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4-Arm Production Roller Centraliser

PRODUCTION ROLLER CENTRALISER

2¹/₈" , 4 Arm, GO Ends

Operational & Maintenance Manual



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0 ABOUT THIS MANUAL

0.1 MANUAL HISTORY

Date	Issue	Description	Auth	Chk	App
08/09/00	A	First Issue.	TS/DO		TS
23/03/02	B	New tool kit, drawings and spares lists.	DO		TS
04/07/02	C	Spares kit re-issued and renamed (ECR 1148)	DO		TS
13/09/02	D	Arms redesigned, ECR 1121.	IH/DO	SA	IH
21/07/04	E	Drawing/Parts List updates, ECR1523.	DO	SA	CD
22/11/05	F	Template update, new layout. Also: ECR2174, 2035, 2060, 3229.	FV	(SA)	(NH)
17/02/09	G	Drawings & BOMs updated: ECRs 3004, 3789, 4902, 4903, 5160, 5572, 6027, 6082, 6365.	RS	RS	(TG)

0.2 UPDATES TO BE USED WITH THIS MANUAL

Consult the CD Directory for the appropriate Manual Updates to be used with this Manual.

0.3 TECHNICAL HELP

For further technical help contact Sondex as follows:

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0.4 FEEDBACK

Please help us improve future issues of this manual by adding your comments or corrections to www.ge-energy.com/oilfield, referencing the document number.

Thank you.

Photographs and sketches are for illustration purposes only. Depending on the tool model that you have, certain features or dimensions may differ from those shown.

1 DESCRIPTION

This compact, four arm, in-line roller centraliser is designed to support and centre production logging tools, accurately in vertical, deviated or horizontal wells.

The centraliser has four sets of paired arms, mounted on the spring housing and linked together to provide accurate centring. Each individual arm has a tungsten carbide coated, stainless steel roller, with a combined retainer/axle that runs in a sintered PTFE dry bearing.

The arms are linked in pairs to ensure accurate centring, whilst providing a constant radial force through the full operating diameter. Special features reduce the force required to pull the tool into small tubing.

The PRC028 includes a mono conductor passing from the upper end to the lower end of the tool, allowing inter-string connection, with continued telemetry operation.

The tool closes at $2\frac{1}{8}$ ".

For safety, these bodies are free to slide on the main shaft of the tool.

Corrosion resistant alloys are used throughout the tool design, which are suitable for use in a normal or in an H₂S environment, EXCEPT for the springs. Special springs for use in an H₂S environment are available on request from Sondex.

Although the mechanical arrangement allows very large centering forces to be achieved, large closing forces may result in undesirably high wireline tension as the tool string enters a small tubing from a large casing. If possible, use more centralisers rather than stronger centralisers.

1.1 PURPOSE

Most Production Logging Tools give the best performance when they are centred in the borehole. Some tools, such as Gamma Ray and Temperature, are relatively insensitive to borehole position. The CCL gives a larger response when it is not centred.

The Sondex Knuckle Joint (PKJ series) can be used to isolate sections of the toolstring that must be centred from sections that are to be positioned against the casing or tubing wall, including any weights. Centred tools are less likely to suffer from wear and toolstring drag. Downhole video cameras must be centred normally to give evenly lighted pictures.

The 4-armed variant was designed for use with heavier tools that require accurate centralisation. They may also be used to maximise the depth attainable on wire line, in heavily deviated wells, due to the low friction and dual rollers.



1.2 APPLICATION

- Centralisation of logging tools in vertical, deviated or horizontal wells.
- Centralisation of slickline tools.
- Minimisation of toolstring drag and wear.
- Can be used as a tubing end locator by observing line tension when pulling into the tubing.

1.3 INTERFACING & TOOL COMBINATIONS

- Simultaneous Operation with other PL Tools.
- 1³/₁₆" UN 12 tpi Sondex, GO or other Heads.

1.4 SPECIFICATION

Parameter	Specification	Remarks
Temperature Rating	177°C	
Pressure Rating	15000psi	
Diameter (min)	2 ¹ / ₈ " (54mm)	
Diameter (max)	9 ⁵ / ₈ " (244mm)	
Make-Up Length	34" (864mm)	
Overall Length	38" (965mm)	Including Thread Protectors.
Weight	27lb (13.3kg)	Without closing ring
Centraliser Force	≈70lb (32kg)	Above it's own weight.
End threads (top/bottom)	GO type A 1 ³ / ₁₆ " UNF 12tpi (female/male)	
End connectors (top/bottom)	4mm single conductor (male pin/female socket)	
Materials	H ₂ S resistant, hard stainless steel rollers (carbide coating on standard rollers only), dry bearings.	

2 SAFETY

**Warning!****SPRING FORCE!**

Care must be taken when removing/fitting the Closing Ring. The Centraliser has strong springs, which will cause the arm to open with great force. Care must also be taken when dismantling the spring housing as there is considerable force acting on the endcap when it is being removed.

**Warning!****HOT WORK!**

Sondex equipment may, under certain circumstances or failure modes, become a potential source of ignition. Using it must therefore be considered "HOT WORK" and appropriate precautionary procedures should be followed when testing at surface in areas where there is a risk of gas leaks or other potentially explosive atmospheres.

**High Temperature Grease**

A High Temperature Grease (Castrol Spheerol L-EP2 or Castrol LMX) is used to fill the Centraliser Body of the tool during maintenance. Contact with skin or eyes can be harmful.

For more details see the [Material Safety Data Sheet for Castrol Spheerol L-EP2](#) or [Material Safety Data Sheet for Castrol LMX](#) respectively.

**Liquid O-ring**

LOR101 is used for lubricating the tool during maintenance. Contact with skin or eyes can be harmful. For more details see the [Material Safety Data Sheet for Liquid O-ring](#).

2.1 RECOMMENDATIONS



The product should be installed, adjusted and serviced by qualified electrical maintenance personnel. Improper installation or operation of the equipment may cause injury to personnel or equipment. Before beginning any installation or commissioning work ensure that electrical power is disconnected and locked out.

NOTE: Installation must meet National Wiring Regulations in accordance with IEC/UL 61010 latest revision.

WARNING 1: The outer casing of the product should be connected to a known good system ground before making any other electrical power connection. This system ground to be maintained until all electrical power connections are disconnected and locked out.

WARNING 2: Units with exposed Electrical Connectors are supplied with protective insulating end caps bearing a warning of High Voltage. These end caps should only be removed when Electrical Power is disconnected and locked out for the purposes of interconnection to other Units. Under no circumstances should equipment be operated with the Electrical Connectors exposed.

WARNING 3: Units with moving parts such as calipers can be activated immediately on application of Electrical Power. A safe area should be established around any such Units before the application of Electrical Power.

WARNING 4: Units with moving parts such as springs can retain significant Potential Energy. Great care should be exercised when removing Closing Rings or handling over tightened assemblies.

WARNING 5: Units containing seals may entrap pressure. Disassembly should only be carried out in accordance with recommended procedures ensuring the release of pressure prior to the disengagement of cap threads.

WARNING 6: If the equipment is not installed, commissioned and used in accordance with the manufacturer's specifications, protection provided may be impaired.



Standard Personal Safety Gear must be worn at all times including but not limited to: Safety glasses, gloves and steel-toed boots.

Equipment exceeding 18Kg in weight should be handled with extreme care. Heavy items should be mechanically lifted. Any installation of equipment over 10Kg to be lifted over 1 metre should be at least a two man lift. Good lifting practice should be exercised at all times including but not limited to:

- Use of correct personal safety gear.
- Lift using legs not back
- **Not** proceeding with a lift in the presence of any doubt of completing the lift safely
- Use of mechanical lifting aids wherever possible
- Ensuring work area is free of clutter and tripping hazards

3 OPERATING PROCEDURE

**Warning!****SPRING FORCE!**

Take care when removing the Closing Ring. The Centraliser has strong springs, which will cause the arm to open with great force.

3.1 PRE-LOGGING CHECKS

3.1.1 MECHANICAL

Ref.: PRC028 General Assembly *09087*
Shaft & Arms Assembly *15114*

- 1 Clean and grease upper and lower O-ring seals. Replace O-rings (item 2, 09087) if damaged.

Note: Viton[®] O-rings are normally used, but the material choice depends on downhole conditions.

- 2 Check for excessive wear of arms. Replace if necessary.
- 3 Check that wear on rollers and axles is acceptable. Check that all roller assemblies (item 12, 15114) are free to rotate. If any do not run freely, they should be disassembled and serviced, see [Section 4.1.5 Centraliser Arms](#).
- 4 Check the spring action.
- 5 Check that all six grub screws (item 4, 15114) are tight. These hold the ball bearings (item 5, 09087) in place, which prevent the Upper and Lower subs (item 3, 09087 & item 16, 09087) from rotating on the main Shaft (item 7, 15114).
- 6 Check that the 2 Spring Housings (item 5, 15114 & item 6, 15114) are filled with high melting point grease (e.g. Castrol LMX), see [Section 5 Extended Checks](#).
- 7 Ensure that upper and lower electrical connectors are clean, dry and undamaged.

3.1.2 ELECTRICAL

- 1 Using a megohmmeter, set to 500V, measure the upper to lower pin resistance. The reading should be less than 0.5Ω.
- 2 Using a megohmmeter, set to 500V, measure the pin to housing resistance. The reading should be greater than 5MΩ.

3.2 CONNECTING TO TOOLSTRING

Upper and lower tool joint O-rings and seal surfaces should be clean, undamaged and lightly greased. The PRC may be inserted into a Production Logging toolstring (wireline or memory) in any location or used with Coiled Tubing.

NOTE: The main tool joints are only pressure tight when connected to another pressure tight tool. If well fluid enters these joints, the PRC and the rest of the toolstring may be flooded.

In wireline applications, two centralisers will hold the full Sondex toolstring straight and ensure accurate centering in deviations up to 70°. If extra weights are included, they should be isolated from the centred string with a Sondex knuckle joint.

Knuckle Joints (PKJ) can be used within a toolstring to separate tools that need to be centralised, from tools that need to be positioned against the casing or tubing.

3.3 LOGGING

The following are guidelines only and must be used in conjunction with local policy and specific well site conditions both downhole and at surface. The table below is appropriate for near vertical wells and must be adjusted accordingly when in deviated wells. Use of a Head Tension Unit is highly recommended.

Note: Do not exceed the calculated safe working load of your selected weakpoint. If in doubt, use a head tension unit, especially in deviated wells where calculation from surface tension is less accurate.

Depth (ft)	Speed Pulling Out of Hole	Speed Running in Hole
In/out of catcher (pressure rig up only)	Dead slow or manual.	
30 to 150	30ft/min	
150 to 400	60ft/min	
>400 clear cased hole	Surface tension not to exceed 120% of tension when tool stationary and speed not to exceed 150ft/min.	Surface tension not to exceed 80% of tension when tool stationary and speed not to exceed 150ft/min.
>400 clear open hole	Surface tension not to exceed 130% of tension when tool stationary and speed not to exceed 150ft/min.	Surface tension not to exceed 70% of tension when tool stationary and speed not to exceed 150ft/min.
Approaching potential obstacles ^a	30ft/min	
Logging Data	Do not exceed the above speeds.	

^a. For example: Reduced diameters, gas lift mandrels, fluid levels, valves, tubing shoes, packers, cross overs and other downhole equipment.

Note: Although the mechanical arrangement allows very large centering forces to be achieved, large closing forces may result in undesirably high wireline tension as the toolstring enters a small tubing from a large casing. If possible use more centralisers rather than stronger centralisers.

3.4 POST-LOGGING DISASSEMBLY

The tool should be cleaned before the toolstring is disassembled.

Ensure that well fluid does not reach the electrical connectors. Refit Thread Protectors and Closing Ring (item 18, 09087; not shown on drawing).

Before storage:

- 1 Check that Rollers rotate. Spray them with WD-40[®] after every run.
- 2 Re-grease body spring assemblies, see [Section 5.2 Extraordinary Maintenance](#).

Always keep the tool in its transport case before and after logging.

3.5 TRANSPORT, HANDLING & STORAGE

Store with end thread lightly greased and water tight thread protectors fitted.

Do not store in the fully closed configuration for excessively long periods of time as the springs may suffer from compression set.

Note: Continued storage of the centraliser with its arms closed and its retaining collar fitted, may lead to spring set and loss of performance. If the centraliser is to be stored for any long period of time, it is recommended that the centraliser is stored with its arms open.

Do not subject tool to extreme shock such as dropping or hitting with a hard object.

Transport the tool with Thread Protectors and Closing Ring fitted.

4 MECHANICAL DESCRIPTION



Warning!

SPRING FORCE!

Care must be taken dismantling the tool as there is considerable force acting on the Endcap of the Spring Housing when disassembled.

4.1 DIS-ASSEMBLY

4.1.1 UPPER SUB & LOWER SUB

Ref.: PRC028 General Assembly *09087*
Shaft & Arms Assembly *15114*

Note: All item numbers in this section refer to drawing 09087, unless stated otherwise.

Note: The End Subs are matched to the Shaft. Before removing, mark each End Sub and the Shaft, so that they can be re-fitted in their original positions.

Note: It is not essential to release the Spring pressure prior to removing the Subs, but it is recommended, see [Section 4.1.4](#).

- 1 Remove Grub Screws (6x item 4) from Lower Sub (item 16) and Upper Sub (item 3).
- 2 Slightly rotate the Lower and Upper Sub (items 16 & 3) with respect to the Shaft (item 7, 15114).

Note: This releases the ball bearings (item 5), which normally prevent rotation of the subs on the shaft.

- 3 Unscrew both the Upper Sub (item 3) and Lower Sub (item 16) from the Shaft (item 7, 15114).

Note: The pair of O-rings (item 15, 15114) at each end of the Shaft prevent fluids passing beyond the thread of the Shaft. **The O-rings maintain integrity between the shaft and the sub, and care should be taken not to damage them. Replace if damaged.**

4.1.2 LOWER CONNECTOR

Ref.: PRC028 General Assembly *09087*

Note: This procedure is easier if the Lower Sub (item 16) has been removed first. Refer to [Section 4.1.1](#).

Note: It is not essential to release the Spring pressure prior to removing the Lower Connector, but it is recommended, see [Section 4.1.4](#).

- 1 Remove the Banana Pin (item 15) from the end of the Connecting Rod (item 11).
- 2 Remove the Half Nut (item 7).
- 3 The Lower Insulator (item 14), Insulator (item 13) and Washer (item 8) may now be removed.

The remaining upper Upper Connector Assembly and Connecting Rod may now be removed by withdrawing them from the upper end of the tool, refer to [Section 4.1.3](#).

4.1.3 UPPER CONNECTOR

Ref.: PRC028 General Assembly 09087

Note: The Connecting Rod is connected to the Banana Pin. Remove the Lower Connector first, refer to [Section 4.1.2](#).

Note: It is not essential to release the Spring pressure prior to removing the Upper Connector, but it is recommended, see [Section 4.1.4](#).

- 1 Withdraw the Upper Connector Assembly and Connecting Rod (item 11) from the upper end of the tool.
- 2 Slide the PTFE Tubing (item 10) from the Connecting Rod (item 11).
- 3 Unscrew the Hex Connector (item 6) and Half Nut (item 27).
- 4 The Upper Insulator (item 9) and Washer (item 8) may now be removed.

4.1.4 SPRING FORCE

Ref.: Shaft & Arms Assembly 15114



Warning! SPRING FORCE! Care must be taken dismantling the spring housing as there is considerable force acting on the endcap when it is being removed.

Note: When removing the Spring force, it is safer to leave the Centraliser Bodies and Subs positioned on the Shaft. This to ensure the Springs remain on the Shaft at all times and cannot cause serious damage or danger when accidentally exiting the Centraliser Bodies.



Warning! SPRING FORCE! Take care of fingers when Springs accidentally exit the Spring Bodies.

Note that there is a spring assembly on either side of the tool.

- 1 Hold the Upper Spring Housing (item 5) in a soft-jawed vice and using a C-spanner or tommy bar, slowly unscrew its End Cap (item 1).

Note: Care should be taken at this stage due to the large spring force acting on the endcap.

Repeat this process for the other Spring Housing and End Cap. This ensures that the stored spring force has been dissipated, making the tool safe to work on.

4.1.5 CENTRALISER ARMS

Ref.: Shaft & Arms Assembly 15114

- 1 If not already done, release the spring pressure as described in [Section 4.1.4](#).
- 2 Ensuring the Arm assembly is sufficiently supported, remove the Axle (item 11).
- 3 Remove the Top Hat Bush (item 13) and Roller Assembly (item 12).

Note: Further disassembly is not required when roll replacement is needed.

- 4 Separate the Arms Assembly (item 10) from the Spring Bodies by unscrewing the Torque screw (item 8) and removing the Arm Locating Cap (item 9).
- 5 Remove the Arms (item 10) from the Spring Housings (item 5 & 6) by sliding the arm enough so it disengages from its arced 'T' slot.
- 6 Repeat for the remainder of the Arm assemblies.

4.1.6 SPRINGS & HOUSINGS

Ref.: Shaft & Arms Assembly 15114



Warning! **SPRING FORCE!** Care must be taken dismantling the spring housings as there is considerable force acting on the End Cap (item 1) when it is being removed.

Note that there is a spring assembly on either side of the tool.

- 1 If not already done, release the spring pressure as described in [Section 4.1.4](#).

Note: Care should be taken at this stage due to the large spring force acting on the End Cap (item 1).

- 2 Slide the End Cap (item 1) off the Shaft (item 7).
- 3 The Spring (item 3) can now be removed.
- 4 Prior to removing the spring housings (items 5 & 6), spring guide (item 4) and actuating bush (item 16), ensure the arms and springs are removed, as described in [Section 4.1.5](#) and this section, respectively.

4.2 REASSEMBLY

Note: Ensure that parts are clean and undamaged before reassembly.

4.2.1 SPRINGS & HOUSINGS

Ref.: Shaft & Arms Assembly 15114

- 1 Fit the Spring (item 3), Spring Guide (item 4) and Actuating Bush (item 16) into the Upper Spring Housing (item 6).
- 2 Fit the End Cap (item 1) over the Shaft (item 7).
- 3 Temporarily screw on the respective End Sub.
- 4 Screw in the End Cap (item 1) just a few turns into the Spring Housing (item 6). Ensure the Spring is not excessively compressed.



Warning! There will be some spring load acting on the parts within the spring housing assembly.

Note: A Spacer Collar can be used to compress the Spring. If a Collar is not available, vertical palm pressure against a flat, solid surface can be used. Maintain pressure and engage the thread on the cap with the thread in the Centraliser body.

- 5 Repeat for the other end of the tool.

4.2.2 CENTRALISER ARMS

Ref.: Shaft & Arms Assembly 15114

Note: Take any previously fitted parts and any annotations applied to them into account, to ensure correct location for refitment. At this stage, the relationship between the Centraliser Arms, the Spring Housing and Spring Collar becomes especially important. The relationship with the End Subs will be ensured at a later stage.

Note: The Upper Arms are weaker than the Lower Arms. The Upper Arms are therefore fitted towards the top of the tool during manufacturing.

- 1 Inspect Arm Assemblies (item 10) and Torque Screws (item 8) for wear and replace if necessary.
- 2 Refit the Arm Assemblies (item 10) into their original positions on the Spring Housings (items 5 & 6) and secure with the Torque Screw (item 8) and Retaining Cap (item 9).



Caution! DO NOT compress the centraliser arms until **all** arms are located in their respective positions. Dummy pins can be used to assist assembly.

Note: If new Centraliser Arms are fitted then, once the arms have been located onto one Spring Housing, move them about over their full range. There will be some spring resistance, but it should not be excessive as the end caps were not screwed in fully in [Section 4.2.1](#).

If there are any issues with physical clashes between parts, then investigate further. New arms may need to be fitted in some areas. This can be done by dressing as required with suitable files.

Note: Fit new Spirol Pins and Pivot Pins to the Arm Assembly if damaged, or if the arms were difficult to rotate or particularly loose.

- 3 Fit the Roller Assemblies (item 12) to the Arms and secure with Axles (item 11) and Top Hat Bushes (item 13), ensuring the location tongues of the bushes mate with the grooves in the respective arm.

Note: Fit new Axles (item 11), Top Hat Bushes (item 13) and Roller Assemblies (item 12) to the Arm Assembly if damaged, or if the arms were difficult to rotate or particularly loose. Replace the O-rings (item 14). If the Axle (item 11) does not show any wear it may be re-used.

4.2.3 SPRING FORCE

Note: Having refitted all arms and reconnected all arms to each other, it is now possible to reinstate the full spring pressure.

- 1 Full screw each Endcap into its respective Spring Housing.



Warning! **SPRING FORCE!**
Care must be taken dismantling the spring housing as there is considerable force acting on the endcap when it is being removed.

4.2.4 UPPER & LOWER CONNECTORS

Remove the End Subs, temporarily fitted in [Section 4.2.1](#), remembering which Sub relates to which end of the Shaft and Fitted Arms.

4.2.4.1 Top Connector

Ref.: PRC028 General Assembly *09087*

- 1 Fit the Insulator (item 9) and Washer (item 8) onto the Connecting Rod (item 11). Note the orientation of the Insulator (item 25).
- 2 Refit the Half Nut (item 7) and Hex Connector (item 6). Ensure the Hex Connector (item 6) is fully screwed on. Back off the Half Nut (item 7) until locked against the Hex Connector (item 6).
- 3 Slide the PTFE Tubing (item 10) onto the Connecting Rod (item 11).
- 4 Refit the entire assembly through the Upper End of the Shaft & Arms Assembly (item 12).

4.2.4.2 Bottom Connector

Ref.: PRC028 General Assembly *09087*

- 1 Fit the Lower Insulator (item 14), Insulator (item 13) and Washer (item 8) onto the Connecting Rod (item 11).
- 2 Refit the Half Nut (item 7).

Note: The Half Nut (item 7) can be used to pull the Lower Insulator (item 14), Insulator (item 13) and Washer (item 8) together. This action will also secure the 2 Insulators (item 9 & 13) against the Shaft, creating a clamping action.

- 3 Refit the Banana Pin (item 15) onto the Connecting Rod (item 11) and tighten against the Half Nut (item 7).

If the Upper and Lower Subs were not fitted previously, they can be fitted now as described in [Section 4.2.5](#).

4.2.5 UPPER SUB & LOWER SUB

Ref.: PRC028 General Assembly 09087
Shaft & Arms Assembly 15114

Note: All item numbers in this section refer to drawing 09087, unless stated otherwise.

Note: Although the Shaft (item 7, 15114) is symmetrical, it is recommended that the Subs are refitted in their original positions, so that the Ball Bearings (items 5) can engage with the original indentations.

- 1 Replace the O-rings (4x item 15, 15114), ensuring the grooves and O-rings are clean, greased and undamaged.
- 2 Refit the Lower Sub (item 16) and Upper Sub (item 3).
- 3 Replace the Ball Bearings (6x item 5) and secure the Lower Sub (item 16) and Upper Sub (item 5) with the Grub Screws (6x item 4).

4.2.6 FINAL REASSEMBLY STAGES - GREASE FILLING

Note: Grease is normally applied with the Centraliser Arms closed and the Closing Ring fitted.

- 1 Remove the grease port Grub Screw (item 2) and fit the grease nipple.
- 2 Fill the End Cap assembly with grease, until the grease extrudes from the Spring Housing.
- 3 Remove the grease nipple and replace the Grub Screw (item 2).

Note: If the Centraliser Arms are opened after Grease filling, grease will be forced out of the Arm locating positions.

5 EXTENDED CHECKS

See also: [APPENDIX B Drawings & Parts Lists](#)

5.1 PREVENTATIVE MAINTENANCE

5.1.1 GREASE & LUBRICANTS

Sondex recommends the use of "Liquid O-ring type 101" (p/n LOR101) on threads and O-rings, see [APPENDIX A](#).

All O-rings and housing threads are assumed to be and must be lightly greased unless specifically indicated differently.

Correct use of grease and lubricants is essential to the maintenance of all Sondex downhole equipment.

Note that some threads are internal such that grease can get inside the tool. Do not use excessive quantities.

Sondex does not recommend Copper loaded greases since some types can cause electrical leaks. Some types are also not suitable for use on O-rings. Silicone grease may be used on O-rings, but must be kept clear of threads especially stainless to stainless.

Cavities, e.g. spring housings, should be filled with a suitable heavy high melting point grease, such as Castrol Spherol L-EP2 or LMX.



Warning! The use of certain greases, such as some types of Lubriplate, can cause electrical failure if they have any volatile content, which can burn off producing corrosive gasses inside the tool.

5.1.2 MECHANICAL

Ref.: PRC028 General Assembly [09087](#)
Shaft & Arms Assembly [15114](#)

- 1 Remove dirt and old grease from pressure housing threads and O-rings and replace with fresh.
- 2 Inspect O-rings for damage or ageing/hardening and replace where required.
- 3 Check for:
 - Damaged components.
 - Loose screws/nuts/components/connectors.

Note: If RTV or similar compound is used to secure loose components, it must be fully cured before housing is replaced.

- Heat or chemical damage (discoloured components).
- Incorrect thread grease or excessive quantity, see [Section 5.1.1](#).
- cleanliness of connectors and loose/bent pins before replacing.

- 4 Check all fixings for tightness.
- 5 Check grub screws (6x item 4, 09087 & 2x item 2, 15114) are tight.
- 6 Ensure that upper and lower electrical connectors are clean, dry and undamaged.

5.1.3 ELECTRICAL

- 1 Measure the tool resistance, using a megohm meter set to 500V:
 - Upper to lower pin resistance should be less than 0.5Ω.
 - Pin to housing resistance should be greater than 5MΩ.

5.2 EXTRAORDINARY MAINTENANCE

Ref.: PRC028 General Assembly 09087
Shaft & Arms Assembly 15114

5.2.1 CORROSION & WEAR

The main mechanical parts of the Centraliser are made from corrosion resistant materials. However, the standard springs are not fully corrosion resistant. Frequent greasing of the spring assemblies, as described below, not only reduces the potential for any corrosion to the springs, but also lubricates the action of the Centraliser.

It is therefore recommended that the Centralisers are disassembled for inspection only about once a year, unless the well fluids are particularly corrosive, in which case inspection should be more frequent.

- 1 The screws holding the arms onto the spring bodies should be checked for tightness before and after every job.
- 2 The roller bushes should be checked for wear between jobs and replaced if necessary.
- 3 The rollers should be replaced if they have worn excessively.

5.2.2 O-RING REPLACEMENT

The following O-rings need replacement after every run.

- 2x item 2, 09087

The following O-rings need replacement after 5 runs or every 3 months.

Note: All O-rings can be replaced without disassembly of the Spring Section.

- 4x item 15, 15114

It is advised to replace all O-rings when the tool is disassembled for inspection.

5.2.3 CONTACT WITH H₂S

In the case of high H₂S, the springs may need replacing after only a few days after initial H₂S contact. In this case, inspection of the springs after every job is essential.

To determine contact with H₂S, check for discoloration of the Upper Sub (item 3, 09087) and Lower Sub (item 16, 09087). These parts are made of Al/Bronze and will turn black when in contact with H₂S.

Also replace the following O-rings:

- 4x item 15, 15114
- 2x item 2, 09087

5.2.4 GREASE FILLING

Note: Grease is normally applied with the Centraliser Arms closed and the Closing Ring fitted.

- 1 Remove the grease port Grub Screw (item 2) and fit the grease nipple.
- 2 Fill the End Cap assembly with grease, until the grease extrudes from the Spring Housing.
- 3 Remove the grease nipple and replace the Grub Screw (item 2).

Note: If the Centraliser Arms are opened after Grease filling, grease will be forced out of the Arm locating positions.

Complete for both spring assemblies.

APPENDIX A EQUIPMENT & RECOMMENDED SPARES

Item	Part No	Description	Qty	Remarks
1	PRC028	Production Roller Centraliser, 2 ¹ / ₈ " , GO Ends	1	

A.1 ANCILLARY EQUIPMENT

Item	Part No	Description	Qty	Remarks
1	17029	Closing Ring	1	

A.2 MAINTENANCE EQUIPMENT

Item	Part No	Description	Qty	Remarks
1	91296	Tool Kit for all 2 ¹ / ₈ " Tools SX and GO	1	
2	LOR101	Grease for O-rings & threads	1	5oz. pot
3	LOR101L	Grease for O-rings & threads	AR	12oz. pot

A.3 RECOMMENDED SPARES

Item	Part No	Description	Qty	Remarks
1	<i>KITB-PRC028</i>	Basic Spares Kit	1	To support 1 run in hole.
2	<i>KITR-PRC028</i>	Recommended Spares Kit	1	To support 25 runs in hole.

NOTE: Spares kits suitable for remote logging operation can be supplied upon request.

PARTS LISTING	
<i>Part</i> <div style="font-size: 2em; font-weight: bold;">91296</div>	<i>Issue</i> <div style="font-size: 2em; font-weight: bold;">B</div>
<i>Description</i> <div style="text-align: center; font-weight: bold;">TOOL KIT ALL 2 1/8 TOOLS SX AND GO</div>	

PARTS LIST					
<i>Item</i>	<i>Part No</i>	<i>Description</i>	<i>Qty</i>	<i>Units</i>	<i>Remarks</i>
1	91006	SHAFT SPRING 2 x OD .72 x .063 WIRE	2	EA	
2	91023	Spanner C (50 - 80, 2 3/4) (WAS 91065)	2	EA	
3	10038	Spanner Box 3/8 x 5/16 Modified	2	EA	
4	91028	Spanner O/E 3/8x5/16	1	EA	
5	91956	Spanner Single Open End 18mm	1	EA	
6	91029	Key, Hex Metric (Set)	1	EA	
7	91030	Punch Pin Parallel set	1	EA	
8	00615	Assy Spanner PKJ	1	EA	
9	91293	Screwdriver Parallel tip (3 0 x 75)	1	EA	
10	91105	Toolroll With SX Badge Large Black	1	EA	
11	91104	Screwdriver Parallel tip (5 5 x 200)	1	EA	
12	91103	Pliers Circlip 812 Chrome/Van	1	EA	
13	91102	Pliers Mini Flat Nose 5 Inch	1	EA	
14	10037	Bar Tommy	2	EA	
15	10051	Kemlon tool Sondex - 4BA Hex Socket	1	EA	
16	91280	Hammer, 4oz ball pein	1	EA	
17	91131	Pin C Spanner 2 5	1	EA	
18	91551	Spanner open ended 1"	1	EA	

PARTS LISTING	
<i>Part</i>	<i>Issue</i>
KITB-PRC028	B
<i>Description</i>	
Kit, Spares, Basic, PRC028	

PARTS LIST					
<i>Item</i>	<i>Part No</i>	<i>Description</i>	<i>Qty</i>	<i>Units</i>	<i>Remarks</i>
1	01030	Scr, Grb Skt Hd, M6 x 6mm Long, St/Steel	2	EA	
2	01063	Scr, Grb Skt Hd, M6 x 8mm Long, St/Steel	6	EA	
3	14505	Axle, (Arm Roller)	8	EA	
4	06810	Arm Locating Cap	16	EA	
5	14562	Bush,DU,10mm ID x 12mm OD x 0.138 Modify	8	EA	
6	91000	Bearing Ball 3/16 Hard	6	EA	
7	91001	Nipple Grease M6 Straight	2	EA	
8	93392	Screw Csk Hd Torx M4(F)x08mmLG (MS-1184)	16	EA	
9	91255	T15 Torx driver, Sandvik Belzer 8915	1	EA	
10	99018	O-ring 018 Viton 90	10	EA	
11	99008	O-ring 008 Viton 90	16	EA	
12	17019	Bush Top Hat Mk II S/Steel 17/4PH	8	EA	
13	17003	Assy Wheel centraliser 1.339 OD	8	EA	
14	99211	O-ring 211 Viton 90	10	EA	

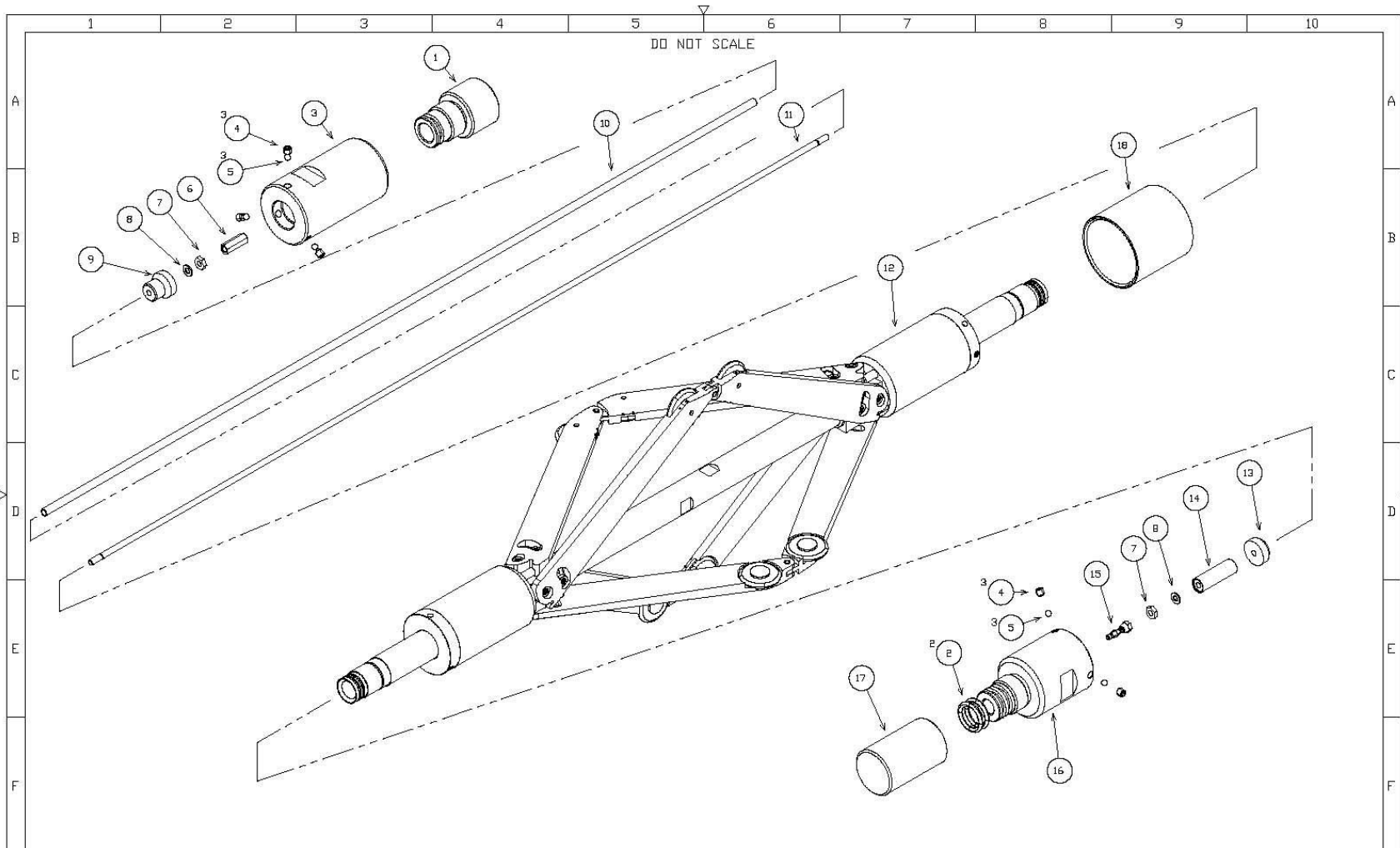
PARTS LISTING	
Part	Issue
KITR-PRC028	C
Description	
Kit, Spares, Recommended(25Run), PRC028	

PARTS LIST					
Item	Part No	Description	Qty	Units	Remarks
1	01004	Socket, Connector, Hex	1	EA	
2	01026	Half-Nut, Hex, 10-32UNF, St/Steel	1	EA	
3	93083	Washer Plain M5 SS-A2 DIN125 Form A	1	EA	
4	01028	Assy, Banana Pin (4mm)	1	EA	
5	01030	Scr, Grb Skt Hd, M6 x 6mm Long, St/Steel	5	EA	
6	01063	Scr, Grb Skt Hd, M6 x 8mm Long, St/Steel	6	EA	
7	02208	Insulator Peek 80 deg	1	EA	
8	02211	Insulator Upper 80o GO	1	EA	
9	14505	Axle, (Arm Roller)	8	EA	
10	06810	Arm Locating Cap	16	EA	
11	06828	Compression Spring MOD	2	EA	
12	14562	Bush,DU,10mm ID x 12mm OD x 0.138 Modify	8	EA	
13	17003	Assy Wheel centraliser 1.339 OD	8	EA	
14	91000	Bearing Ball 3/16 Hard	6	EA	
15	91001	Nipple Grease M6 Straight	1	EA	
16	93392	Screw Csk Hd Torx M4(F)x08mmLG (MS-1184)	16	EA	
17	02210	Insulator Lower GO	1	EA	
18	17006	Assy Arms 4 Arm Centraliser Mule Type	1	EA	
19	17019	Bush Top Hat Mk II S/Steel 17/4PH	8	EA	
20	99211	O-ring 211 Viton 90	50	EA	
21	99018	O-ring 018 Viton 90	100	EA	
22	95008	O-ring 008 Viton 75	8	EA	

APPENDIX B DRAWINGS & PARTS LISTS

B.1 MECHANICAL DRAWINGS

Description	Drawing	Parts List
PRC028 General Assembly (2 sheets)	<i>09087-E</i>	see drawing
Shaft & Arms Assembly (2 sheets)	<i>15114-C</i>	see drawing



DRAWN TLS	CHECKED TW	APPROVED TLS	ISS E	DESCRIPTION ECR 6082 REFERS	APPD NPB	DATE 11/11/08	Sondex Tel. 0118 932 6755 THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION	MACHINE FINISH 64	USED ON PRC028	TITLE ASSEMBLY CENTRALISER 4 ARM GO ENDS 2 1/8" OD	
DATE 26-03-00	DATE 26-06-00	DATE 26-06-00	D	ECR 5572 REFERS - ITEM 18 P/N WAS 17029	JDR	10/06/08		GEN TOL 0.X ±0.020" 0.XX ±0.010" 0.XXX ±0.005" ANGLE ±0.5°	SHEET 1 / 1	DRAWING No. 09087	ISSUE E
DIM IN INCHES	MATL	AS DETAIL DRWGS	C	ECR 4903 REFERS - SHEET 2 ADDED	NPB	12/12/07		THIRD ANGLE PROJECTION			
SCALE 1:2	A 2		B	INITIAL RELEASE							

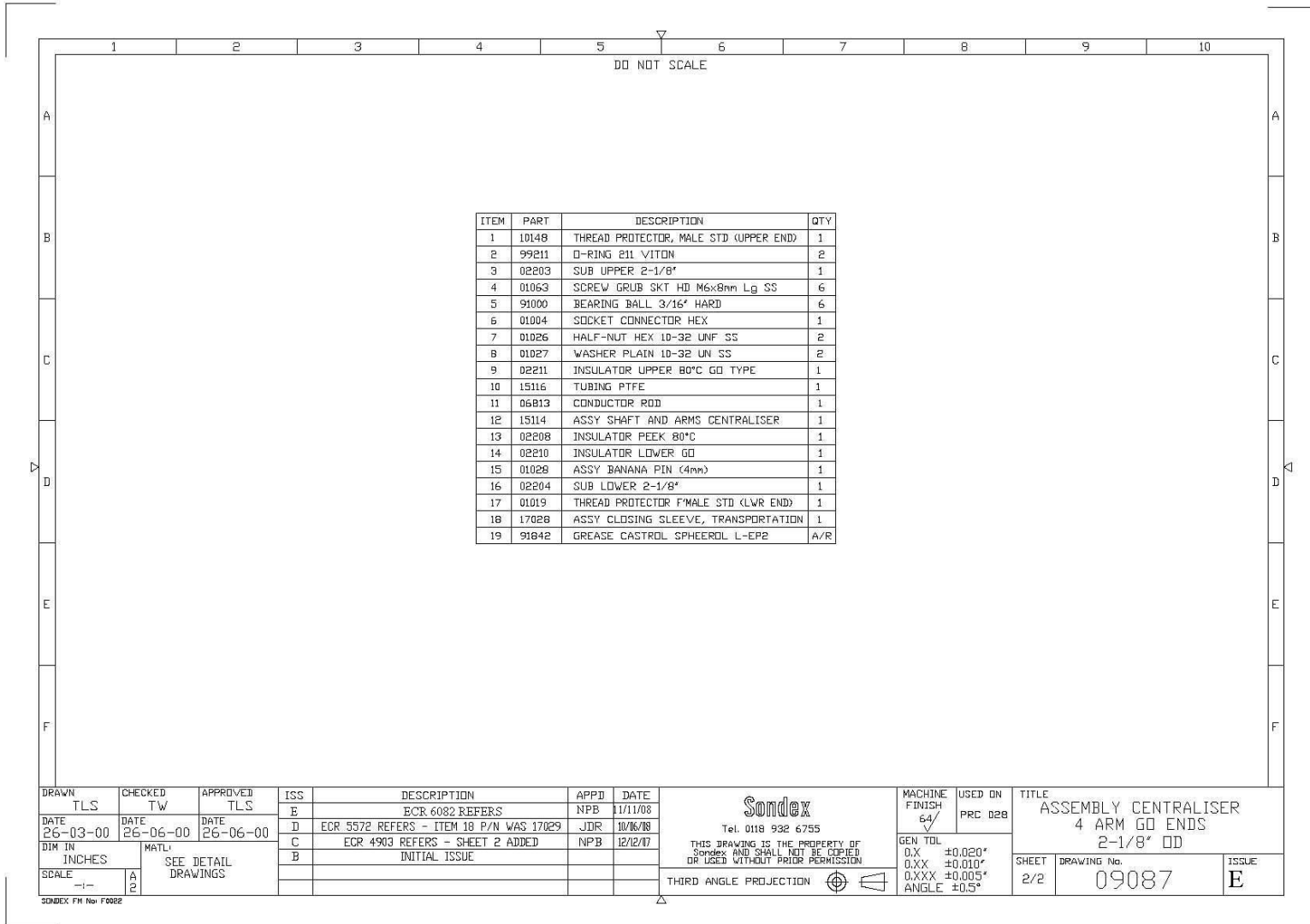
SONDEX FM No F0022

B-2

4-Arm Production Roller Centraliser

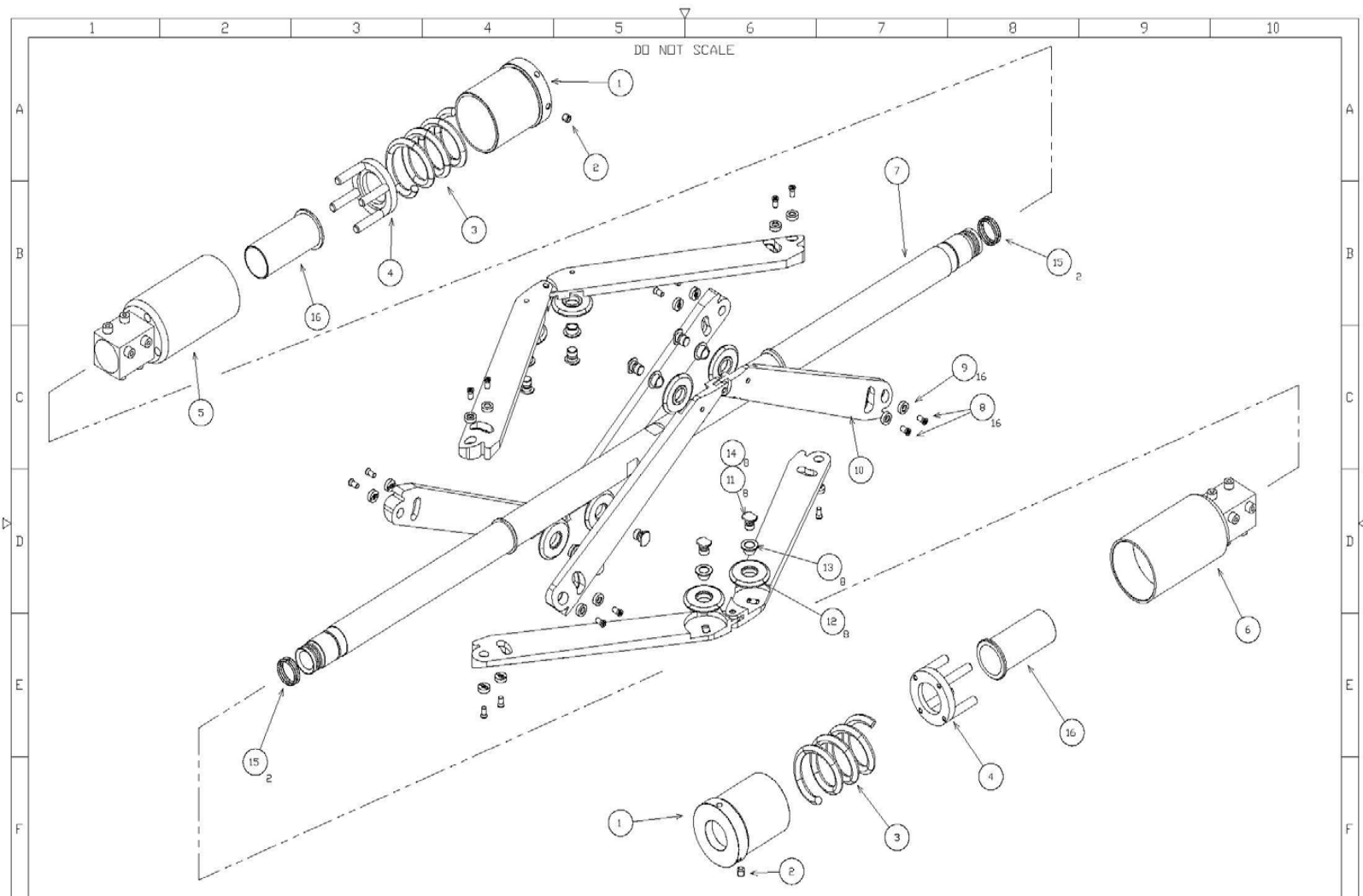
PRC028

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4-Arm Production Roller Centraliser

PRC028



DRAWN TLS	CHECKED TW	APPROVED TLS	ISS C	DESCRIPTION ECR 6027 - MKIT REMOVED	APP'D MJC	DATE 09/10/08	Sondex Tel. 0118 932 6753 THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION	MACHINE FINISH 64	USED ON 09086 09087	TITLE ASSEMBLY SHAFT AND ARMS 4 ARM CENTRALISER	
DATE 23-06-00	DATE 28/06/00	DATE 28/06/00	B	DESCRIPTION ECR 4902 REFERS - SHEET 2 ADDED	APP'D NFB	DATE 11/12/07		GEN TOL 0.X ±0.020" 0.XX ±0.010" 0.XXX ±0.005" ANGLE ±0.5°	SHEET 1/2	DRAWING No. 15114	ISSUE C
DIM IN INCHES		MATL: AS DETAIL DRWGS	A	DESCRIPTION AXLE MATERIAL CHANGE - ECR 1523	APP'D TLS	DATE 04/04/03					
SCALE 1:2			PT3	DESCRIPTION WHEEL FIXING METHOD CHANGED, REF ECR1121	APP'D TLS	DATE 03/09/02					
			PT2	DESCRIPTION ACTUATING BUSH ADDED	APP'D TLS	DATE 28/06/00					
			PT1	DESCRIPTION INITIAL RELEASE							

SONDEX FM No. F0022

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4-Arm Production Roller Centraliser

PRC028

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1 2 3 4 5 6 7 8 9 10
DO NOT SCALE

ITEM	PART	DESCRIPTION	QTY
1	06021	BODY END CAP	2
2	01090	SCREW GRUB SKT HD M6x6mm Lg SS	2
3	06028	COMPRESSION SPRING MUD	2
4	15115	ASSY SPRING GUIDE	2
5	06804	SPRING HOUSING UPPER	1
6	06803	SPRING HOUSING LOWER	1
7	06807	SHAFT CENTRALISER	1
8	93392	SCREW CSK HD TORX M4x8mm Lg	16
9	06810	ARM LOCATING CAP	16
10	17006	ASSY ARMS 4 ARM CENTRALISER MULE TYPE	4
11	14505	AXLE (ARM ROLLER)	8
12	17003	ASSY WHEEL CENTRALISER 1.339 DD	8
13	17019	BUSH TOP HAT Mk II SS	8
14	99008	O-RING 008 VITON 90	8
15	99018	O-RING 018 VITON 90	4
16	14340	ACTUATING BUSH	2

DRAWN TLS	CHECKED TW	APPROVED TLS	ISS C	DESCRIPTION ECR 6027 - MKIT REMOVED	APPD MIC	DATE 091008	 Tel. 0118 932 6755 THIS DRAWING IS THE PROPERTY OF SONDEX AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION	MACHINE FINISH 64	USED ON 09086 09087	TITLE ASSEMBLY SHAFT AND ARMS 4 ARM CENTRALISER
DATE 23-06-00	DATE 28-06-00	DATE 28-06-00	B	DESCRIPTION ECR 4902 REFERS - SHEET 2 ADDED	APPD NFB	DATE 191207		GEN TOL 0.X ±0.020" 0.XX ±0.018" 0.XXX ±0.005" ANGLE ±0.5°	SHEET 2/2	DRAWING No. 15114
DIM IN INCHES	MATL A	SEE DETAIL DRAWINGS	A	DESCRIPTION AXLE MATERIAL CHANGE - ECR 1523	APPD TLS	DATE 040403	THIRD ANGLE PROJECTION			
SCALE NTS	2		PT3	DESCRIPTION WHEEL FDGNG METHOD CHANGED REF ECR 1121	APPD TLS	DATE 030902				
			PT2	DESCRIPTION ACTUATING BUSH ADDED	APPD TLS	DATE 280600				
			PT1	DESCRIPTION INITIAL RELEASE	APPD	DATE				

4-Arm Production Roller Centraliser

PRC028