Appendix to:

Bulkline 650 & 1000 Installation, Operating & Maintenance Instructions

DRUM

BULKLINE
650 & 1000 LNC

Low Noise Cooler Package

4990877002
September 2013

Gardner Denver

Form 1085

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EC Machinery Directive

2006/42/EC

DECLARATION OF INCORPORATION

Vehicle Discharge Equipment Comprising:

Machine Name:
Bulkline LNC (Low Noise Cooler) Package

Machine Assembly Number:
TW910188, TW910189

Machine Installation /Operating Instructions:
T-BA-4000/4050-3-GB-xx-xx & 4990877xxx

Is in conformity with the provisions of the following other EEC Directives:

N/A

Harmonised standards applied (including parts/clauses of):

N/A

The equipment above must not be put into service until the machinery into which it has been incorporated has been declared in conformity with the provisions of the directive.

Signed: B Thomas.

Date: 20TH JAN 2010.

Name: Barry Thomas

Position: Director Engineering (Gardner Denver Drum Ltd)
Being the responsible person appointed by the manufacturer.

See KP01 – 08 for information on completion

Contents

To be used in conjunction with the Bulkline 650 & 1000 machine instructions

Do not use in isolation

General

1.1 Health & Safety

Static electricity
Ensure, that where required, the compressor and ancillaries are earthed in accordance with BS5958 Part 1 1983; 'Control of Undesirable Static Electricity'. Powder-air combinations are potentially explosive.

Drive line
It is the responsibility of the installer of the equipment to ensure all rotating and moving parts of the installation are adequately guarded to a standard which complies with the prevailing safety legislation.

Compressor
The compressor has internal moving parts some of which may be accessed through the inlet and outlet apertures. Do not place any objects especially fingers into these apertures since personal injury could result.

Fire
The compressor includes seals made of fluoroelastomer polymers which degrade if exposed to temperatures above 300°C. If the material has been so exposed then it must not be handled with bare hands.

Relief Valve
A relief valve must be fitted in the outlet pipe work as close to the compressor as possible. The valve must be positioned so as not to vent air onto any personnel since the air discharged will be hot and can cause severe burns. The operation of the valve should be checked every month to clear the valve seat and check the valve is functional. (Ear protection is recommended)

Hot Surfaces
To avoid the risk of burns, do not touch pipework, compressor body or stand next to venting valves. If there is a risk for any reason we recommend the use of heat resistant gloves/clothing.

Noise
Prolonged exposure to noise should be avoided, it is recommended earplugs should be provided.

Lifting
The machine should be handled using correctly rated lifting equipment, and the method shown in this manual.

1 General

1.2 Product general description

The package is a fully assembled compressor and ancillary unit mounted on a common bracket. The unit produces air at low noise levels for discharging temperature sensitive dry bulk materials from road tankers. The configuration is designed for out-of-the box direct mounting to vehicle chassis. Depending on the specification, the unit may include a cooler and/or a full enclosure.

Hot and cold connections are provided at the front of the package and a rear 'cool-air' discharge kit is available as an option.

The assembly is designed to be driven directly from the PTO inside the chassis to make best use of the space available and facilitate prop shaft driving. Versions are available in clockwise (right hand) and anti clockwise (left hand) rotation.

The Bulkline 650/1000 LNC Package includes a cooler and an enclosure.

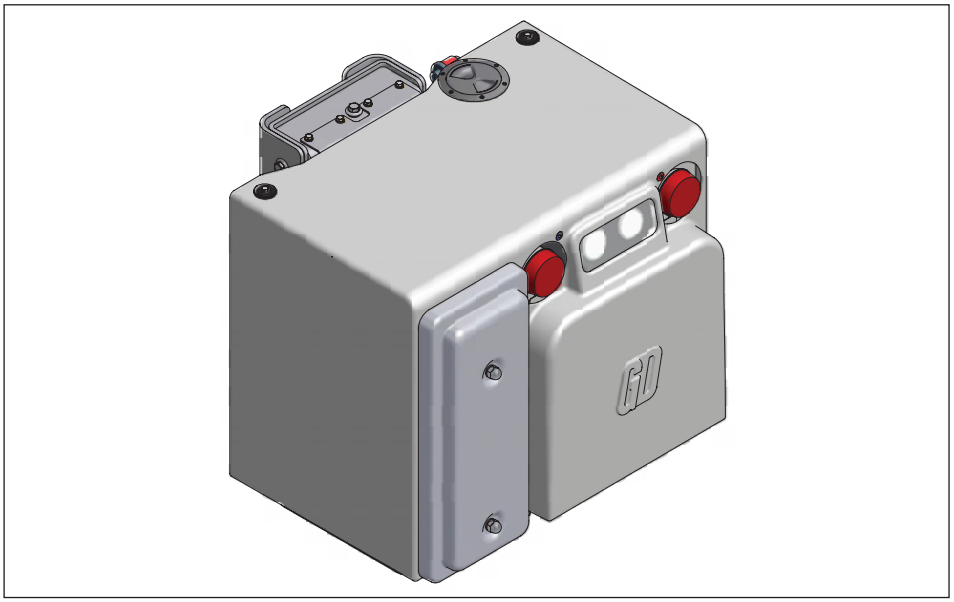


Figure 1a - Bulkline 650/1000 LNC Package Clockwise (Right Hand) Rotation

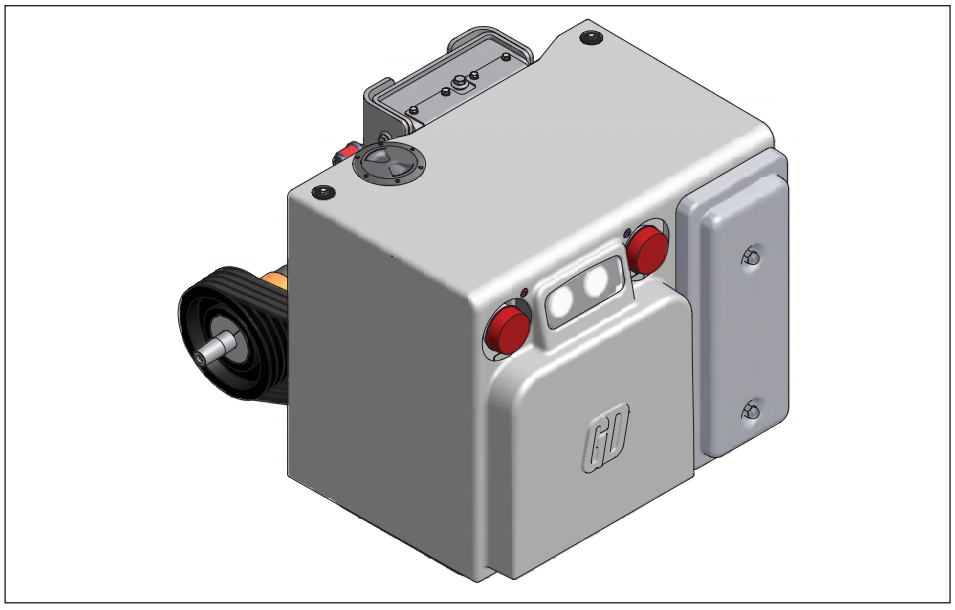


Figure 1b - Bulkline 650/1000 LNC Package Anti-Clockwise (Left Hand) Rotation

1.3 Package Components

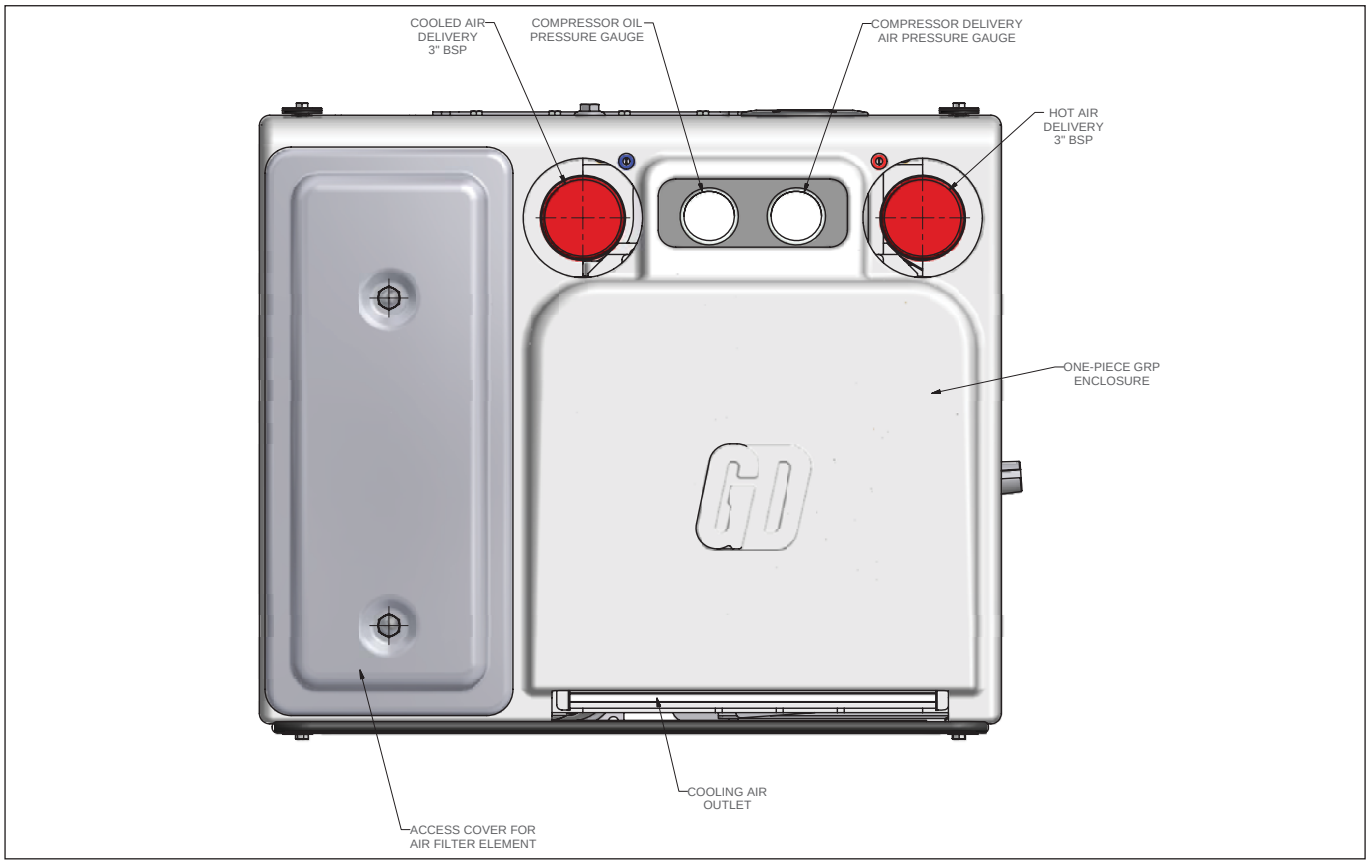


Figure 2a - Components Front View Clockwise (Right Hand) Rotation

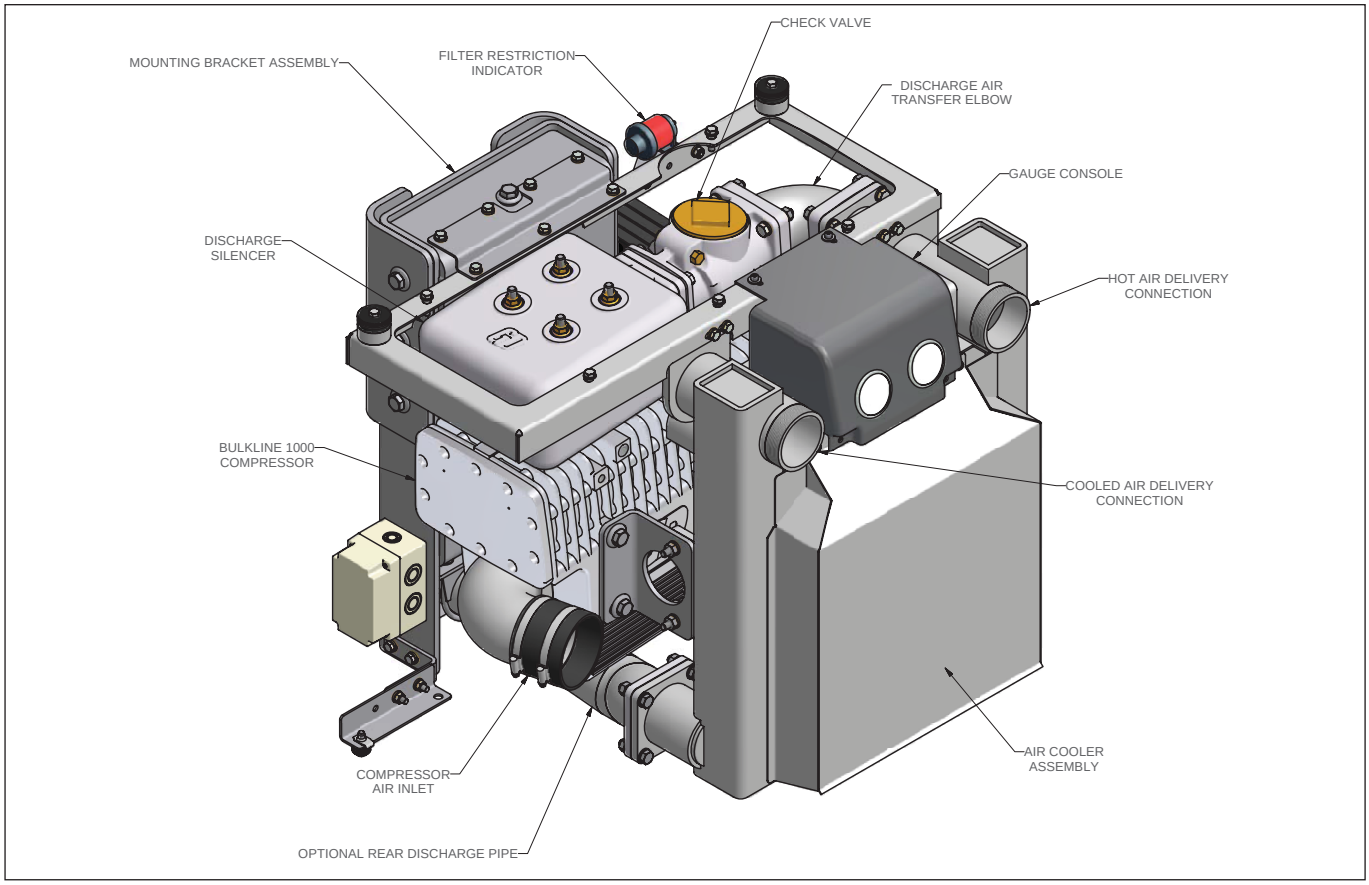


Figure 2b - Components Front Isometric View with Enclosure Removed Clockwise (Right Hand) Rotation

1.3 Package Components (Cont..)

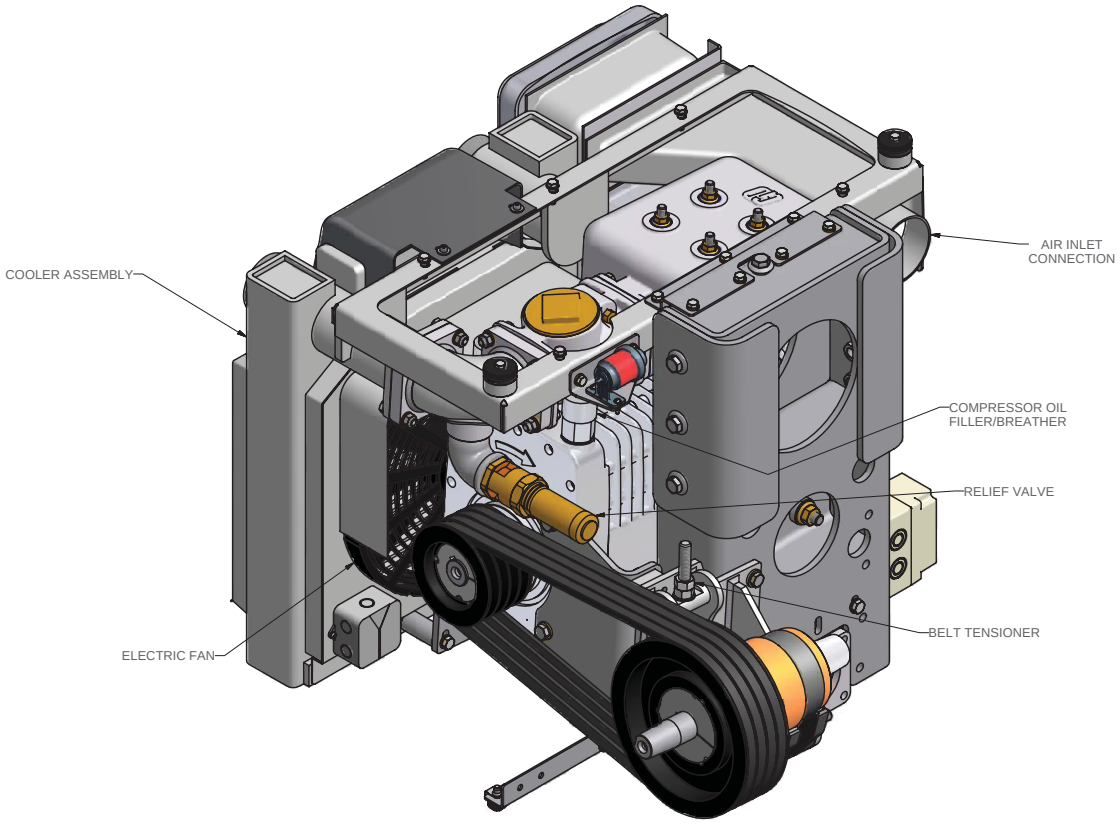


Figure 2c - Components Rear Isometric View with Enclosure Removed Clockwise (Right Hand) Rotation

1.4 Package Dimensions

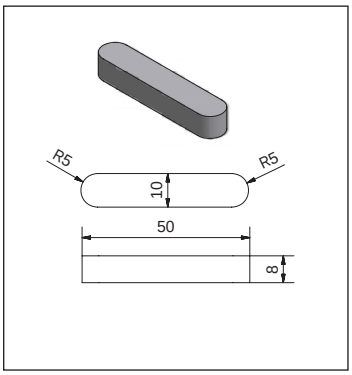


Figure 3a - Dimensions - Drive Shaft Key

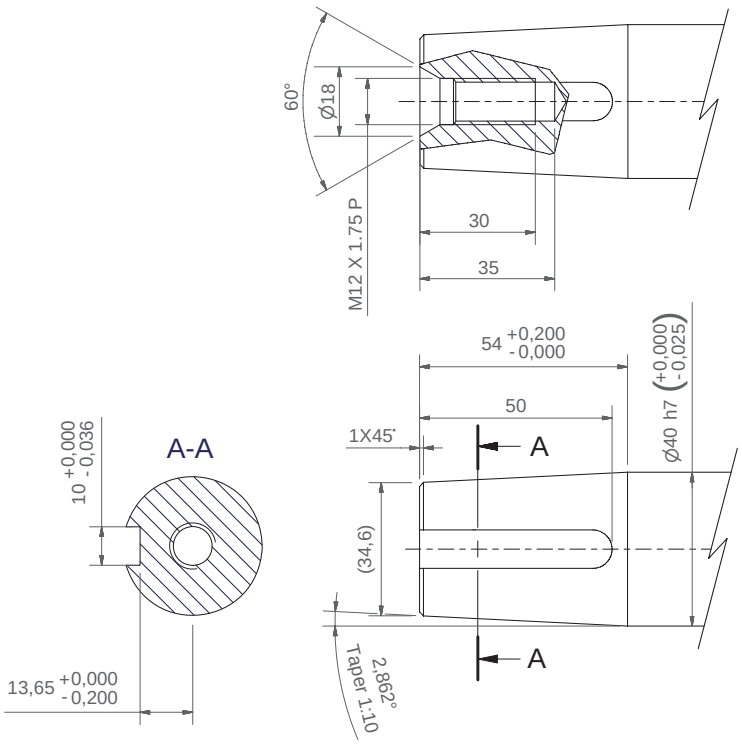


Figure 3b - Dimensions - Bulkline 650/1000 LNC Package Drive Shaft and Keyway

1.4 Package Dimensions (Cont..)

INPUT FLANGE CENTRE POSITIONS

RATIO	PULLEY DIA	PULLEY POS'N	BELT LENGTH	DIM "X"	DIM "Y"
1.79:1	250	HIGH	1500	181	429
1.79:1	250	HIGH	1550	206	437
2:1	280	HIGH	1500	156	426
2:1	280	HIGH	1550	181	428
2:1	280	HIGH	1590	201	437
1.79:1	250	LOW	1500	168	507
1.79:1	250	LOW	1550	192	513
2:1	280	LOW	1500	142	507
2:1	280	LOW	1550	168	507
2:1	280	LOW	1590	187	513

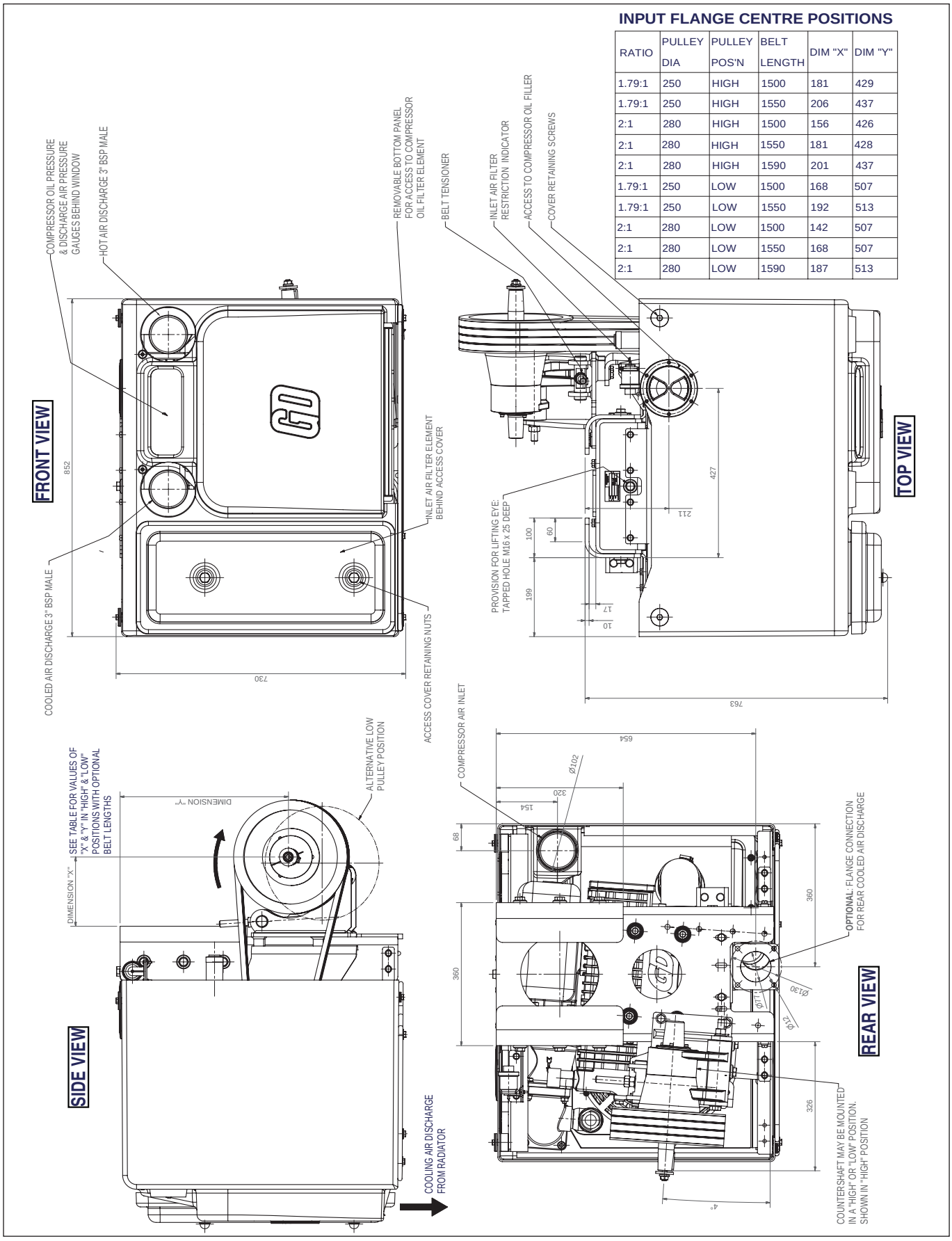


Figure 3c - General Arrangement Drawing - BL1000 Clockwise (Right Hand) Rotation Package (Pulley Shown in High Position)

1.4 Package Dimensions (cont..)

INPUT FLANGE CENTRE POSITIONS

RATIO	PULLEY DIA	PULLEY POS'N	BELT LENGTH	DIM "X"	DIM "Y"
1.79:1	250	HIGH	1500	181	453
1.79:1	250	HIGH	1550	207	461
2:1	280	HIGH	1500	157	448
2:1	280	HIGH	1550	182	453
2:1	280	HIGH	1590	202	461
1.79:1	250	LOW	1500	171	531
1.79:1	250	LOW	1550	195	538
2:1	280	LOW	1500	142	530
2:1	280	LOW	1550	171	530
2:1	280	LOW	1590	190	538

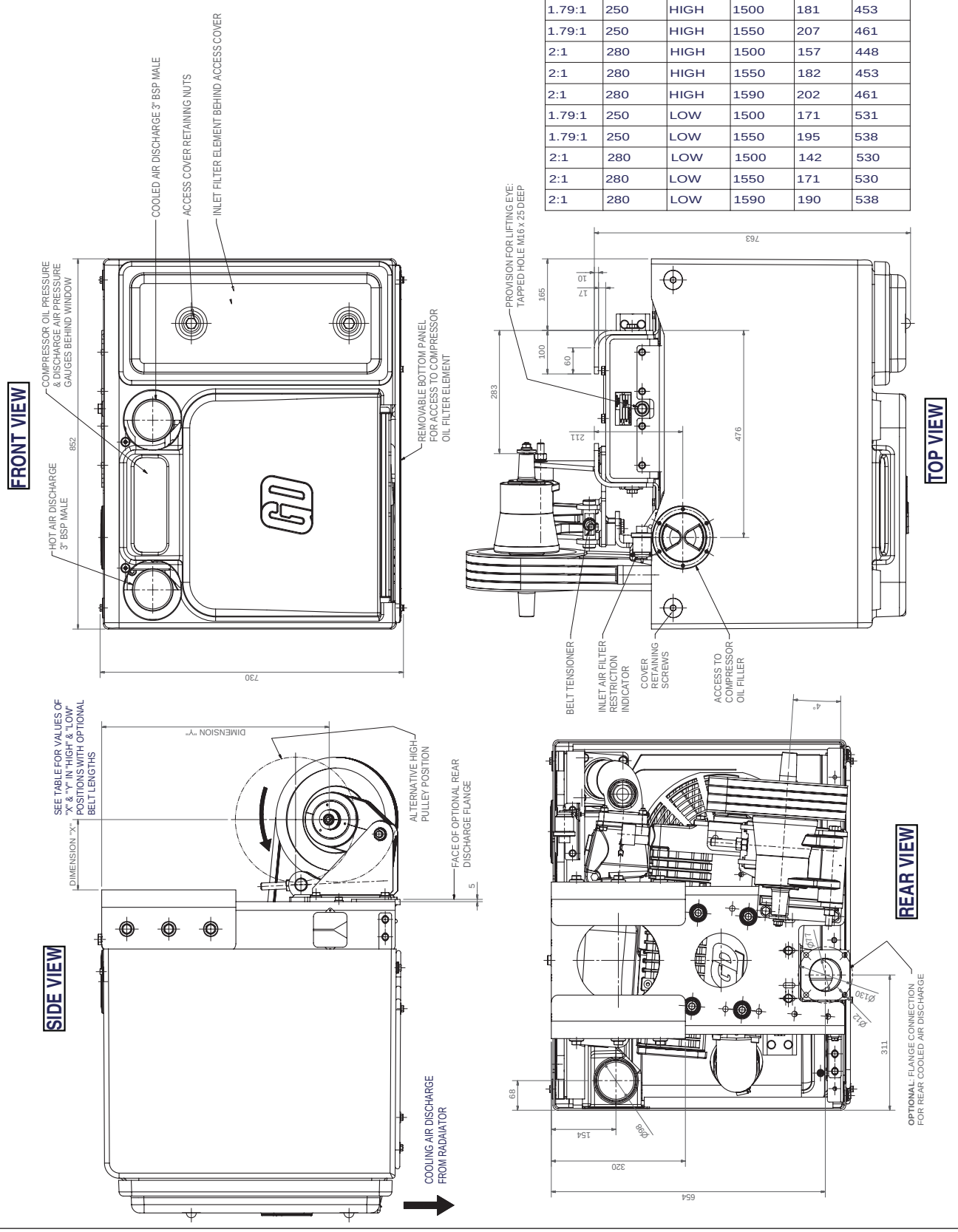


Figure 3d - General Arrangement Drawing - BL1000 Anti-Clockwise (Left Hand) Rotation Package (Pulley Shown in Low Position)

2 Installation

2.1 General

When selecting the machine mounting position, the following points should be considered:

- Ensure visibility of gauges.
- Ensure easy access to the air filter (via access cover).
- Ensure visibility of the filter restriction indicator.
- Ensure easy access to the oil filler (via access cover where fitted).
- Ensure easy access to the relief valve.
- Ensure that, where necessary, covers can be removed for maintenance access to oil filters, oil drain plugs, belts, etc.
- Ensure that adequate access is available to the air inlet pipe connection and consider the likely pipe route (minimise length where possible)
- To achieve maximum cooling performance, air entering the cooler should be as clean and cool as possible. ie install away from vehicle exhaust and other sources of heat and dirt.

2.2 Lifting

See Section 1.1 Health & Safety

The Bulkline 650/1000 LNC Package should be lifted for installation using the pallet provided.

OR

Any equipment used for lifting should be rated accordingly. The machine, on the delivery pallet, weighs approximately **350kg**, including pulleys and belts.

There is provision for attaching a lifting eye to the mounting bracket (Figures 3c and 3d).

2.3 Mounting and drive

Fixing to the Chassis

The Bulkline 650/1000 LNC Package vehicle mounting brackets should be attached to the vehicle chassis using 6 mounting bolts, washers & nuts (Fig. 4a – items 3, 4 & 5). All mounting fasteners should be M16 grade 8.8 (or higher).

All M16 grade 8.8 fasteners should be tightened to a torque setting of 210Nm.

The mounting brackets should be positioned against the chassis so that the maximum amount of surface to surface contact is made to eliminate any potential flexing of the brackets.

On some vehicles it may be necessary to offset the mounting brackets from the vehicle chassis to achieve clearance for other chassis mounted equipment. In this event it may also be necessary to fit a spreader plate between the brackets and the chassis to distribute the clamping loads. See vehicle manufacturer's instructions for further guidance.

The mounting hole centres should be positioned as shown. Figure 4f shows the preferred location of the mounting holes. However, if required, the hole centres can be positioned elsewhere within the shaded area shown in Figure 4g to suit existing holes in the chassis. The holes should be vertically spaced as far apart as the vehicle chassis will practically allow, and no less than 75mm, If required, further fixing holes (in addition to the six recommended) may be drilled in any other location on either of the two brackets, provided that they are a minimum of 50mm from any existing holes.

2.3 Mounting and drive (Cont..)

Fixing to the Chassis

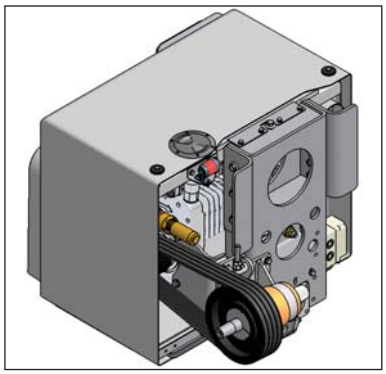


Figure 4c - Alternative Bracket Position (1)

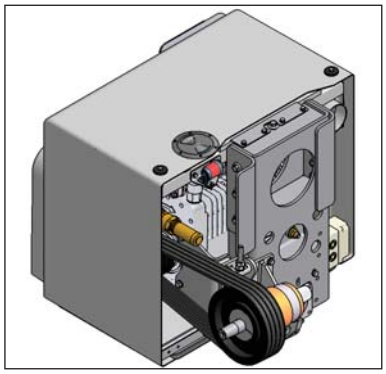


Figure 4d - Alternative Bracket Position (2)

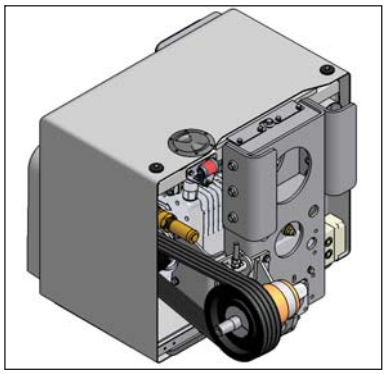
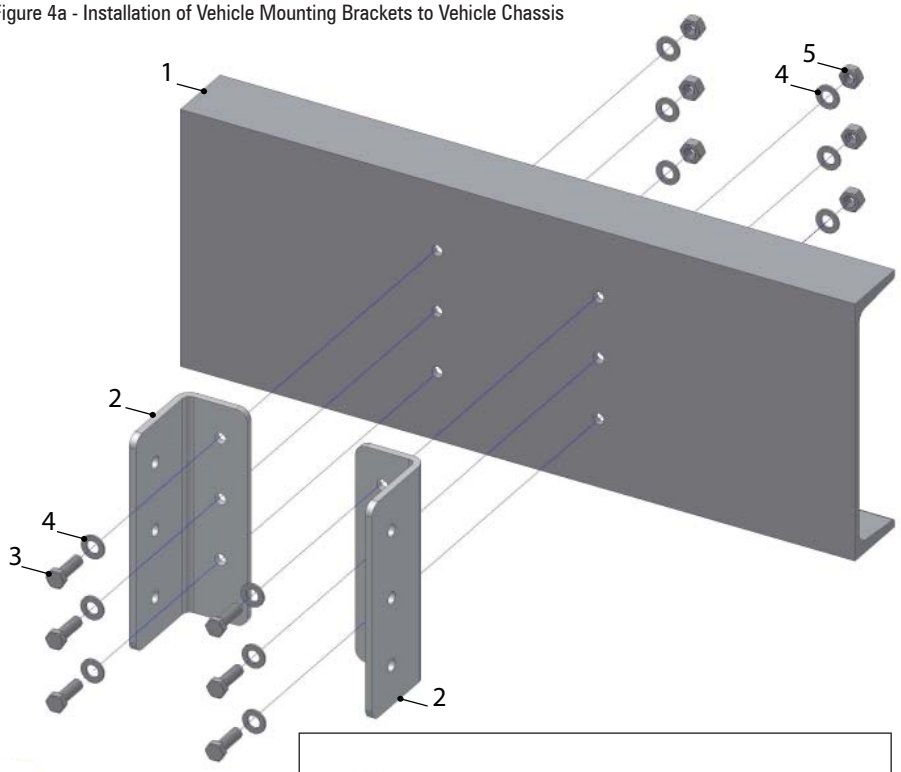


Figure 4e - Alternative Bracket Position (3)

Figure 4a - Installation of Vehicle Mounting Brackets to Vehicle Chassis



No.	Description
1	Vehicle Chassis
2	Vehicle Mounting Brackets
3	M16 Bolt
4	M16 Washer
5	M16 Nut

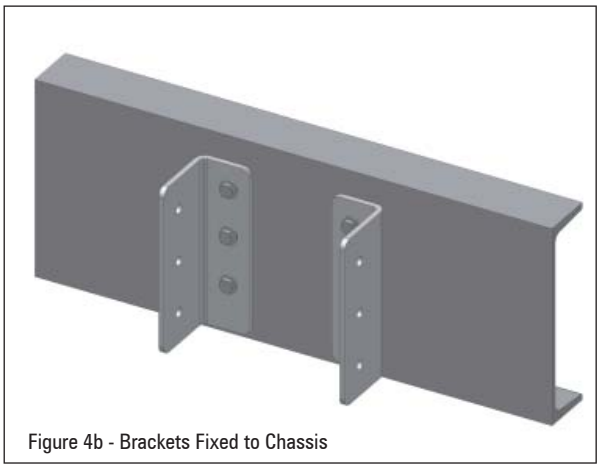


Figure 4b - Brackets Fixed to Chassis

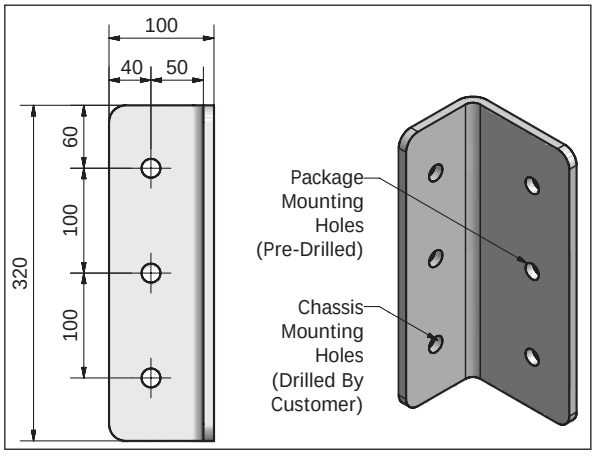


Figure 4f - Recommended Vehicle Chassis Mounting Bracket Hole Positions.

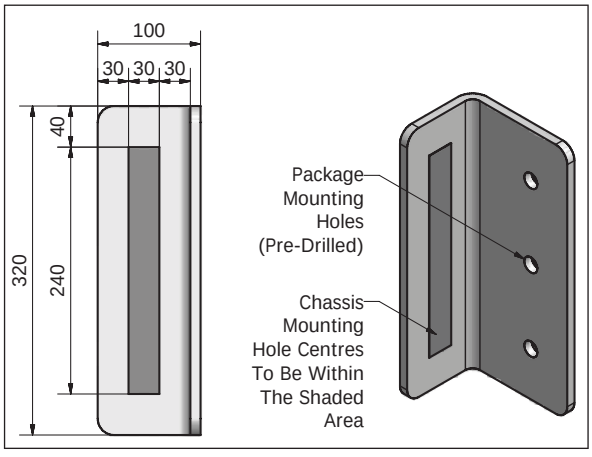


Figure 4g - Permissable Vehicle Chassis Mounting Bracket Hole Positions.

2.3 Mounting and drive (Cont..)

Fixing the Package to the Brackets

Initially, the vehicle mounting brackets should be loosely attached to the vehicle chassis (tightened later), the Bulkline package is then fastened to the brackets.

The Bulkline 650/1000 LNC Package should be attached to the mounting bracket using a total of 6 (3 on either side) flanged mounting screws M16 grade 8.8 or higher (Figure 5b).

The package mounting bracket has two sets of 6 x M16 tapped holes on each side to permit alternative mounting heights. The side mounting screws should be tightened to a torque of 210Nm before then tightening the screws holding the brackets to the vehicle chassis to 210Nm.

Figure 5a

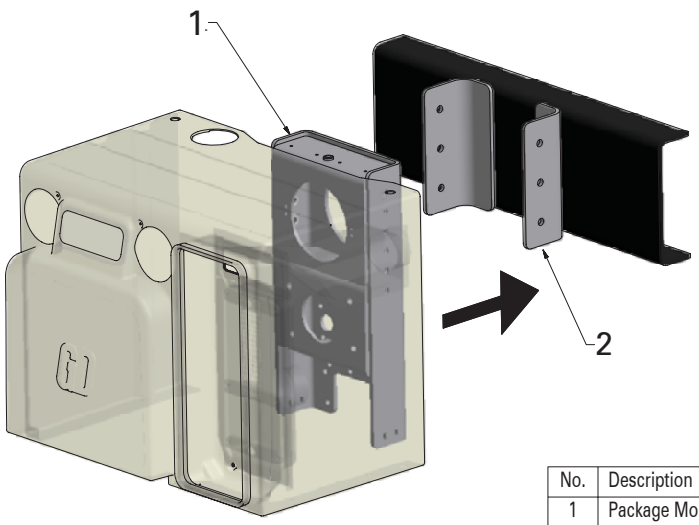
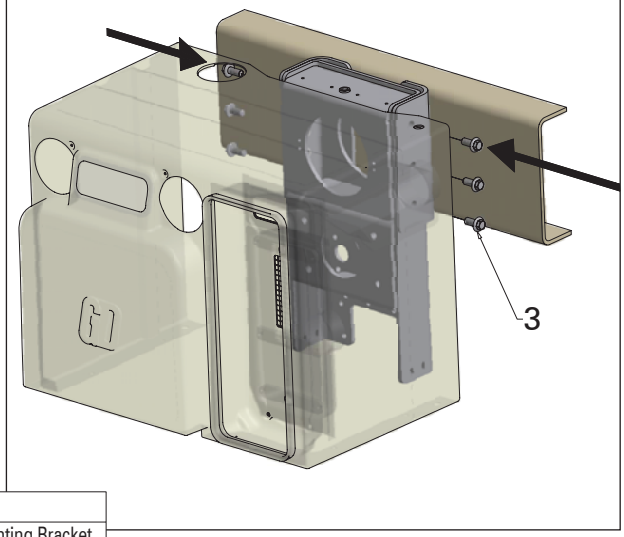


Figure 5b



No.	Description
1	Package Mounting Bracket
2	Vehicle Mounting Brackets
3	M16 Flanged Screws

Figure 5 - Installation of Bulkline 650/1000 LNC Package to the Vehicle Mounting Bracket/Chassis

Ensure that adequate clearance exists between the vehicle chassis and the Bulkline acoustic package. Figures 5c and 5d show that particular care needs to be taken to avoid interference between the vehicle chassis and the drive belts. There are two sets of mounting holes for the drive shaft housing so that it may be installed in a high or low position.

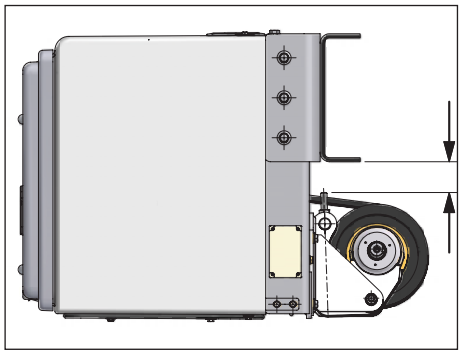


Figure 5c - Chassis/Package Clearance

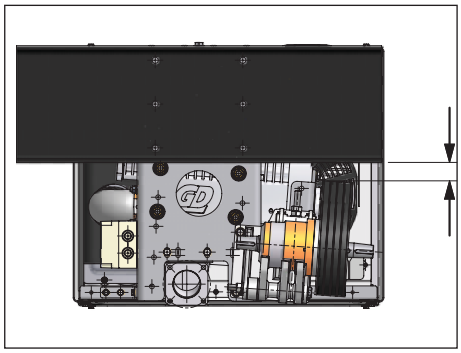


Figure 5d - Chassis/Package Clearance

2.3 Mounting and drive (Cont..)

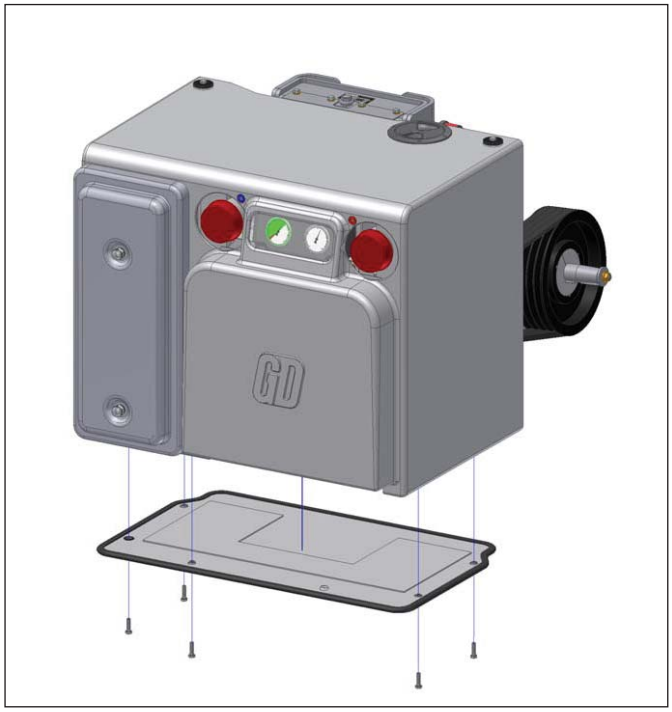


Figure 5e - Underside Cover Removal

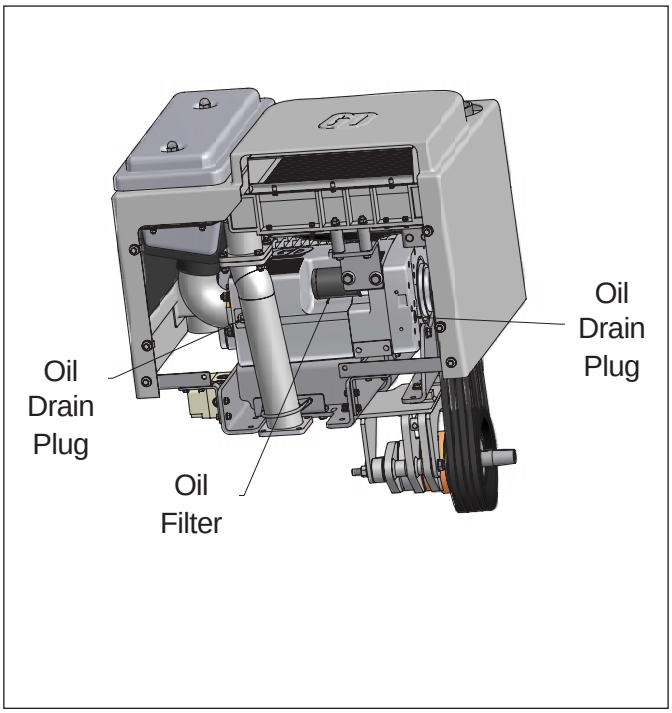


Figure 5f - Access From Underside of Package

The package is supplied without the bottom cover installed. It must be fitted before the machine is put into service. (Figure 5e).

If the optional rear connection for cooled air is included, care should be taken to ensure that piping may be connected to the flange without contacting chassis components.

The Bulkline machine and the drive shaft/pulley assembly are mounted within the package at an angle of 4 degrees to the horizontal to allow easy parallel alignment/adjustment with the vehicle PTO shaft.

See Section 1.1 Health & Safety

NOTE

The package should be mounted at the appropriate angle to ensure that the pulley drive shaft axis is parallel to the PTO axis.

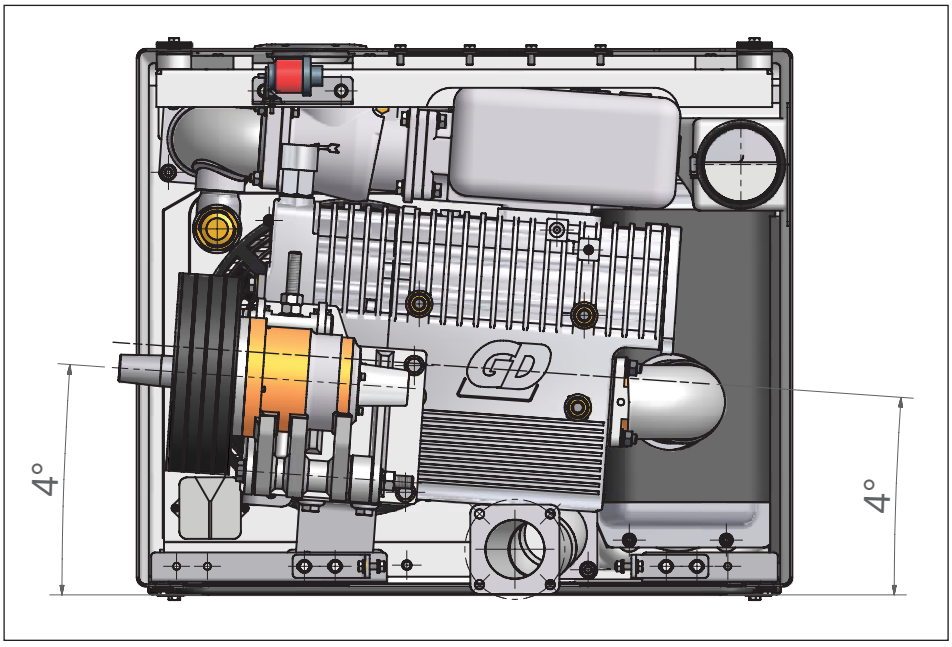


Figure 5g - Bulkline & Pulley Package Mounting Arrangement

2.3 Mounting and drive (Cont..)

NOTE

The compound prop. shaft angle must also be less than 12°

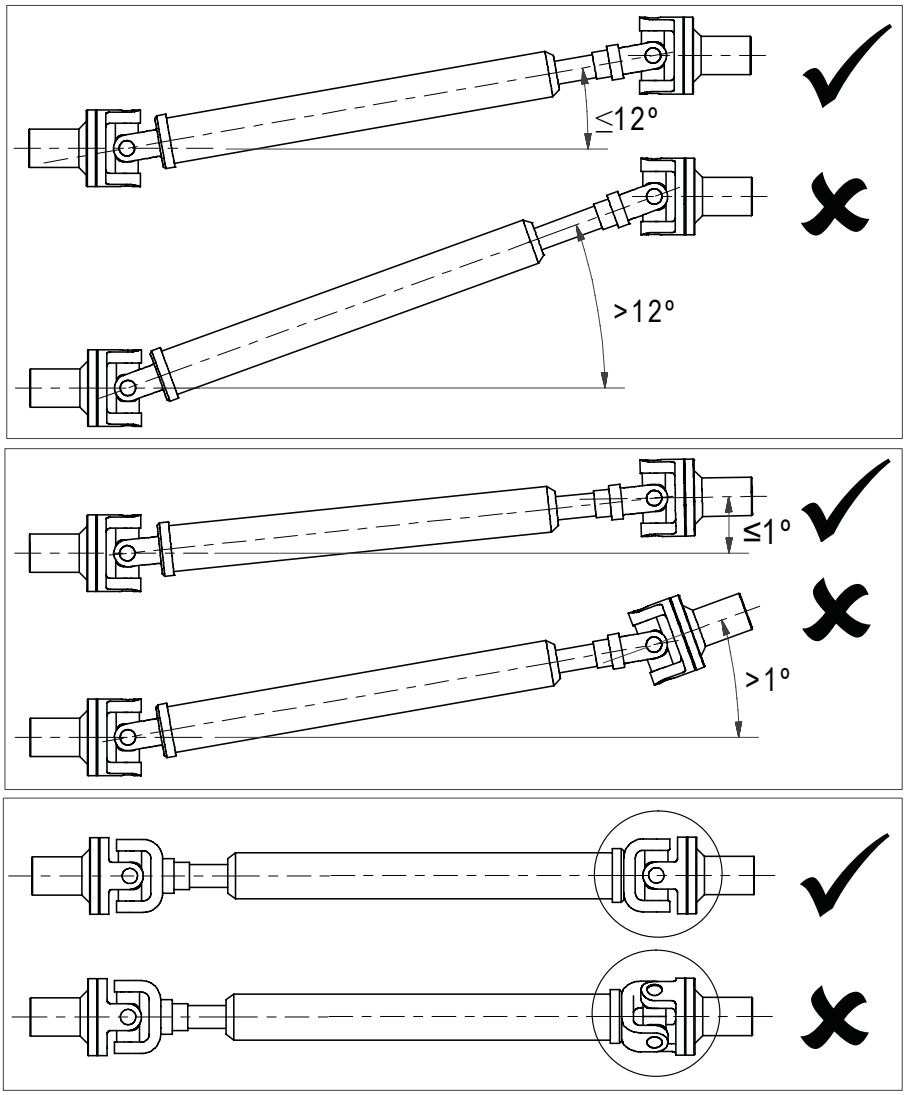


Figure 5h - Package Alignment

2.4 Air Inlet Connection

The Bulkline 650/1000 LNC Package is supplied with a 4" OD air inlet connection (Figures 6a, 6b). The air inlet piping kit comprises of a 4" nominal bore flexible pipe connected to the inlet stub pipe with a cuff and hose clip. The other end should be connected to the raincap mounted in a position that will result in only cool, clean and dry air entering the assembly.

Figure 6a - Air Inlet Connection Location

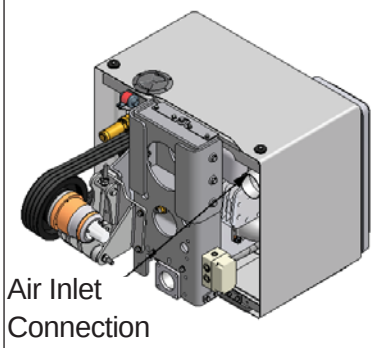
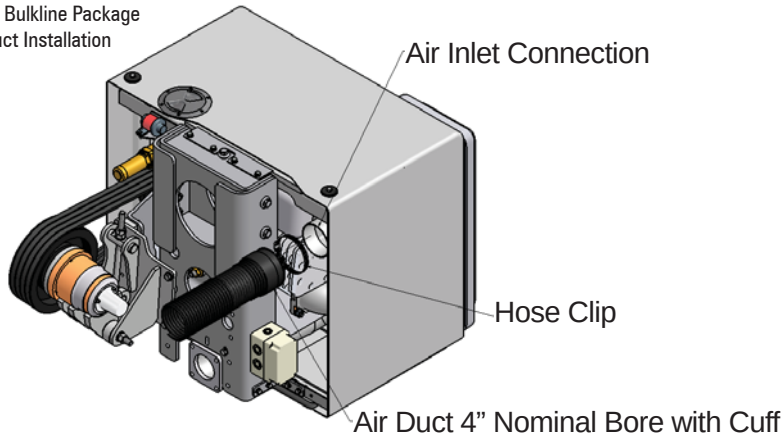


Figure 6b - Bulkline Package
Air Inlet Duct Installation



2.5 Instrumentation

The Bulkline Package has a gauge panel (figures 7a and 7b) mounted behind a window carrying the following:

- Oil pressure gauge
- Delivery air pressure gauge

In addition, there is a filter restriction indicator mounted at the rear of the package (figure 2b).

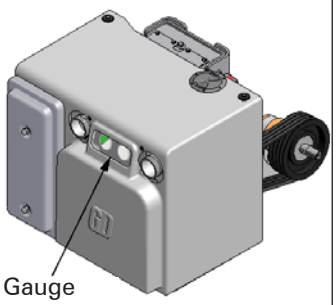


Figure 7a - Gauge Panel Location

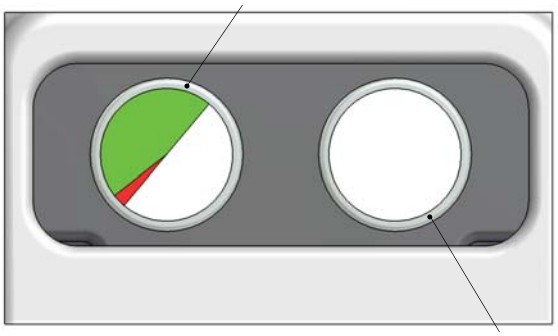


Figure 7b - Gauge Panel Layout

2.6 Air Filter Restriction Indicator

See Section 1.1 Health & Safety

The air filter restriction indicator shows when the air filter element is excessively dirty. See Section 3.3 for actions to clean or change the filter element.

Figure 8 - Discharge Air Pressure Gauge Display

2.7 Discharge Air Pressure Gauge

The discharge air pressure gauge shows the pressure at which the machine is currently operating.

See the compressor operating instructions for more information on the recommended operating pressure range of the compressor.

Figure 9 - Oil Pressure Gauge Display

2.8 Oil Pressure Gauge

The oil pressure gauge shows the current oil pressure of the compressor and has a range of 0 – 7bar. When the system is at operating temperature the pressure, with a new oil filter, should be > 1.0 bar and < 6.0 Bar.

During operation, the oil pressure should not fall below 0.5 bar. If it does, then the oil filter should be changed and the oil level checked.

See the compressor operating instructions for more information on the maximum oil pressure for the machine.

2.9 Air cooler

CAUTION ⚠

The temperature of the discharge couplings will exceed 80 deg C.
Use protective gloves when handling couplings.

- The cooling air enters the package from the rear of the unit as shown in Figure 10a.
- The air is blown across the integral radiator by the electric cooler fan and the exhaust air is discharged from the front of the package as shown in Figure 10b

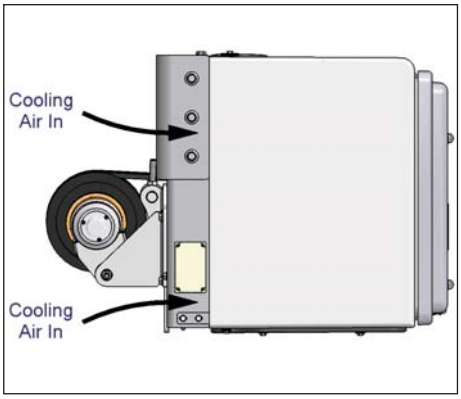


Figure 10a - Cool Air In

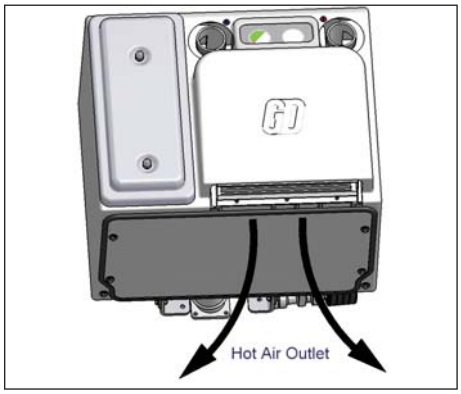


Figure 10b - Hot Air Out

Optional

As an option, a flanged connection may be provided to discharge cooled air at the rear of the package (Figures 3c and 3d).

Cooling performance

To obtain the maximum cooling effect:

- Do not obstruct the inlet air path into the package.
- Locate the assembly so that only cool air will be drawn into the package, ie away from engine exhausts or other heat sources, eg hot piping, relief valves etc.

2.10 Electrical connection

⚠

See Section 1.1 Health & Safety

The cooler should be connected to a 24 volt DC supply as shown in Figures 11a, 11b and 11c. This must be a permanent connection and must not be switched.

All connections to the chassis electrical system, and all details of the electrical wiring, must be strictly in accordance with the vehicle manufacturer's instructions, and also in accordance with local legislation.

Fuses, if not part of the chassis system, should be located as close as possible to the connection to the vehicle system and before any switches, relays, etc.

All electrical installation work must be carried out by suitably qualified personnel.

On installation check that the direction of air flow from the fan is correct, see Figure 11d

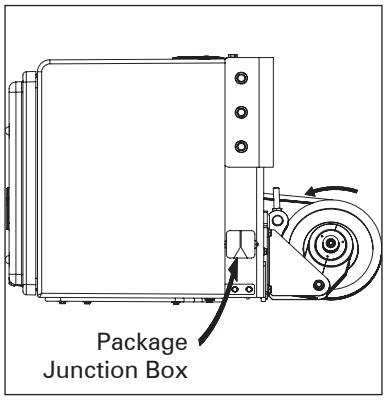


Figure 11a - Junction Box Location

The package electrical system incorporates a temperature switch to control the fan. The following operating features will be noticed:

- The electric fan will not start to run immediately when the PTO is engaged.
- After a few minutes, when the compressor discharge air temperature has risen, the fan will start.
- At the end of the discharge, when the PTO is disengaged, the fan will continue to run for a few minutes.

These characteristics are normal.

2.10 Electrical connection (cont..)

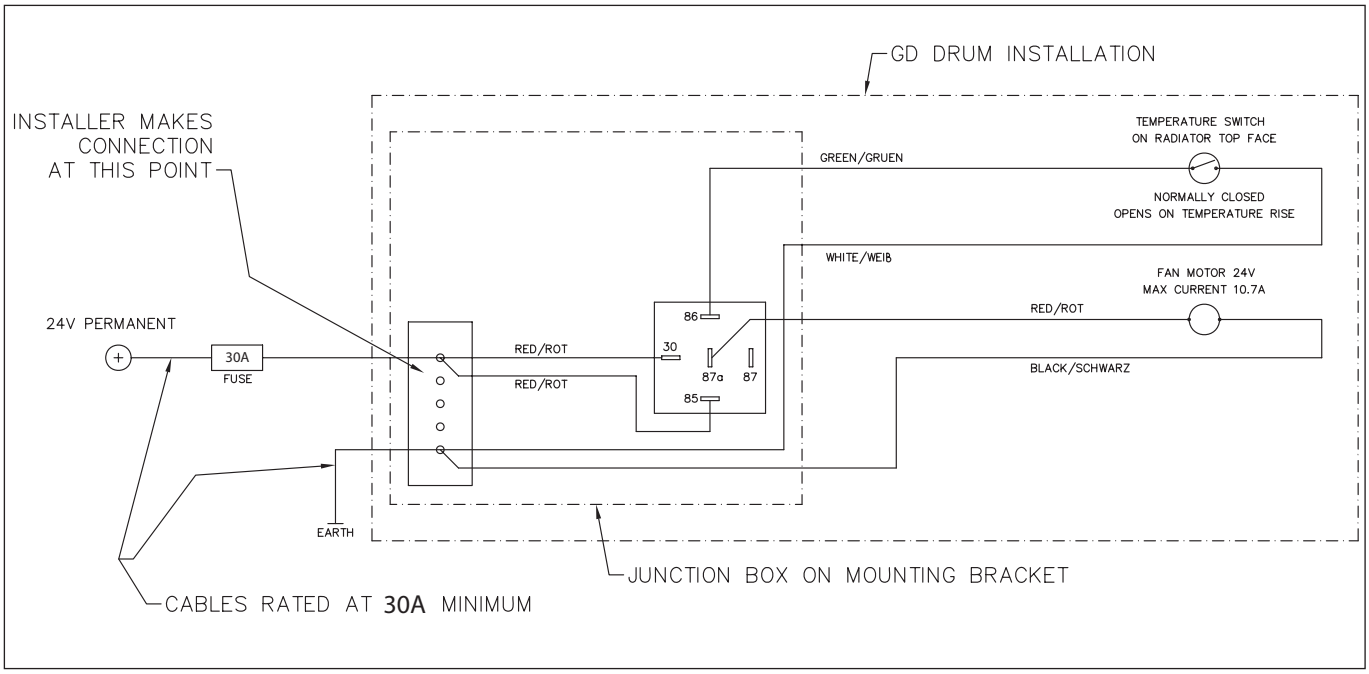


Figure 11b. Electrical Circuit Diagram.

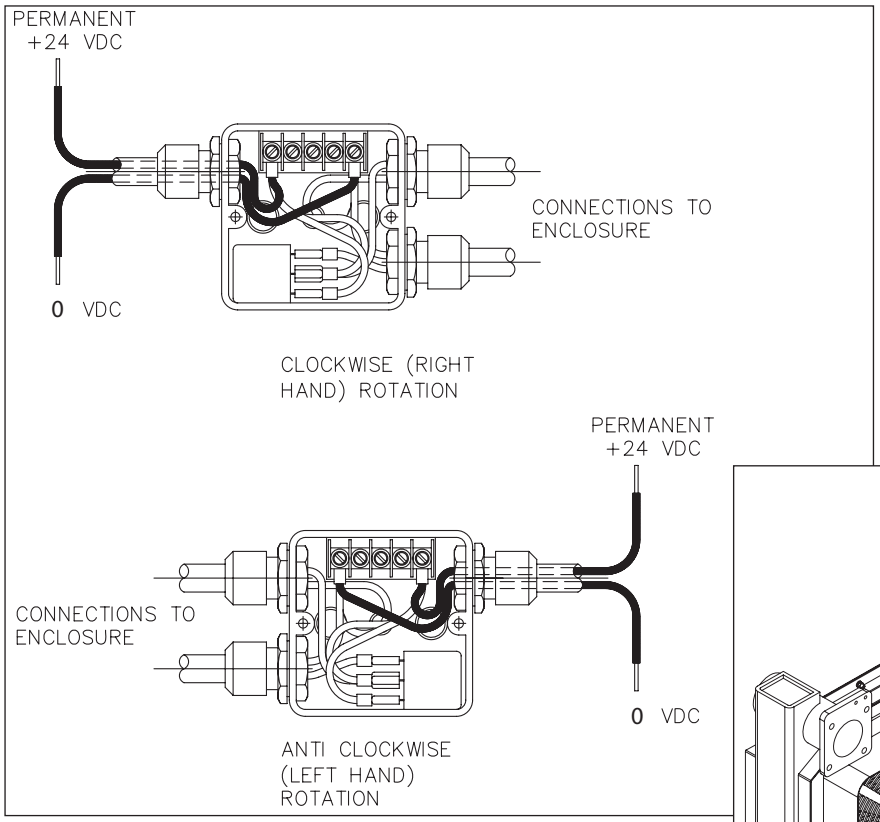


Figure 11c. Junction Box Connection Diagram

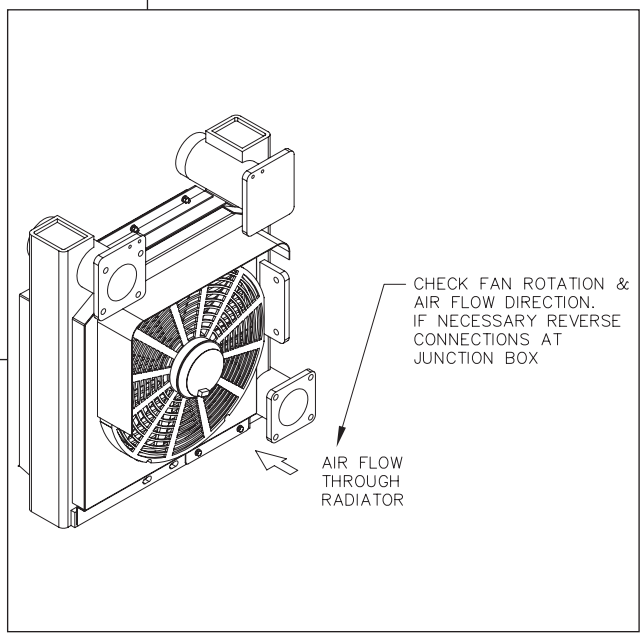


Figure 11d. Air Flow Direction

Maintenance

See Section 1.1 Health & Safety

Use alongside the Bulkline machine maintenance instructions

3.1 Package Maintenance Schedule

The package maintenance schedule below should be used alongside the machine maintenance schedule in the Bulkline 650 & 1000 machine maintenance instructions.
The maintenance intervals in the table below refer to intermittent operation of around 3 hours every day at 2 barg working pressure.

Maintenance point	Action	Section	Maintenance Interval
Replace/Clean the Integral Air Filter	Replace/Clean	3.3	Signaled by Filter Restriction Indicator
Clean the Cooling Radiator	Clean	3.4	Half-Yearly

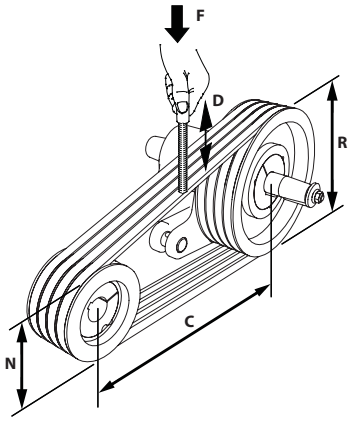
3.2 Replacing the drive belts

See Section 1.1 Health & Safety

The Bulkline LNC package compressor is driven by a set of 4 off XPB drive belts. Various lengths of belt are available as detailed in Figures 3c and 3d. If belt replacement is necessary, replace all the belts as a set.
To replace the belts, follow the procedure below:

1. Ensure that the Package is isolated from the drive and that there is no pressure in the system.
2. Release the belt tension – slacken the locknut and retaining nut on the tensioner (Figures 2c, 3c and 3d).
3. Slacken the nut on the Drive Shaft Housing pivot bolt.
4. Swing the Drive Shaft Housing Assembly towards the mounting bracket until the belts can be removed.
5. Remove the old belts.
6. Install the new belts.
7. Set the belt tension in line with the belt tensioning tables below.
8. Re-tighten the locknut on the tensioner.
9. Re-tighten the nut on the pivot pin (210Nm).

Belt Tension Values



Ref.	Description
C	Distance Between Pulley Centres
D	Deflection of Belt When Pressure is Applied to Tension Tester
F	Force Applied to Tension Tester
N	Compressor Input Pulley Diameter
R	Package Input Pulley Diameter

Figure 12. Belt Tension Testing

Package Input Speed = 1800 rpm Max. / Compressor Speed = 3600 rpm Max. (2:1 Step Up)

C mm	R mm	N mm	Belt Length mm	Installation Tension Force per Belt (N)				F = Force Applied to Tension Tester (N)				D = Belt Deflection mm
				New Belt		Used Belt		New Belt		Used Belt		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
415	280	140	1500	744	797	638	691	31	33	27	29	4.1
440	280	140	1550	741	794	635	688	31	33	26	29	4.3
460	280	140	1590	738	791	633	686	31	33	26	29	4.5

Package Input Speed = 2015 rpm Max. / Compressor Speed = 3600 rpm Max. (1.786:1 Step Up)

C mm	R mm	N mm	Belt Length mm	Installation Tension Force per Belt (N)				F = Force Applied to Tension Tester (N)				D = Belt Deflection mm
				New Belt		Used Belt		New Belt		Used Belt		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
415	250	140	1450	733	785	628	680	30	32	26	28	4.1
440	250	140	1500	730	782	626	678	30	32	26	28	4.4
465	250	140	1550	728	780	624	676	30	32	26	28	4.6

3 Maintenance

3.3 Replacing/cleaning the Integral Air Filter

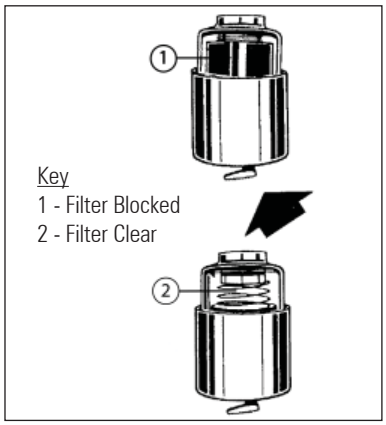


Figure 13a. Maintenance Indicator

See Section 1.1 Health & Safety

Restriction Indicator

If the indicator has reached the red portion of the scale (See Figure 13a), change/clean the filter element as follows:

Accessing the element (Figure 13b)

- Remove the two cover retaining nuts (#1) and remove the filter housing cover (#2).
- Remove the filter clamp plate (#3).
- Remove the air filter element (#4).

Cleaning the element;

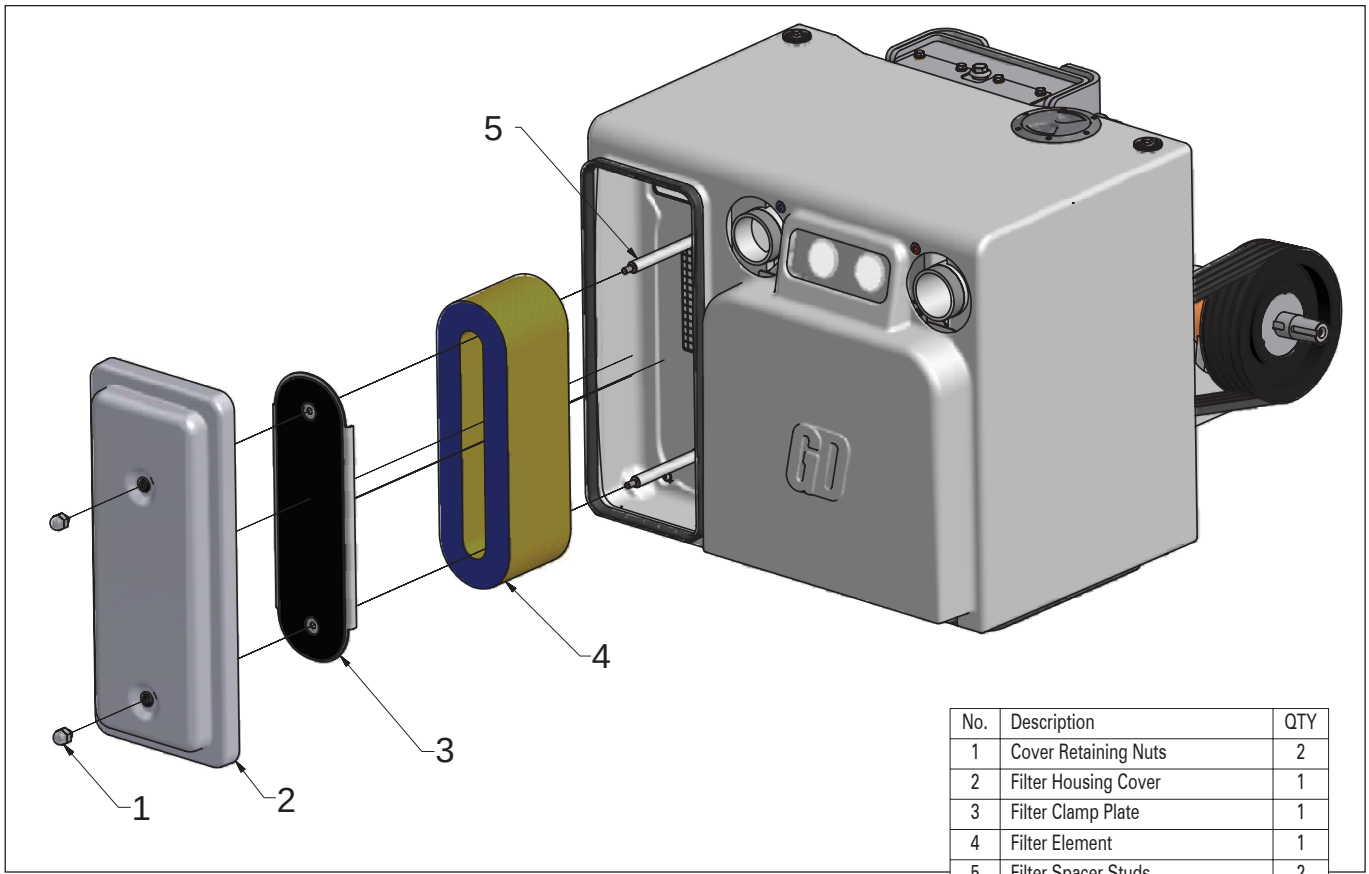
Clean the element by lightly tapping the element or blowing compressed air through it from the inside outwards.

Note: This will not return the element to new condition, but should prolong the life until it can be replaced.

Replacing the element:

This is a direct reversal of the “Accessing the element” section above. Lightly lubricate the nuts and the grommets before re assembly.

After cleaning or replacing the element, reset the filter restriction indicator by pressing the yellow button.



No.	Description	QTY
1	Cover Retaining Nuts	2
2	Filter Housing Cover	1
3	Filter Clamp Plate	1
4	Filter Element	1
5	Filter Spacer Studs	2

Figure 13b. Replacing the filter element

3.4 Cleaning the cooling radiator

The radiator should be periodically cleared of debris to maintain efficiency.

To gain access to the radiator/fan assembly refer to Figure 14 and follow the procedure below:

1. Remove the 5 off bottom cover retaining screws (#4).
2. Remove the bottom cover.
3. Remove the 2 off top retaining screws (#1), flanged bushes (#2) and rubber washers (#3).
4. Release the hose clip (#6) retaining the connection hose to the compressor inlet elbow. Access from below the package.
5. Lift the main enclosure (#7) clear.
6. Blow through the radiator fins with an air line. Access to the radiator can be gained via the air outlet duct (#8), and also from the area between the compressor and the radiator.
7. Replace and re-fix the main cover by reversing the above steps. Ensure that the connection hose is correctly engaged on the stub pipe in the cover and also on the compressor inlet elbow. Also ensure that the hose clips are secure. Re-fix the underside cover.

No.	Description	QTY
1	Top Retaining Screws	4
2	Top Flanged Bushes	4
3	Top Rubber Washers	2
4	Underside Retaining Screws	5
5	Underside Cover	1
6	Air Inlet Elbow Hose Clip	1
7	Main GRP Enclosure	1
8	Air Outlet Duct	1

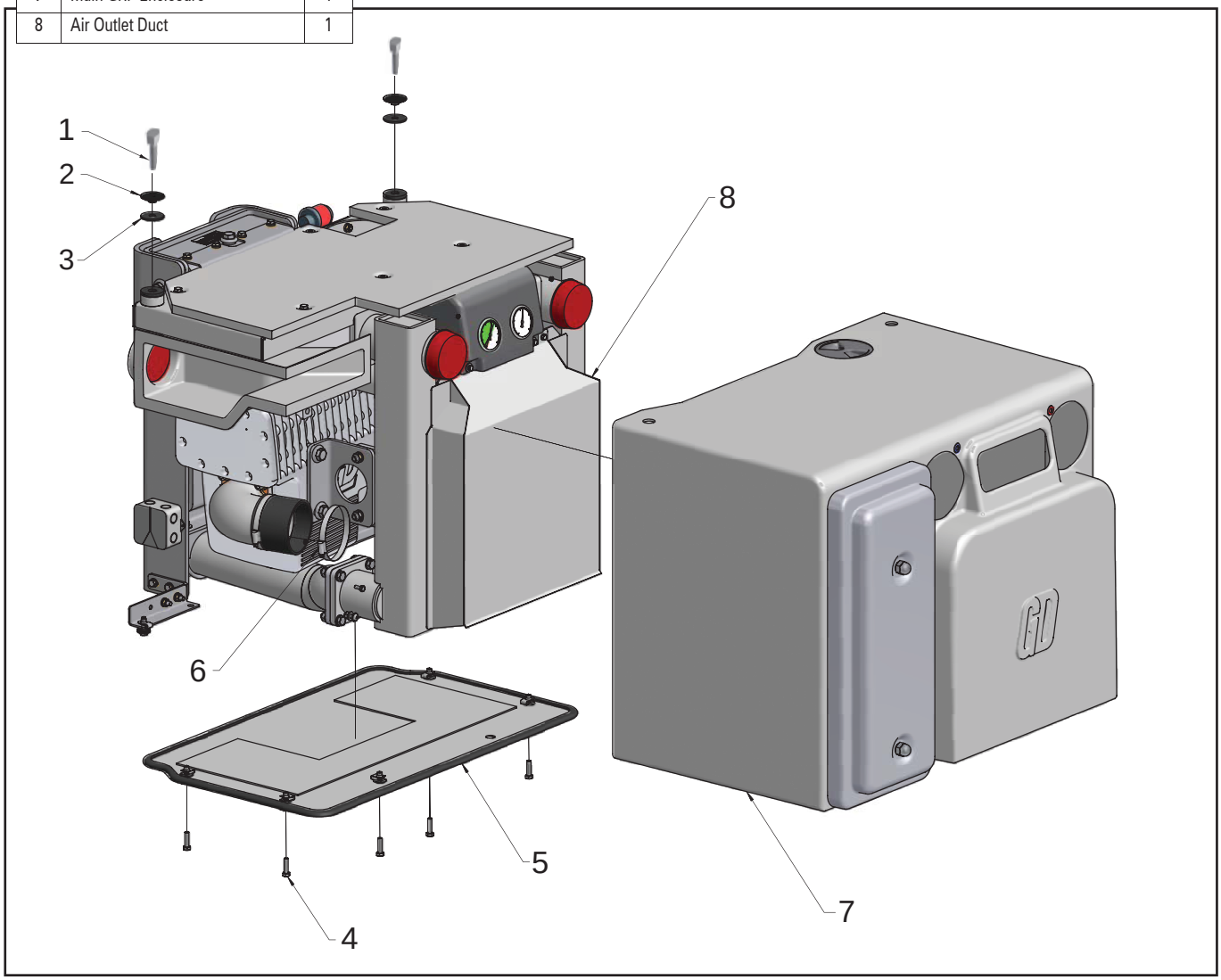


Figure 14 - Cleaning the radiator

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