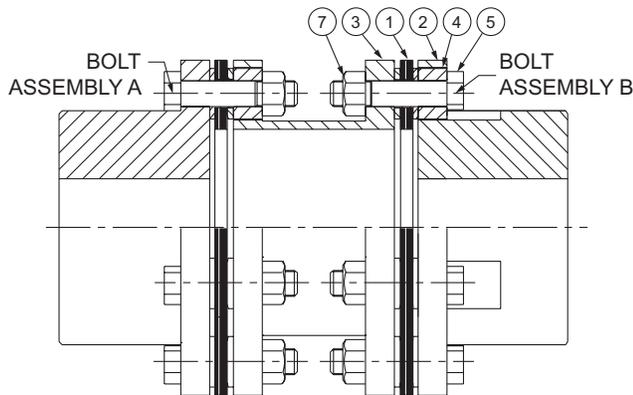
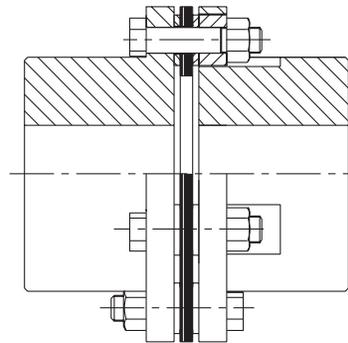
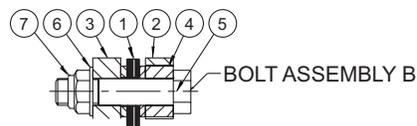


FIGURE 1A. Spacer Option

- 1 – Membrane pack
- 2 – Hub
- 3 – Spacer
- 4 – Overload collar
- 5 – Bolt
- 6 – Washer (1850 and above)
- 7 – Locknut

FIGURE 1B. Non-spacer Option**FIGURE 1C. Bolt Assembly for Sizes LLES-1850 to 9025**

Foreword

These instructions are provided to familiarize the user with the coupling and its designated use. These instructions must be read and applied whenever work is carried out on the coupling and must be kept available for future reference.

ATTENTION These instructions are for the fitting, operation and maintenance of the coupling as used in rotating equipment and will help to avoid danger and increase reliability. The information required may change with other types of equipment or installation arrangements. These instructions must be read in conjunction with the instruction manuals for both the driver and driven machinery. If the coupling is to be used for an application other than that originally intended or outside the recommended performance limits, John Crane must be contacted before its installation and use.

Any warranty may be affected by improper handling, installation or use of this coupling. Contact the company for information as to exclusive product warranty and limitations of liability.

If questions or problems arise, contact your local John Crane sales/service engineer or the original equipment manufacturer as appropriate.

ATTENTION John Crane couplings are precision products and must be handled appropriately. Take particular care to avoid damage to spigots, mating faces, hub bores, keyways and membranes. Do not excessively compress the coupling membranes during assembly. Refer to Table 1 for compression limits [Min gap 'X'].

These instructions are written for standard catalog products, generally designed in accordance with the drawing shown.

Safety Instructions

The following designations are used in the installation instructions to highlight instructions of particular importance.

IMPORTANT is used for items of particular concern when using the coupling.

ATTENTION where there is an obligation or prohibition concerning the avoidance of risk.



where there is an obligation or prohibition concerning harm to people or damage to the equipment.

Safety Instructions (continued)

IMPORTANT All reasonable care has been taken in the design and manufacture of this coupling to ensure that it will be safe when properly used. It is assumed that the user is aware of the statutory requirements of his plant.

ATTENTION When repairing John Crane's Metastream flexible disc couplings, only John Crane-approved parts should be used.



Maintenance work must only be carried out:

- when the equipment is stationary and has been made safe
- by suitably trained and qualified personnel.



Prior to installing or removing the coupling, ensure that the machinery is made safe.



Hubs must be adequately supported during installation or removal to avoid accidental damage should they slip.



The spacer must be adequately supported during installation or removal to avoid accidental damage should it slip.

ATTENTION Before starting the machinery, ensure that all necessary safety procedures are being observed.

IMPORTANT These instructions are of a general nature; if a general arrangement (GA) drawing is supplied with the coupling then all data indicated on that drawing takes precedence over information included in these instructions.

The usual extent of supply comprises:

- A hub for the driving machine (e.g., motor) shaft
- A hub for the driven machine shaft
- Two membrane pack assemblies (one for the non-spacer option)
- A spacer (distance piece). The overall length of the spacer plus membrane units is sized to suit the shaft end separation of the coupled machines
- A set of fasteners to assemble the unit between the two hub flanges

Storage

If the coupling is not to be used immediately, it should be stored away from direct heat in its original packing.

All documentation supplied with the coupling should be retained for future reference.

Spares

When requesting spares, always quote the full designation of the coupling.

The following spares can be purchased from John Crane:

- Bolt-set (ref. 4, 5, 6, 7)
- Hubs, bored to your requirement or unbored (ref. 2)
- Spacer (ref. 3)
- Membrane packs (ref. 1)

Installation

Remove coupling from packaging and carefully inspect for signs of damage. Pay particular attention to the hub bores and the spigot/recess location features, which should be free from burrs and other damage.

Installation of hubs



Prior to installing the coupling, ensure that the machinery is made safe. Hubs must be adequately supported during installation to avoid accidental damage should they slip.

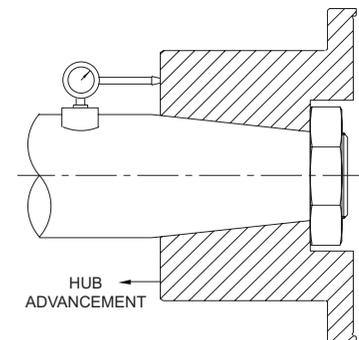
Installation (continued)**Parallel bore with keyed drive**

1. Ensure the hub bore and mating shaft are clean.
2. The hub is usually installed with the hub face and shaft end flush although $\pm 1-2$ mm overhang is acceptable to correct for errors in setting distance between shaft ends (DBSE).
3. Measure the shaft diameter and hub bore to confirm the correct fit.
4. For clearance fits, install the key(s) into the shaft keyway and with a little lubrication on the shaft, slide the hub onto the shaft. The key should be a tight sliding fit in the keyway with a small clearance at the top of the key. Secure the hub to the shaft in the correct axial position with one or more grub screws.
5. John Crane recommends a light interference fit for most applications, and it may be necessary to apply heat to assist fitting of such hubs. A warm oil bath will usually be adequate. DO NOT spot heat or exceed 175°C as this may cause distortion. A thermal heat stick can be used to estimate the temperature before quickly sliding the hub onto the shaft. A suitable stop will ensure the correct axial position is located.

Taper bore with keyed drive (see Figure 2)

1. Thoroughly clean all contact surfaces and smear the tapered surfaces with oil.
2. Fit the hub onto the shaft without the key(s). Lightly hammer the hub with a soft-faced mallet to ensure metal-to-metal contact takes place.
3. Measure the distance from the end of the shaft to the face of the hub using a depth micrometer (record this measurement).
4. Securely mount a dial gauge onto the inboard hub flange and set to zero.
5. Remove the hub and fit the key(s), which should be a tight sliding fit in the keyway with a small clearance at the top of the key.
6. Refit the hub and draw up the shaft to the correct axial position indicated by the dial gauge. If an interference fit is required the hub may have to be heated (this is rare, however).
7. When the hub has cooled remeasure the distance from the end of the shaft to the face of the hub to confirm the correct axial position.
8. Fit the shaft-end retaining nut if applicable to ensure the hub is locked in position axially.

NOTE: The hub face may not be flush with the shaft end when taper bores are used.

FIGURE 2**Hubs mounted by FB taper bushes**

To mount hubs supplied with taper bushes, refer to the FB Taper Bushes Fitting & Maintenance Instructions, I-FB BUSH.

Unbored hubs

John Crane recommends a light interference fit for keyed hubs and shafts (e.g., a P7/h6 fit). The finished bore size can be calculated from the measured shaft diameter. When setting up the hub to machine the bore, use the hub location recess and face as datum surfaces, as shown in Figure 3. The hub face should be set such that the maximum runout does not exceed 0.025 mm TIR. The hub location recess should be set so the maximum runout does not exceed 0.03 mm TIR. Please note that for API 671 applications the required tolerances will be tighter.

Adapters

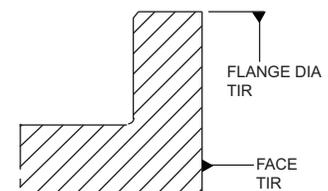
For machines where the coupling bolts to a flywheel, the coupling will be supplied with a SAE flange adapter. Refer to L-Series supplement for flywheel adaptor location and mounting details.

Shaft alignment

Align the center lines of the driving and driven machine shafts as follows:

1. Move the equipment into position.
2. Check for any soft foot and correct before commencing alignment.
3. With one machine firmly bolted down, set the DBSE according to the drawing or catalog dimension.

IMPORTANT DBSE should be measured between the inner faces of the hubs. DBSE may not be equal to the precise distance between shaft ends. In particular, the faces of taper bored hubs may not be flush with the shaft end.

FIGURE 3

Installation (continued)

- Align the shaft center lines both horizontally and vertically by aligning the hub flanges. John Crane recommends the reverse periphery method for accurate alignment. This can be done using dial gauges or with laser shaft alignment kit. Further details are available from John Crane on request.
- Recheck the DBSE after the shafts have been aligned.

IMPORTANT The misalignment tolerances quoted in literature and on drawings allow for dynamic conditions and variations. For the best service from the coupling, John Crane recommends that installed misalignment is no more than 10% of the maximum allowable misalignment, allowance being made for any anticipated movements that will occur during operation (e.g., thermal movements on hot pumps).

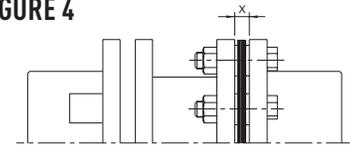
Installation of the Transmission Unit

Spacer option – with flanged spacer and two membrane units

- Support the spacer (3) in position between the hubs and align the larger sets of holes in the spacer flanges with the smaller sets of holes in the hub flanges, and vice versa.
- Slide a membrane unit (1) between one end of the spacer and its corresponding hub, such that the holes in the membrane unit align with the holes in the spacer and hub flanges.
- Assemble drive bolts as instructed in the Bolt Assembly section on below.
- Moving to the other end of the coupling, check that the smaller bolt holes in the hub align with the larger bolt holes in the spacer flange, and vice versa.
- Insert the second membrane unit (1) between the two flanges.

NOTE: To assist in this operation, a lever may be inserted between the spacer and hub flanges to move the spacer slightly against the flexibility of the membrane unit that was first fitted (Figure 4). Minimum gap 'X' when compressed is given in Table 1.

- Assemble drive bolts as instructed in the Bolt Assembly section on below ensuring all bolts are inserted from the hub towards the spacer.

FIGURE 4

Non-spacer option – with single membrane unit

- Align the larger sets of holes in one hub flange with the smaller sets of holes in the other hub flange.
- Slide a membrane unit (1) between the hubs, such that the holes in the membrane unit align with the holes in the hub flanges.
- Insert drive bolts as instructed in the bolt assembly section below [Bolt Assembly A].

Finally, rotate the machinery two or three times slowly to ensure it moves freely. The coupling is now ready for continuous and trouble free service.

Bolt Assembly

Bolt assembly A

- Sizes 0007 to 1560 Ensure the large flat machined on the head of the bolt (5) is next to the hub boss.
Sizes 1850 to 9025 Place plain washer (6) over bolt (5).
- Insert bolt from hub side into one of the smaller bolt holes in the hub flange and through the sleeve in the membrane unit (see Bolt Assembly A on the drawing).
- Place collar (4) onto bolt shank (5) and secure using locknut (7).
- Repeat Bolt Assembly A steps 1 through 3 for alternate holes around the hub flange.

Bolt assembly B

- Place collar (4) over bolt (5), ensuring that the chamfer accommodates the bolt head radius.
- From the hub side, pass bolt through one of the larger holes in the hub flange and insert through the sleeve in the membrane unit into the small hole of the spacer flange (see Bolt Assembly B on the drawing).
- Sizes 0007 to 1560 Secure using locknuts (7).
Sizes 1850 to 9025 Place plain washer (6) onto bolt shank (5). Secure using locknuts (7).
- Repeat Bolt Assembly B steps 1 through 3 for the remaining holes around the hub flange.

NOTE:

- Drive bolts must not be turned; hold the bolt and tighten the locknuts evenly one flange at a time in a "diametrically opposite" sequence.
- If a GA drawing is supplied with the coupling, tighten the nuts to the torque values quoted on that drawing, otherwise use the values quoted in Table 1.

TABLE 1. Standard Coupling Bolt Tightness Torques

| Coupling | | Compressed 'X' Min. mm | Bolt | Spanner A/F mm | Bolt Tightening Torque | |
|-----------|------|---------------------------|------|-------------------|------------------------|-------|
| | | | | | N-m | lb-ft |
| LDES-0007 | L001 | 4.6 | M5 | 8 | 4 | 3 |
| LDES-0014 | L002 | 4.6 | M5 | 8 | 4 | 3 |
| LDES-0028 | L003 | 4.6 | M6 | 10 | 6 | 4 |
| LSES-0045 | L004 | 5.0 | M6 | 10 | 6 | 4 |
| LSES-0090 | L009 | 5.4 | M8 | 13 | 15 | 11 |
| LSES-0175 | L017 | 6.1 | M10 | 17 | 30 | 22 |
| LSES-0265 | L026 | 4.6 | M12 | 19 | 54 | 40 |
| LSES-0525 | L052 | 8.1 | M14 | 22 | 86 | 63 |
| LSES-0810 | L081 | 9.9 | M16 | 24 | 165 | 122 |
| LSES-1150 | L115 | 10.1 | M18 | 27 | 225 | 166 |
| LSES-1560 | L156 | 13.1 | M20 | 30 | 322 | 237 |
| LLES-1850 | L185 | 20.4 | M20 | 30 | 286 | 211 |
| LLES-3000 | L300 | 21.1 | M22 | 32 | 389 | 287 |
| LLES-4200 | L420 | 21.9 | M24 | 36 | 494 | 364 |
| LLES-6000 | L600 | 23.0 | M30 | 46 | 981 | 724 |
| LLES-9009 | L909 | 24.1 | M33 | 50 | 1335 | 985 |
| LLES-9012 | L912 | 25.0 | M36 | 55 | 1714 | 1264 |
| LLES-9015 | L915 | 25.5 | M36 | 55 | 1714 | 1264 |
| LLES-9025 | L925 | 27.6 | M42 | 65 | 2741 | 2022 |

Operation, Inspection and Maintenance

Routine examination should include a periodic check on the tightness of fasteners and visual inspection of transmission components for signs of fatigue or wear.

If the coupled machinery is disturbed at any time, shaft alignment should be rechecked. Alignment checking is recommended if a deterioration of installation alignment during service is suspected.

Failures are rare and can generally be attributed to excessive misalignment and/or severe torsional overload. In all cases of coupling failure, the cause should be identified and corrected before replacing the coupling.

It is possible to repair the coupling by fitting replacement disc pack assemblies and, if necessary, the spacer.

Removing the coupling spacer

1. Having ensured that the equipment is safely isolated, loosen all the nuts (7) at both ends of the coupling, but do not remove them.
2. Support the spacer (3) and remove all the fasteners (4, 5, 6 and 7) from one end of the coupling.
3. Gently withdraw the membrane unit (1) from between the hub and spacer flanges, using a combined pulling and rotational action. If necessary, a lever may be used to move the spacer slightly against the flexibility of the other membrane unit (see Figure 4).
4. Remove all the fasteners from the second membrane unit and pull out the spacer and membrane unit. Separate the membrane unit from the spacer.
 - Do not attempt to dismantle the membrane units (disc pack assemblies) any further; replacements are always supplied as assembled units.
 - It is recommended that BOTH membrane units be replaced, as failure of one inevitably results in some damage to the other.

IMPORTANT Fastener sets (4, 5, 6 and 7) should be replaced after the coupling has been disassembled five times.

This section refers to couplings that bear the CE and ATEX required markings:

CE / ATEX Marking

All couplings that comply with CE and ATEX legislation will be marked as shown. This will be etched on the spacer element of the transmission unit if enough room is available.

A) Ambient temperature is standard (40°C max)

CE  I M2_C  II 2GD_C T6 (T85°C)  SL1 4LU, UK. XX

John Crane's Metastream metal membrane couplings are required for use in higher ambient temperatures, John Crane UK Ltd certifies that the equipment complies with the temperature classification range listed below in Table 2, and in all other respects complies with the type certificates.

TABLE 2

| Ambient Range Marking | | Group II, Category 2 GD ** | Group I, Category 2 M2 | Marking Option |
|-----------------------|------------|-------------------------------|------------------------|----------------|
| Min. | Max. | | | |
| Unknown | | T3 (T200°C) | Not Applicable | B |
| -55°C < | Ta < 150°C | T3 (T200°C) | Not Applicable | B |
| -55°C < | Ta < 90°C | T4 (T135°C) | 150°C | C |
| -55°C < | Ta < 55°C | T5 (T100°C) | 150°C | C |
| -55°C < | Ta < 40°C | T6 (T85°C) | 150°C | A |

B) Ambient temperature is (-55°C < Ta < 150°C) OR ambient temperature is unspecified, the equipment is not suitable for mining applications, Group I, Category 2.

CE  II 2GD_C T3 (T200°C)  SL1 4LU, UK. XX

C) Ambient temperature is (-55°C < Ta < 90°C)

When the ambient temp. is specified, 'T3' is replaced by the following 'T' mark (**) according to Table 2.

CE  I M2_C  II 2GD_C **  SL1 4LU, UK. XX

NOTE:

'XX' is the year of manufacture and will change. For example, for year 2016; XX = 16.

CE and EX marks must meet requirements of Annex II in Reg. (EC) No. 765/2008 and Annex II in Dir. 84/47/EEC respectively.

Operation in aggressive atmospheres

The following components contain non-metallic materials. Confirm compatibility or provide suitable protection if the coupling is to operate in an aggressive atmosphere.

- The hub electrical insulation (if supplied option) – reinforced thermosetting plastic
- Limited end float bearings (if supplied option) – PTFE based plastic

Temperature classification of John Crane's Metastream couplings

John Crane's metal membrane couplings, supplied in conformance with Directive 2014/34/EU, have to meet the classifications specified in Table 2 when used in accordance with instructions and information supplied.

T, L and H series couplings, using the disk type flexible elements, are covered by type examination certificate **Sira 02ATEX9403**.

M series couplings, using the diaphragm type flexible elements, are covered by type examination certificate **Sira 02ATEX9404**.

**John Crane UK Ltd**

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www.johncrane.com

Declaration of Conformity

EEC Directive 2014/34/EU of 26.02.2014
and resultant legislation and standards

We, the manufacturers – John Crane UK Ltd, – confirm that the explosion prevention requirements have been implemented for

Metastream® metal-membrane couplings

Equipment complies with the requirements of directive 2014/34/EU. It is in accordance with article 13. (a) of the directive and the fundamental Health and Safety requirements of Annex II, are fulfilled.

The current Type Examination Certificates for the couplings are:-

| | |
|-------------------------|-----------------|
| 'T', 'L' & 'H' Series - | Sira 02ATEX9403 |
| 'M' Series - | Sira 02ATEX9404 |

The technical documentation is deposited with the designated notified body in accordance with article 13 (b) (ii) of the Directive 2014/34/EU.

SIRA Certification Services
Unit 6, Hawarden Industrial Park
Hawarden, Chester, CH5 3US
United Kingdom

Signed:

Date: 20th July 2016

S. Pennington
(Engineering Manager - Couplings)



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Declaration of Incorporation

E.C. Machinery Directive (2006/42/EC)

Section 1.0 - Machinery Description:
 Flexible Power Transmission Ring and Diaphragm Form Membrane Couplings
 Types:

'H', 'T', 'L' & 'M' Series

Section 2.0 - Applicable Harmonised Standards
 ISO13709 (API 610) for centrifugal pumps
 ISO14691 couplings for - General-purpose applications
 ISO10441 (API 671) (opt) couplings for - Special-purpose applications

Section 3.0 - Declaration:
 We, John Crane declare that under our sole responsibility for the supply of the machinery defined in Section 1.0 above, the said machinery parts are intended to be incorporated into other machinery or assembled with other machinery to constitute machinery as covered by this Directive.

The machinery parts, covered by this declaration must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Signed:

Date: 20th July 2016

S. Pennington
 (Engineering Manager - Couplings)



| North America | Europe | Latin America | Middle East & Africa | Asia Pacific |
|--------------------------|---------------------|----------------------|----------------------|-------------------|
| United States of America | United Kingdom | Brazil | United Arab Emirates | Singapore |
| Tel: 1-847-967-2400 | Tel: 44-1753-224000 | Tel: 55-11-3371-2500 | Tel: 971-481-27800 | Tel: 65-6518-1800 |
| Fax: 1-847-967-3915 | Fax: 44-1753-224224 | Fax: 55-11-3371-2599 | Fax: 971-488-62830 | Fax: 65-6518-1803 |

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.