batteries you get with those tend to be low quality and low capacity (2600mAh), with cheap chargers that don't tell you much. TFM can provide you with the best battery technology currently available.

Part #	Description	Price	Picture
31-001	Panasonic 18650 Protected Li Ion Cell, high capacity 3400mAh (70mm long, 20mm diameter)	\$12.50	
31-002	2-cell 18650 holder (clear, pink, blue, yellow, green)	\$2	
31-003	4-cell 18650 holder (clear, pink, blue, yellow, green)	\$3	
31-005	TFM-recommended smart charger (4 independent slots, capacity testing, various other useful options). Comes with adaptors to run off 240VAC, car cigarette lighter, or 12V battery	\$76	



Sometimes getting to the water is really hard! Accessing the water of the very brief Sump 3 of Umbu's Shaft (Dead Cat Extension). This is on the other side of the aptly-named "Stairway to Hell" - a steep and crumbly rockpile which is particularly oppressive in the 28degC/100% humid cave conditions.

SCUBA TOOLS

TFM Engineering produces and sources a range of stainless steel tools for SCUBA equipment maintenance and servicing.

REGULATOR 2ND STAGE ADJUSTMENT TOOL

Part# 40-408: \$123

Adjusting the cracking pressure on most 2nd stage regulators has to be done while pressurized. This handy tool installs inline between hose and 2nd stage and allows you fine adjustment to the optimum point. It has an intermediate pressure gauge as well so you can set the first stage intermediate pressure, and can be set up for slot (most regs, including Apeks) or hex drive.



INTERMEDIATE PRESSURE GAUGE

Part# 40-808: \$15 (budget analog version)

Part# 40-808-1: \$45 (digital version)

Knowing your intermediate pressure is a simple thing which can quickly help diagnose regulator problems, or just give you reassurance that the setting is still correct. TFM Engineering offers a budget no-frills version and a digital gauge version - both of which have standard BCD connector nipples.



KINKY BCD BALLOON INFLATOR

Part# 40-811: \$23

If you have compressed air (or better yet, compressed helium) it seems silly to get lightheaded blowing up a whole lot of balloons. This fitting will attach to your BCD hose and has a kink valve to make inflating balloons a whole lot easier.



STAINLESS STEEL PICK

Part# 40-806-1: \$24

This tool is extremely handy for general scraping, removal of old teflon tape etc - much tougher than a brass one, but you need to be very careful not to scratch sealing surfaces if using to pick O rings on brass or plastic surfaces. Not recommended for nose picking.



SCUBA TANK AIR DUSTER

Part# 10-002 (BCD hose connection): \$55

Part# 10-003 (Reg hose connection): \$59

Part# 10-004 (LP port connection): \$59

Being able to squirt clean dry SCUBA air on things is extremely handy. It will dry things in seconds (rebreather electronics anyone?), save on sweeping/dusting or provide hours of fun with your pets. Having a decent gun on a decent recoil hose around the place makes it MUCH more user friendly than a little one stuck on your short BCD hose.



Note that you don't get all 3 adaptors with a hose, and that if you use the BCD type there will be a bit less flow because of the restriction caused by the Schrader valve in it.

SCUBA VALVE TESTING ADAPTOR (BENCH MOUNT)

Part# 40-804: \$139



This adaptor is going to be very handy if you're servicing a lot of valves - it will allow you to quickly and easily simulate a full tank to check for leaks or issues. Much better than installing in a tank and having to pressurise the whole tank to check, and then depressurise to fix!

It's anodised aluminium, with the top being standard 3/4"-14 NPSM thread, and the bottom being 1/4" NPT with 2 mounting holes to fix to a benchtop or panel.



CYLINDER/VALVE THREAD BRUSHES

Cleaning tanks and valves properly can be a pain, but these custom brushes with stainless steel bristles will make it quick and easy.

Part #	Description	Price	Picture
40-801	Cylinder thread brush	\$24	
40-802	Valve thread brush	\$24	

SCUBA TANK VALVE TOOL

Part# 79-013: \$9

Stainless steel tool for undoing the split nut to get the knob off most common scuba tank valves. Put it on your keychain or in your diving tool kit and use for replacing or changing the knob.



DIVE COMPUTER BATTERY DOOR TOOL

Part# 79-018: \$11

Tool to get the door off many dive computers that have user replaceable batteries. 29.3mm between the centres of the pins - this suits Oceanic Veo and others. Stainless steel so won't rust in your spares box.



SKINNY 11/16 SPANNER TO SUIT APEKS 2ND STAGE REGULATOR

Part# 79-019: \$21

Sometimes you get reg hoses that go right up against the reg nut and they are too skinny to get opposing spanners on. At times like this you can either swear and think of some kind of hack fix, or do that lots of times and then get a tool like this. It's stainless steel so won't rust in your box of diving spares.



SKINNY 34MM SPANNER FOR APEKS XTX (AND OTHERS) 1ST STAGE REGULATOR

Part# 79-016: \$24

For the Apeks XTX and other first stages where they have the flats for a spanner but it's too skinny to get a regular spanner or shifter in there. 34mm across the flats. Stainless steel so won't rust in your spares box.



SCUBA REGULATOR YOKE SPANNER TOOL

Part# 79-037: \$41

Handy tool to get a variety of yoke nuts undone. They are skinnier than normal spanners so you can actually get them in between the sides of the yoke. The 4 spanner sizes included are 19mm, 21mm, 25mm and 1 inch. They swivel out to be used and back in for compact storage. Stainless steel so won't rust in your spares box.



SCUBA REGULATOR PIN SPANNER/"C" SPANNER

Part# 79-038: \$39

This is designed to suit Apeks DS4 first stages, having a 4mm pin and 42mm nominal diameter. It has also been tested on ScubaPro Mk25 first stages. It's stainless steel so it will last just about forever.



BCD INFLATOR TOOL

Part# 40-805: \$15.50

Small stainless steel tool with all the special tools required to service most standard BCD inflators. Also has a valve nut tool, just because it can.



DIVING MULTI-TOOL

Part# 40-807: \$18.50

A favorite with sump divers, this small multitool has most of the tools you will need. It has flathead/phillips screwdrivers, schraeder valve tool, tank nut, O-ring pick and allan keys (1/4", 3/16", 5/32"), and stone the crows it's a bottle opener as well.



BCD TYRE INFLATOR

Part# 40-810: \$12

Options are all important when you can't just connect pressure equipment together with duct tape. If you have SCUBA tank with air in it and a tyre with no air in it, this fitting will give you a new and exiting option. (be careful and use a tyre gauge to check the pressure frequently while filling!)



SCHRAEDER VALVE TOOL

Part# 40-809: \$13.50

Dedicated tool for getting the schraeder valve out of the end of a BCD hose.

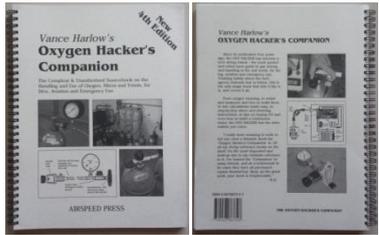
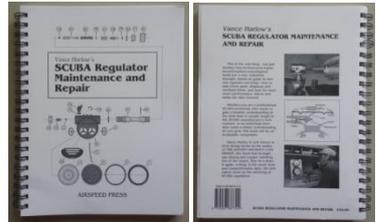
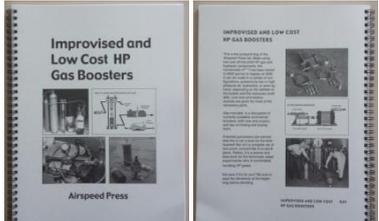


SCUBA DIVING BOOKS AND CALENDARS

AIRSPEED PRESS DIY DIVE GEAR BOOKS

The quintessential series of books for anyone who tinkers, and the Oxygen Hackers Companion is highly recommended for anyone thinking of mixing their own gas. They are all full of practical, useful knowledge and designs to help you make your own canister light, fix your own suit or understand regulator servicing.

Disclaimer: Going DIY on your dive gear has all sorts of dire consequences - an oxygen fire could consume your house, your partner's reg could stop working at depth, or your drysuit flood at the start of a 4-hour winter deco. Don't do it unless you are prepared to accept the risk of failure and the consequences if things go wrong!

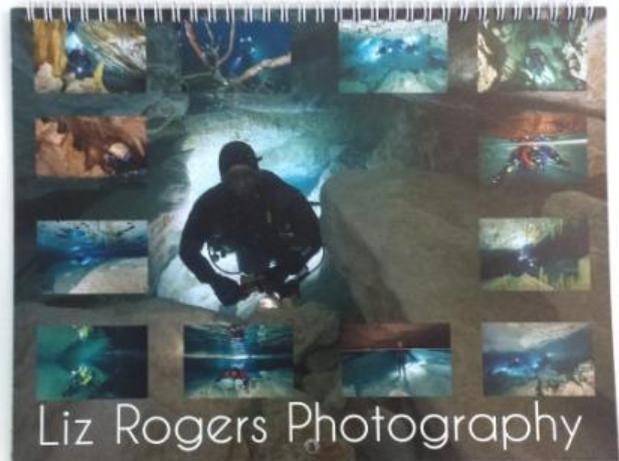
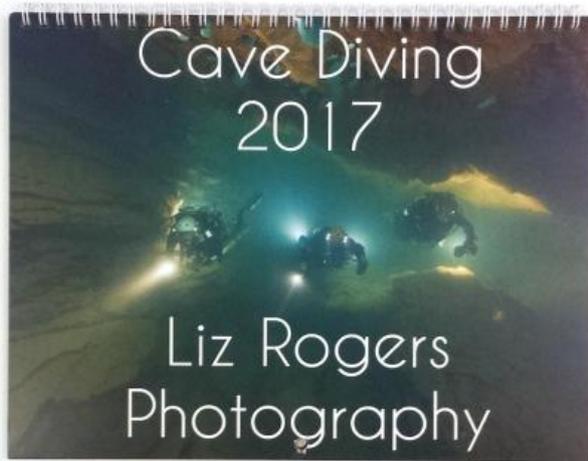
Part #	Description	Price	Picture
40-101	<p>"Oxygen Hackers Companion 4ed" by Vance Harlow</p> <p>This is THE book for anyone involved in or thinking about home gas mixing or doing just about anything with oxygen. There is also a good chapter on trimix/helium. Heaps of useful explanations, ideas, resources and insight that will save you time, money and wondering if you're going to blow yourself up.</p>	\$61	
40-102	<p>"SCUBA Regulator Maintenance and Repair" by Vance Harlow</p> <p>The book covers the servicing of just about all makes of SCUBA regulators, and is intended for both the professional technician who wants to learn more about the subject than what is taught in quick brand-specific tech courses, and for the individual diver who wants to better understand the workings of theirs gear.</p>	\$82	
40-103	<p>"The Divelight Companion" by Steve Lindblom</p> <p>This book is a comprehensive guide to canister dive lights, from a DIY perspective, and also touches on smaller lights as well as underwater housings in general. Even if you already own a canister dive light, or are planning to buy a commercial version, this book will help a lot as the information on building them is just as applicable to maintaining and repairing them. The book is a few years old so doesn't go into heaps of detail on Lilon batteries or LEDs, but they still get a mention.</p>	\$51	
40-104	<p>"Wetsuit and Drysuit Repair" by Steve Lindblom</p> <p>A very comprehensive book that covers all manner of drysuit repairs - including replacing seals, boots and zippers, patching/alterations and valve servicing. Also an overview of commercial P-valves and drygloves, and details on how to make low-cost DIY versions.</p>	\$64	
40-105	<p>"Improved Gas Boosters" by... (nobody wanted to take responsibility!)</p> <p>This is kind of the sequel to the THE OXYGEN HACKER'S COMPANION (see other listing), and is a lot more advanced and dangerous, as you can probably tell from the title. This book is great to have because it is the only book on dive gas boosters out there.</p>	\$39	

2017 CAVE DIVING CALENDAR – LIZ ROGERS

Part# 40-120: \$35 (includes shipping)

Liz Rogers is a well known underwater photographer who specializes in cave diving and cave photography, and is active in cave exploration and general exciting diving of all kinds, in Australia and overseas. Every year she produces a cave diving calendar which makes an excellent addition to your office or workshop wall.

You can see more of her work at <http://lizrogersphotography.com>

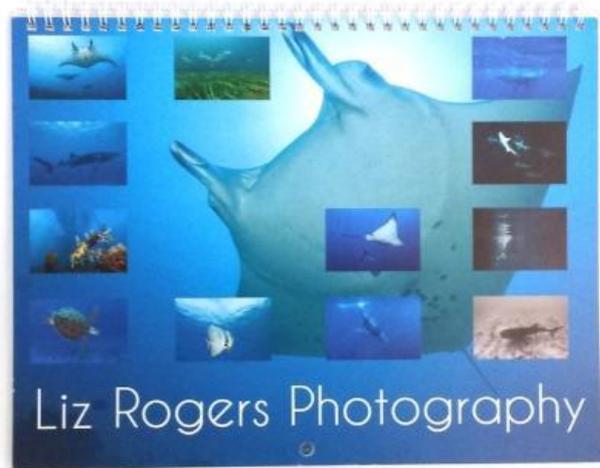
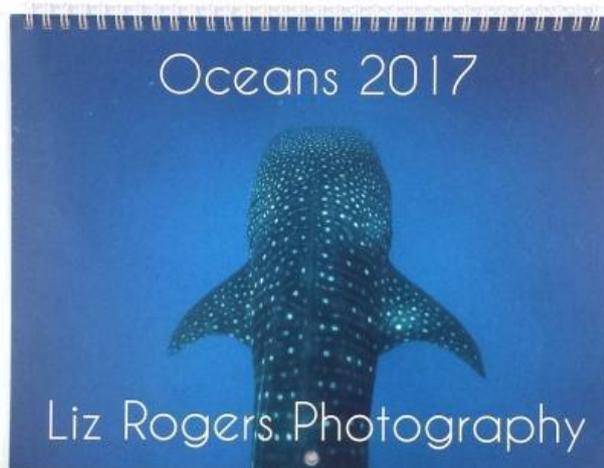


2017 OCEAN DIVING CALENDAR – LIZ ROGERS

Part# 40-121: \$35 (includes shipping)

Liz Rogers also does a lot of ocean diving, and there's a lot of ocean when you're a rEvo rebreather diver qualified to 100m. Every year she also produces an ocean diving calendar which makes an excellent addition to your office or workshop wall if you like pretty fish instead of dark holes in the ground.

You can see more of her work at <http://lizrogersphotography.com>



SCUBA EQUIPMENT & SUPPLIES

TFM Engineering has the resources for high quality custom and production fabrication of marine grade stainless steel, aluminium and plastic products. Where an opportunity presents itself to improve on currently available gear, we will grab it.

HIGH QUALITY ELECTROPOLISHED TWIN TANK BANDS FOR 7.25" FABER STEEL TANKS

Part# 20-003: \$221

High quality twin tank bands - these are the equivalent of any top band out there. At 2.5 inches wide, they are designed to fit the 7.25" Faber steel 10L and 12L tanks that are commonly used.

Made of marine grade stainless steel (316) rather than the regular 304 grade used on the cheap bands you can get online. The welding is TIG and done by professional boilermakers. High finish raw materials are pickled and passivated for extra corrosion resistance and a high-shine finish.

Custom bands can be manufactured, and spare parts are available on request



DRYSUIT TALC

Part# 20-010 (in squeeze bottle): \$11

Part# 20-011 (refill): \$9



Unscented (and well-tested) diver talc, but in a squeeze bottle. The squeeze bottle makes it MUCH easier to, well, squirt some talc INSIDE your wrist seals, because you can actually see how much is going in, unlike a shaker bottle, where you have to jam the whole thing in. It's quicker too - with practise, a quick squirt delivers the right amount in about 14 milliseconds.

Works fine on neck seals and other parts too. The cap is pretty good but make sure it's on well if you're going to chuck it in your spares bag and throw it all around, or save your shaker bottle for that, and keep the squeeze bottle handy near your drying station for after your suit is dry (a very good time to apply talc, if you want to make your seals last).



WATERPROOF PAPER (A4, 5-PACK)

Part# 20-104: \$11.50

High quality waterproof paper, non-tearing, non-smudging and can be printed on (inkjet works best, but laser works too), or written on with pencil or pen. Well tested and highly useful for printing cave maps, survey grids, or wreck plans – it's actually amazing how well it lasts (something like 6 downstream Elk River trips thus far).

STAINLESS STEEL SPRINGLOADED SHEARS

Part# 40-414: \$36

Another nice stainless tool for the spares box - springloaded shears (they spring open, but have a catch to keep them closed). You could dive with them as well, if you're planning on hacking through a lot of electrical cables or anchor rope! Like most dive knives, it's not marine grade stainless (which doesn't hold an edge well) but will go much better than regular steel, especially if you wash and lube it now and again.



DRYSUIT DRYERS - COMPLETE, KITS OR FREE PLANS(!!!)

Features:

- Properly dry your suit inside and out any time of year
- Spots for boots, gloves and hood
- Made to order, DIY kits, or free plans
- Compact, stand-alone base

There's nothing worse than a drysuit that's wet on the inside. Apart from that terrible feeling of irony, there is the terrible feeling of clammy coldness that usually goes with it. Whether it's from sweat, leaks, blowing off an integral part of your pee valve, or just washing your expensive piece of dive gear, there are plenty of times when a good drying is the only answer. If you've got socks rather than boots, then turning inside out is an option, but then you have to turn it back again, taking several winter days to dry each side, or risking the wrath of other family members by bringing it inside by the heater.

(The blue Otter Britannic membrane suit is still going despite a very hard life of pain and punishment, having had 4+ years of drysuit dryer TLC)



Options and Prices:

Whether you're a DIY wizard and can knock one up yourself or just want something that works, there should be something here to keep you happy. (and in the interests of dryness everywhere, the plans are FREE if want to build your own from scratch.)

Part#	Description	Source your own...	Price
20-201	Drysuit dryer - made to order complete except for heat gun	Heat Gun	\$232
20-202	Kit: Fittings, pipe cut to size, holes drilled, plans (glue yourself)	Heat Gun, Glue	\$165
20-203	Drysuit dryer plans & instructions only	Everything!	Free!

Notes:

- The heat gun is NOT included but the suggested budget/Ozito model can be bought at Bunnings for \$49. They have a 3 year warranty, are adjustable to LOW heat and have given good service through several years of testing.
- In general, kits and dryers will need to be picked up from Oakleigh South (Melbourne) but shipping is possible and will depend on size and shipping location - feel free to get in touch about this.
- A true DIY wizard should be able to complete the build from scratch in about 3 hours, plus shopping time, which could be a further 5-6hrs unless you are a well restrained DIY wizard...



"SINKING" CAVE LINE

#24/2mm white polyester "sinking" cave line is the most common size used on diving spools and reels. It seems skinny when new, but bulks up with use.

(500m roll) 2mm (#24) White Sinking Cave Line – Part#20-102: \$82
Other thicknesses, colours and materials are available on request



AQUASKETCH RE-USEABLE SCROLLING WRIST SLATE

The Aquasketch combines the best of both wetnotes and wrist slates, for the ultimate in underwater note-taking devices. Thoroughly tested on various cave diving expeditions, it quickly becomes the tool of choice for surveying - allowing for a hands-free and easy approach to recording and safely storing data before the silt rolls in. The Aquasketch comes pre-loaded with blank paper equivalent to about 10 wetnotes pages, plenty enough for several trips (it's erasable and re-usable). There is an optional custom TFM "app" which is a pre-printed paper with grid for survey data. The design even goes as far as having a high quality graphite pencil which gives very readable results with the paper, not to mention a pencil storage pocket, and velcro to keep the pencil bungee out of the way.



Surveying new cave on the 2016 Timor expedition.

Photo by Liz Rogers - <http://lizrogersphotography.com>

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Part #	Description	Price
42-001	Aquasketch with blank roll	\$69
42-003	"Aquasketch" Solid Graphite Pencil	\$4
42-005	"Aquasketch" Eraser Foam Pad	\$4.50
42-007	Small Velstretch wrist strap (for people with skinny wrists wearing wetsuits)	\$12.50
42-008	Blank Roll (1.5m)	\$8.50
42-011	Decompression "app"	\$21
42-012	Reuseable TFM custom cave survey "app"	\$21

TFM CAVING

Inevitably, some caving gear has been found to be non-existent, inappropriate or improvable. Some of the more useful results of this realisation are available below.

HELMET GOPRO MOUNT

Part# 61-004: \$95

This GoPro mount has been successfully trashed through heavy duty caving all over Australian and in Timor - in fact it's responsible for practically all the TFM trip photos on Facebook. Rather than mounting on the top of your helmet, where it inevitably gets knocked back, covered in mud, or accidentally turns off without you knowing, while filming the GoPro sits in front of the one place you are unlikely to scrape along the cave surface - your face! This also means that you can keep an eye on the rear screen, frame your shot, check that it's clear/actually on, etc. It tucks nicely out of the way behind your helmet light when stowed. A bonus feature is that it gets the camera further away from your helmet light to reduce backscatter. Another bonus feature is that you can turn it towards yourself for "bobblehead" selfies (hilarious facial expressions are encouraged).



CUSTOM CAVING PACKS FOR SCUBA TANKS

Contact us for pricing

TFM Engineering will be keeping some of these packs in stock - they are what we use in Elk River Cave and have been customised over a couple of iterations.

In practical terms:

- These bags are heavier and more expensive than normal caving bags
- But the advantage is that they are long enough to properly cover the valve, and have longer tether attachment points to suit, as well as extra drain holes at the base and a few other things.
- They can comfortably fit a 12L steel Faber with some room around it, or 2x foam-wrapped 7L steel Fabers with a little bit of room leftover.
- They are also good if you're carrying bulky camping gear to the bottom of the deepest (dry) cave in Australia
- The Aspiring bags they are based on are generally considered to be some of the toughest caving bags around, and will survive a lot of punishment.



CAVING ROPE CLEANER

Part# 61-001: \$155 (fully assembled)

Part# 61-002: \$105 (kit only - drill, cut and glue yourself)

Taking ropes caving gets them about as dirty as is humanly possible - and following a caving trip to Tasmania, TFM Engineering was asked what sort of cleaner might be possible to replace the aging existing cleaner installed there. The concept of water and brushes was kept but improved upon, to allow quick and easy changing of the brushes. A water jacket final cleaning stage directs jets of water at the rope from all sides.



STAINLESS STEEL SOCKET WRENCH (3/8" DRIVE)

Part# 50-517: \$78

This tool is specifically aimed at cavers who are installing bolts in wet, muddy, dirty conditions that usually see ratcheting tools wear out quicker than dropping off the end of a rope without a knot in it. Being stainless there will be no rusting, and it can be disassembled for cleaning. It's recommend you purchase your own carbon steel "impact" socket for best results.



Looking down the 185m free-hanging "BSG" pitch in Niggly Cave, Tasmania - the deepest cave in Australia, December 2016. We are currently pushing leads at both ends, with an Australian depth record (400m) in sight.



STAINLESS STEEL HAND TOOLS (NOW ALL 316)

If you've done much work around boats and salt water you will have experienced the frustration of tools that rust and freeze up after use. These tools are an excellent alternative, being made of "marine grade" 316 stainless steel. Although more expensive, they will last a lot longer, and you won't have to worry about exposure to salt water, including frequent immersion.

Be aware that because they are stainless, the cutting edges are less hard than regular tools - meaning they are fine for copper/electrical and gal wire, and will do thin stainless wire, but cutting thick SS wire will mark the cutting edges.

The tools listed below are generally kept in stock - a variety of other tools are available on request.

STAINLESS STEEL 316 SHIFTERS

If you've lost count of the number of shifters that have frozen with rust in your diving spares box or on your boat, a stainless one is probably a good move. TFM Engineering keeps a number of sizes in stock. The most popular size for divers is 40-511-1, at 0-18mm opening and 150mm length, it should fit on any regulator hose end you're likely to come across while being small enough to keep in your wetnotes.



Part #	Description	Price
40-510-1	SS316 shifter (13x100mm)	\$67
40-511-1	SS316 shifter (18x150mm)	\$87
40-512-1	SS316 shifter (24x200mm)	\$97
40-513-1	SS316 shifter (30x250mm)	\$107

STAINLESS 316 PLIERS, CUTTERS AND VICEGRIPS

Be the envy of all your boatie friends when you pull out a big shiny pair of stainless steel pliers. And if you think the vicegrips look good in the picture, just wait until you see them for real.



Part #	Description	Price
40-518-1	SS316 needlenose pliers (150mm)	\$79
40-519-1	SS316 lineman pliers (150mm)	\$79
40-520-1	SS316 sidecutters (150mm)	\$79
40-521-1	SS316 vicegrips	\$139
40-522-1	SS316 multigrips	\$139

STAINLESS STEEL 304 SOCKET WRENCH (3/8" DRIVE)

This tool is specifically aimed at cavers who are installing bolts in wet, muddy, dirty conditions that usually see ratcheting tools wear out quicker than dropping off the end of a rope without a knot in it. Being stainless there will be minimal rusting, and it can be disassembled for cleaning. Other sizes and 316 versions are available on request.



Part #	Description	Price
40-517	SS ratchet wrench (3/8" drive)	\$78
40-517-13	SS socket (13mm, 3/8" drive)	\$30

STAINLESS 316 SCREWDRIVERS AND ALLAN KEYS

So if you've got everything else in stainless, why not screwdrivers as well? 8mm Allan keys are also available in case you want to keep one on the dive boat for frequent messing about with DIN/yoke conversions.

Part #	Description	Price
40-514-1	Stainless steel 316 phillips head screwdriver (#2 x 150mm)	\$29
40-515-1	Stainless steel 316 flat head screwdriver (5mm x 150mm)	\$29
40-516-8-1	Stainless steel 316 8mm allan key	\$20



BOAT TRAILER JUNCTION BOX & LIGHTS SYSTEM

Part# 50-001 (junction box only): \$150

Part# 50-002 (no side marker lights – all with pre-wired 9m cable): \$245

Part# 50-003 (with side marker lights – all with pre-wired 9m cable): \$290

This junction box is designed to be mounted on the front of a boat trailer so that it does not regularly get wet and where it can be seen. It will help bring down costs of your trailer lights maintenance and time spent troubleshooting by making it very easy to replace one component at a time, and to see which one it is.



Key benefits include:

- LED indicators of signal from the car
- Fuses for each light (2x rear, 2x side marker, 1x number plate)
- No DIY underwater connections
- Very easy to install & replace components
- Faults and leaks are obvious and not catastrophic
- Testing: All components are UV, water and salt-proof, and prototypes have been heavily tested in both salt and fresh water, sitting in the sun & weather for over 6 months with no ill effects. Each box is leak tested by 30min submersion in 30cm deep water.

Comes with marine grade stainless steel mounting screws, and spare fuses

REPLACEMENT LIGHTS – PRE-WIRED

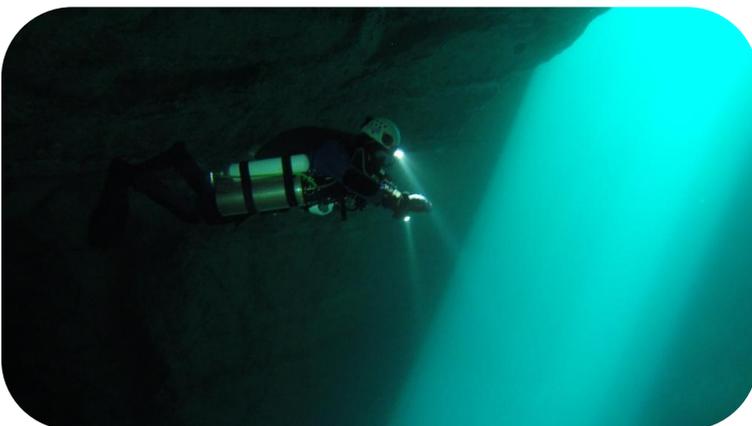
Part# 50-004 (rear/main light – with pre-wired 9m cable): \$43

Part# 50-005 (marker light – with pre-wired 9m cable): \$33

Part# 50-006 (number plate light – with pre-wired 9m cable): \$27

Part# 50-007 (7-pin flat – with pre-wired 3m cable): \$16

Part# 50-008 (7-pin round – with pre-wired 3m cable): \$16



Enjoying the rays of sun while doing rebreather training in Kilsby's Sinkhole, Mt Gambier, South Australia. The ElkLight is pretty powerful, but it's certainly no competition.

STAINLESS 316 HOSE CLAMPS

We needed a few hose clamps for a project, and for stage tank kits, and for something else... so once we found a supply of good quality 316 ones it was just easier to get all the hose clamp sizes, and here they are.

P/N	Description	Price
51-006	#6 clamp, 11-20mm diameter	\$3
51-008	#8 clamp, 11-23mm diameter	\$3
51-010	#10 clamp, 14-27mm diameter	\$3
51-012	#12 clamp, 17-32mm diameter	\$3
51-016	#16 clamp, 19-38mm diameter	\$3
51-020	#20 clamp, 21-44mm diameter	\$3
51-024	#24 clamp, 27-51mm diameter	\$3
51-028	#28 clamp, 33-57mm diameter	\$3
51-032	#32 clamp, 40-64mm diameter	\$4
51-036	#36 clamp, 46-70mm diameter	\$4
51-040	#40 clamp, 52-76mm diameter	\$4
51-042	#42 clamp, 56-80mm diameter	\$4
51-044	#44 clamp, 59-83mm diameter	\$4
51-048	#48 clamp, 65-89mm diameter	\$4
51-052	#52 clamp, 71-95mm diameter	\$4
51-056	#56 clamp, 78-102mm diameter	\$4
51-060	#60 clamp, 84-108mm diameter	\$5
51-064	#64 clamp, 90-114mm diameter	\$5
51-068	#68 clamp, 97-121mm diameter	\$5
51-072	#72 clamp, 103-127mm diameter	\$5



P/N	Description	Price
51-076	#76 clamp, 110-133mm diameter	\$5
51-080	#80 clamp, 116-140mm diameter	\$5
51-084	#84 clamp, 122-146mm diameter	\$5
51-088	#88 clamp, 129-152mm diameter	\$4
51-092	#92 clamp, 135-159mm diameter	\$5
51-096	#96 clamp, 141-165mm diameter	\$5
51-104	#104 clamp, 154-178mm diameter	\$5
51-116	#116 clamp, 165-197mm diameter	\$4
51-128	#128 clamp, 144-216mm diameter	\$6
51-140	#140 clamp, 163-235mm diameter	\$6
51-152	#152 clamp, 182-254mm diameter	\$6
51-164	#164 clamp, 201-273mm diameter	\$6
51-176	#176 clamp, 225-292mm diameter	\$9
51-188	#188 clamp, 239-311mm diameter	\$9
51-200	#200 clamp, 259-330mm diameter	\$9
51-212	#212 clamp, 277-349mm diameter	\$9
51-224	#224 clamp, 296-368mm diameter	\$9
51-236	#236 clamp, 315-387mm diameter	\$9
51-248	#248 clamp, 335-406mm diameter	\$9

TUBULAR WEBBING FOR HOSE CLAMPS

Part# 51-000: \$5/m



ROPE RINGS (STAINLESS STEEL 316)



When you want a ring in the middle of a rope (ie. for a deco station or drop line), a knot is too bulky and a pair of eye splices takes ages. These rope rings can be quickly and easily installed and adjusted, and are held in place by optional cable ties.

Part #	Description	Price
60-011	Deco line double ring	\$22
60-012	Deco line big/small ring	\$22





TFM Engineering Australia

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