Contents

Maintenance and Inspection Procedures

1.1 General

The following section describes the maintenance and inspection procedures that are used to complete the Annual, Monthly and Daily Checklists, to ensure optimum reliability and performance. These procedures are additionally used in conjunction with the daily pre and post dive maintenance checklists. The following service intervals are the minimum recommended for helmets being used under good conditions. Helmets and BandMasks® used in harsh conditions, i.e., contaminated water, welding / burning operations, or jetting may require more frequent servicing.

The intention of the maintenance and overhaul program is to help maintain all helmet components in good working order in accordance with KMDSI factory specifications. It will also help to identify worn or damaged parts and components before they affect performance and reliability. Whenever the serviceability of a component or part is in question, or doubt exists, replace it. All mask and helmet components and parts have a service life and will eventually require replacement.


NOTE

The side block does not need to be removed from the helmet or mask annually, provided excessive internal corrosion is not present. Kirby Morgan recommends that every three years the side block assembly be physically removed from the helmet or mask. For fiberglass shells per "1.1.6 Separating the Side Block Assembly from the Helmet/ Mask Shell" on page SB-7, and for stainless steel shells per "1.1 Separating the Side Block Assembly from the Helmet Shell" on page SSB-1. Clean and inspect the stud and securing screw, replace if bent, stripped, or any damage is detected.


NOTE

All pipe thread fittings used on our helmets, masks and components require sealing with Teflon® tape. **DO NOT USE LIQUID SEALANT**. When installing Teflon® tape on pipe threads, apply the tape starting two threads back from the end of the fitting.

Apply the tape in a clockwise direction under tension. Two wraps are all that is needed. Applying more than two wraps of tape is not recommended. The use of more than two wraps could cause excess Teflon® tape to travel into the breathing system.

Disassembly and reassembly of components is explained in a step-by-step manner that may not necessarily call out that all O-rings and normal consumable items will be replaced. The manual is written in this way so that if an assembly, component, or part is being inspected or disturbed between normal intervals, it is acceptable to reuse O-rings and components provided they pass a visual inspection . When conducting annual or scheduled overhauls, all O-rings should be replaced. The side block should be removed from the helmet at least every three years (or 400 operating hours) so that the stud and securing screw can be inspected. All O-rings should be lightly lubricated with the applicable lubricant.

1.2 Lubrication/Cleanliness

Helmets intended for use with breathing gas mixtures in excess of 50% oxygen by volume, should be cleaned for oxygen service. They must only be lubricated with oxygen compatible lubricants. All air supply systems must be filtered and must meet the requirements of grade D quality air or better. Helmet breathing gas systems/gas train components used for air diving should only be lubricated with silicone grease Dow Corning® 111® or equivalent where noted. KMDSI uses Christo-Lube® at the factory for lubrication of all gas train components requiring lubrication, and highly recommends its use.

Before 1999, Kirby Morgan Dive Systems, Inc., used Danger and Warning Notices in the helmet and mask owner's manuals limiting the breathing gas percentage to less than 23.5 percent oxygen. This was due primarily to cleaning issues in regards to possible fire hazards and was in compliance with the recommendations of the Association of Standard Test Methods (ASTM), National Fire Protection Agency (NFPA), and the Compressed Gas Association (CGA) as well as other industry standards.

During the 1990's, open circuit scuba use of enriched-air (Nitrox) by technical and recreational

divers became very popular, and as use increased, so did the number of combustion incidents during the mixing and handling of the breathing mixtures. These combustion incidents brought attention to the dangers and inherent risks associated with oxygen and oxygen enriched gas mixtures.

Kirby Morgan cannot dictate or override regulations or recommendations set forth by industry standards or governing bodies pertaining to enriched gas use. However, it is the opinion of Kirby Morgan that breathing gas mixtures up to 50% oxygen by volume should not pose a significant increased risk of fire or combustion in Kirby Morgan helmet and mask low-pressure components and does not warrant the need for the stringent specialized oxygen clean post-sampling and particulate analysis normally accomplished for components used in high pressure oxygen valves, regulators, and piping systems. The decision for using 50% has been primarily based on a long history of operational field use.

As long as Kirby Morgan helmets and masks are cleaned and maintained in accordance with the maintenance manual, the equipment should not pose a significant increased risk of a fire or ignition originating in the helmet or mask low-pressure (<250 p.s.i.g. /<17.2 bar or less) components when used with enriched gases of up to 50% oxygen. However, CAUTION should be exercised any time enriched gases are handled or used.

In general, helmets and masks used primarily for mixed gas use are subject to far less oil and particulate contamination than those used for air diving. For this reason, helmets and masks commonly used with both air and enriched breathing gases should be cleaned and maintained with greater care and vigilance. It is important that all internal gas-transporting components, i.e., side block, bent tube, and demand regulator assemblies remain clean and free of hydrocarbons, dirt, and particulates. Whenever the equipment is depressurized, all exposed ports or fittings should be plugged/capped to help maintain foreign material exclusion.

Gas train components should be cleaned according to the procedures outlined in the operations manual at least annually and/or whenever contamination is suspected or found. Helmet and mask interior and exterior surfaces should be cleaned at least daily at the completion of daily diving operations. Helmets and masks used in waters contaminated with oils and other petroleum or chemical contaminants may require cleaning after each dive.

Helmet and mask components requiring lubrication should be lubricated sparingly with lubricants approved for oxygen use such as Christo-Lube® or equivalent oxygen compatible lubricant. KMDSI highly recommends using Christo-Lube®, and uses Christo-Lube® during the assembly of all KMDSI gas train components.

⚠ WARNING

Do not use lubricants of any kind on the diaphragm or exhaust valves. Use of lubricants can attract and hold debris that could interfere with the proper operation of the regulator.

Regardless of the approved lubricant used, never mix different kinds of lubricants. Persons mixing handling and working with breathing gases should be properly trained in all aspects of safe gas handling.

During annual overhauls, all O-rings and soft goods, i.e., valve seats and washers should be replaced. KMDSI offers kits that have all the necessary parts.

The neck dam rubber need not be replaced if the inspection reveals no damage or significant wear and the rubber components are not dried out.

The oral nasal mask and oral nasal valve requires replacement, only if inspection reveals damage, distortion, or signs of damage.

All threaded fasteners and parts require careful cleaning and inspection as well as the mating parts. Replace any and all threaded parts or components that show signs of wear or damage.

KMDSI highly recommends a certified KMDSI repair technician make all repairs and that only genuine KMDSI repair and replacement parts be used. Owners of KMDSI products that elect to do their own repairs and inspections should only do so if they possess the knowledge and experience. All inspections, maintenance and repairs should be completed using the appropriate KMDSI Operations and Maintenance Manual.

Persons performing repairs should retain all replacement component receipts for additional proof of maintenance history. Should any questions on procedures, components, or repairs arise, please telephone Kirby Morgan Dive Systems, Inc., at (805) 928-7772 or E-mail them at kmdsi@kirbymorgan.com or telephone Dive Lab, Inc., at (850) 235-2715 or E-mail them at divelab@divelab.com.

Supply Pressure Requirements & Tables

The corresponding low pressure supply table should be used whenever low pressure compressors are used or when using surface control panels that are limited to outlet pressures within the range of 220 psig or less.

It is important to insure the required outlet pressure from the table can be maintained in a stable manner at the surface to insure adequate supply at depth. When used with high pressure consoles that can regulate pressures greater than 220 psig use the corresponding high pressure regulated source supply table.

1.1 Diver Work Rates

The divers work rate, also known as respiratory minute volume (RMV), is basically how hard the diver breathes. As the diver's physical exercise increases, so does the ventilation rate. Proper training teaches the diver to never push the work rate beyond normal labored breathing. (This is in the 30-50 RMV range). To put things in perspective, heavy work for a physically fit person:

Swimming at one knot is about	38 RMV
Running at 8 miles per hour is about	50 RMV

Once the diver hits 55 RMV, he is entering the extreme range. Many fit divers can do 75 RMV for one to two minutes providing the inhalation resistive effort of the breathing system is not much above 1-1.3 J/L. The divers work rate should never be so heavy that the diver cannot maintain a simple conversation with topside.

When the work rate gets into the moderately heavy to heavy range 40-50 RMV the diver needs to slow down!

Working to the point of being excessively winded should be avoided at all costs!

Working at rates greater than 58 RMV underwater is extreme, and can pose hazards that are not present when doing extreme rates on the surface. When underwater, inhalation and exhalation resistive effort increases due to the density of the breathing gas and resistive effort of the equipment. The increase in resistive effort can cause an increase in blood level CO_2 because the diver cannot ventilate as freely as when breathing at the surface. When breathing air at the deeper depths, nitrogen narcosis can mask CO_2 symptoms which can then snowball into even heavier breathing, often resulting in confusion, panic, and in rare cases muscle spasm, unconsciousness, sometimes resulting in death. In some rare cases, high ventilation rates have been suspected as the cause of respiratory barotraumas, including arterial gas embolism. The possibility of suffering a respiratory over inflation event during high work rates while underwater could be even greater for divers that smoke, or have previously known or unknown lung disease or respiratory damage. The safest course for the diver is to keep the equipment properly maintained for peak performance and to know and understand the capabilities and limitations of the equipment including all breathing supply systems they use.

The output capability of the supply system, including umbilicals, should be known to all that use it and periodic tests should be done to ensure flow capability.

1.2 Use Of Low Pressure Supply Table

The low pressure supply tables were developed to simplify calculation of supply pressure. In order to get the required volume to the diver, you need to have the proper supply pressure. The table starts at 90 psig and increases in 10 psig increments. The user simply selects the lowest pressure that best represents the low cycling pressure of the compressor being used. The table basically shows the maximum depth that can be attained while breathing at RMV's (breathing rates in liters per minute) listed. It is strongly recommended that divers plan for a minimum supply pressure that will allow the diver to work at no less that 50 - 62.5 RMV.

1.3 Work Rate Expressed as Respiratory Minute Volume (RMV)*

Work Load	RMV	Cubic Feet/Minute (CFM)	Equivalent Land Based Exercise
Rest	7-10 RMV	0.2 - 0.35 CFM	
Light Work	10-20 RMV	0.35 - 0.7 CFM	Walking 2 miles per hour
Moderate Work	20-37 RMV	0.7 - 1.3 CFM	Walking 4 miles per hour
Heavy Work	37-54 RMV	1.3 - 1.9 CFM	Running 8 miles per hour
Severe Work	55-100 RMV	1.94 - 3.5 CFM	
** source: U.S. Navy Diving Manual*			

1.4 SuperFlow®/SuperFlow® 350 LP Compressor Supply Table

Supply Pressure Requirements for Helmets & Masks equipped with SuperFlow®/SuperFlow® 350 Non-balanced regulators when used with low pressure compressors

Supply Pressure	RMV	Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
90 PSIG / 6.21 BAR	**40**	76	23	3.30	132.12	158.55	5.60
	50	63	19	2.91	145.45	174.55	6.17
	62.5	44	13	2.33	145.83	175.00	6.18
	75	33	10	2.00	150.00	180.00	6.36
100 PSIG / 6.9 BAR	**40**	86	26	3.61	144.24	173.09	6.11
	50	72	22	3.18	159.09	190.91	6.74
	62.5	55	17	2.67	166.67	200.00	7.06
	75	42	13	2.27	170.45	204.55	7.23
110 PSIG / 7.59 BAR	**40**	100	31	4.03	161.21	193.45	6.83
	50	83	25	3.52	175.76	210.91	7.45
	62.5	67	20	3.03	189.39	227.27	8.03
	75	50	15	2.52	188.64	226.36	8.00
120 PSIG / 8.28 BAR	**40**	112	34	4.39	175.76	210.91	7.45
	50	91	28	3.76	187.88	225.45	7.96
	62.5	71	22	3.15	196.97	236.36	8.35
	75	57	17	2.73	204.55	245.45	8.67
130 PSIG / 8.97 BAR	**40**	122	37	4.70	187.88	225.45	7.96
	50	100	31	4.03	201.52	241.82	8.54
	62.5	82	25	3.48	217.80	261.36	9.23
	75	60	19	2.82	211.36	253.64	8.96
140 PSIG / 9.66 BAR	**40**	137	42	5.15	206.06	247.27	8.73
	50	108	33	4.27	213.64	256.36	9.06
	62.5	84	26	3.55	221.59	265.91	9.39
	75	65	20	2.97	222.73	267.27	9.44
150 PSIG / 10.35 BAR	**40**	145	44	5.39	215.76	258.91	9.15
	50	120	37	4.64	231.82	278.18	9.83
	62.5	95	29	3.88	242.42	290.91	10.28
	75	69	21	3.09	231.82	278.18	9.83

Supply Pressure	RMV	Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
160 PSIG / 11.04 BAR	**40**	157	48	5.76	230.30	276.36	9.76
	50	124	38	4.76	237.88	285.45	10.08
	62.5	100	31	4.03	251.89	302.27	10.68
	75	76	23	3.30	247.73	297.27	10.50
170 PSIG / 11.73 BAR	**40**	167	51	6.06	242.42	290.91	10.28
	50	135	41	5.09	254.55	305.45	10.79
	62.5	107	33	4.24	265.15	318.18	11.24
	75	86	26	3.61	270.45	324.55	11.46
180 PSIG / 12.42 BAR	**40**	181	55	6.48	259.39	311.27	11.00
	50	148	45	5.48	274.24	329.09	11.62
	62.5	115	35	4.48	280.30	336.36	11.88
	75	93	28	3.82	286.36	343.64	12.14
190 PSIG / 13.11 BAR	**40**	190	58	6.76	270.30	324.36	11.46
	50	154	47	5.67	283.33	340.00	12.01
	62.5	122	37	4.70	293.56	352.27	12.44
	75	100	31	4.03	302.27	362.73	12.81
200 PSIG / 13.8 BAR	**40**	192	59	6.82	272.73	327.27	11.56
	50	166	51	6.03	301.52	361.82	12.78
	62.5	132	40	5.00	312.50	375.00	13.25
	75	102	31	4.09	306.82	368.18	13.01
210 PSIG / 14.49 BAR	**40**	212	65	7.42	296.97	356.36	12.59
	50	175	53	6.30	315.15	378.18	13.36
	62.5	137	42	5.15	321.97	386.36	13.65
	75	108	33	4.27	320.45	384.55	13.58
220 PSIG / 15.18 BAR	**40**	220	67	7.67	306.67	368.00	13.00
	50	182	56	6.52	325.76	390.91	13.81
	62.5	147	45	5.45	340.91	409.09	14.45
	75	111	34	4.36	327.27	392.73	13.87

1.5 SuperFlow®/SuperFlow® 350 HP Regulated Supply Table

Depth		Regulator Setting Surface Gauge in P.S.I.G.		Regulator Setting Surface Gauge in BAR	
FSW	MSW	Minimum P.S.I.G.	Maximum P.S.I.G.	Minimum Bar	Maximum Bar
0-60	0-18	150	225	10.3	15.5
61-100	19-30	200	250	13.8	17.2
101-132	31-40	250	275	17.2	18.9
133-165	41-50	250	300	17.2	19.6
*166-220	51-67	300	325	20.6	22.4

*May not be capable of performing at 75 RMV deeper than 165 FSW.

Performance is based on a minimum of 75 RMV to 165 FSW (50 MSW) and 62.5 RMV to 220 FSW (67

MSW) using a ⅜" (9.5 mm) umbilical 600 foot (183 meters) long, made up of two 300 foot (91 meter) sections.

1.6 REX® LP Compressor Supply Table

Supply Pressure Surface Gauge Reading	RMV (Respiratory Minute Volume)	Maximum Recommended Depth		Required SCFM**	Required SLPM**
		FSW	MSW		
90 P.S.I.G . (6.21 BAR)	40 (heavy work)	104	32	7.0	198
	50 (heavy work)	76	23	7.0	198
	62.5 (severe work)	61	18.8	7.5	212
	75 (severe work)	50	15.4	8.0	227
100 P.S.I.G. (6.9 BAR)	40 (heavy work)	108	33	7.25	205
	50 (heavy work)	90	27	7.9	223
	62.5 (severe work)	75	22.9	8.7	246
	75 (severe work)	59	18	8.9	252
110 P.S.I.G. (7.59 BAR)	40 (heavy work)	117	35	7.7	218
	50 (heavy work)	100	30	8.6	244
	62.5 (severe work)	83	25	9.3	263
	75 (severe work)	68	21	9.7	275
120 P.S.I.G. (8.28 BAR)	40 (heavy work)	127	38.7	8.2	232
	50 (heavy work)	113	34	9.4	266
	62.5 (severe work)	93	28	10	283
	75 (severe work)	75	23	9.7	275
130 P.S.I.G. (8.97 BAR)	40 (heavy work)	145	44	9.1	258
	50 (heavy work)	125	38	10	283
	62.5 (severe work)	106	32	11	311
	75 (severe work)	85	26	11.36	322
140 P.S.I.G. (9.66 BAR)	40 (heavy work)	160	48	10	283
	50 (heavy work)	135	41	11	311
	62.5 (severe work)	114	35	12	340
	75 (severe work)	92.5	29	12	340
150 P.S.I.G. (10.35 BAR)	40 (heavy work)	170	52	10.5	297
	50 (heavy work)	149	45	11.7	331
	62.5 (severe work)	126	38	13	368
	75 (severe work)	105	32	13.3	377
160 P.S.I.G . (11.04 BAR)	40 (heavy work)	186	57	11.3	320
	50 (heavy work)	157	48	12.2	345
	62.5 (severe work)	134	41	13.4	379
	75 (severe work)	112	34	14	396

Supply Pressure Surface Gauge Reading	RMV (Respiratory Minute Volume)	Maximum Recommended Depth		Required SCFM**	Required SLPM**
		FSW	MSW		
170 P.S.I.G. (11.73 BAR)	40 (heavy work)	203	62	12.2	345
	50 (heavy work)	170	52	13	368
	62.5 (severe work)	143	43	14	396
	75 (severe work)	121	37	14.9	422
180 P.S.I.G. (12.42 BAR)	40 (heavy work)	219	67	13	368
	50 (heavy work)	180	55	13.7	388
	62.5 (severe work)	158	48	15.4	436
	75 (severe work)	130	39	15.7	445
190 P.S.I.G. (13.11 BAR)	40 (heavy work)	220	67	13	368
	50 (heavy work)	192	58	14.5	411
	62.5 (severe work)	165	50	16	453
	75 (severe work)	141	43	16.8	476
200 P.S.I.G. (13.80 BAR)	40 (heavy work)	220	67	13	368
	50 (heavy work)	205	62	15.3	433
	62.5 (severe work)	174	53	16.7	473
	75 (severe work)	147	45	17.4	493
210 P.S.I.G. (14.49 BAR)	40 (heavy work)	220	67	13	368
	50 (heavy work)	214	65.8	16	453
	62.5 (severe work)	186	56	17.6	498
	75 (severe work)	159	48	18.5	524
220 P.S.I.G. (15.18 BAR)	40 (heavy work)	220	67	13	368
	50 (heavy work)	220	67	16.3	462
	62.5 (severe work)	194	59	18.2	515
	75 (severe work)	165	50	19	538

These values were derived from actual breathing simulator tests using an ANSI wet simulator with 600' long umbilical 3/8" I.D (9.5mm) at Dive Lab, Inc. The respiratory work rates and test procedures used are based on internationally recognized test practices and procedures.

*** includes a 20% safety factor*

NOTE

Most sustained work rates by professional divers average between 20 to 40 RMV. When calculating supply requirements, KMDSI® recommends using no less than 40 RMV.

For more information, check the Dive Lab website, www.divelab.com.

1.7 REX® HP Regulated Supply Table

Depth		Regulator Setting P.S.I.G.		Regulator Setting BAR	
FSW	MSW	Optimum P.S.I.G.	Maximum P.S.I.G.	Optimum BAR	Maximum BAR
0-60	0-18	140	200	9.7	13.8
61-100	19-30	165	220	11.4	15
101-132	31-40	180	250	12.4	17
133-165	41-50	220	300	15	20.7
166-220	51-67	270	300	18.6	20.7

Performance is based on a minimum of 75 RMV to depths of 220 FSW (67 MSW) using a 3/8 (9.5mm) umbilical 600 foot (183 meters) long, made up of two 300 foot (91 meter) sections.

1.8 455 & KM Diamond LP Compressor Supply Table

Supply Pressure Surface Gauge Reading	RMV (Respiratory Minute Volume)	Maximum Recommended Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
90 P.S.I.G . (6.21 BAR)	40 (heavy work)	101	30	4.06	162.42	194.91	6.88
	50 (heavy work)	84	25	3.55	177.27	212.73	7.51
	62.5 (severe work)	66	20	3.00	187.50	225.00	7.95
	75 (severe work)	51	16	2.55	190.91	229.09	8.09
100 P.S.I.G. (6.9 BAR)	40 (heavy work)	115	35	4.48	179.39	215.27	7.60
	50 (heavy work)	97	29	3.94	196.97	236.36	8.35
	62.5 (severe work)	77	23	3.33	208.33	250.00	8.83
	75 (severe work)	62	19	2.88	215.91	259.09	9.15
110 P.S.I.G. (7.59 BAR)	40 (heavy work)	130	39	4.94	197.58	237.09	8.37
	50 (heavy work)	100	30	4.03	201.52	241.82	8.54
	62.5 (severe work)	90	27	3.73	232.95	279.55	9.87
	75 (severe work)	73	22	3.21	240.91	289.09	10.21
120 P.S.I.G. (8.28 BAR)	40 (heavy work)	145	44	5.39	215.76	258.91	9.15
	50 (heavy work)	125	38	4.79	239.39	287.27	10.15
	62.5 (severe work)	101	30	4.06	253.79	304.55	10.76
	75 (severe work)	83	25	3.52	263.64	316.36	11.17
130 P.S.I.G. (8.97 BAR)	40 (heavy work)	157	47	5.76	230.30	276.36	9.76
	50 (heavy work)	130	39	4.94	246.97	296.36	10.47
	62.5 (severe work)	110	33	4.33	270.83	325.00	11.48
	75 (severe work)	91	28	3.76	281.82	338.18	11.95

Supply Pressure Surface Gauge Reading	RMV (Respiratory Minute Volume)	Maximum Recommended Depth		ATA	Required SLPM	w/20% safety margin	Required SCFM
		FSW	MSW				
140 P.S.I.G. (9.66 BAR)	40 (heavy work)	171	52	6.18	247.27	296.73	10.48
	50 (heavy work)	145	44	5.39	269.70	323.64	11.43
	62.5 (severe work)	120	36	4.64	289.77	347.73	12.28
	75 (severe work)	103	31	4.12	309.09	370.91	13.10
150 P.S.I.G. (10.35 BAR)	40 (heavy work)	187	57	6.67	266.67	320.00	11.30
	50 (heavy work)	158	48	5.79	289.39	347.27	12.27
	62.5 (severe work)	134	41	5.06	316.29	379.55	13.41
	75 (severe work)	103	31	4.12	309.09	370.91	13.10
160 P.S.I.G . (11.04 BAR)	40 (heavy work)	198	60	7.00	280.00	336.00	11.87
	50 (heavy work)	176	54	6.33	316.67	380.00	13.42
	62.5 (severe work)	147	45	5.45	340.91	409.09	14.45
	75 (severe work)	125	38	4.79	359.09	430.91	15.22
170 P.S.I.G. (11.73 BAR)	40 (heavy work)	203	61	7.15	286.06	343.27	12.13
	50 (heavy work)	183	56	6.55	327.27	392.73	13.87
	62.5 (severe work)	154	47	5.67	354.17	425.00	15.01
	75 (severe work)	125	38	4.79	359.09	430.91	15.22
180 P.S.I.G. (12.42 BAR)	40 (heavy work)	230	70	7.97	318.79	382.55	13.51
	50 (heavy work)	196	60	6.94	346.97	416.36	14.71
	62.5 (severe work)	163	50	5.94	371.21	445.45	15.73
	75 (severe work)	144	44	5.36	402.27	482.73	17.05
190 P.S.I.G. (13.11 BAR)	40 (heavy work)	239	73	8.24	329.70	395.64	13.98
	50 (heavy work)	196	60	6.94	346.97	416.36	14.71
	62.5 (severe work)	173	53	6.24	390.15	468.18	16.54
	75 (severe work)	152	46	5.61	420.45	504.55	17.82
200 P.S.I.G. (13.80 BAR)	40 (heavy work)	201	61	7.09	283.64	340.36	12.02
	50 (heavy work)	220	67	7.67	383.33	460.00	16.25
	62.5 (severe work)	187	57	6.67	416.67	500.00	17.66
	75 (severe work)	156	48	5.73	429.55	515.45	18.21
210 P.S.I.G. (14.49 BAR)	40 (heavy work)	273	83	9.27	370.91	445.09	15.72
	50 (heavy work)	237	72	8.18	409.09	490.91	17.34
	62.5 (severe work)	201	61	7.09	443.18	531.82	18.79
	75 (severe work)	172	52	6.21	465.91	559.09	19.75
220 P.S.I.G. (15.18 BAR)	40 (heavy work)	245	75	8.42	336.97	404.36	14.28
	50 (heavy work)	203	62	7.15	357.58	429.09	15.16
	62.5 (severe work)	194	59	6.88	429.92	515.91	18.22
	75 (severe work)	181	55	6.48	486.36	583.64	20.62

1.9 455 HP Regulated Supply Table

Depth		Regulator Setting P.S.I.G.		Regulator Setting BAR	
FSW	MSW	Optimum P.S.I.G.	Maximum P.S.I.G.	Optimum BAR	Maximum BAR
0-60	0-18	100	150	7	10
61-100	19-30	125	150	8.6	10.3
101-132	31-40	175	225	12	15.5
133-165	41-50	200	250	14	17
166-190	51-61	225	275	15.5	19
191-220	58-67	225	300	15.5	20.6

Performance is based on a minimum of 75 RMV to depths of 220 FSW (67 MSW) using a ⅜" (9.5 mm) umbilical 600 foot (183 meters) long, made up of two 300 foot (91 meter) sections.

1.10 KM Diamond HP Regulated Supply Table

Depth		Regulator Setting P.S.I.G.			Regulator Setting BAR		
FSW	MSW	Minimum P.S.I.G.	Maximum P.S.I.G.	Recommended P.S.I.G.	Minimum BAR	Maximum BAR	Recommended BAR
0-60	0-18	101	275	145	7	19	10
61-100	19-30	145	275	174	10	19	12
101-132	31-40	174	275	203	12	19	14
133-165	41-50	218	275	245	15	19	17

The proper supply pressure is important to ensure maximum overall breathing performance. The minimum recommended and maximum supply pressures listed below will allow for at least a respiratory work rate of 75 RMV at all depths listed.

When the diver is working at light to heavy work rates, (15–50 RMV) the minimum recommended Supply Pressure for a particular depth, should offer the smoothest overall performance. **Use of the maximum pressure should only be needed at a depth of 165 fsw (50 MSW) or deeper in the event the diver is breathing at the extreme work rate of 75 RMV or greater.** The maximum supply pressure is listed primarily due to European CE requirements which requires the maximum and minimum supply pressures be listed. The minimum supply pressures for the depths listed below will allow for a work rate of 75 RMV IAW the CE requirements of EN15333-1.

1.11 Standard Kirby Morgan Surface Supply Pressure Formula - Old Method

1.11.1 Old Pressure Table Calculation

The old method of determining supply pressure was to multiply the dive depth by .445 PSI and then add the over-bottom pressure called out in the depth ranges for the depth from the KMDSI operations manual. The old method was based on a minimum RMV of 62.5. This method can still be used. The old

method used the formula and called out over bottom pressures for depth as follows [(FSW x .445) + PSIG for depth] from the table below.

Depth in Feet and Meters		Over Bottom Pressure	
0-60 FSW	(0-18 MSW)	90 PSIG	(6.2 Bar)
61-100	(18-30)	115	(7.9)
101-132	(30-40)	135	(9.3)
133-165	(40-50)	165	(11.4)
166-220	(50-67)	225	(15.5)

For more information on determining supply pressure related information check the Dive Lab web site at www.divelab.com.

1.12 KM Diamond Exhaust Back Pressure Flow Table

1.12.1 Back Pressure System

When the KM Diamond surface return line helmet reaches 90 to 100 fsw (27–30.48 msw) in depth, the combination of differential pressure and air density starts having a significant effect on the exhalation effort at heavy respiratory work rates above 60 RMV. The increase in exhalation effort at depths in excess of 100 fsw (30.48 msw) is primarily due to the high differential pressure on the 2nd stage exhaust diaphragm on one side and the existing lower pressure found at the surface (topside). Another effect is the flow resistance that is created in the surface return hose due to gas density.

To compensate for the increased gas density and high differential pressure, the topside end of the return hose is attached to a back-pressure regulator system which allows a back pressure to be applied to the hose, reducing this differential pressure, allowing the exhaust regulator second stage to operate with less exhalation effort.

The amount of topside back pressure needed is based on what is required to enable the diver to breathe and exhale at the extreme work rates above 60 RMV while maintaining the helmet exhalation pressure below 18 mbr. The back pressure required is determined using a specially designed table. See “1.12.4 Table” on page APNDX-14.

The table and the topside back pressure system is desirable whenever the diver is breathing at heavy work rates and diving deeper than 100 fsw (30.48 msw) to keep exhalation pressure below the KMDSI 18 mbr limit and to avoid gas from escaping from the overpressure relief and water purge valves installed on the helmet. Exhausting into the water in a contaminated water situation is not desirable and defeats the primary purpose of using a surface return line helmet that vents to the surface (topside). A topside back pressure system will prevent inadvertent activation of these valves on the KM Diamond.

1.12.1.1 Topside Exhaust Back Pressure System Operation

Minimum requirements for a Topside Exhaust Back Pressure System:

- A means to secure both the primary and stand by diver’s exhaust hose to the unit.
- A Flow meter per diver.
- Means of increasing and decreasing exhaust back pressure.

For optimal exhaust performance (minimum exhalation effort), the topside exhaust back pressure is set according to the flow reading on the flow meter in use and the diver’s depth. As an example, a diver at a

depth of 100 fsw (30.48 msw) working at the extreme breathing rate of 60 RMV or higher without using the topside back pressure control system, the exhalation pressure would be in a range of 14–16 mbr. With the proper back pressure, it would be in the 6–8 mbr range.

The recommended topside exhaust control system must be capable of controlling the exhaust pressure based on the depth and respiratory rate. One example of a topside back pressure system is the DL-TSC-00 from Dive Lab, Inc. This system is a two-diver system and consists of a simple manifold assembly with back pressure regulator, two flow meters, with shut off valves, and two 0–100 psig pressure gauges. The divers exhaust hose connects to the topside exhaust system via a ½" brass quick connect. The exhaust enters the adjustable back pressure regulator and is regulated according to the depth and divers' breathing rate as shown on the flow meters.

In addition, the flow meter system allows for the calculation of the diver's respiratory work rate which can be useful for planning air usage. By always beginning the dive with zero back pressure and adjusting for optimal back pressure based on depth and flow optimizes for low exhalation effort, this minimizes possible gas from escaping from the valve in the over pressure relief valve and Water Purge Assembly.

1.12.1.2 Calculating Work of Breathing

As previously mentioned, the topside back pressure exhaust system is not necessary for minimizing exhaust pressure at depths less than 100 fsw (30 msw), however depending on the diver's respiratory work rate, it can be used starting at depths of 30 fsw to monitor the divers RMV.

As an example, a diver is at a depth of 60 fsw (18 msw) the exhaust flow on the flow meter shows a flow of between 75–95 lpm. The console operator checks the exhaust table and selects the closest depth to the diver's depth and the peak flow, then slowly adjusts the regulator for a back pressure according to the reading on the chart. With the flow meter showing a flow between 75–95 lpm and taking the high number, 95 lpm and dividing it by the depth in ATA (2.8), it will give the respiratory work rate of the diver also known as RMV. The calculation will look like this:
Depth (60 fsw +33 fsw) ÷ 33 = 2.8 ATA.
(95 lpm ÷ 2.8 ATA) = 33.9 RMV. The result is the diver's work of breathing is 33.9 respiratory minute volume which is considered to be in the heavy work category.

1.12.2 Instructions

Step 1
Determine Depth

Step 3
Find the closest matching flow reading from the table

110	33.5	4.33	Flow LPM	45–65	85–110	115–150	150–185	180–235	230–290	280–350
			BP (psig)	26–28	30–32	31–35	32–36	34–39	36–41	37–41

Step 2
Take the average reading from your flow meter. Example is 180 to 210. The average flow is 195

Step 4
Recommended Back Pressure Regulator Setting

1.12.3 Abbreviations and Formulas

Abbreviations

ATA – Atmospheres Absolute
FSW – Feet Sea Water
LPM – Liters Per Minute
MSW – Meter Sea Water
RMV – Respiratory Minute Volume

Formulas

(Depth + 33) ÷ 33 = ATA
FSW ÷ 3.28 = MSW
LPM ÷ ATA = RMV

To calculate RMV with the greatest accuracy, simply take the highest and lowest flow reading, add them together, then divide by 2. Take the result and divide by the diver's depth in ATA.

1.12.4 Table

FSW	MSW	ATA	BP-Back Pressure (psig) LPM-Liters Per Minute	RMV 10–15	RMV 20–24	RMV 30–34	RMV 37–40	RMV 48–50	RMV 60–63	RMV 73–75
10	3	1.3	Flow LPM	n/a*	n/a*	n/a*	40–60	35–90	55–105	70–120
			BP (psig)	n/a*	n/a*	n/a*	1–2	1–2	1–2	1–2
20	6.09	1.6	Flow LPM	n/a*	n/a*	35–65	40–80	55–100	80–120	105–135
			BP (psig)	n/a*	n/a*	1–2	1–2	1–2	2–3	3–5
30	9.1	1.9	Flow LPM	n/a*	30–55	50–75	55–90	75–110	100–130	115–160
			BP (psig)	n/a*	1–2	2–3	2–3	3–4	3–5	4–6
40	12.2	2.21	Flow LPM	10–40	40–60	45–80	70–95	90–125	120–150	140–180
			BP (psig)	2–3	3–4	4–5	4–6	5–7	6–8	7–9
50	15.2	2.51	Flow LPM	15–45	50–70	70–85	85–105	110–135	140–170	170–200
			BP (psig)	3–4	4–6	5–7	5–8	7–9	8–13	9–13
60	18.3	2.82	Flow LPM	25–45	55–70	75–95	95–120	125–150	155–185	190–230
			BP (psig)	5–7	7–9	9–10	9–12	11–14	11–14	15–18
70	21.3	3.12	Flow LPM	30–45	65–80	85–105	110–130	135–170	170–210	200–250
			BP (psig)	7–8	10–13	13–14	13–17	15–18	15–20	16–20
80	24.4	3.42	Flow LPM	35–50	70–85	90–110	120–145	150–190	185–225	225–275
			BP (psig)	11–13	14–16	16–18	17–19	18–22	20–23	21–24
90	27.4	3.72	Flow LPM	35–55	75–95	100–125	125–155	150–200	200–245	245–300
			BP (psig)	17–20	21–24	22–25	24–28	26–30	27–31	27–33
100	30.5	4.03	Flow LPM	40–60	80–105	110–135	135–170	170–220	220–260	260–330
			BP (psig)	22–24	25–28	28–31	28–32	29–33	33–36	31–37
110	33.5	4.33	Flow LPM	45–65	85–110	115–150	150–185	180–235	230–290	280–350
			BP (psig)	26–28	30–32	31–35	32–36	34–39	36–41	37–41
120	36.6	4.63	Flow LPM	56–65	90–120	120–155	150–200	200–250	250–320	300–380
			BP (psig)	29–32	32–35	34–37	35–40	37–43	39–44	39–45
130	39.6	4.93	Flow LPM	50–75	95–130	130–170	165–210	210–270	270–340	320–400
			BP (psig)	32–35	36–40	39–42	39–43	42–47	44–48	44–50
140	42.7	5.24	Flow LPM	55–80	100–135	145–170	170–220	220–290	280–350	340–425
			BP (psig)	33–35	38–41	40–44	42–45	43–48	45–50	45–51
150	46	5.55	Flow LPM	55–80	110–145	145–190	170–240	230–310	300–380	355–450
			BP (psig)	37–40	41–44	44–47	43–49	47–51	50–56	50–57

FSW	MSW	ATA	BP-Back Pressure (psig) LPM-Liters Per Minute	RMV 10–15	RMV 20–24	RMV 30–34	RMV 37–40	RMV 48–50	RMV 60–63	RMV 73–75
160	49	5.84	Flow LPM	55–75	110–150	150–195	190–250	240–320	310–390	370–470
			BP (psig)	38–41	42–45	43–45	45–50	48–51	49–54	51–58
165	50.3	6	Flow LPM	60–85	115–155	155–205	195–260	245–330	320–410	380–480
			BP (psig)	41–43	44–48	47–50	49–53	50–55	53–59	54–60

*At this depth and RMV flow accuracy cannot be accurately determined.

Troubleshooting

1.1 General

Kirby Morgan diving helmets and BandMasks® are highly reliable life support equipment which should not malfunction if proper preventative maintenance procedures are followed. Most problems encountered in using the equipment can be easily remedied. The following information covers most potential operating difficulties.

1.2 Communication Malfunction

VIDEO

How To Install an Earphone and Microphone on Communications Module (MWPC)

https://www.youtube.com/watch?v=Eo4qqT7xrCA

VIDEO

How To Install an Earphone and Microphone on Communications Module (Two Wire Post)

https://www.youtube.com/watch?v=IfurxrQ5yY8

Symptoms	Probable Cause	Remedy
No sound at either communications box or helmet.	**Communications box not on.**	**Activate switch and adjust volume.**
	Communications incorrectly hooked up.	Switch terminal wires.
	Communications not hooked up.	Plug into terminals.
	Communicator not functional.	Replace communicator.
	Broken/damaged comm wire	Check continuity replace wire or umbilical.
	Battery dead	Recharge / use alternate D.C. source
Communications weak or broken up.	Terminals in communications module corroded.	Clean terminals with wire brush. Terminals should be bright, shiny metal.
	Battery weak.	Recharge / use alternate D.C. source
	Loose wire.	Clean and repair.
Communications only work when wire is wiggled back and forth.	Break in diver's communication wire.	Splice wire if damage is minor. Replace wire if damage is major.
Communications only work when connector is wiggled back and forth.	Break in waterproof connector.	If connector is suspect, remove from line and test line for integrity prior to replacing connector.
Diver speech weak or can't be heard.	Microphone in helmet dead or damaged.	Replace microphone as per manual.

1.3 One Way Valve Malfunction

VIDEO

How To Check The One Way Valve

https://www.youtube.com/watch?v=hxoLiqpbtW8

Symptoms	Probable Cause	Remedy
One way valve allows back-flow.	Foreign matter in valve.	Disassemble valve, clean and rebuild. Replace if needed.
One way valve doesn't flow any gas.	Foreign matter in valve.	Disassemble valve, clean and rebuild. Replace if needed.

1.4 Side Block Malfunction

Symptoms	Probable Cause	Remedy
Steady flow can't be shut off. Helmet free flows through defogger.	Seat assembly damaged or debris under seat.	Clean and/or replace seat assembly. Check - clean side block seal area.
	Side Block damaged by debris	Replace side block.
Steady flow valve will not flow gas.	No air in umbilical.	Turn air on to diver's supply topside.
	Foreign matter in side block or one way valve.	Disassemble side block one way valve and clean.
Steady flow valve knob hard to turn.	Valve stem bent.	Replace valve stem.

1.5 Water Leakage Into Helmet

Symptoms	Probable Cause	Remedy
Water leakage into helmet.	Exhaust valve damaged or stuck open.	Seat or replace valve.
	Communications module O-ring extruded or damaged.	Replace O-ring.
	Communications module not properly tightened.	Tighten module mount nut.
	Communications module damaged.	Replace.
	Binding posts or connector seal damaged.	Remove posts, clean and reseal with RTV sealant.
	Diaphragm damaged or not seated properly.	Seat or replace diaphragm.
	O-ring in neck dam ring damaged or missing.	Replace O-ring.
	Port retainer screws loose.	Tighten screws.
	Neck dam torn or damaged.	Replace neck dam.
	Hair caught between O-ring and base of helmet.	Remove hair from this space.
	Head cushion or chin strap caught under O-ring at neck dam.	Clear cushion or dam
	Regulator assembled improperly.	Check for proper assembly.
	Damaged gasket	Replace gasket

1.6 Demand Regulator Malfunction

Symptoms	Probable Cause	Remedy
Regulator continuously free flows.	Adjustment knob not screwed in.	Screw in adjustment knob.
	Bent tube damaged causing misalignment of nipple tube.	Check the inlet nipple and soft seat. Replace as necessary.
	Supply pressure too high.	Adjust supply pressure lower than 225 p.s.i. over ambient.
	Regulator out of adjustment.	Adjust regulator
Regulator continuously free flows when underwater only.	Neck dam turned down, or too large for divers neck.	Neck dam must be turned up. Replace neck dam with proper size.
	Hair caught between O-ring and base of helmet.	Clean hair out.
	Neck dam torn.	Repair or replace neck dam.
	Poor seal in neck dam ring Assembly	Replace O-rings
Regulator is hard breathing.	Adjustment knob screwed too far in.	Screw adjustment knob out.
	Supply pressure too low.	Increase supply pressure.
	Regulator improperly set up.	
Regulator does not supply gas.	Gas supply pressure too low.	Increase supply pressure to minimum required for depth.
	Regulator is out of adjustment.	Adjust regulator
	No gas in umbilical	Turn diver's gas supply on topside.
	Blockage in breathing system.	Disassemble regulator, clean, and adjust.

1.7 Emergency Gas Supply Valve

Symptoms	Probable Cause	Remedy
Bail-out bottle drained without diver opening EGS valve	Stem fails to seat in valve body.	Replace EGS valve body.
	Debris under seat causing leakage.	Service valve.
	Leaking over-pressure relief valve on bail-out regulator.	Service valve.
	Leaking bail-out regulator on bottle.	Service regulator.
	Leak in supply line 1st stage	Service regulator.
Knob difficult to turn.	Stem bent.	Replace stem.

Valve will not flow gas.	Foreign matter in valve.	Disassemble, clean, and reassemble.
	Stripped control knob.	Replace knob.

Torque Specs

1.1 SL 17B Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
4	530-090	Screw, Alignment	35–50 *Loctite® 222/248*	4–5.6 *Loctite® 222/248*
8	555-154	Bent Tube Assembly, Side Block End	100	11.3
12	530-032	Screw, Main Exhaust Body	6 RTV Sealant	0.67 RTV Sealant
15	530-070	Screw, Handle	35 RTV Sealant	4 RTV Sealant
18	530-040	Screw, Handle	12	1.3
20	530-050	Screw, Side Block	20	2.25
23	530-317	Nut, Air Train (Inner)	35	4
26	530-317	Nut, Air Train (Outer)	15	1.6
27	530-052	Screw, Port Retainer Plug	20	2.25
28	530-035	Screw, Port Retainer	12	1.3
29	550-062	Knob, Nose Block	*Tighten to bottom out*	
32	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
43	530-019	Screw, Quad Exhaust	12	1.3
56	530-045	Screw, Whisker Kidney Plate	12	1.3
62	530-070	Screw, For Mounting Weights And Chin Strap	35 RTV Sealant	4 RTV Sealant
64	530-078	Screw, For Mounting Weights	35 RTV Sealant	4 RTV Sealant
67	530-308	Nut, Communications Posts	*Snug—DO NOT overtighten* RTV Sealant	
84	550-038	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads

1.2 SL 17C Torque Tables

Loc. #	Part #	Description	Torque in inch pounds	Torque in Newton Meters
9	555-154	Bent Tube Assembly, Side Block End	100	11.3
3 and 13	530-070	Screw, Top Weight	35	4
14	530-035	Screw, Water Dump Body	6 RTV Sealant	0.67 RTV Sealant
15	530-070	Screw, Port Weight	35	4
18	530-078	Screw, Top Weight	35	4
19	530-040	Screw, Bracket	12	1.3
22	530-062	Screw, Rear Handle And Bracket	35	4
26	530-045	Screw, Handle	12	1.3
28	530-050	Screw, Side Block	20	2.25
31	530-317	Nut, Air Train (Inner)	35	4
34	530-317	Nut, Air Train (Outer)	15	1.6
35	530-052	Screw, Port Retainer Plug	20	2.25
36	530-035	Screw, Port Retainer	12	1.3
37	550-062	Knob, Nose Block	*Tighten to bottom out*	
40	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
46	530-015	Screw, Pull Pin	*Apply Loctite® 222/248 to the threads and install the screw until the head is bottomed out, just snug.*	
48	530-032	Screw, Swing Catch Spring	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
49	530-059	Screw, Front Standoff	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
55	530-019	Screw, Water Dump Cover (Exhaust)	12	1.3
69	530-045	Screw, Kidney Plate	12	1.3
74	530-035	Screw, Swing Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
79	530-045	Screw, Swing Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
83	530-018	Screw	24 *Loctite® 222/248*	2.7 *Loctite® 222/248*
89	530-064	Screw, Neck Pad	*Snug—to no movement of pad*	
113	550-081	Nut Regulator Mount	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
117	530-018	Screw, Earphone Retainer	16	1.8
120	530-031	Screw, Chin Strap	14	1.6

1.3 SL 27 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
7	555-154	Bent Tube Assembly, Side Block End	100	11.3
10	530-070	Screw, Port Weight	35	4
13	530-078	Screw, Rear Weight, SL 27	35 RTV Sealant	4 RTV Sealant
16	530-070	Screw, Handle	35 RTV Sealant	4 RTV Sealant
20	530-045	Screw, Handle	12	1.3
22	530-050	Screw, Side Block	20	2.25
25	530-317	Nut, Air Train (Inner)	35	4
28	530-317	Nut, Air Train (Outer)	15	1.6
30	530-062	Screw, Port Weight	20–35	2.25–4
31	530-052	Screw, Port Retainer Plug	20	2.25
32	530-035	Screw, Port Retainer	12	1.3
33	550-062	Knob, Nose Block	*Tighten to bottom out*	
36	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
41	530-015	Screw, Helmet Ring, Sealed Pull Pin	*Apply Loctite® 222/248 to the threads and install the screw until the head is bottomed out, just snug.*	
44	530-059	Screw, Front Standoff	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
46	530-032	Screw, Water Dump Body	6 RTV Sealant	0.67 RTV Sealant
65	530-045	Screw, Whisker Kidney Plate	12	1.3
70	530-035	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
75	530-045	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
83	530-064	Screw, Neck Pad	*Snug—to no movement of pad*	
98	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
102	530-018	Screw, Earphone Retainer	16	1.8
105	530-031	Screw, Chin Strap	14	1.5

1.4 KM 37 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque Newton Meters
7	555-154	Bent Tube Assembly, Side Block End	100	11.3
11	530-070	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
12	530-032	Screw, Water Dump Body	6 RTV Sealant	0.67 RTV Sealant
13	530-070	Screw, Top Weight (Handle)	20	2.25
13	530-070	Screw, Port Weight	35 RTV Sealant	4 RTV Sealant
16	530-078	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
19	530-078	Screw, Top Weight (Outer)	20 RTV Sealant	2.25 RTV Sealant
23	530-045	Screw, Handle	12	1.3
25	530-050	Screw, Side Block	20	2.25
28	530-317	Nut, Air Train (Inner)	35	4
31	530-317	Nut, Air Train (Outer)	15	1.6
33	530-062	Screw, Port Weight	20–35	2.25–4
34	530-052	Screw, Port Retainer Plug	20	2.25
35	530-035	Screw, Port Retainer	12	1.3
36	550-062	Knob, Nose Block	*Tighten to bottom out*	
39	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
44	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 222/248 to the threads and install the screw until the head is bottomed out, just snug.*	
46	530-032	Screw, Swing Catch Spring	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
47	530-059	Screw, Front Standoff	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
53	530-019	Screw, Quad Exhaust Cover	12	1.3
67	530-045	Screw, Whisker Kidney Plate	12	1.3
72	530-035	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
77	530-045	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
85	530-064	Screw, Neck Pad	*Snug—to no movement of pad*	
100	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads

1.4 KM 37 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque Newton Meters
104	530-018	Screw, Earphone Retainer	16	1.8
107	530-031	Screw, Chin Strap	14	1.5

1.5 KM 37SS Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
6	530-058	Screw, Handle Rear	15 *Loctite® 248*	1.7 *Loctite® 248*
8	530-078	Screw, Handle Grip	15 *Loctite® 248*	1.7 *Loctite® 248*
15	530-059	Screw, Handle Front	15 *Loctite® 248*	1.7 *Loctite® 248*
19	530-083	Screw, Side Block	35	4
23	530-317	Nut, Air Train Assembly	35	4
25	530-059	Screw, Port Retainer	15 *Loctite® 248*	1.7 *Loctite® 248*
26	550-566	Adaptor, Port Retainer Plug	15 *Loctite® 248*	1.7 *Loctite® 248*
27	530-052	Screw, Port Retainer Plug	15	1.7
28	550-062	Knob, Nose Block	*Tighten to bottom out*	
31	550-577	Nose Block Guide	15 *Loctite® 248*	1.7 *Loctite® 248*
36	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
64	530-070	Screw, Whisker Kidney Plate/Anode	15 *Loctite® 248*	1.7 *Loctite® 248*
74	530-032	Screw, Tongue Catch Spring	12 *Loctite® 248*	1.3 *Loctite® 248*
75	530-035	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
82	530-045	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
90	530-037	Screw, Earphone Retainer	10 *Loctite® 248*	1.1 *Loctite® 248*
90	530-037	Screw, Snap Tab	10 *Loctite® 248*	1.13 *Loctite® 248*
94	530-059	Screw, Front Standoff	15 *Loctite® 248*	1.7 *Loctite® 248*
97	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 248 to the threads and install the screw until the head is bottomed out, just snug.*	
106	555-154	Bent Tube, Side Block End	100	11.3
not numbered	530-037	Screw, Chin Strap Assembly	6 *Loctite® 248*	0.67 *Loctite® 248*

1.6 KM 47 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
9	550-372	Regulator Mount Nut	80 Christo-Lube® or equivalent on regulator threads	9 Christo-Lube® or equivalent on regulator threads
14	555-167	Bent Tube Assembly, Side Block End	100	11.3
14	555-167	Bent Tube, Regulator End	40	4.5
18	530-070	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
20	530-070	Screw, Handle	35	4
20	530-070	Screw, Port Weight	35 RTV Sealant	4 RTV Sealant
23	530-078	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
26	530-078	Screw, Top Weight (Outer)	20 RTV Sealant	2.25 RTV Sealant
30	530-045	Screw, Handle	12	1.3
32	530-050	Screw, Side Block	20	2.25
35	530-317	Nut, Air Train (Inner)	35	4
38	530-317	Nut, Air Train (Outer)	15	1.6
40	530-062	Screw, Port Weight	20	2.25
41	530-052	Screw, Port Retainer Plug	20	2.25
42	530-035	Screw, Port Retainer	12	1.3
43	550-062	Knob, Nose Block	*Tighten to bottom out*	
46	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
51	530-015	Screw, Pull Pin	*Apply Loctite® 222/248 to the threads and install the screw until the head is bottomed out, just snug.*	
55	530-045	Screw, Whisker, Kidney Plate	12	1.3
57	530-032	Screw, Tongue Catch Spring	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
58	530-059	Screw, Front Standoff	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
63	530-035	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
68	530-045	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
76	550-113	Screw, Neck Pad	*Snug—to no movement of pad*	
88	530-018	Screw, Earphone Retainer	16	1.8
91	530-031	Screw, Chin Strap	14	1.5

1.7 KM 57 Torque Table

Loc. #	Part #	Description	Torque in Inch Pounds	Torque Newton Meters
7	555-154	Bent Tube Assembly, Side Block End	100	11.3
11	530-070	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
12	530-032	Screw, Water Dump Body	6 RTV Sealant	0.67 RTV Sealant
13	530-070	Screw, Top Weight (Handle)	20	2.25
13	530-070	Screw, Port Weight	35 RTV Sealant	4 RTV Sealant
16	530-078	Screw, Top Weight	35 RTV Sealant	4 RTV Sealant
19	530-078	Screw, Top Weight (Outer)	20 RTV Sealant	2.25 RTV Sealant
23	530-045	Screw, Handle	12	1.3
25	530-050	Screw, Side Block	20	2.25
28	530-317	Nut, Air Train (Inner)	35	4
31	530-317	Nut, Air Train (Outer)	15	1.6
33	530-062	Screw, Port Weight	20–35	2.25–4
34	530-052	Screw, Port Retainer Plug	20	2.25
35	530-035	Screw, Port Retainer	12	1.3
36	550-062	Knob, Nose Block	*Tighten to bottom out*	
39	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
44	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 222/248 to the threads and install the screw until the head is bottomed out, just snug.*	
45	530-032	Screw, Swing Catch Spring	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
51	530-019	Screw, Quad Exhaust Cover	12	1.3
66	530-045	Screw, Whisker Kidney Plate	12	1.3
71	530-035	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
76	530-045	Screw, Tongue Catch	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
84	530-064	Screw, Neck Pad	*Snug—to no movement of pad*	
99	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
103	530-018	Screw, Earphone Retainer	16	1.8
106	530-031	Screw, Chin Strap	14	1.5

1.8 KM 77 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
6	530-058	Screw, Handle Rear	15 *Loctite® 248*	1.7 *Loctite® 248*
8	530-078	Screw, Handle Grip	15 *Loctite® 248*	1.7 *Loctite® 248*
15	530-059	Screw, Handle Front	15 *Loctite® 248*	1.7 *Loctite® 248*
19	530-083	Screw, Side Block	35	4
23	530-317	Nut, Air Train Assembly	35	4
25	530-059	Screw, Port Retainer	15 *Loctite® 248*	1.7 *Loctite® 248*
26	550-566	Adapter, Port Retainer Plug	20 *Loctite® 248*	2.25 *Loctite® 248*
27	530-052	Screw, Port Retainer Plug	15 *Loctite® 248*	1.7 *Loctite® 248*
28	550-062	Knob, Nose Block	*Tighten to bottom out*	
31	550-577	Nose Block Guide	15 *Loctite® 248*	1.7 *Loctite® 248*
42	550-372	Regulator Mount Nut	80 Christo-Lube® or equivalent on regulator threads	9 Christo-Lube® or equivalent on regulator threads
56	530-070	Screw, Whisker Kidney Plate/ Anode	15 *Loctite® 248*	1.7 *Loctite® 248*
59	530-032	Screw, Tongue Catch Spring	12 *Loctite® 248*	1.3 *Loctite® 248*
60	530-035	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
67	530-045	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
75	530-037	Screw, Earphone Retainer	10 *Loctite® 248*	1.1 *Loctite® 248*
75	530-037	Screw, Snap Tab	10 *Loctite® 248*	1.13 *Loctite® 248*
79	530-059	Screw, Front Standoff	15 *Loctite® 248*	1.7 *Loctite® 248*
82	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 248 to the threads and install the screw until the head is bottomed out, just snug.*	
91	555-167	Bent Tube, Side Block End	100	11.3
not numbered	530-037	Screw, Chin Strap Assembly	6 *Loctite® 248*	0.67 *Loctite® 248*

1.9 KM 97 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
6	530-058	Screw, Handle Rear	15 *Loctite® 248*	1.7 *Loctite® 248*
8	530-078	Screw, Handle Grip	15 *Loctite® 248*	1.7 *Loctite® 248*
15	530-059	Screw, Handle Front	15 *Loctite® 248*	1.7 *Loctite® 248*
19	530-083	Screw, Side Block	35	4
23	530-317	Nut, Air Train Assembly	35	4
25	530-059	Screw, Port Retainer	15 *Loctite® 248*	1.7 *Loctite® 248*
26	550-566	Adapter, Port Retainer Plug	20 *Loctite® 248*	2.25 *Loctite® 248*
27	530-052	Screw, Port Retainer Plug	15	1.7
28	550-062	Knob, Nose Block	*Tighten to bottom out*	
31	550-577	Nose Block Guide	15 *Loctite® 248*	1.7 *Loctite® 248*
36	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
63	530-070	Screw, Anode	15 *Loctite® 248*	1.7 *Loctite® 248*
73	530-032	Screw, Tongue Catch Spring	12 *Loctite® 248*	1.3 *Loctite® 248*
74	530-035	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
81	530-045	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
93	530-059	Screw, Front Standoff	15 *Loctite® 248*	1.7 *Loctite® 248*
89	530-037	Screw, Earphone Retainer	10 *Loctite® 248*	1.1 *Loctite® 248*
89	530-037	Screw, Snap Tab	10 *Loctite® 248*	1.13 *Loctite® 248*
96	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 248 to the threads and install the screw until the head is bottomed out, just snug.*	
105	555-154	Bent Tube, Side Block End	100	11.3
not numbered	530-037	Screw, Chin Strap Assembly	6 *Loctite® 248*	0.67 *Loctite® 248*

1.10 KM Diamond Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
500-710/500-711 KM Diamond				
9	530-058	Screw, Handle Rear	15 *Loctite® 248*	1.7 *Loctite® 248*
11	530-078	Screw, Handle Grip	15 *Loctite® 248*	1.7 *Loctite® 248*
18	530-059	Screw, Handle Front	15 *Loctite® 248*	1.7 *Loctite® 248*
23	530-059	Screw, Port Retainer	15 *Loctite® 248*	1.7 *Loctite® 248*
24	550-566	Adapter, Port Retainer Plug	20 *Loctite® 248*	2.25 *Loctite® 248*
25	530-052	Screw, Port Retainer Plug	15	1.7
29	550-062	Knob, Nose Block	*Tighten to bottom out*	
32	550-577	Nose Block Guide	15 *Loctite® 248*	1.7 *Loctite® 248*
35	530-074	Screw, SBV	30 *Loctite® 248*	3.38 *Loctite® 248*
38	530-059	Screw, SBV Bracket	20 *Loctite® 248*	2.26 *Loctite® 248*
41	530-076	Screw, SBV Bracket	30 *Loctite® 248*	3.38 *Loctite® 248*
45	530-317	Nut, Air Train Assembly	35	4
46	530-083	Screw, Side Block	35	4
50	530-032	Screw, Tongue Catch Spring	12 *Loctite® 248*	1.3 *Loctite® 248*
52	530-059	Screw, Front Standoff	15 *Loctite® 248*	1.7 *Loctite® 248*
91	530-059	Screw, Pod Mounting (Inside)	30	3.38
93	530-035	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
98	530-045	Screw, Tongue Catch	20 *Loctite® 248*	2.25 *Loctite® 248*
101	530-037	Screw, Earphone Retainer	10 *Loctite® 248*	1.1 *Loctite® 248*
101	530-037	Screw, Snap Tab	10 *Loctite® 248*	1.13 *Loctite® 248*
122	530-015	Screw, Pull Pin Assembly	*Apply Loctite® 248 to the threads and install the screw until the head is bottomed out, just snug.*	
136	555-154	Bent Tube, Side Block End	100	11.3
not numbered	530-037	Screw, Chin Strap Assembly	6 *Loctite® 248*	0.67 *Loctite® 248*

1.10 KM Diamond Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
		505-373 Regulator Cover Assembly		
27	530-099	Cover Retainer Screw	18	1.3
28	550-074	Bishop Pin	20	2.26
		505-375 Surface Bypass Valve Assembly		
1	550-616	Hose Fitting Adapter ½" NPT	60	6.78
24	550-617	Adapter Nipple	60	6.78
		505-400 Diamond Exhaust Assembly		
2	830-015	Screw, Split Retainer	20	2.26
22	530-309	Cap Screw	20	2.26
23	550-618	Adapter Outlet	60	6.78
		505-752 Diamond Main Tube		
14	550-567	Adjustment packing Nut	60	6.78
87	550-533	Bent Tube Adapter	60	6.78

1.11 KMB 18 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
7	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
11 *See note 2*	530-095 530-097	Screw, Band Adjustment Screw, Band Adjustment, Brass	26 *See note 2*	2.94 *See note 2*
15	530-060	Comfort Insert Screw	6	0.68
18	530-317	Nut, Air Train (Inner)	35	4
20	530-317	Nut, Air Train (Outer)	15	1.6
24	530-050	Screw, Side Block	20	2.25
28	530-073	Screw,Band Keeper	12	1.3
33	530-052	Screw, Port Retainer Plug	20	2.25
34	530-073	Screw,Band Keeper	12	1.3
37	530-035	Screw, Port Retainer	12	1.3
38	550-062	Knob, Nose Block	*Tighten to bottom out*	
41	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
42	530-045	Screw, Whisker Kidney Plate	12	1.3
60	530-035	Screw, Water Dump	6 RTV Sealant	0.67 RTV Sealant
62	555-154	Bent Tube Assembly, Side Block End	100	11.3

1.12 KMB 28 Torque Tables

Loc. #	Part #	Description	Torque in Inch Pounds	Torque in Newton Meters
7	550-081	Regulator Mount Nut	75 Christo-Lube® or equivalent on regulator threads	8.5 Christo-Lube® or equivalent on regulator threads
11 *See note 2*	530-095 530-097	Screw, Band Adjustment Screw, Band Adjustment, Brass	26 *See note 2*	2.94 *See note 2*
18	530-317	Nut, Air Train (Outer)	15	1.6
20	530-317	Nut, Air Train (Inner)	35	4
22	530-050	Screw, Side Block	20	2.25
26	530-073	Screw,Band Keeper	12	1.3
31	530-052	Screw, Port Retainer Plug	20	2.25
32	530-073	Screw,Band Keeper	12	1.3
35	530-035	Screw, Port Retainer	12	1.3
36	550-062	Knob, Nose Block	*Tighten to bottom out*	
39	550-116	Nose Block Guide	15 *Loctite® 222/248*	1.7 *Loctite® 222/248*
40	530-045	Screw, Whisker Kidney Plate	12	1.3
58	555-154	Bent Tube Assembly, Side Block End	100	11.3

1.13 Side Block Torque Specifications

Stainless Steel Side Block Torque Specifications

1	555-117	Adapter, Brass (Umbilical)	See Note 1	See Note 1
2	555-195	One Way Valve Seat	150	17
8	555-195	One Way Valve Body	150	17
11	550-046	Inlet Nipple, EGS Valve	40	4.5
15	350-060	Low Pressure Plug, Large	20	2.25
18	550-178	Stud	20 *Loctite® 248*	2.25 *Loctite® 248*
24	550-568	Bonnet, Steady Flow Valve	100	11.3
29	550-564	Side Block Bent Tube Adapter	100 *Loctite® 248*	11.3 *Loctite® 248*
31	550-095	L.P. Plug, w/O-ring	20	2.25
38	550-551	Bonnet, EGS Valve	100	11.3

Brass Side Block Torque Specifications

1	555-117	Adapter, Brass	See Note 1	See Note 1
2	555-195	Seat, One Way Valve	150	17
8	555-195	Body, One Way Valve	150	17
12	550-024	Stud, Side Block	20 *Loctite® 222/248*	2.25 *Loctite® 222/248*
18	550-020	Bonnet, Steady Flow Valve	100	11.3
23	550-095	L.P. Plug, w/O-ring	20	2.25
25	550-140	Emergency Valve Body	See Note 1	See Note 1
29	550-091	Packing Nut	45 after seating	5.65 after seating

1.14 Regulator Torque Specifications

SuperFlow® Torque Specifications

1	550-050	Jam Nut, Regulator	40	4.5
2	550-048	Inlet Nipple, Regulator	40	4.5
3	550-046	Inlet Nipple, Regulator	40	4.5
17	550-055	Packing Nut, Regulator	40 after seating	4.52 after seating
27	530-030	Screw, Regulator Clamp	12	1.3

SuperFlow® 350 Torque Specifications

1	550-050	Jam Nut	40	4.5
2	550-048	Inlet Nipple	40	4.5
13	550-055	Packing Nut	40 after seating	4.5 after seating

23	530-030	Screw, Regulator Clamp	12	1.3
32	530-020	Screw, Exhaust Flange	10 *Loctite® 222/248*	1.13 *Loctite® 222/248*

SuperFlow® 450 Torque Specifications

1	550-050	Jam Nut, Regulator	40	4.5
2	550-533	Bent Tube Adapter, 450 Regulator	30	3.38
18	550-526	Packing Nut, 450 Regulator	30	3.3
30	530-052	Screw, 450 Regulator Cover	12	1.3

REX® Regulator Torque Specifications

8	350-025	Packing Nut, Regulator Knob	40	4.5
34	550-560	Adjustment Lock Nut, REX	40	4.5

455 Balanced Regulator Torque Specifications

17	550-567	Adjustment Packing Nut	60	6.78
31	530-099	Cover Retainer Screw	15–18	1.7–2
35	550-533	Bent Tube Adapter	60	6.78
36	550-050	Jam Nut	40	4.5

1.15 Communications Torque Specifications

Communications Torque Specifications

15	530-308	Nut, Communications Posts	*Snug—DO NOT overtighten* RTV Sealant	
21	550-040	Mount Nut, Communications Gland	20	2.25
27	555-178	Packing Nut, Waterproof Connector	20	2.25

1.16 Neck Ring Torque Specifications

Neoprene Neck Ring Assembly Torque Specifications

5	530-024*	Screw, Split Ring	14	1.6
6	530-022	Screw, Split Ring	14 *Loctite® 222/248*	1.6 *Loctite® 222/248*
7	530-220	Screw, Pull Strap	14	1.6

Neoprene <u>Stainless Steel</u> Neck Ring Assembly Torque Specifications

5	530-024*	Screw, Split Ring	14	1.6

6	530-022	Screw, Split Ring	14 *Loctite® 222/248*	1.6 *Loctite® 222/248*
7	530-220	Screw, Pull Strap	14	1.6

Latex Neck Ring Assembly Torque Specifications

6	530-018	Screw	24 *Loctite® 222/248*	2.7 *Loctite® 222/248*
7	530-024*	Screw	14	1.6
8	530-022	Screw	14 *Loctite® 222/248*	1.6 *Loctite® 222/248*
9	530-220	Screw, Pull Strap Plate	14 *Loctite® 222/248*	1.6 *Loctite® 222/248*

SL 17B Neck Clamp Yoke Assembly

5	530-320	Nut, Lock	50 ***Maximum***	5.7 ***Maximum***
7	530-066	Screw	20	2.25
19	530-080	Screw, Yoke	20	2.25
23	530-025	Screw, Rear Hinge Tab	25	2.8

1.17 Locking Collar Torque Specifications

Stainless Steel Locking Collar Torque Specifications

5	530-064	Screw, Neck Pad	*Snug—to no movement of pad*

1.18 Miscellaneous Torque Specifications

Miscellaneous Torque Specifications

—	200-017	Overpressure Relief Valve	20	2.25
—	530-210	Weld Lens Mount Bolt	23	2.6
—	555-210	Restrictor Adaptor	20	2.25

1.19 Notes on Torque Specifications

NOTE 1: Use Teflon® tape for two to two and a half wraps, starting two threads back from the pipe thread end of the fitting to avoid getting Teflon® tape in the valve. Tighten pipe thread using standard pipe threading procedures.

NOTE 2: Maximum torque, bands should have no less than an 1/8 inch even gap between the bands. On installation, a marine grade anti-seize may be used on this screw.

NOTE 3: Kirby Morgan recommends that torque tools be calibrated annually. (Allowable deviation: ±8%).

*The screws may need adjustment after several dives.

1.20 Checklist, Maintenance, and Pre-Dive Inspections

For the most current check lists, helmet and BandMask® maintenance procedures, and pre-dive inspections, please check on the internet at www.divelab.com.