



PRC034

Document: MN-PRC034-B

Production Roller Centraliser

PRODUCTION ROLLER CENTRALISER

1¹¹/₁₆" , 4 ARM, SONDEX ENDS

Operational & Maintenance Manual

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Contents

0 About This Manual.0-1

- 0.1 Manual History 0-1
- 0.2 Updates To Be Used With This Manual 0-1
- 0.3 Technical Help 0-1
- 0.4 Feedback 0-1

1 Description.1-1

- 1.1 Purpose 1-1
- 1.2 Application 1-2
- 1.3 Interfacing & Tool Combinations 1-2
- 1.4 Specification 1-2

2 Safety2-1

3 Operating Procedure3-1

- 3.1 Pre-logging Checks 3-1
 - 3.1.1 Mechanical 3-1
 - 3.1.2 Electrical 3-1
- 3.2 Connecting To Toolstring 3-2
- 3.3 Logging 3-2
- 3.4 Post-Logging Disassembly 3-3
- 3.5 Transport, Handling & Storage 3-3

4 Mechanical Description4-1

- 4.1 Disassembly 4-1
 - 4.1.1 .Upper Sub & Lower Sub 4-1
 - 4.1.2 Lower Connector 4-1
 - 4.1.3 Upper Connector 4-2
 - 4.1.4 Spring Force 4-2
 - 4.1.5 Centraliser Arms 4-2
 - 4.1.6 Springs & Housings 4-3
- 4.2 Reassembly 4-3
 - 4.2.1 Springs & Housings 4-3
 - 4.2.2 Centraliser Arms 4-4
 - 4.2.3 Spring Force 4-5
 - 4.2.4 Upper & Lower Connectors 4-5
 - Upper Connector* 4-5
 - Lower Connector* 4-5
 - 4.2.5 Upper Sub & Lower Sub 4-6
 - 4.2.6 Final Reassembly Stages - Grease Filling 4-6

5	Extended Checks	5-1
5.1	Preventative Maintenance	5-1
5.1.1	Grease & Lubricants	5-1
5.1.2	Mechanical	5-1
5.1.3	Electrical	5-2
5.2	Extraordinary Maintenance	5-2
5.2.1	Corrosion & Wear	5-2
5.2.2	O-ring Replacement	5-2
5.2.3	Contact with H ₂ S	5-3
5.2.4	Grease Filling	5-3
Appendix A	Equipment & Recommended Spares	A-1
A.1	Ancillary Equipment	A-1
A.2	Maintenance Equipment	A-1
A.3	Recommended Spares	A-1
Appendix B	Drawings & Parts Lists	B-1
B.1	Mechanical Drawings	B-1

0 ABOUT THIS MANUAL

0.1 MANUAL HISTORY

Date	Issue	Description	Auth	Chk	App
08/02/02	A	Original Release.	SA/NH	DO	NH
05/02/07	B	Template update, new layout. Also: ECR2174,	FV/RS	NH	(NH)
17/08/07		1319, 2425, 2336, 3259, 4435, 2468, 3838, 4025.			

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 sending your comments or corrections to Documentation-UK@sondex.com, 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 tool closes at $1\frac{11}{16}$ " and the maximum opening is restricted to 7" casing. The tool has the ability to operate in $9\frac{5}{8}$ " casing after conversion.

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

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.

The centraliser is designed for extra high centralising forces. The design has been optimised to reduce the force required to pull into tubing to a minimum. However, at the extremes (e.g. $9\frac{5}{8}$ " into $2\frac{3}{8}$ ") this force can still be high. In this case the tool can be fitted with weaker springs. However, this will result in a lower centralising force.

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)	1 ¹¹ / ₁₆ " (43mm)	
Diameter (max) ^a	7" (178mm)	
Make-Up Length	33 ¹ / ₄ " (844.5mm)	
Overall Length	37" (939.8mm)	Including Thread Protectors.
Weight	13lb (5.9kg)	Without closing ring
Centraliser Force	≈110lb (50kg) ≈90lb (40.8kg)	When fully open at 9 ⁵ / ₈ " When restricted at 7"
Closing Entry Force	≈238lb (108kg) ≈303lb (140kg)	Open at 9 ⁵ / ₈ " into 2 ⁷ / ₈ " tubing Open at 9 ⁵ / ₈ " into 2 ³ / ₈ " tubing
End threads (top/bottom)	Sondex 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.	

a. It is possible to remove the restrictors to increase the maximum diameter to 9⁵/₈" (244mm)

2 SAFETY



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.

Care must be taken dismantling the spring housing as there is considerable force acting on the end cap 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 tool during maintenance. Contact with skin or eyes can be harmful.

For more details refer to the Material Safety Data Sheet for Castrol Spheerol L-EP2 or 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, refer to the Material Safety Data Sheet for Liquid O-ring.

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.: PRC034 General Assembly 09381

- 1 Clean and grease upper and lower O-ring seals. Replace O-rings (item 35) 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 8 roller assemblies (item 13) 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 39) are tight. These hold the ball bearings (item 38) in place, which prevent the Upper and Lower subs (items 1 & 2) from rotating on the main Shaft (item 3).
- 6 Check that the 2 Spring Housings (items 4 & 5) 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 Megohm meter, set to 500V, measure the upper to lower pin resistance. The reading should be less than 0.5Ω.
- 2 Using a Megohm meter, 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. Speed not to exceed 150ft/min.	Surface tension should not be less than 80% of tension when tool stationary. Speed not to exceed 150ft/min.
>400 clear open hole	Surface tension not to exceed 130% of tension when tool stationary. Speed not to exceed 150ft/min.	Surface tension should not be less than 70% of tension when tool stationary. Speed not to exceed 150ft/min.
Approaching potential obstacles^a	30ft/min	
Logging Data	<p>Do not exceed the above speeds.</p> <p>Recommended speed is <30ft/min.</p>	

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 34, 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 end cap of the Spring Housing when disassembled.

Ref.: PRC034 General Assembly

09381

4.1 DISASSEMBLY

4.1.1 UPPER SUB & LOWER SUB

Note: The end Subs are matched to the Shaft. Before removing, mark each end Sub and the Shaft so that they can be refitted in their correct 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 39) from Lower Sub (item 2) and Upper Sub (item 1).
- 2 Slightly rotate the Lower and Upper Sub (items 2 & 1) with respect to the Shaft (item 3).

Note: This releases the ball bearings (item 38), which normally prevent rotation of the subs on the shaft.

- 3 Unscrew both the Upper Sub (item 1) and Lower Sub (item 2) from the Shaft (item 3).

Note: The pair of O-rings (item 26) 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

Note: This procedure is easier if the Lower Sub (item 29) 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 Hex Nut (item 29) from the end of the Connecting Rod (item 27).
- 2 Remove the Half Nut (item 23).
- 3 The Lower Insulator (item 28) and Washer (item 24) 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

Note: The Connecting Rod is connected to the Banana Pin. Remove the Lower Connector first, see [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 27) from the upper end of the tool.
- 2 Slide the PTFE Tubing (item 42) from the Connecting Rod (item 27).
- 3 Unscrew the Banana Pin (item 22) and Half Nut (item 23).
- 4 The Upper Insulator (item 25) and Washer (item 24) may now be removed.

4.1.4 SPRING FORCE



Warning!

SPRING FORCE!

Care must be taken dismantling the spring housing as there is considerable force acting on the end cap when it is being removed.

Note: When removing the spring force, it is safer to leave the Spring Housings and Subs positioned on the Shaft. This is to ensure the Springs remain on the Shaft at all times and cannot cause serious damage or danger when accidentally exiting the Spring Housings. The end cap has sufficient thread length to allow the stored spring force to almost fully dissipate prior to full end cap disengagement.



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 4) in a soft-jawed vice and using a C-spanner or tommy bar, slowly unscrew its End Cap (item 6).

Note: Care should be taken at this stage due to the large spring force acting on the End Cap (item 6).

Repeat this process for the other centraliser body 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

- 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 15).
- 3 Remove the Top Hat Bush (item 14) and Roller Assembly (item 13).

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

- 4 Separate the Upper Arm (item 11) and Lower Arm (item 12), by extracting the Spirol Pin (item 19) and removing the Pivot Pin (item 20).
- 5 Unscrewing the Torque screw (item 18) and removing the Retaining Cap (item 17).
- 6 Remove the Upper Arm (item 11) from the Upper Spring Housing (item 4) by sliding the arm enough so it disengages from its arced 'T' slot.
- 7 Remove the Lower Arm (item 12) from the Lower Spring Housing (item 5) by sliding the arm enough so it disengages from its arced 'T' slot.
- 8 Repeat for the remainder of the Arm assemblies.

4.1.6 SPRINGS & HOUSINGS



Warning!

SPRING FORCE!

Care must be taken dismantling the spring housing as there is considerable force acting on the end cap 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 6).

- 2 Slide the End Cap (item 6) off the Shaft (item 3).
- 3 The Spring (item 6) can now be removed.
- 4 Prior to removing the remaining parts (spring housings, thrust plates, etc.), 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

- 1 Replace the parts, removed in operation 4 of [Section 4.1.6 Springs & Housings](#).

Note: Refit the thrust plate and pre-closing sleeve, being careful to have orientated the tapped holes in the collar edge with the slots in the spring housing. Also having ensured that the 4 drive pins are located in their location recesses on the face of the thrust plate.

Having fitted the thrust plate, pre-closing sleeve and drive pins, fit the tapped lock screws, through the slots in the spring housing and into the thrust plate. Orientation is important, in order to fit all three lock screws.

Note: If the Centraliser Arms are replaced in [Section 4.2.2](#), the Spring Collars need to be replaced as well.

- 2 Fit the Spring (item 6) over the Shaft (item 3) and onto the Upper Spring Housing (item 4).

- 3 Fit the End Cap (item 6) over the Shaft (item 3).
- 4 Temporarily screw on the respective End Sub.
- 5 Screw in the End Cap (item 6) just a few turns into the Spring Housing (item 4). 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 End Cap with the thread in the Spring Housing.

- 6 Repeat the procedure for the Lower Spring Housing (item 5).

4.2.2 CENTRALISER ARMS

- 1 Inspect arms and Torque Screws (item 18) for wear and replace if necessary.
- 2 Refit the Arms (items 11 & 12) into their original positions on the Spring Housings (items 4 & 5) and secure with the Torque Screw (item 18) and Retaining Cap (item 17).

Note: Fit new Spirol Pins (item 19) and Pivot Pins (item 20) to the Arm Assembly if damaged, or if the arms were difficult to rotate or particularly loose.

- 3 Connect the Upper Arm (item 11) and Lower Arm (item 12) to each other with the Spirol Pins (item 19) and Pivot Pins (item 20).



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: Fit new Axles (item 15), Top Hat Bushes (item 14) and Roller Assemblies (item 13) to the Arm Assembly if damaged, or if the arms were difficult to rotate or particularly loose. Replace the O-rings (item 30). If the Axle (item 15) does not show any wear it may be re-used.

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.

- 4 Fit the Roller Assemblies (item 13) to the Arms and secure with Axles (item 15), Top Hat Bushes (item 14), ensuring the location tongues of the bushes mate with the grooves in the respective arm.

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 End Cap (item 6) into its respective Spring Housing (item 4).



Warning!

SPRING FORCE!

Care must be taken dismantling the spring housing as there is considerable force acting on the end cap 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 Upper Connector

- 1 Fit the Insulator (item 25) and Washer (item 24) onto the Connecting Rod (item 27). Note the orientation of the Insulator (item 25).
- 2 Refit the Half Nut (item 23) and Banana Pin (item 22). Ensure the Banana Pin (item 22) is fully screwed on. Back off the Half Nut (item 23) until locked against the Banana Pin (item 22).
- 3 Slide the PTFE Tubing (item 42) onto the Connecting Rod (item 27).
- 4 Refit the entire assembly through the Upper End of the main Shaft (item 3).

4.2.4.2 Lower Connector

- 1 Fit the Lower Insulator (item 28) and Washer (item 24) onto the Connecting Rod (item 27).
- 2 Refit the Half Nut (item 23).

Note: The Half Nut (item 23) can be used to pull the Lower Insulator (item 28) and Washer (item 24) together. This action will also secure the 2 Insulators (item 25 & 28) against the Shaft (item 3), creating a clamping action.

- 3 Refit the Hex Connector (item 29) onto the Connecting Rod (item 27) and tighten against the Half Nut (item 23).

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

Note: Although the Shaft (item 3) is symmetrical, it is recommended that the Subs are refitted in their original positions, so that the Ball Bearings (items 38) can engage with the original indentations.

- 1 Replace the O-rings (4x item 26), ensuring the grooves and O-rings are clean, greased and undamaged.
- 2 Refit the Lower Sub (item 2) and Upper Sub (item 1).
- 3 Replace the Ball Bearings (6x item 38) and secure the Lower Sub (item 2) and Upper Sub (item 1) with the Grub Screws (6x item 39).

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 34) and fit the grease nipple.
- 2 Fill the End Cap assembly with grease, until the grease extrudes near the drive pins (item 9) and/or Pre-Closing Sleeve (item 10).
- 3 Remove the grease nipple and replace the Grub Screw (item 34).

Note: If the Centraliser Arms are opened after grease filling, grease will be forced out of the Spring Collar location slots and 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.

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

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

Note that some threads are internal, which can cause grease to 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 for grease are not suitable for use on O-rings. Silicone grease may be used on O-rings, but must be kept clear of threads, especially stainless steel to stainless steel.

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



Caution!

The use of certain greases, which contain volatile content, (e.g. some types of Lubriplate) can cause electrical failure due to production of corrosive gasses inside the tool when burned off.

5.1.2 MECHANICAL

Ref.: PRC034 General Assembly 09381

- 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 39 & 2x item 34) 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.: PRC034 General Assembly 09381

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 35

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 26

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 1) and Lower Sub (item 2). These parts are made of Al/Bronze and will turn black when in contact with H₂S.

Also replace the following O-rings:

- 4x item 26
- 2x item 35

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 34) and fit the grease nipple.
- 2 Fill the End Cap assembly with grease, until the grease extrudes near the drive pins (item 9) and/or Pre-Closing Sleeve (item 10).
- 3 Remove the grease nipple and replace the Grub Screw (item 34).

Note: If the Centraliser Arms are opened after grease filling, grease will be forced out of the Spring Collar location slots and Arm locating positions.

Complete for both spring assemblies.

APPENDIX A EQUIPMENT & RECOMMENDED SPARES

Item	Part No	Description	Qty
1	PRC034	4 Arm Roller Centraliser, 1 ¹¹ / ₁₆ " , Sondex Ends.	1

A.1 ANCILLARY EQUIPMENT

Item	Part No	Description	Qty	Remarks
1	14589	Closing Ring	1	
2	14520	Restrictor Ring	2	

A.2 MAINTENANCE EQUIPMENT

Item	Part No	Description	Qty	Remarks
1	91050	Tool Kit for all 1 ¹¹ / ₁₆ " 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	KITB-PRC 1-11/16	Basic Spares Kit	1	To support 1 run in hole.
2	KITR-PRC 1-11/16	Recommended Spares Kit	1	To support 25 runs in hole.

All spares kits, mentioned in this section, can be supplied upon request. However, Sondex recommends the purchase of these kits to properly support your logging tools from job to job. Contact Sondex and quote the part number of the spares kit for additional information or when ordering the spares kit.

As a guidance:

- A Basic Spares Kit mainly contains essential maintenance equipment, O-rings and parts, which are likely to need replacing on a run-by-run basis (including spare parts for the initial tool run) or parts that can be lost easily (like grub screws).
- A Recommended Spares Kit has got a multitude of the same parts as a Basic Spares Kit, supplemented by parts that might need replacement at a lower frequency, i.e. 5 runs and/or 25 runs.
- Spares Kits, suitable for remote logging operations, can be supplied upon request.

Note that the information above is a guidance only and Sondex reserves the right to change the contents of the Spares Kits as required.

PARTS LISTING						
Part:		Issue:		Drawn:	Checked:	Approved:
91050		-		NGH	PD	DJF
				Date:	Date:	Date:
				14/01/2002	14/01/2002	14/01/2002
Description: Tool Kit for all 1 11/16 Tools SX and GO						

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
-	14/01/2002	Initial Release	PD	DJF			

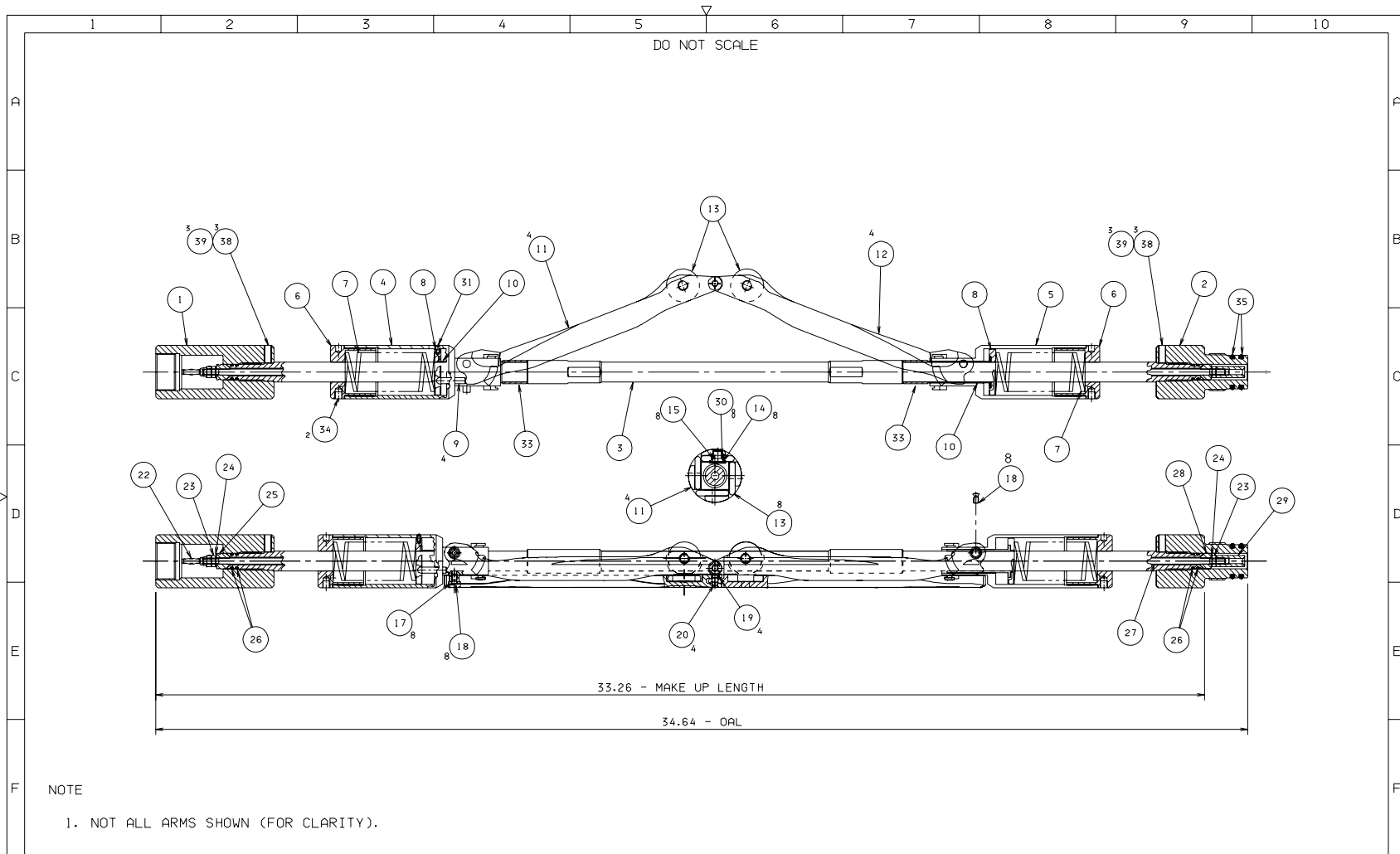
PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	91005	-	Spanner Open Ended 42mmx38mm		2	ea	
002	91019	-	Spanner C 50mm 35mm		1	ea	
003	10038	A	Spanner Box 3/8 x 5/16 Modified		2	ea	
004	91028	-	Spanner 3/8x5/16		1	ea	
005	91027	-	Spanner Single Open End 18mm		1	ea	
006	91029	-	Key Hex Metric		1	ea	
007	91030	-	Punch Pin Parallel set		1	ea	
008	00615	A	Assy Spanner PKJ		1	ea	
009	91293	PT1	Screwdriver Parallel tip (3 0 x 75)		1	ea	
010	91105	-	Toolroll With SX Badge Large Black		1	ea	
011	91104	-	Screwdriver Parallel tip (5 5 x 200)		1	ea	
012	91103	-	Pliers Circlip 812 Chrome/Van		1	ea	
013	91102	-	Pliers Mini Flat Nose 5 Inch		1	ea	
014	10037	A	Bar Tommy		2	ea	
015	10051	A	Kemlon tool Sondex - 4BA Hex Socket		1	ea	
016	91280	-	Hammer, 4oz ball pein		1	ea	
017	91130	-	Pin C Spanner 35-50mm		1	ea	

(AR = As Required)

APPENDIX B DRAWINGS & PARTS LISTS

B.1 MECHANICAL DRAWINGS

Description	Drawing	Parts List
PRC034 General Assembly	<i>09381-B</i>	<i>09381-G</i>



NOTE

1. NOT ALL ARMS SHOWN (FOR CLARITY).

DRAWN NGH	CHECKED TLS	APPROVED TLS	ISS B	DESCRIPTION AXLE MATERIAL CHANGED - ECR 1523	APPD TLS	DATE 04/04/03	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 PRC 34	TITLE ASSY \varnothing 1 11/16" 4 ARM CENTRALISER - SX	
DATE 17/10/00	DATE 17/05/01	DATE 17/05/01	A	ITEMS 8,9,11 & 12 CHANGED. 16 REMOVED. REF ECR1319	TLS	03/03/03		GEN TOL 0.X \pm 0.020" 0.XX \pm 0.010" 0.XXX \pm 0.005" ANGLE \pm 0.5°		SHEET 1/2	DRAWING No. 09381
DIM IN INCHES	MATL: SEE DETAIL DRAWINGS		PT4	ARMS & PIVOT CHANGED. REF ECR946	TLS	15/08/01	THIRD ANGLE PROJECTION				
SCALE 1:2			PT3	ROLLER AXLE CHANGED & O RING FITTED	TLS	17/05/01					
			PT2	DESIGN REVIEW CHANGES - REFER ECRs 508 & 789	TLS						
			PT1	INITIAL RELEASE							

SONDEX FM No: F0022

Production Roller Centraliser

PRC034

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PARTS LISTING					
Part:	Issue:		Drawn:	Checked:	Approved:
09381	G		NGH	TLS	TLS
Description:			Date:	Date:	Date:
PRC(4Arm), 1 11/16, Sondex			04/02/2000	17/05/2001	17/05/2001

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
A	04/04/2003	Items 8, 9, 11 & 12 updated. Item 16 removed. Ref ECR1319.	AJB	TLS			
B	04/04/2003	Axle material changed - ECR 1523	IH	TLS			
C	02/02/2005	ECR 2425	NPB	NPB			
D	--/--	Spring Rate Reduced - ECR 2336					
E	16/12/2005	ECR 3259 REFERS	JC	GC			
F	18/08/2006	ECR 3841 REFERS	GT	NGH			
G	31/08/2006	ECR3914 Grease added	AW	NB			

PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	00503	E	Upper Sub, 1 11/16		1	ea	
002	00504	E	Lower Sub, 1 11/16		1	ea	
003	14500	PT4	Main Shaft, 4 Arm Centraliser 1 11/16 x 9 5/8		1	ea	
004	14596	PT1	Upper Spring Housing, (Arm Carriage)		1	ea	
005	14597	PT1	Lower Spring Housing, (Arm Carriage)		1	ea	
006	14503	PT2	End Cap, (Spring Housing)		2	ea	
007	91310	-	Compression Spring Cr/Vd 1.147(OD) x 3.500(FL) 500.0(lb/in)		2	ea	
008	14506	PT4	Thrust Plate		2	ea	
009	14507	PT4	Drive Pin, (Thrust Plate)		8	ea	
010	14508	PT2	Pre-closing Sleeve, (Spring)		2	ea	
011	14584-2	PT4	Arm Upper 4 Arm Centraliser - Machined		4	ea	
012	14585-2	PT3	Arm Lower 4 Arm Centraliser - Machined		4	ea	
013	14565	PT2	Assy Roller and Bush		8	ea	
014	17019	PT2	Bush, Top Hat Mk II, S/Steel 17/4PH Aged & Plasma Nitrided		8	ea	
015	14505	PT5	Axle, (Arm Roller)		8	ea	
016							(AR)
017	14586	PT1	Retaining Cap (Arm Pivot) for CSK screw		8	ea	
018	93954	-	Screw Csk Hd Skt Beryllium Copper Fully Hard M4 x 8mm LG		8	ea	
019	93235	-	Pin Spirol 1/16 x 3/8 LG MCK SS Heavy Duty		4	ea	
020	14575	PT1	Pivot Pin Arms Joint (0.370 LG)		4	ea	
021							(AR)
022	01028	C	Assy, Banana Pin (4mm)		1	ea	
023	01026	-	Half-Nut, Hex, 10-32UNF, St/Steel		2	ea	
024	01027	-	Washer, Plain, 10-32UN, St/Steel		2	ea	
025	00590	C	Upper Insulator, Sondex		1	ea	
026	99012	-	O Ring Viton 90 Type 012		4	ea	
027	14501	PT2	Feedthrough Rod, (Main Shaft, Sondex)		1	ea	
028	00589	B	Lower Insulator, Sondex (80 Deg)		1	ea	
029	01004	A	Socket, Connector, Hex		1	ea	
030	99008	-	O Ring Viton 90 Type 008		8	ea	
031	14522	PT1	Anti-Rotation Pin		4	ea	
032							(AR)

PARTS LISTING					
Part:	Issue:		Drawn:	Checked:	Approved:
09381	G		NGH	TLS	TLS
Description:			Date:	Date:	Date:
PRC(4Arm), 1 11/16, Sondex			04/02/2000	17/05/2001	17/05/2001

PARTS LIST							
<i>Item</i>	<i>Part No.</i>	<i>Issue</i>	<i>Description</i>	<i>Component Value</i>	<i>Qty</i>	<i>Units</i>	<i>Remarks</i>
033	14520	PT1	Spacer Ring (7 Restrictor)		2	ea	
034	93171	-	Screw Grub Skt Hd M6x05mm LG SS - Refer 01082		2	ea	
035	99211	-	O Ring Viton 90 Type 211		2	ea	
036	10148	A	Thread Protector, Male, Standard, (Upper End) with O'Ring		1	ea	
037	01019	E	Thread Protector, Female, Standard (Lower End)		1	ea	
038	91000	-	Bearing Ball 3/16 Hard		6	ea	
039	01063	-	Screw, Grub Skt Hd, M6 x 8mm Long, St/Steel		6	ea	
040	14589	PT3	Closing Tube High strength PRC		1	ea	
041	91001	-	Nipple Grease M6 Straight		1	ea	
042	91054	-	PTFE Tubing, ID 4.8 mm Dia x 0.4 mm Wall Thickness			(AR)	
043	91842	-	Grease Castrol Spheerol L-EP2			(AR)	
800	AI-09381	A	Assembly Instruction			(AR)	
900	AD-09381	B	Assembly Drawing			(AR)	

(AR = As Required)

