

Operations Manual

BR - 2000

Parts labelling 50-184/12:00

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1. Description

1.1 General Information

1.1.1 Designation

Reserve parachute BR - 2000

1.1.2 Supply product name

Reserve parachute, BR-2000

1.1.3 Supply number (NSN)

1.1.4 Parts identification

SPEKON: 50-184/12:00

1.1.5 Development and management company

SPEKON Sächsische Spezialkonfektion GmbH Nordstraße 40 D-02782 Seifhennersdorf GERMANY

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1.1.6 Identification

Identification is based on the manufacturer's labelling on the following modules:

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- Canopy with suspension lines and risers (canopy base between gores 24 and 1) Rubber stamp with details: - Module
 - Serial number
 - Manufacturer
 - Manufacturing date
 - QA stamp
- **Deployment bag with static line**(upper closing flap / cover flap) Printed equipment plate, sewn with data:
 - Module
 - Serial number
 - Manufacturer
 - Manufacturing date
 - QA stamp
- DAD ejector spring
- Manufacturing date

1.1.7 Intended purpose

The reserve parachute BR-2000 is used for planned jumps from aircraft. The reserve parachute is opened upon partial or complete failure of the main parachute. It is triggered manually by pulling on the ripcord handle.

Optionally, the deployment bag can be opened through an opening device such as the CYPRES STATIC LINE by Airtec.

The reserve parachute provides a low self-propulsion.

The canopy can be rotated by pulling on the coloured suspension lines no. 23 and no. 2 about its longitudinal axis.

If possible, land with the reserve parachute against the surface wind direction.

1.1.8 Components

By default, a complete reserve parachute is shipped with the following components:

Pos.	Number	Component	Part no.	Comments
1	1	Canopy with suspension lines	50-186/12:00	
2	1	Deployment bag	50-185/11:00	
3	1	Risers	50-78/09:00	
4	1	DAD ejector spring	50-776/02:00	
5	1	Parachute tote bag	50-137/12:00	optional
6	1	Parachute control booklet	-	
7	1/10	Operating Manual BR-2000	-	

Customer design changes may result in part number changes.

1.2 Specifications

1.2.1 Construction features

Canopy shape:	Tapered round	l canopy		
Number of gores:	24			
Steering equipment:	Shortened canopy gores 24, 1 and 2 (keel) Steering is performed by pulling on the colour-coded suspension lines no. 23 and 2			
Placement options:	Breast parach	ute		
Drop rate:	All up weight	54 kg: 100 kg: 180 kg:	approximately 5.0 m / s approximately 5.6 m / s approximately 6.5 m / s	
360° rotation:	approximately	12 seconds		

1.2.2 Dimensions

Designation	Abbreviation	Value
Canopy surface	Ак	about 55 m ²
Nominal canopy diameter	Dк	approximately 8.4 m
Vent surface	A s	about 0.15 m ²
Vent diameter	D s	approximately 0.6 m
Length of the suspension lines (skirt - D-rings)	LF	approximately 5.50 m
Length of extended parachute (apex - risers)	Lt	approximately 10.1 m
Dimensions of packed parachute	L	approximately 40 cm
	В	approximately 28 cm
	В	approximately 16 cm

1.2.3 Compatible parachutes

By default, the reserve parachute can be used with the following main parachutes:

- RS-4/4T by SPEKON
- RS-2000 "
- RS-4/4 0 "

with harnesses manufactured or on after 05/2012.

The use with other parachutes must be agreed with the manufacturer SPEKON. If necessary, contact the manufacturer of the main parachute.

1.2.4 Mass

Approximately 7 kg without a parachute carrying case

1.2.5 Operating limits

Criterion	Operating limits	Comments
Minimum opening	100 m	Immediate opening out of aircraft with> 60 knots
height		Speed
With maximum load	120 m	Immediate opening out of aircraft with 0 knots
		Speed
Operating speed	0 - 280 km / h	
Max. working height	4000 m AGL	
Total load mass	68-180 kg	Springer with parachute and equipment
All up weight	max. 180 kg	
Temperature range	-40 ° C to + 70 °	
	С	
Useful life	max. 15 years	Recommended useful life
Number of jumps	max. 3	The master-rigger / verifier determines airworthiness
		in accordance with the technical condition
Packing interval	max. 180 days	

1.3 Technical Description

1.3.1 Canopy with suspension lines and risers

The canopy has a special shape and is made of two different fabrics with different air permeability. It consists of 24 gores and suspension lines, which run from the D-rings on the risers to the canopy skirt.



Illustration 1: Reserve parachute BR-2000



Illustration 2: Canopy sketch

Each canopy gore is made of 5 parallel cut, variable-length panels. To facilitate the unfolding procedure, the canopy skirt is fitted with 9 air pockets between gores 9-17.

Gores 24, 1 and 2 are shortened. Thus, this area features a keel that lends the canopy a 1-2 m/s forward propulsion. The reserve parachute is thereby partially steerable.

Steering is accomplished by pulling on the colour-coded suspension lines 23 and 2. Please see Section 2.2.3 for further information on steering the parachute canopy. 6 vent lines run through the vent. At the top of the canopy is the apex ring shield, which acts as a pilot chute, pulling the canopy out of the deployment bag and extending it.

Skirt retainers designed to hold the canopy skirt until deployment are sewn left and right of suspension line 12.

The equipment plate is placed between suspension lines 24 and 1, near the skirt of gore 1

Suspension lines and risers are connected through four D-rings. The left and right D-rings are connected to each other via two connecting bars.



Illustration 3: Suspension lines with risers and connecting bars

1.3.2 Deployment bag with static line

The deployment bag is made of durable Cordura fabric sandwich.

Suspension lines are stowed in rubber bands fixed to the bottom of the deployment bag. The first fold of the inserted parachute canopy is secured by means of an inner flap.

The deployment bag is closed through 2 inner and 4 outer closing flaps and the locking loop is pulled through their eyelets.

Sewn to the inner side of the deployment bag we can find a bag as well as guide channels for the installation of a CYPRES AAD STATIC LINE AAD.

Rubber linkages are attached to the 4 outer closing flaps to allow for rapid opening of the deployment bag.





Illustration 4: Deployment bag: Inner view

- 1 Upper closing flap
- 2 Upper inner closing flap
- 3 Right closing flap
- 4 Connecting rubber bands
- 5 CYPRES bag

- 6 Inner flap
- 7 Locking loop
- 8 Left closing flap
- 9 Lower inner closing flap



Illustration 5: Deployment bag: Outer view

- 1 Upper closing flap 6 Belt loop for waist belt
- 2 Equipment plate 7 Document bag
- 3 Right closing flap 8 Left closing flap
- 4 Rubber linkages 9 Lower closing flaps
- 5 CYPRES inspection window 10 Carrying handle

The deployment bag is closed through the ripcord handle with locking pin and a loop-and-eye closing pin (Fig. 6).



Illustration 6: Ripcord handle with lock pin

1.3.3 DAD ejector spring

The so-called DAD ejector spring is designed to facilitate the opening process (Fig. 7).

This is pushed under the upper part of the canopy inside the deployment bag. As the user pulls on the ripcord handle or cuts the locking loop via the opening device, the DAD ejector spring launches the canopy apex out of the deployment bag and brings the pilot chute into the air stream.

The connection between DAD ejector spring and canopy apex is broken and the former falls separately to the ground.



Illustration 7: DAD ejector spring

- 1 Upper spring plate 3 Lower spring plate
- 2 Steel spring 4 Locking strips with eyelets

1.3.4 Parachute bag (optional)

Use the parachute bag to stow the packed or unpacked reserve parachute. A document pocket is sewn on its narrow side.

1.4 Operation

The reserve parachute is used to rescue parachutists in emergency situations. In particular, upon:

- Total failure of the main parachute
- Partial failure of the main parachute with a significantly increased drop rate
- Emergency bail-out of the aircraft from low altitude
- Request of the user during training, further to the fully functional main parachute

The deployment bags opens after pulling on the ripcord handle or whenever the opening device cuts the locking loop. The DAD ejector spring is suddenly released and launches the canopy apex into the air stream. The pilot chute integrated in the canopy apex fills with air and pulls the canopy out of the deployment bag. Suspension lines are unstrapped, stretched and the canopy starts to fill. The connection between DAD ejector spring and canopy apex is broken and the former falls separately to the ground.

If the reserve parachute is activated only upon an slightly increased drop rate of the main parachute or for training purposes alone, the parachutist must actively deploy the parachute canopy and unthread the suspension lines.

1.5 Documentation

Unless otherwise agreed, the following documents will be supplied by the manufacturer:

- Parachute control booklet: with test certificate of the manufacturer, Helps document packing operations, cracks, repairs and inspections. The parachute control booklet is in the document pocket of the parachute bag.
- Operators Manual: usual delivery: 1 Operating manual for 10 reserve parachutes BR-2000

2. Operation

2.1 Completion

Modules are packed by the manufacturer in a polybag as per delivery scope or in the parachute bag, if included in the delivery scope.

Once the presence of all components is confirmed, pack the reserve parachute as per point 3.

2.2 Double jump use

2.2.1 Putting on and fitting the reserve parachute

After putting on the main parachute, the reserve parachute is donned as follows:

- Thread the right waist belt attached to the deployment bag of the main parachute through both belt loops at the bottom of the deployment bag of the reserve parachute.
- Hook both snap hooks of the reserve parachute risers into the designated D-rings on the harness.
- Thread the right waist strap through the pull tab of the left waist straps and tighten carefully

With proper fastening, risers should appear loosely tensioned and waist straps run approximately horizontally (Fig. 8).



Illustration 8: Putting on the main and reserve parachute

Users carrying an additional deployment bag must decide, depending on bag design and attachment, whether this must be donned before or after the reserve canopy.

2.2.2 Activation

Activate the reserve parachute by pulling firmly on the red ripcord handle towards your head.

The handle may be pulled with either hand. The release force required to such end is 7 - 15 daN.

2.2.3 Steering

The canopy provides a low self-propulsion of 1-2 m / s and is partially steerable.

The canopy can be steered by pulling down one of both colour-coded suspension lines. Depending on the intended steering manoeuvre, the parachutists must locate the left or right colour-coded suspension line above the D-ring and pull down until the manoeuvre is completed.

If the user pulls down simultaneously on both colour-coded suspension lines, the parachute glides slightly backwards.

2.2.4 Landing

Before landing, it is advisable to set the canopy against the surface wind direction if possible. During landing preparation, avoid any steering manoeuvres and concentrate exclusively on the impending landing.

Landing must be made with both legs. It is advisable to master the landing fall appropriately.

2.3 Decommissioning

2.3.1 Removing the reserve parachute

Remove the reserve parachute by loosening the waist strap and unhooking both snap hooks from the harness D-rings. If the reserve parachute opened, roll up the canopy and suspension lines into an S-shape or insert them into the parachute carrying bag for transportation. Hook the ripcord handle into the snap hook.

3. Maintenance and repair tasks

3.1 Ongoing inspections

Attention: Reserve parachutes can be packed only by people in possession of a valid permission to that end

Continuous inspection shall be carried out before each regular packing process. The inspection of all parachute components shall proceeds as follows:

3.1.1 Documents

The reserve parachute must avail of a clearly identifiable document (parachute control booklet, parachute register or the like), setting out the date of the last packing process, last inspection, and service period end.

Do not pack the reserve parachute past the service period end.

3.1.2 Deployment bag with static line

Check the deployment bag fabric, all seams, seam and tie points, sewn straps and tapes for proper condition.

Closing flap eyelets must sit tightly and appear burr-free. The locking loop must present no chafing or loose filaments.

The ripcord handle - locking pin connection must be specifically checked. The locking pin must be free of burrs and distortion.

3.1.3 Canopy with suspension lines and risers

Suspension lines must be checked for proper condition over their entire length. In particular, check for seam and thread breaks, loops and puller, abrasion and melting points and material destructing spots (rust, etc.).

Each canopy gore must be checked for proper condition over its entire length. This inspection may also be conducted during the packaging process. When checking seams, look for thread breaks and discontinuities. Also, check the entire canopy fabric for holes, melting points, as well as the thread puller.

Finally, check the pilot chute, vent lines and vent lines cover.

Strap tapes and connecting bars must be checked for:

- Seam breaks
- Fabric yarn breaks
- Cracks
- Abrasion and melting points
- Material destructing spots

Fittings must be checked for:

- Deformation
- Cracks
- Fractures
- Corrosion
- Function of the movable parts

3.1.4 DAD ejector spring

Check the gauze fabric for chafing and melting points, as well as for fabric-damaging stains (rust, etc.). Check the spring plate, retaining tapes with closing eyelets for proper condition.

When inspecting the steel spring, please ensure the spring clamping force is appropriate.

Note: Avoid packing the reserve parachhute if the clamping force of the steel spring is deemed inappropriate.

If the satisfactory condition of all components has been established beyond reasonable doubt, the reserve parachute can be packed as per point 3.

3.2 Packing the reserve parachute

3.2.1 Packing permissions

Attention: Reserve parachutes can be packed only by people in possession of a valid permission to that end

Permissions are granted by either the development and management company or by authorised persons of the respective parachute holder (user).

3.2.2 Packing interval

The maximum packing interval is 180 days. In the packing interval is exceeded, the reserve parachute must not be used. In this case, the reserve parachute must be opened, raised to let air in and, following a thorough checking, repacked or submitted to further examination.

The packing process must be documented (see section 3.5.8).

3.3 Packing tools, infrastructure

Reserve parachute packing should preferably be performed on packing tables with a minimum size of 12-m length and 0.8-m width.

Packing on the floor is also possible provided the reserve parachute is protected by means of suitable measures (e.g., packing cover) against dirt and moisture. When packing outdoors, the reserve parachute should not be exposed to direct sunlight whenever possible, or such exposure reduced to a minimum otherwise.

Packing can be performed by one or two people as required. When packing with two people, responsibilities (parachute packers, packing helper) must be clearly defined.

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Reserve parachute packing must rely on the packing tool provided for by SPEKON. This tool comprises the following parts (Figure 9 and 10):

- 3 pc. sand bag of about 1kg weight (pos. 1)
- 1 pc. packing lever to close the deployment bag (pos. 2)
- 1 pc. threading needle DAD ejector spring (pos. 3)
- 2 pc. peg DAD ejector spring (pos. 4)
- 1 pc. stop pin (not in picture)
- 1 pc. suspension line tightener (pos. 6)
- 1 pc. packing loop (pos. 7)
- 1 pc. protection fabric (pos. 8)



Illustration 9: Packing tools

Illustration 10: Packing tools

3.4 Documentation

The packing of the reserve parachute must be properly documented.

To this end, please use the parachute control booklet or individual documents of the parachutist (user). Minimum data required includes name and signature of the parachute packer and packing date.

The relevant document must be kept to ensure the unambiguous assignment to the reserve parachute.

3.5 Packing process

3.5.1 Inspecting and arranging the reserve parachute

Extend the reserve parachute on the packing table. First, check that all components appear in a correct and untwisted position (Fig. 11).

- Vent lines are ordered and the apex is correctly placed
- The canopy lies on the packing table with its outer side facing outwards and gore no.
 1 (stemped gore) facing upwards
- Suspension lines must run without crossing each other from the canopy skirt to the risers
- Risers present no twists, knots or tangles
- Snap hooks lie on the table with their opening pointing downwards



Illustration 11: Extended reserve parachute canopy



Illustration 12: Attachment of canopy apex

Remove any transverse, longitudinal twisting and tangle.

Next, attach the parachute canopy to the canopy apex. For this purpose, attach the packing loop below the apex around the parachute canopy to the apex fixture using a protecting mesh. Both apex ends must lie at a certain height (Fig. 12).

Hook riser D-rings into the suspension line tighteners (Fig. 13) and tighten the canopy.



Illustration 13: Suspension line tightener



Illustration 14: Inspecting suspension lines

3.5.2 Arranging the canopy gores

As the parachute packer, position yourself on the left side of the packing table and lift the left riser to the D-rings. Take suspension line 13, which is located inside the left lower left riser, and pull it down leftwards and outwards. Holding the suspension line 13 in the left hand and the remaining suspension lines of the left riser, move around to the canopy skirt.

Keeping the suspension line 13 in the left hand, place the left half of the canopy over the right half thereof.

Slide the right hand over the canopy skirt from suspension line 13 to 14 and tighten the canopy skirt to the top and right (Fig. 15).



Illustration 15: Arranging the canopy gores

Illustration 16: Arranging the canopy gores

Move your right hand abruptly downwards and to the left and then pass suspension line 14 over to the left hand (Fig. 16). Arrange all gores analogously Place the arranged canopy on the left side of the packing table.

Starting with gore 12, fold the right canopy half exactly on itself - gores must match - on the right side of the packing table, and hold it down with 3 sand bags (Fig. 17).

Illustration 17: Arranging the parachute canopy

Illustration 18: Arranging the parachute canopy

After that, the left canopy half is placed above the already arranged right canopy half (Fig. 18). Starting with suspension line 13, fold the left canopy half exactly on itself ensuring gores match - as done before for the right half.

Pull air pockets on gores 9-17 tightly outwards.

Lift he upper of the lower risers and recheck the left and right upper and lower suspension line bundles for free running, all the way from the risers up to the canopy skirt (Fig. 19).

Illustration 19: Suspension line inspection

Illustration 20: Completely arranged parachute canopy

Pull back and forth left and right suspension line bundles simultaneously to bring close together all gore seams inside the parachute canopy. Suspension lines 24 and 1 must then lay inside between gore seams in the middle of the arranged parachute canopy (Fig. 20).

3.5.3 Folding the parachute canopy

Fold (short) gore 24 to the right and place it on top of the other two short gores (Fig. 21).

Next, fold gore 23 to the right thus covering the short canopy gores.

Illustration 21: Folded gore 24

Illustration 22: Folded gore 23

Pull the skirt retaining strips over the skirt and arrange them on the parachute canopy (Fig. 23). Starting with the right half, fold in the parachute canopy skirt towards the canopy apex. Then, do the same thing with the left half (Fig. 24).

Illustration 23: Arranging skirt retaining strips

Illustration 24: Folding in the skirt

At this point, both canopy halves should be folded inwards. The upper third of the canopy is not folded inwards to ensure the canopy presents a constant width over almost its entire length (Fig. 25). Fold both canopy halves inwards again and hold down using sand bags. (Fig. 26).

Illustration 25: Parachute canopy 1st fold

Illustration 26: Parachute canopy 2nd fold

Fold the left canopy half on top of the right half and hold down with 3 sand bags (Fig. 27).

Illustration 27: Parachute canopy 3rd fold

3.5.4 Stowing the suspension lines

Remove the suspension line tightener and place the deployment bag in front of the risers, so that the lower closing flap points towards the risers, and the inside of the deployment bag lies on top (Fig. 28).

In this position, push the deployment bag under the risers, so that the D-rings come to rest on the retaining straps (Fig. 29).

Illustration 28: Prepared deployment bag

Illustration 29: Deployment bag under risers

Fig. 30 shows retaining straps looped through the D-rings (clamping buckles principle)

Illustration 30: Looping retaining straps through D-rings

Illustration 31: Stowed central loop

Bring together left and right suspension line bundles and loop through the central loop. (Fig. 31). Draw the packing aid loop (CYPRES loop material) of about 1.6 m in length into the locking loop.

Rotate the deployment bag by 90° to the right on the packing table. Loop the suspension lines starting with the left lower rubber loops (Fig. 32).

Illustration 32: Rotated deployment bag

Illustration 33: Looped suspension lines

Subsequently, loop all suspension lines so that they protrude approximately 4 cm from the rubber loops. Pull the locking loop and the inner flap perpendicularly upwards between two suspension line bundles (Fig. 33).

Next, release the apex fixture and arrange appropriately the apex area of the parachute canopy. Fold every 6 canopy gores and place the bundle neatly above the previous one as left and right packages. Tighten vent lines (Fig. 34). Fold the apex section by half (Fig. 35) and arrange the vent lines in an S-shape before the apex section. Pull the apex cover over this apex section (Fig. 36). Fig. 37 shows the completed apex section.

Illustration 34: Extended apex section

Illustration 35: Halved apex section

Illustration 36: Overlaying the apex cover

Illustration 37: Completed apex section

Next, pull out the air pockets of the apex ring screen, arrange and lay them of top of each other. There are 6 air pockets on each side.

3.5.5 Stowing the parachute canopy in the deployment bag

Arrange the canopy in an S-shape and place it on the looped suspension lines. Close the canopy skirt with the right and upper edge of the deployment bag bottom. (Fig. 38).

Pull the inner flap over the first and second inlaid folds and secure it using snap fasteners (Fig. 39). The second wrap on the right deployment bag side must be within 5 cm from the right edge of the deployment bag bottom.

Illustration 38: Stowing the parachute canopy

Illustration 39: Stowing the parachute canopy, securing with inner flap

Illustration 40: Closing top inner flap

Illustration 41: Top inner flap secured with stop pin

Stow the canopy with 5 additional folds. Make the last fold smaller. Place the rest of the parachute canopy towards the right side of the deployment bag (Fig. 42).

Pull the locking loop through the upper inner flap (Fig. 40) and secure by means of a stop pin (Fig. 41).

Pull the locking loop through the bottom inner flap and secure again (Fig. 43).

Illustration 42: Further canopy stowing

Illustration 43: Closed bottom inner flap

3.5.6 Closing the deployment bag

Before closing the deployment bag, prepare the DAD ejector spring, packing tools, packing lever, threading needle, and stop pin (Fig. 44).

The packing auxiliary loop will be pulled through the DAD ejector spring by means of the threading needle (Fig. 45).

Illustration 44: Preparation for closing

Illustration 45: DAD ejector spring with pulled-through packing auxiliary loop

Compress the DAD ejector spring and lock it by means of two stop pins (Fig. 46). Take the free upper part of the parachute canopy (Fig. 47) and place the apex section pointing downwards on the DAD ejector spring using the insertion flap attached to the apex cover (Fig. 48).

Illustration 46: DAD spring screen locked

Illustration 47: Inserting the apex section

Illustration 48: Apex section set on AAD

Illustration 49: Flap inserted into rubber mount

Push the insertion flap into the rubber mount of the top spring seat of the DAD-ejection spring (Fig. 49).

Pull the packing aid loop through the closing eyelets of the right and left closing flaps and secure it by means of the locking lever and the stop pins (Fig. 50). Next, pull the stop pin out of the DAD ejector spring (Fig. 51).

Illustration 50: Closure of right and left closing flap

Illustration 51: Removal of DAD ejector spring

At this point, close the lower and upper closing flaps (Fig. 52) and secure them with the stop pin (Fig. 53).

Illustration 52: Closing the lower closing flap

Illustration 53: Closing the upper closing flap

Push the locking pin of the ripcord handle through the locking loop (Fig. 54). Remove the stop pin and attach the ripcord handle with Velcro on the top flap (Fig. 55). Align the locking pin longitudinally with the deployment bag. Finally, remove the packing aid loop.

Illustration 54: Closing the deployment bag by means of locking pin

Illustration 55: Attached ripcord handle

3.5.7 Sealing the closing

The locking pin of the ripcord handle is secured with a red securing thread - as shown in Figure 56 - and sealed.

Illustration 56: Sealing the locking pin

3.5.8 Registration in the parachute control booklet

The packing process must be duly documented. To that end, users can define a separate process.

The manufacturer provides a parachute control booklet to document each packing process. At a minimum, packers should enter the name and signature of the parachute packer and packing process date.

3.5.9 Closing the cover flap

Place the cover flap of the upper closing flap over the ripcord handle. Insert and spread the tuck flaps on the upper flap (Fig. 57).

Leave rubber linkages open - these must be only clamped when donning the reserve parachute before the jump (Fig. 58).

Illustration 57: Closing the cover flap

Illustration 58: BR-2000 packing complete

3.5.10 Stowing in the parachute carrying bag

Insert the packed reserve parachute into the (optionally) supplied parachute carrying bag and stow according to the storage conditions (see point 3.8).

3.5.11 Inspection of the packing tool

The parachute packer must check the packing tool for completeness after each packing process. In case any packing tool component is missing, the last packed parachute must be re-opened to ensure that the missing piece was not accidentally packed.

3.6 Cleaning

3.6.1 Shaking out and airing

Reserve parachutes must be shaken out soon as possible after use. Furthermore, air any unused reserve parachutes if exposed to moisture or if the storage period has expired.

Shake out reserve parachutes thoroughly to remove foreign bodies. This can be accomplished in a parachute drying tower or outdoors in dry weather.

The shake-out process can be performed by the user / parachute packer. For this end, hang the reserve parachute canopy by its apex and lift it with a wire rope hoist. While the parachute is suspended, shake out the canopy vigorously with a cloth to remove any foreign bodies entanglements. Once all foreign bodies are removed and the canopy is dried with a cloth, lower the reserve parachute and pack it in the parachute bag.

Reserve parachutes with an expired storage period must be aired for at least 6 hours following the shake-out process.

3.6.2 Outdoors shake-out process

Place the reserve parachute on a clean floor or a tarpaulin. Remove foreign bodies from the outer surface of the canopy by shaking it vigorously or brushing them off with a soft brush. Next, turn the parachute canopy inside out and repeat the process. Remove all foreign bodies. When finished, turn the canopy inside out again. Proceed accordingly with the deployment bag. Finally, roll up the reserve parachute or insert it into a parachute bag.

3.6.3 Dry cleaning

Foreign bodies shall be removed as far as possible via dry brushing with a soft brush. Dirt spots or blemishes that cannot be removed this way must be treated in accordance with the following procedure.

3.6.4 Spot cleaning

Stains must be removed with a damp cloth or brush and water. Use bleach-free mild detergent for heavier soiling. Limit you cleaning to the soiled area. Finally, rinse repeatedly with clean water.

3.6.5 Corrosion of metal parts

Remove slight corrosion on metal parts with fine sandpaper. Next, rub treated areas with Vaseline.

Replace any parts presenting higher corrosion levels or whenever such corrosion cannot be treated (e.g., inaccessible area).

3.6.6 Washing

Wash any textile components exposed to salt water / salt brine, or if, due to the degree of contamination, dry / spot cleaning proves impractical.

In particular, components exposed to salt water / salt brine must be washed within 48 hours. Discard and replace any parts for which washing proves infeasible or exposed for over 24 hours.

The washing arrangement is agreed with the Master Rigger / Inspector.

Use clean fresh water for washing; for heavier soiling, add a mild bleach-free detergent to suitable containers with at least 300 I water. Make circular movements to dissolve and distribute any clogged mild detergent.

Parachute washing must proceed as follows:

- Drop the parachute canopy with suspension lines into the filled container and wash by hand back and forth for at least 5 minutes
- Pre-soak any canopy areas showing dried or encrusted dirt
- Wash contaminated areas by hand with compression / pivoting movements. Brush heavily soiled areas with a soft brush, avoiding however excessive fabric strain
- Repeat the washing process for any salt water-exposed areas
- After loosening the dirt / salt, use a piece of cloth to rinse the canopy with clean water
- Keep on rinsing until the rinse water is clear and no detergent foam is visible

Other textile assemblies of the reserve parachute must be washed analogously.

3.6.7 Drying

Hang and dry the wet or humid reserve parachute in the parachute drying tower or a well ventilated area out of direct sunlight. Temperature must not exceed 75° C and relative humidity not fall below 40%.

Textile components may not be wrung, dried on radiators or in drying machines.

3.7 Repair tasks of material maintenance levels 1 and 2

Note: Any repair tasks omitted below require no description.

3.7.1 Resewing of stitching / darning

All modules must be sewed with nylon sewing thread of original thickness.

New seams must be resewn on the original ones. All seams must be extended at least 50mm on both sides of the area to be repaired.

Holes and damage to the deployment bag of up to 20mm in diameter can be darned. Cracks up to 80mm can be darned using zigzag stitches. Zigzag stitching must be extended at least 25mm on both sides of the damage area. The number of darning locations is unlimited.

Note: When sewing with a flatbed and zigzag sewing machine: 30 ± 3 stitches per 100mm. When using a Sattler sewing machine: 20 ± 2 stitches per 100mm.

3.7.2 Replacing the clasp

Remove the damaged clasp. Use pliers or wire cutters if necessary. Insert the new clasp with a flanging tool in the original location.

3.7.3 Replacing the locking loop

Hot cut the locking loop of CYPRES Loop Material to a length of XX mm. Tie both ends as per model with a 3-hole plate. Run the loop through the clasp provided and secure with the elastic band.

3.7.4 Replacing snap fasteners

Remove damaged parts. Pinch them off with pliers or wire cutters if necessary. Avoid damaging the fabric. Insert snap fastener parts in the original location and flange them.

3.7.5 Replacing the ripcord handle

Replace the damaged ripcord handle with a new one.

3.7.6 Replacing rubber linkages

Cut out damaged rubber linkages from the retaining eyelet. Loop the new rubber linkage through the retaining eyelet and sew with nylon thread Nm 40/3 as per model.

3.8 Storage

Attention: The use of open fire in the storage room and within a certain radius of the storage location - to be determined by local conditions - is prohibited.

Parachutes must be stored in dry, dust-free, well-ventilated and sunlight- protected areas. In the storage room, temperature must range between 10 to 25C and relative humidity between 30% and 70%.

Parachutes must be stored in cabinets or on shelves under the following minimum distances :

-	From the floor	25 cm
-	From a radiator	100 cm
-	From an outer wall	50 cm

- From partition walls 100 cm

The storage room must not contain any substances deemed to be damaging to parachute materials (e.g., fats, oils, acids or other chemicals). The storage room must be kept free from vermin.

Field-type storage (outside fixed regular storage areas) must adhere to the following principles:

- Limit field-type storage of parachutes to the absolute minimum
- Avoid storing parachutes outdoors but use buildings, tents or motor vehicles instead
- Protect parachutes against the weather (humidity, sunlight, dust)
- Guard parachutes

3.9 Transport

Parachute transport must adhere to the following principles:

- Protect parachutes against the weather (humidity, sunlight, dust)
- Prevent damage from transport influences (scrubbing, pushing, shaking)
- Guard parachutes

yes

4. **Repair and testing instructions**

4.1 General

Repairs must be conducted pursuant to the relevant specifications of the parachute holder (user). If such specifications do not exist, please refer to the REPAIR INSTRUCTIONS for rescue and personal parachutes, published by SPEKON, Issue 1, Release date 07/2011.

Specifications contained therein shall be construed as minimum requirements and must be implemented in all cases. Further specifications can be individually agreed with the parachute holder (user).

Repair tasks shall only be performed by duly authorized personnel. Proper performance of such maintenance work must always be verified and certified by an authorized master rigger or verifier.

Maintenance / Repair type	Manufacturer	Parachute packer, rigger	Parachute maintenance personnel	Master rigger and verifier
Mounting and compatibility inspection	Yes	yes	yes	yes
Repair tasks level 1 and 2	Yes	yes	yes	yes
Repair tasks level	Yes	no	yes	yes

4.2 Maintenance levels

4.3 **Repair tasks maintenance level 3**

Yes

4.3.1 General

Verification

Repairs and modifications must be performed only by specifically authorised personnel.

All sewing and resewing tasks on the

parachute canopy must be performed with contrasting stitching thread

no

no

Repair the deployment bag and AAD- ejector spring with sewing thread of the same colour.

When resewing, sew the new seam over the one to be repaired and extend it at least 50 mm on both sides of the repair area.

Hot cut any nylon tapes and straps.

Use the following stitch sizes:

- When sewing with 1-needle or zigzag sewing machine:
- Number of stitches 30 +/- 3 per 100 mm - Sattler machine: 20 +/- 2 stitches per 100 mm

When replacing modules, transfer all necessary unit data to the new module to ensure that the latter can be unambiguously attributed to the entire unit.

4.3.2 Parachute canopy with suspension and risers

4.3.2.1 Replacing the parachute canopy with suspension lines and risers

Replace any damaged module with a new one.

4.3.2.2 Replacing suspension lines

Detach damaged suspension lines. Hot cut suspension line BR-2000 at 5860 mm and 6610 mm (suspension line for gore 1 and 24) with 1 daN pre-tension. Introduce the new suspension line through the V-flap, mark, splice and secure. Run the suspension line without twisting from the base edge to the D-ring. Match with the adjacent suspension line, mark and tie up with a knot in the D-ring. Finally, zigzag sew the suspension line with nylon yarn Nm 40/3 on the skirt edge and on the D ring.

Illustration 59: Replacing suspension lines

4.3.2.3 Replacing the vent line

Carefully detach the pilot chute in the area of the damaged vent line. Disconnect the damaged vent line. Size and hot cut the new one as per model. Please ensure that the vent line runs to the correct point and is zigzag sewn with sewing thread Nm 40/3 like the adjacent vent line. Sew the pilot chute with sewing thread Nm 40/3 at the apex.

Illustration 60: Replacing the vent line

4.3.2.4 Patching panels

- Place the parachute canopy on the table with its inner surface facing up
- Secure the damaged canopy section to the table with stitching needles
- In the damaged area, mark within 12mm of any internal seam with contrast colour
- Cut out the marked damaged area
- If necessary, detach and unstitch suspension lines, vent lines, longitudinal reinforcements, transverse reinforcements, reinforcement tapes, and V-flaps
- Fold edges up to the respective inner seam and staple
- Cut the replacement patch using a template from the corresponding canopy fabric
- Place the replacement panel exactly above the cut-out canopy section and fold down along the transverse and longitudinal seams so that these remain hidden and secure with a basting pin
- Sew the replacement panel with Nm 40/3 nylon thread. If necessary, resew or zigzag sew any detached / unstitched suspension lines, vent lines, reinforcing tapes, and Vflaps.

4.3.2.5 Patching the parachute canopy

Holes in the canopy fabric of up 250x250mm in size and cracks up to 400mm in length can be repaired via patching.

Patches must exceed the damaged area dimensions by 50mm on all sides. The patch thread direction must match the thread direction of the canopy gore fabric. Apply patches externally to the damaged canopy section; patch edges must be folded 10mm inwards and stitched close to the edge with a sewing machine. On the other canopy side, cut out the damaged area, fold hole edges by 10mm, and stitch close to the edge with the sewing machine.

Once the patch arrangement on the canopy matches that of the reinforcement tapes, proceed as follows: Detach tapes, sew the patch, and reattach detached tapes to the patch.

In case of damage within 10mm of a seam, further detach the seam on both sides of the damaged area by approximately 100 - 130 mm, and repair the damaged area as described. The unstitched seam must be placed in its original condition and closed again with a single needle machine. If the canopy fabric presents non-destructing damage inside the skirt tape, affix a patch to the inside of the canopy, spread around the skirt tape, and stitch it down on the outside of the canopy.

Fig. 61: Canopy patches 1

If the canopy fabric presents damage that is immediately adjacent to the skirt edge, unstitch the base in both directions about 150mm from the damaged location. Apply the patch from the outside. Subsequently, arrange the skirt in its original condition and stitch it down. Start and end must be oversewn by 50mm.

Fig. 62: Canopy patches 2

Repair damaged areas on reinforcement tapes by placing identical tapes with 110mm extra length on both sides. Both tape ends must be folded inwards by 10mm. The length of the tape damaged area must not exceed 150mm. Repair burst machine seams with additional stitching directly on the old seam. All seams must be oversewn by 50mm.

In case the canopy fabric and the skirt tape present damage near a suspension line, this must be detached and the skirt unstitched as far as necessary. The damage of the skirt tape ma. 150mm. The skirt tape must overlap for 200mm on both sides. Arrange the skirt in its original condition and stitch it down, oversewing the start and end of the seam by 50mm. Stitch or zigzag sew the sustaining line and V-flap accordingly. To that end, use preferably a Nm 40/3 sewing thread Nm.

Fig. 63: Canopy patches 3

4.3.2.6 Replacing the V-flap

- Detach the damaged V-flap
- Size a new V-flap as per model and hot cut at a 45° angle (in gores 2 and 23, cut only 1 side at a 45° angle)
- Secure the replacement flap tightly around the suspension line so that the loop rests on the lower skirt edge
- Stitch and zigzag sew the V-flap
- Zigzag sew the suspension line along the longitudinal canopy seam

4.3.2.7 Replacing risers

Detach the damaged riser. Hot cut new the new riser as per model, run the webbing through D-rings and snap hook, and stitch up with nylon thread Nm 11/4 as per model.

4.3.2.8 Replacing snap hooks

Implementation analogous to 4.3.2.7

4.3.2.9 Replacing connecting bars

Detach the damaged connecting bar. Hot cut new connecting bar as per model. Run the webbing through D-rings, mark and stitch up with nylon thread and Nm 11/3 as per model.

Deployment bag with static line

4.3.2.10 Replacing the deployment bag

Replace the damaged deployment bag with a new one.

4.3.2.11 Replacing the internal top and bottom closing flap

Detach the damaged closing flap. Produce a new closing flap as per model and resew on the deployment bag with Nm 40/3 nylon yarn.

4.3.2.12 Replacing the inner flap

Produce a new inner flap as per model.

4.3.2.13 Replacing the CYPRES bag

Detach the damaged bag. Sew the new bag on the deployment bag with Nm 40/3 nylon yarn.

4.3.2.14 Repairing the reinforcement tape

Darn damages up to 15mm using the zigzag machine with Nm 40/3 nylon yarn. Repair major damages exceeding the damaged area by 25mm on each side. Cut the reinforcement tape to its original length plus 20mm, make 10mm folds, and stitch up with nylon thread Nm 40/3.

Fig. 64: Repairing the reinforcement tape

4.3.3 DAD ejector spring

4.3.3.1 Replacing the DAD ejector spring

Replace the damaged DAD ejector spring with a new one.

4.4 Testing instructions

4.4.1 Verification

The airworthy condition of the parachute must be ensured by periodic inspections. According to manufacturer specifications, a mandatory verification is due in the following cases:

- After damage and subsequent repair
- Upon parachute overload (usage outside the intended load limits)
- After replacing modules
- At least every 24 months (each user may determine a shorter interval)
- On special instructions of the manufacturer

Attention: The parachute may only be inspected by people with a model-specific authorisation

As a rule, the master rigger and parachute inspector are entitled to carry out verifications.

In any case, the parachute holder (users) remains solely responsible for the proper verification procedure.

4.4.2 Verification procedure

4.4.2.1 Parachute control booklet

The following points must be inspected:

- Condition of the parachute control booklet
- Concordance with plant no.
- Manufacturing date
- Last verification
- Number of jumps
- Proper management
- Review of the information on section Notes

4.4.2.2 Deployment bag with static line

Check the deployment bag fabric, all seams, seam and tie points, sewn straps and tapes for proper condition.

Closing flap clasps must be tightly secured and free of burrs. The locking loop must present no chafing or loose filaments.

Hardware components must be checked for deformation, cracks, fractures and corrosion.

4.4.2.3 Parachute canopy with suspension lines and risers

Suspension lines must be checked over their entire length for proper condition. In particular, look out for:

- Seam breaks
- Yarn breaks
- Chafing / Melting points
- Fabric-damaging stains (rust, etc.)

Pushed-out yarn ends or loop formations are not considered thread breaks. If any, push them back into the fabric with a butt needle.

Parachute canopy verification must cover all gores. The verifier checks seams, sewn straps and tapes, as well as any field area for proper condition. The vent lines verification procedure is analogous to that of suspension lines.

Particular attention shall be paid to strap edges when verifying risers and connecting bars.

Tapes must be checked for:

- Seam breaks
- Fabric yarn breaks
- Cracks
- Chafing / Melting points
- Fabric-damaging stains (rust, etc.)

Fittings must be checked for:

- Deformation
- Cracks
- Fractures
- Corrosion
- Function of the movable parts

4.4.2.4 DAD ejector spring

Check the gauze fabric, spring plate and sewn retaining tapes for proper condition. The clamping force of the steel spring demands particular attention.

Note: Replace the DAD ejector spring if insufficient clamping force is observed.

4.4.3 Certification

After successfully completing the verification process, BR-2000 reserve parachute components must be certified with a verification stamp and date affixed next to the unit data. The completed verification process must be documented (e.g., in the parachute control booklet and / or history file).

Upon failed verification, the verifier / master rigger must clearly mark the reserve parachute as "not airworthy". The verifier / master rigger determines whether the parachute can be refurbished or must be discarded altogether.

4.4.4 Post-repair verifications

Parachutes must be checked for airworthiness following any repair work. Upon successful testing, certification shall ensue according to 4.4.3

4.4.5 Service life

The service life of the reserve parachute should in no case exceed 15 years.

Usage must be interrupted in the following circumstances:

- Upon reaching the service life limit of 15 years from manufacturing date
- Upon known or suspected overuse
- Upon damage repairs deemed unreasonable on economic