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|-----------------------|---|
| 1 – Transmission unit | 6 – Membrane pack |
| 2 – Hub | 7 – Drive bolt assembly (drive bolt, spacer washer, washer and locknut) |
| 3 – Stripper nut | 8 – Spacer |
| 4 – Stripper bolt | 9 – Axial shims (H_MA only) |
| 5 – Guard ring | 10 – Shim carrier (H_MA only) |

Foreword

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

Throughout these instructions, the generic high performance coupling code H_ME/A indicates HSME, HLME and HTME in addition to HSMA, HLMA and HTMA.

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 John Crane 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 (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.

Extent of Supply

The coupling will generally be supplied in the following configuration:

- Factory-assembled transmission unit, which will have been dynamically balanced for high-speed applications. The transmission unit will be supplied with transit gags (painted red) fitted to give protection during transportation and to aid installation of the coupling. These must be removed before running the coupling.
- Depending on the associated machinery, the coupling may be supplied with hubs or adapters, or designed for direct mounting onto machine flanges. These instructions are written for the general case where couplings have been designed and supplied with two hubs, suitably machined to fit the driver and driven shafts. Where transmission units are directly mounted to flanged machine shaft ends or adapters, reference to the specific general arrangement drawing will give sufficient information for the correct installation of the coupling.
- When indicated on the arrangement drawings, adjustment shims are supplied. These couplings contain the "A" designation, e.g., HSMA. A shim carrier component may also be supplied to maintain the shim pack. These allow the coupling length to be adjusted on site to suit the specific application. Refer to the specific general arrangement drawing for details of the use of these shims.
- Note components with match-markings must be assembled together with their corresponding marks aligned. Match marked stripper bolts sets must be maintained.

IMPORTANT A general arrangement (GA) drawing is always supplied for high-performance couplings. These instructions are to be read in conjunction with the GA and any specific information on the drawing takes precedence over the general information included herein.

Handling and storage

- Couplings and components should be stored in a dry building away from direct heat.
- For maximum protection, the coupling and components should be stored in the original packaging. If any packaging has been removed or damaged in transit, it should be restored to a secure safely packaged condition.
- The coupling should be stored horizontally and should not be stood on end for long periods. Avoid shock during handling and protect against corrosion.
- Always examine parts thoroughly when taking them from storage for signs of damage or deterioration.
- During transport, handling and storage, the transit gags (painted red for identification) should be in position. These include gagging plates item 11 and screws item 12 as shown in Figure 2 and 3.
- Following installation of the coupling, all transit gags and bolts should be tagged with the plant/coupling ID and stored ready for subsequent reuse on coupling removal, as should ancillary items such as spare shims.
- Documentation supplied with the coupling should be retained for future reference.

FIGURE 2

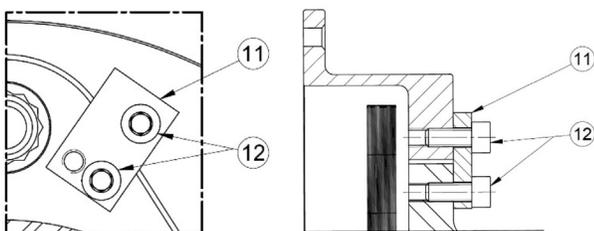
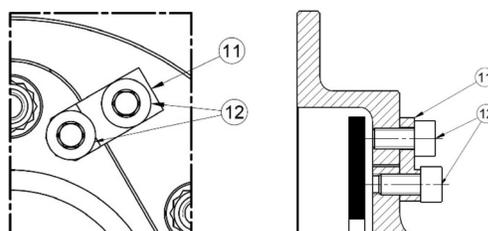


FIGURE 3 (HSM_0074 size ONLY)



Spares

When requesting spares, always quote the full designation of the coupling, e.g., HSMA-0179-0055-4571, order number and appropriate general arrangement drawing.

The following spares can be purchased from John Crane:

- Set of stripper bolts and nuts (3,4)
- Hubs, bored to your requirement or unbored (2)
- Complete transmission unit (1) — new or refurbished by John Crane

Installation

Remove the coupling from the 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. Note any match marks that must be aligned when the coupling is installed.

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.

IMPORTANT Refer to the coupling assembly drawing for all dimensions.

Parallel bore with keyed drive

1. Ensure the hub bore and mating shaft are clean and free from burrs.
2. The hub is usually installed with the hub face flush to the shaft end.
3. Measure the shaft diameter and hub bore to confirm the correct fit.
4. John Crane recommends a light interference fit for most applications and it may be necessary to apply heat to assist fitting of such hubs. An oven or induction type heater 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.

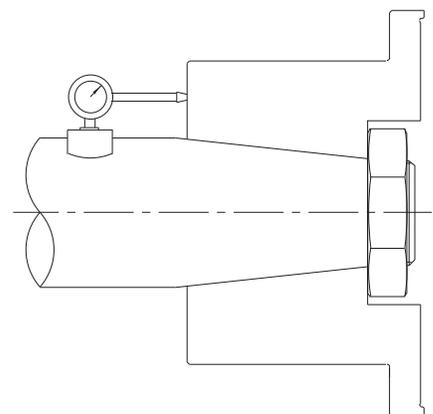
Taper bore with keyed drive (see Figure 4)

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. Taper surface contact should be checked for compliance with applicable standards.
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 re-measure 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. Ensure the nut is seated against the hub recess face. N.B. The hub face may not be flush with the shaft end when taper bores are used.

Taper hubs mounted by oil injection (see Figure 4)

1. Ensure that fillets and corner radii of mating surfaces, oil distribution and drainage grooves are well rounded and free from burrs and contamination. Taper surface contact should be checked for compliance with applicable standards.
2. Thoroughly clean all contact surfaces and smear the tapered surfaces with oil.
3. Remove O-rings if fitted.

FIGURE 4



4. Fit the hub onto the shaft. Lightly hammer the hub with a soft-faced mallet to ensure metal-to-metal contact takes place.
5. Measure the distance from the end of the shaft to the face of the hub using a depth micrometer (record this measurement).
N.B. Where O-rings are used this measurement should be taken with the O-rings removed.
6. Position a dial gauge against the hub flange face to measure axial movement and set to zero.
N.B. Dial gauge should be zeroed with O-rings removed.
7. If O-rings are used, remove hub and refit the O-rings before continuing.
8. Fit the oil injection equipment, axial stop and mounting tools. Consult the arrangement drawing and the oil injection system supplier's instructions.



Fit and secure the axial ram or hydraulic nut BEFORE injecting oil between the components.

9. Inject oil between the component interface until the required mounting pressure is reached, or it leaks out at the ends of the mating surfaces.
10. By means of the mounting tools, draw the hub up the shaft to the correct axial position, injecting oil during this operation.
N.B. The correct pull-up distance should be shown on the GA drawing along with max. permissible installation pressure.
11. Release the interface oil pressure and leave equipment fitted for one hour to allow for oil to drain from mating surfaces.
12. Remove the mounting tool and oil injection equipment.
13. Remeasure the distance from the end of the shaft to the face of the hub to confirm the correct pull-up.
14. Fit the locking washer and shaft-end retaining nut if applicable.



WAIT for 3-4 hours before applying torque.

Adapters

For machines having an integral flanged shaft, the flange may be machined to suit the bolting configuration of the coupling transmission unit. Alternatively, the coupling may be supplied with a customized flange adapter. Refer to the specific general arrangement drawing for 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 soft foot and correct before commencing alignment.
3. With one machine firmly bolted down, set the distance between shaft ends (DBSE) according to the drawing or catalog dimension.

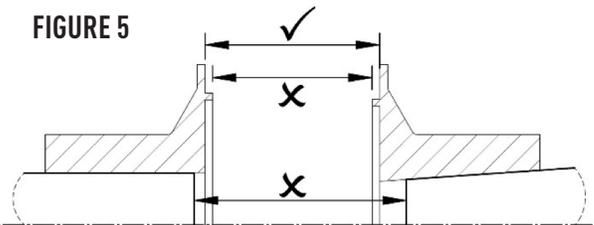
IMPORTANT DBSE should be measured between the outer face of the hubs and should not be taken as the length of the transmission unit at its outer periphery. DBSE may not be equal to the precise distance between shaft ends. In particular, the faces of taper bored hubs may not be flush with the shaft end (refer to Figure 5).

4. Align the shaft center lines both horizontally and vertically, ideally using the shafts. However, if access prohibits this, align using the hub bosses or flanges. John Crane recommends the reverse periphery method for accurate alignment. This can be done using dial gauges or with a laser shaft alignment kit. Further details on recommended laser alignment vendors are available from John Crane on request.
5. Recheck the DBSE after the shafts have been aligned.
6. Axial shims (together with a shim carrier in some cases) may be supplied on applications where it is difficult to accurately set a predetermined shaft end separation (DBSE). This is always the case where one or both of the hubs are taper bored. Where this feature is supplied, the thickness of shims (plus carrier if applicable) are added to the free length of the transmission unit so that the combined length is equal to the measured distance between the hub flange faces, making any allowance for known shaft movements. N.B. It is best to measure the transmission unit when it is in a gaged condition, where possible.

Shim-setting procedure (where supplied)

Shims are supplied to compensate for minor variations in the axial setting of taper bored hubs. The assembly is supplied with one set of shims fitted and a separate set for installation. If necessary, the distance between transmission unit flange faces can be increased or decreased by adding or removing shims as required.

FIGURE 5



Required shim thickness can be found from:

- $S = A - CSL$ Where S = Shim thickness
 A = Measured distance between flange faces (DBFF)
 CSL = Cold setting length = $L + \Delta + \zeta$ (see arrangement drawing)
 L = Transmission unit length
 Δ = Thermal growth to normal operating temperature*
 ζ = Compensation for transient thermal growth*
 *Where appropriate

- IMPORTANT** Total shim set thickness must not exceed the value stated on the assembly drawing.
- 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 recommend that installed misalignment is no more than 10% of the maximum allowable misalignment, with allowance being made for any anticipated movements that will occur during operation (e.g., thermal movements on hot pumps).

Installation of the Transmission Unit

IMPORTANT Match marked components must be aligned when re-fitting the shim carrier (10) to the transmission unit (1) in order to preserve coupling balance.

1. Check spigot and recess locations on the hubs and transmission unit for damage.

! The transmission unit must be adequately supported during installation to avoid accidental damage should it slip.

2. Compress the transmission unit using gagging plates (painted red) and gagging screws (Figure 6) while observing the appropriate maximum permissible compression value per membrane pack shown in Table 1.

TABLE 1 Maximum permissible compression offset "X" per membrane pack.

HSME/A	0074	0096	0115	0139	0159	0179	0200	0220	0240	0262	0283	0320	0357
Offset "X" mm	1.5	1.8	2.1	2.3	3.0	3.5	3.6	4.1	4.5	5.0	5.4	5.7	6.8
HLME/A			0115	0139	0159	0179	0200	0220	0240	0262	0283	0320	0357
Offset "X" mm			1.5	1.9	2.0	2.4	2.5	2.9	3.1	3.5	3.7	4.2	4.8
HTME/A						0179	0200	0220	0240	0262	0283	0320	0357
Offset "X" mm						1.7	1.8	2.1	2.2	2.5	2.6	3.0	3.2

Bolt all gagging plates to the guard-ring component and insert gagging screws into the tapped holes at the spacer end of each gagging plate as shown in Figure 6. Do not exceed compression values shown in Table 1.

For size HSM_0074, the gagging plate (11) is reversed and membrane compressed by tightening the guard-ring side screw (12) as shown in Figure 7.

IMPORTANT Ensure the spacer side compression screw is jacking against an uninterrupted flat surface of the spacer component clear of any tapped holes, edges or radii.

3. With each membrane unit compressed, slide the transmission unit assembly between the hubs and align any match marks.
4. Remove all gagging plates and screws and store them safely for future use.

FIGURE 6

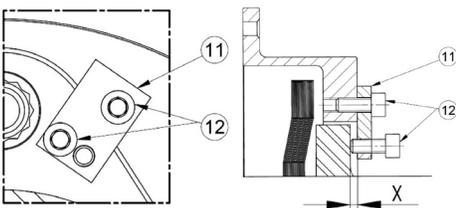
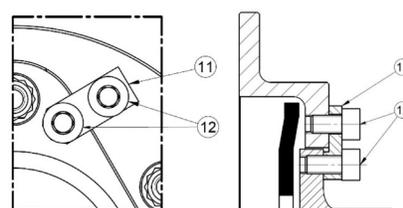


FIGURE 7 (HSM_0074 SIZE)



IMPORTANT Always remove the compression bolts/plates as soon as the transmission unit is in position.

- Fit the stripper bolts by hand initially, then tighten evenly to locate the transmission unit, ensuring the spigots enter their recesses squarely. Using a torque wrench, tighten in a "diametrically opposite" sequence to the torque values shown in Table 2. Tightening torque values on the general arrangement drawing take precedence.
- Measure dimension "X" (see Figure 6) on the transmission unit. If the combined total value at both membrane units is outside the axial operating limits stated on the coupling GA drawing, redo the axial alignment. Note: If the coupling is stretched at installation dimension "X" will be reversed.

TABLE 2

Hub Stripper bolt tightening torque (Nm)

HSME/A	0074	0096	0115	0139	0159	0179	0200	0220	0240	0262	0283	0320	0357
Size	M6	M6	M6	M6	M8	M8	M8	M12	M12	M12	M12	M12	M16
Torque (Nm)	14	14	14	14	30	30	30	95	95	95	95	95	220
HLME/A			0115	0139	0159	0179	0200	0220	0240	0262	0283	0320	0357
Size			M6	M6	M8	M8	M8	M12	M12	M12	M12	M16	M16
Torque (Nm)			14	14	30	30	30	95	95	95	95	220	220
HTME/A						0179	0200	0220	0240	0262	0283	0320	0357
Size						M12	M12	M12	M12	M12	M16	M16	M16
Torque (Nm)						95	95	95	95	95	220	220	220

Operation, Inspection and Maintenance



Before starting the machinery, ensure all gagging plates and screws are removed, all necessary safety procedures are being observed and coupling guards are fitted.

Routine examination should include a periodic check on the tightness of fasteners and visual inspection of transmission unit 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.

The stripper bolts use prevailing torque lock-nuts. It is recommended that all the nuts are used no more than 5 times, or until the prevailing friction torque is lost.



Maintenance work must only be carried out by suitably qualified personnel when the equipment is stationary and has been made safe.

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.

A transmission unit is the minimum spare which can be ordered. In order to ensure that the quality of transmission unit assembly is maintained, they are factory-assembled and balanced by John Crane.

Removal of coupling



Ensure coupling is stationary and has been made safe prior to commencing removal.

Support the transmission unit (1) to ensure the weight is never imposed on one end only. Slacken off the stripper bolts and nuts (4) & (3).

Tapped holes are provided in the hub (2) flanges to assist in breaking the spigot/recess fit. Fit the gagging plates (11) and bolts (12). Compress the membrane units evenly and no further than value "X" shown in Table 1 until there is sufficient gap to permit removal of the transmission unit (refer to Table 1 & Figure 6).

IMPORTANT Do not over compress either assembly as this may damage the flexing elements.

Remove the stripper bolts (4) and nuts (3), and lift out the transmission unit.

Gagging of each membrane unit

Slacken and remove the spacer-side screws (12) used to compress each membrane unit. Align the gagging plate clearance hole and spacer-tapped hole (7) and refit the spacer-side screws into the spacer-tapped hole, passing through the gagging plate (11). Tighten the screws to lock the membrane unit rigid per Figure 2.

On size HSM_ 0074, the gagging plate (11) must be reversed as shown in Figure 3.

IMPORTANT The gagging method described above is only intended for transportation and fitting.

IMPORTANT Do not dismantle the transmission unit assembly as this will invalidate the dynamic balance.

The transmission unit must be adequately supported during removal to avoid accidental damage should it slip.

Hub removal

Keyed hubs

1. Puller holes are provided as an aid to hub removal. They are not intended for "cold" removal of the hub.
2. Insert screwed rods and position a puller plate or bar over the rods, bridging a packer bearing on the shaft end.
3. Tension the rods up to the safe tightening torque.
4. Taking due safety precautions, preferably using an induction heater or heating tape, heat the hub quickly and evenly until it moves and draw off.
5. DO NOT use spot heat or exceed 175°C, as this may cause distortion.
6. If the hub must be removed "cold", use a heavy-duty puller bearing on the back of the hub boss. Avoid contact and load transfer between the puller and the hub flange, as this may cause distortion.

Hubs mounted by oil injection



A suitable method of controlling axial movement of the hub/membrane unit must be fitted BEFORE oil injection begins.

1. For reasons of safety and to prevent damage to mating surfaces, use the mounting tools to restrict the movement of the hub from the shaft which may suddenly separate with considerable force.
2. Assemble the oil injection equipment. Consult the oil injection system supplier's instructions.
3. Inject oil between the components until the required pressure is reached, or it leaks out at the ends of the mating surfaces.
4. Gradually release the mounting tool so that the hub/membrane unit slides off smoothly.

Adapters

1. Refer to the specific general arrangement drawing for location and mounting details.
2. Note the position on the shaft flange and any match markings.
3. Support the weight of the adapter.
4. Remove the adapter stripper bolts.
5. Tapped holes are provided in flanges to assist in breaking the spigot/recess fit.

Transmission unit refurbishment

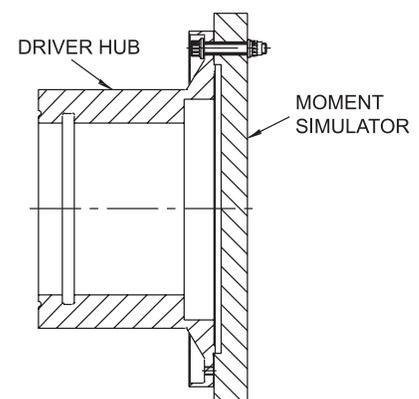
John Crane's Metastream flexible power transmission couplings are designed and selected to give an unlimited service if used within the parameters for which they are specified. Failures are rare and can generally be attributed to excessive misalignment, severe overload or a combination of both. In all cases of coupling failure, it is advisable that the cause of failure is first identified and corrected.

All John Crane High Performance couplings are factory assembled and balanced. All couplings must be returned to John Crane for refurbishment and rebalancing where required.

Solo running (using a moment simulator)

Where the driving machine is required to be run uncoupled, a moment simulator may be provided. The moment simulator is designed to imitate the half-weight and center of gravity of the coupling when bolted to the hub face.

FIGURE 8: Solo running with moment simulator

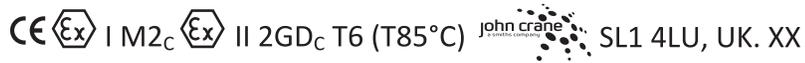


This section refers to couplings which bear the CE and ATEX required markings:

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)

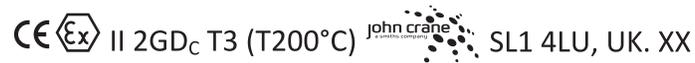


Where John Crane's Metastream metal membrane couplings are required for use in higher ambient temperatures, John Crane UK Ltd certifies that the equipment complies with the temperature classification range listed below in Table 4, and in all other respects complies with the type certificates.

TABLE 4

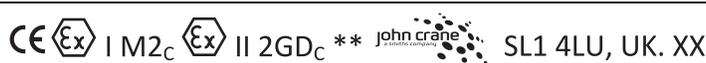
Ambient Range Marking		Group II, Category 2 GD **	Group I, Category 2 M2	Marking Option
Min.	Max.			
Unknown		T3 (T200°C)	Not Applicable	B
-55°C <	Ta < 150°C	T3 (T200°C)	Not Applicable	B
-55°C <	Ta < 90°C	T4 (T135°C)	150°C	C
-55°C <	Ta < 55°C	T5 (T100°C)	150°C	C
-55°C <	Ta < 40°C	T6 (T85°C)	150°C	A

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.



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 4.



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 Metastream metal membrane couplings, supplied in conformance with Directive 2014/34/EU, have to meet the classifications specified in Table 4 when used in accordance with instructions and information supplied.

John Crane's Metastream T, L and H series couplings, using the disk type flexible elements, are covered by type examination certificate **Sira 02ATEX9403**.

John Crane's Metastream 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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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 1 3. (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)



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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.