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KUBÍČEK

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Maintenance Manual

for use with the hot air balloon

Type: .....

Model: .....

Serial No.: .....

Registration: .....

The technical content of this document is approved under the authority of DOA, number EASA.21J.277

A full description of the balloon systems and operating procedures is provided in the Kubíček Flight Manual for use with the hot air balloon.

This balloon is to be maintained in an airworthy condition in compliance with instructions and limitations contained herein.

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0.1 Record of revisions

Any revision of the present Manual must be recorded in the following table.

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The new or amended text in the revised page is indicated by a black vertical line in the outer margin, and the revision number and the date is shown on the bottom of the page.

CAUTION	Mandatory revisions are introduced by a Service Bulletin published on the Kubíček Factory website www.kubicekballoons.com.

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SECTION 1 – GENERAL

1.1 Introduction

This Maintenance Manual describes the correct way to maintain balloons built by Kubíček Factory s.r.o. and its predecessor companies. If a balloon requires maintenance which is not covered by this manual or by the documentations published on the website (www.kubicekballoons.com) then contact either your local Kubíček dealer or KF directly.

All parts and spare components must be supplied by KF and delivered with an appropriate release document (EASA Form 1 or equivalent), which must be retained in the life file of the balloon or component. Exceptions are permitted only with prior approval from KF.

It is essential that hot air balloons are properly maintained and that those who carry out this maintenance are correctly trained and qualified. To make it clear who may carry out specific repairs the maintenance in this manual has been divided into four categories as described in paragraph 1.3. In some countries certain operations may only be carried out by certified repair stations.

Kubíček Factory run courses covering all aspects of maintenance and repair work. Scheduled course dates and registration details are available on the company website.

Unless otherwise specified the spare parts and materials are identified by a number in italic. In case there is a risk of confusion of parts (e.g. load tapes), contact Kubíček Factory for advice.

CAUTION	1. *All materials and components used to repair a KF balloon must be approved by the company and have the correct paperwork (EASA Form One if applicable)* 2. *Incorrect use of specified parts or material or carrying out work other than described in this manual will render the balloon non-airworthy and may cause an extreme danger.* 3. *In the case of a failure where the cause can not be established contact either a KF authorised repair station or KF and have them make the repair.*

1.2 Applicability

The information contained within this Manual applies to all BB and BB-S type (Type Certificate EASA.BA.003) Kubíček balloons.

1.3 Maintenance Categories

The degree of practical knowledge required to maintain a hot air balloon varies with the complexity of the procedure and the facilities available. To make it clear precisely who is considered competent to carry our a particular procedure balloon maintenance has been divided into four categories, A, B, C and D. Each of these categories is defined in the following sub paragraphs. Each heading within this manual that relate to any maintenance or repair task has a letter, A, B, C or D at the end of the heading: this is the lowest maintenance category for this particular procedure.

All work carried out on a balloon must be written in the balloon's log book and signed for by the person carrying out the work.

National aviation authorities may require a higher maintenance standard than stipulated in this manual.

1.3.1 Category A Maintenance

Category A maintenance may be carried out by a licensed balloon pilot.

Envelope

- Cleaning.
- Replacement of carabiners.

- Replacement of titanium rings
- Replacement of Temperature streamer.
- Installation or removal of an instrument sensor
- Removal or replacement of Scoop
- Repairs to minor fabric damage below the first horizontal load tape
- Repairs to the envelope using sticky patches

Basket

- Cleaning
- Re varnishing or oiling of wicker
- Repair or replacement of suede or leather top trimming and padding
- Repair or replacement of leather, rawhide and sliding shims
- Removal / replacement of side wall padding
- Removal / replacement of foam floor and cylinder straps
- Removal / replacement of protection plates and pocket strap out of the fabric sidewalls (for collapsible basket)

Burner

- Cleaning not requiring disassembly
- Lubrication not requiring disassembly
- Replacement or adjustment of piezo igniter.
- Removal / replacement of seals in Tema and Rego couplings

Burner Frame

- Cleaning

Fuel Cylinders

- Cleaning not requiring disassembly
- Removal / repair / replacement of padded jackets
- Removal / replacement of top padding rings.
- Any lubrication not requiring disassembly
- Removal / replacement of Rego seals and O rings not requiring disassembly

1.3.2 Category B Maintenance

Category B maintenance covers the common maintenance taks that may be carried out by individuals who have undertaken a Kubíček Factory maintenance course and who have a valid KF Maintenance Certificate.

The B category maintenance techniques are not listed in this paragraph however easily distinguishable in the following chapters.

1.3.3 Category C Maintenance

Category C maintenance includes a more complex procedures that may only be carried out by individuals with written approval from Kubíček Factory for a specific repair process and, where appropriate, the correct national approvals. Certain maintenance and repair techniques of the C category are described by the appropriate supplement of this Manual, not the Maintenance Manual itself.

All welding must be performed using the TIG (Tungsten Inert Gas) method in accordance with the applicable national standard. The work must be carried out by a welder approved by the relevant national authority, who has completed the KF maintenance course and holds a valid KF Maintenance Certificate.

1.3.4 Category D Maintenance

Category D maintenance may only be carried out by Kubíček Factory s.r.o. No description is provided in this Manual.

Envelopes

- The replacement of more than 50% of the fabric present at the time that the envelope was manufactured with respect to a number of panels

Baskets

- Wickerwork repairs which extend across more than 1/3 of the total woven area of the basket or more than 1/4 of one basket side
- Repairs of broken aluminium alloy tube frames

Burner units and burner frames

- The re-manufacture, repairing or welding of metal components or hose assemblies

Fuel Cylinders

- Repair to the aluminium, stainless steel or titanium shell of a cylinder or any of its screw threads.

Kubíček Factory s.r.o. accept no responsibility for any consequences resulting from the carrying out of unauthorized repairs.

CAUTION	*During maintenance, industrial cleaning agents may be used; however, they should be tested in advance on a non-visible or non-critical area due to the risk of surface damage.*

1.4 Warnings, Cautions and Notes

The following definitions apply to Warnings, Cautions and Notes used in this manual:

WARNING	*Warns that, in all probability, the non-observation of these instructions and limits will lead to injury or danger of a fatal accident.*

CAUTION	*Warns that the non-observation of the corresponding instructions and prescribed limits could lead to damage.*

NOTE	*Draws attention to any special item not directly related to safety but which is important or unusual.*

1.5 Revisions

This Manual is updated by revisions or Service Bulletins. All Service Bulletins and the latest revision of this Manual are available at **www.kubicekballoons.com**.

The areas affected by the revision is indicated by a black vertical line in the outer margin.

1.6 Definitions and Abbreviations

Operator - The person responsible for the condition of the balloon and the proper implementation of periodic inspections and repairs.

Approved organisation - The person or organisation commissioned by the relevant national aviation authority to carry out periodical inspections.

Periodical inspections - The mandatory inspections as determined by the manufacturer and the operator's national aviation authority.

Parts/Components All instrument, mechanisms, equipment, accessory or assembly used during balloon operating and listed herein.

KF - Kubíček Factory s.r.o.

SI - Service Instruction

S/N - Serial Number

1.7 Balloon Technical Description

A complete description of the balloon, its systems, controls and equipment is provided in the Kubíček Factory Flight Manual (document no. B.3102 in its latest revision), section 1 - chapt. 1.5. and section 6.

1.8 Feedback From Operators

In case any technical trouble occurs every operator is obligated to report it to KF. This mainly concerns:

- Fire caused by a failure
- Burner defect which resulted to damage to the envelope
- Leaks or accumulation of the fuel in the basket crew space or balloon envelope
- Burner failure
- Failure of either the burner or the balloon control system

For reporting troubles and other technical questions operators are kindly asked to use the email: **technical@kubicekfactory.com**.

SECTION 2 - AIRWORTHINESS LIMITATIONS

2.1 Approval Statement

The Airworthiness Limitations section is EASA approved and specifies maintenance required under the applicable certification basis.

2.2 Inspection Period

The balloon must undergo the annual/100 hour inspection after 12 calendar months or 100 hours of operation, whichever is the sooner.

The envelope fabric with a reduced strength must undergo the strength test (grab-test) after every 50 hours of operation or after 12 calendar months, whichever is the sooner.

The fuel cylinders Kubíček KB72L, KB85L and KB97L must undergo the 10 year inspection after 10 years from the date of manufacture and then every 10 years.

2.3 Personnel

Inspections must be performed by an organisation approved by a relevant national airworthiness authority. Inspecting personnel must be suitably trained.

2.4 Inspection Procedure

The annual/100 hour inspection description and checklist is provided in section 7 of this manual.

Item	The annual/100 hour inspection description
Envelope	Chapter 7.5, 7.6, 7.7, 7.8, 7.9, 7.10
Burner	7.11
Fuel cylinders	7.12
Basket	7.13
Ancillary equipment	7.14

2.5 Life Limited Items

When a life limited item has reached the end of its life it must be replaced and the original item discarded. All items replaced because they have reached the end of their life must be recorded in the balloon's logbook. Other items are to be replaced when worn or damaged.

Item	Part no.	Limit
KF burner fuel hoses	53102.XX* 53103.XX* 56006.XX* 57975.XX* 57979.XX* 57997.XX*	10 years
Other manufacturers burner fuel hoses	All	According to instructions of the respective manufacturer

* XX is a two-digit code identifying the hose length and coupling

Fuel cylinders	-	According to instructions of the respective manufacturer
Pressure Relief Valve - Kubíček Fuel Cylinders (KB72L, KB85L, KB97L)	3466.00 - Standard 3188.00 - Master	10 years (maximum storage life prior to installation 5 years)

2.5.1 Limited storage time items

Limited storage life items must be stored in accordance with the manufacturer's recommendations and cannot be used after the specified storage period has expired. The manufacturing date and storage life shall be verified before installation or use.

Adhesives	-	According to date of usage on package
Lubricants		
Thread lockers		
0-rings	-	48 months of storage

2.6 Minimum Fabric Strength

The envelope fabric is not given a time life limit. Its actual strength is a limiting factor.

Minimum fabric strength: **200 N/5cm (44 lb/2 in)**

This value corresponds to the lowest acceptable strength obtained by a grab test. A full description of the fabric grab test and evaluation of its results is described in para 7.17.

2.7 Minimum Load Tape Strength

Type of Load Tape	Minimum Strength	
PES, width 25 mm, thickness 1.7 mm*	7 500 N	1 690 lb
PES, width 25 mm, thickness 2.7 mm**	12 500 N	2 810 lb
PES, width 20 mm	5 100 N	1 150 lb
PES, width 30 mm	15 000 N	3 370 lb
PES KEVLAR, width 16 mm, thickness 1,5mm	5 700 N	1 280 lb
PES, width 25mm, thickness 1,1mm (horizontal tape)	8 750 N	1 690 lb
PES, width 17mm, thickness 0,9mm (horizontal tape)	4 900 N	1 100 lb

* Identified by a single longitudinal thread in a contrasting colour.
** Identified by two longitudinal threads in a contrasting colour.

NOTE	*There is no need to test and evaluate the load tape strength. The fabric grab test is decisive.*

SECTION 3 - ENVELOPE REPAIRS AND MAINTENANCE

3.1 General

3.1.1 Preventative Maintenance (A)

A	B	C	D

Dirty patches on the envelope may be removed by wiping the effected area with a sponge soaked in clean water or water containing a mild soapy solution. Some industrial cleaning agents may damage surfaces. It is recommended to test the cleaner in advance on a non-visible or non-critical area. The envelope should be allowed to dry completely before packing.

Carabiners should be kept clean and their gates and threads oiled occasionally. Any surplus oil should be removed before the envelope is packed.

3.1.2 Stitching and Thread (B)

	B	C	D

Envelope repairs must be made using a lock stitching; chain stitching is not permitted. All seams should be French Fell Seams with both rows of stitches penetrating four layers of fabric. Needles must be in perfect condition and be size 110.

The ends of stitch lines should always be 'locked' by overlapping for a minimum of 6 cm (2 1/2") or back-tacking to prevent the new seam from pulling apart.

When the lower thread runs out during sewing, return 7 cm (2,8") back, secure the seam by back-tacking 3-4 stitches and then continue sewing.

When replacing pulleys or remaking loops, copy the stitching from the original item.

A three-strand metric 40 (210 denier) nylon or polyester thread must be used, ideally in a contrasting colour to the fabric. The envelopes are manufactured using polyester thread.

Nomex thread 40 (210 denier) - fire resistant thread must be used when sewing nomex panels together, attaching the pre-sewn load tape turnbacks to the nomex (turnbacks are to be pre-sewn using polyester thread) and sewing the scoop.

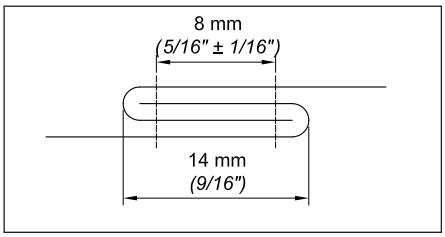
3.1.3 French Fell Seams (B)

	B	C	D

The seam used in the manufacture of balloon envelopes is known as French Fell or Balloon seam.

To make a French Fell seam correctly the two pieces of fabric are folded together and the two rows of stitching each penetrate four layers of fabric as shown it the illustration below. When whole panels of the balloon are replaced this type of seam must be used. If load tapes are present they should be unpicked and sewn back when the seam is complete. The ends of stitch lines should always be 'locked' by overlapping for a minimum of 6 cm, or back-tacking to prevent the new seam from pulling apart.

The length of the stitch should be 2.5 to 5 mm (5 to 10 stitches per inch).



French Fell Seam

3.2 Fabric Repairs

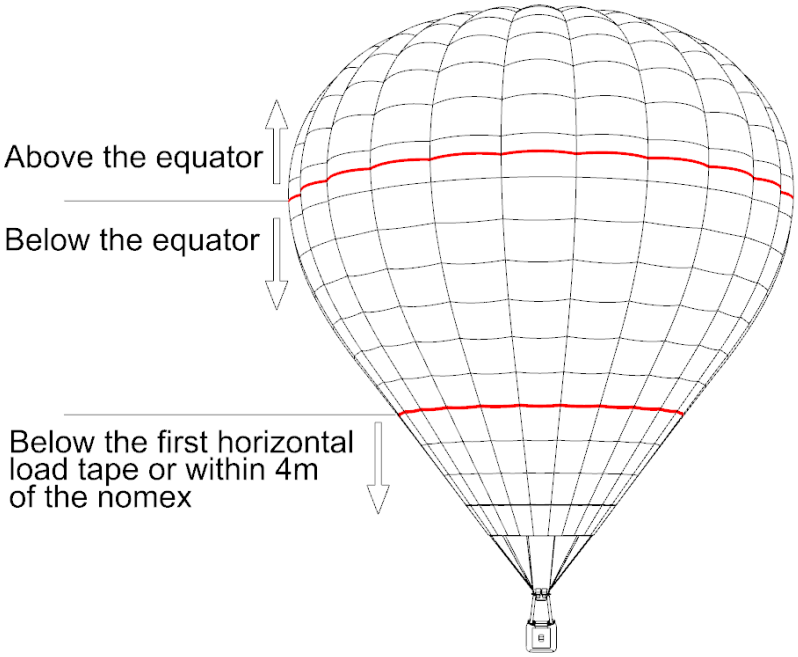
Inspections must be carried out by an organisation, which is approved by the relevant national airworthiness authority. Inspectors dealing with inspections/repairs must be trained.

3.2.1 General

Damaged fabric should be repaired by one of the following methods:

- Panel replacement
- Partial panel replacement
- Sewn patch
- Adhesive patch - without oversticking
  - with oversticking

All the replaced panels and patches must be made from the same material as was used in the original panel (except for TEAR AID - chapt. 3.2.9). If in doubt, contact KF for advice.



The limitation for each type of repair is as follows:

Type of repair	Location		
	Below the first horizontal load tape or within 4 m of the nomex	**Below the equator ***	**Above the equator ***
Panel Replacement	*May be used anywhere on the envelope.*		
Partial Panel Replacement	*May be used anywhere on the envelope.*		
Sewn Patch (lapped seam)	*If the damage is not more than 10 cm (4'') in any dimension.*		
Sewn patch (Partial French Fell Seam)	*May be used anywhere on the envelope.*		
Swen patch (French fell seam)	*May be used anywhere on the envelope.*		
Adhesive Patch without Oversticking	*If the damage is not more than 2,5 cm (1") in any dimension. There must be minimum of 10 cm (4") between any two damaged locations on a single panel.*		
Adhesive Patch with Oversticking	*If the damage is not more than 1,5 m (5 ft) in any dimension.*		*If the damage is not more than 10 cm (4") in any dimension. May not be used if the damage extends to within 2,5 cm (1") of a load tape. There must be a minimum of 10 cm (4") between any two adhesive patches on a single panel.*

* For location of the equator on your envelope refer to Appendix 5 of this Manual

NOTE	*Always check adhesion of the patch as the adhesive may adhere differently on different materials (polyester vs. polyamide, ripstop, etc.) and its adhesion may also be affected by outside temperature, age and dustyness of the fabric, and other factors.* *When in doubt, use sewn patch.*

3.2.2 Not Used

3.2.3 Repairs to Heavy Weight Fabric Panels (B)

	B	C	D

Heavy weight fabric panels may only be repaired by panel replacement, partial panel replacement, an adhesive patch with overstitching or a sewn patch. Only the same material may be used (part no. 1437).

3.2.4 Repairs to Fire Resistant Panels - Nomex (B)

	B	C	D

Repairs to the fire resistant panels at the mouth of the balloon or to the scoop may only be made with fire resistant fabric. Vertical load tapes, in the mouth area, must be always protected on the inside of the balloon by fire resistant fabric.

3.2.5 Panel Replacement (B/C/D)

	(B)	(C)	(D)

The repair category (B/C/D) is determined by the scope of the repair, see the table below and Appendix 5.

Unpick the damaged panel. If the damage extends to a load tape then this must be first unpicked. Remove the stitches and carefully pull the seam apart. Extending the unpicking at least 10 cm beyond the panel will make replacing it easier. Remove all the thread from the area unpicked.
The panel that has been removed may be used as a template for the new panel. If the damaged panel can not be used as a template then an adjacent panel of the same size may be removed and used instead.
The new panel should be stitched into the envelope using a French Fell seam (see Section 3.1.3).

NOTE	*When replacing a panel make sure that the direction of weaving is the same as on the panel that is being replaced.* *Where seams are attached to the load tapes, the seam should be sewn first. The completed seam should then be sewn to the load tape.*

Categories of envelope panel replacement (based on location and number of panels°)

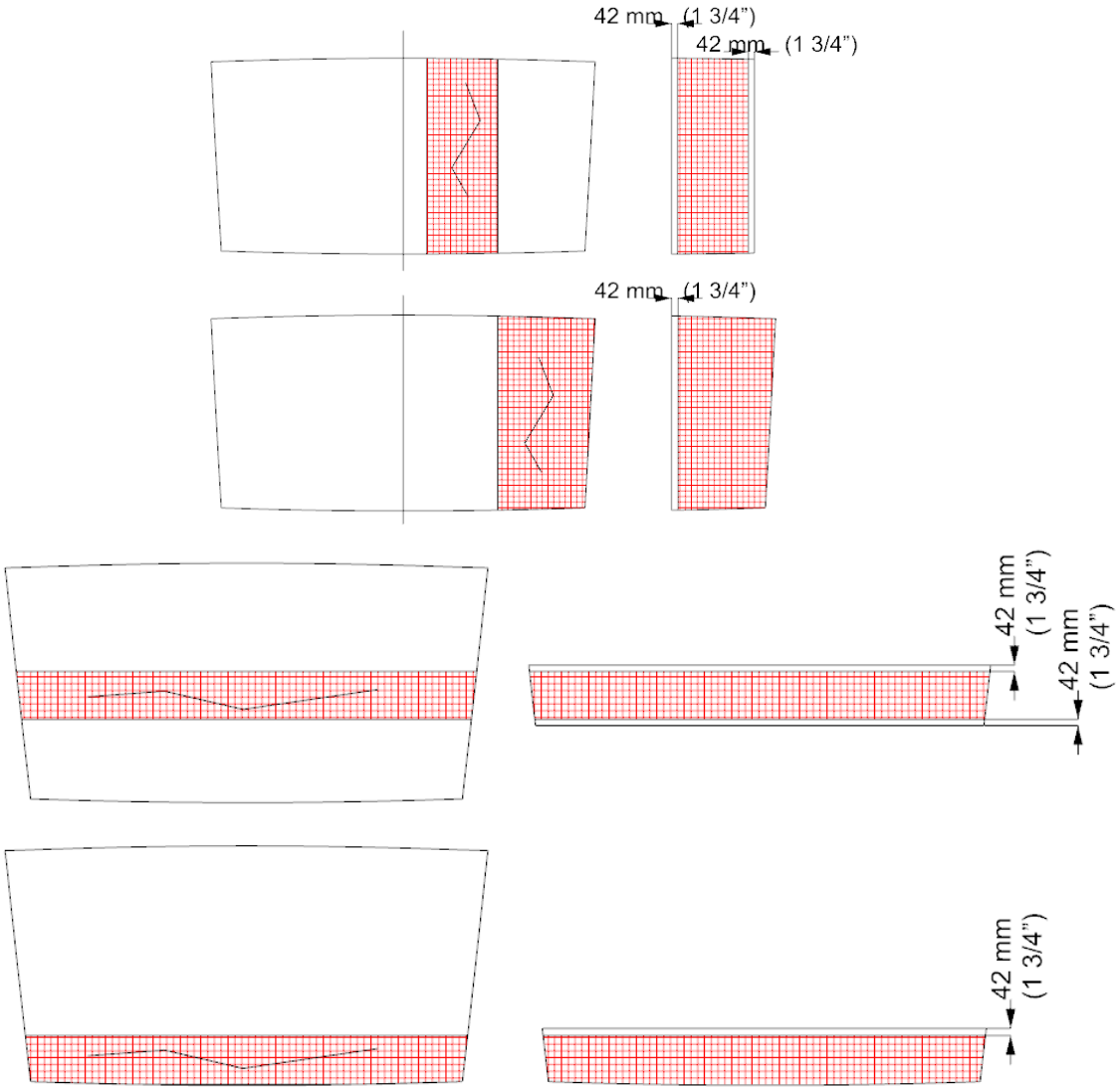
Categories	Above the equator*	Below the equator*
A	No panel replacement allowed	No panel replacement allowed
B	The number of replaced panels in specified area must be less than or equal to **2x** the number of gores on the envelope#	Nomex panel replacement
		The number of replaced panels in specified area must be less than or equal to **4x** the number of gores on the envelope#
C	The number of replaced panels in specified area is **higher than B and lower than D**	The number of replaced panels in specified area is **higher than B and lower than D**
D	More than 50% of panels in specified area	More than 50% of panels in specified area

° For exact numbers of panels to be replaced within limitations of each category refer to Appendix 5 of this Manual
** For location of the equator on your envelope refer to Appendix 5 of this Manual.*
 # This rule does not apply for envelopes of N-type. For information about your N-type envelope, refer to Appendix 5 of this Manual.

3.2.6 Partial Panel Replacement (B)

	B	C	D

Partial Panel Replacement means to replace a part of the panel with a hole or damage. The new and the original part of the panel are joined in one or two lines parallel to the axis of symmetry of the panel. To make a patch mark the fabric around the damage. Measure the same distance from axis of symmetry of the panel as shown on the picture below. Unpick the damaged panel between the marks and extend unpicking at least 10 cm (4") beyond the marks. Cut out the damaged part of the panel. Cut the patch (you can use the damaged part of the panel as a template) with overlap of 42 mm (1 3/4"). Sew the patch in with French Fell Seam.



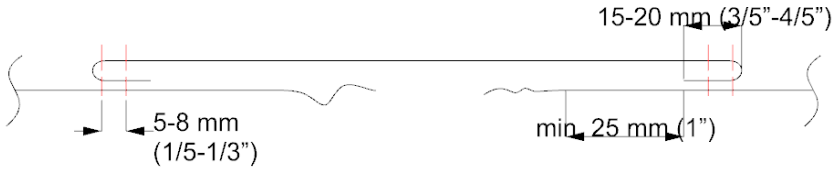
3.2.7 Repairing With a Sewn Patch (B)

	B	C	D

Sewn patch - lapped seam (B)

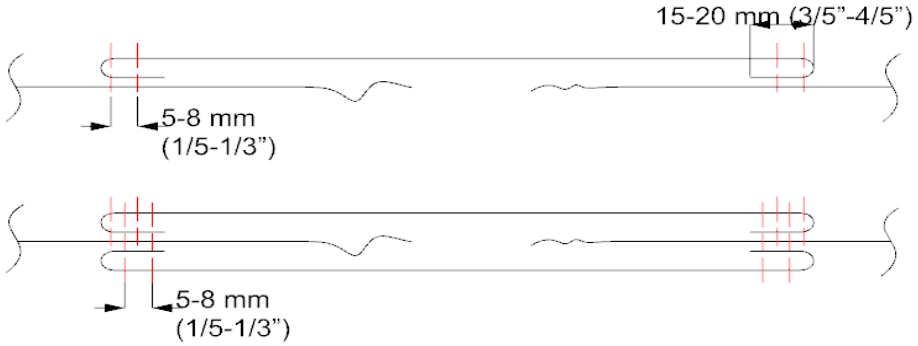
Repair with one overlaid sewn patch

Mark out the damaged area on the panel so that the patch will be parallel to the warp and weft of the fabric. Cut out a patch in a shape that will cover the damaged area with an overlap of at least 90 mm (3 1/2”). Fold under all four edges of the patch by 15-20 mm (3/5”-4/5“). Sew the patch to the panel, over the damaged area, using two single rows of stitching, the first row close to the folded edge of the patch and the second row in the distance between 5-8 mm (1/5-1/3”) from the first one.



Repair with two overlaid sewn patches

Mark out the damaged area on the panel so that the patch will be parallel to the warp and weft of the fabric. Cut out two patches in the shape that will cover the damaged area with an overlap of at least 90 mm (3 1/2”). Fold one patch under all four edges of the patch by 15-20 mm (3/5”-4/5“). Sew the patch to the panel, over the damaged area, using two single rows of stitching, the first row close to the folded edge of the patch and the second row in distance between 5-8 mm (1/5-1/3”) from the first one. Than sew the second patch on the other side of the fabric in the same way like the first one.

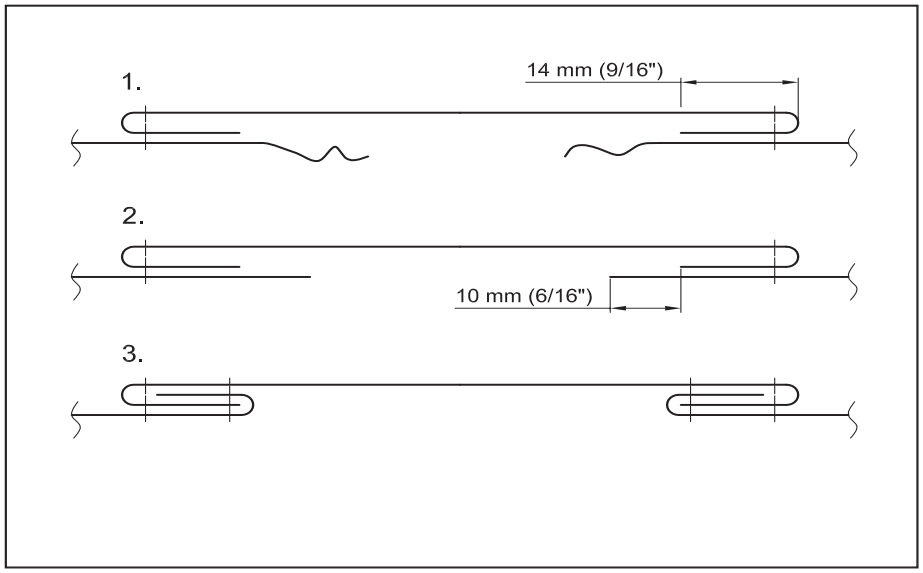


Sewn patch - Partial French Fell Seam (B)

	B	C	D

To make a fell seam a patch has to be wider by 21 mm (7/8”) on each side than the hole it is to cover and the fabric that it has to be patched onto has to have the same allowance.

- Mark out the damaged area on the panel so that the patch will be parallel to the warp and weft of the fabric.
- Cut a patch to shape that will cover the damaged area with an overlap of at least 90 mm (3 1/2”).
- Fold under all four edges of the patch by 14 mm (9/16”).
- Sew the patch to the panel, over the damaged area, using a single row of stitching close to the folded edge of the patch.
- Cut out the damaged area leaving 10 mm (3/8”) excess that can be folded back under the edge of the patch.
- Fold the fabric back inside the patch and sew in place with a single row of stitching.
- Seems constructed in this way are not complete French Fell Seams however these repairs are acceptable
- If the damage reaches to within 20 mm (13/16”) of a seam then the seam should be unpicked and the patch continued to the edge of the panel. The seam at the edge of the panel should be closed using a French Fell Seam.



Sewn patch - French fell seam (B)

	B	C	D

To make a French fell seam a patch has to be wider by 21 mm (7/8”) on each side than the hole it is to cover and the fabric that it has to be patched onto has to have the same allowance. This technique

- Mark out the damaged area on the panel so that the patch will be parallel to the warp and weft of the fabric.
- Cut a patch to shape that will cover the damaged area with an overlap of at least 90 mm (3 1/2”).
- Carry out the seam according to para 3.1.3.

3.2.8 Adhesive Patches Without Overstitching (A)

A	B	C	D

The limitations for adhesive repairs without overstitching are given in section 3.2.1 of this manual. Panels damaged beyond this limit may be repaired by an adhesive patch with overstitching, a sewn patch or replacement of the panel. Adhesive repairs may be in the form of circular or oval patches, depending on the shape of the damage that requires repair.

The patch should be cut out with rounded corners and should have an overlap around the damage of at least 2.5 cm (1”). The area around the damage must be thoroughly cleaned to maximise the adhesion of the patch. A single patch may be applied to the inner surface of the envelope for tears, whereas for holes two patches – one on each side of the fabric - shall be used.

Repair by two adhesive patches is recommended.

Patches may be parallel to the warp and weft of the fabric and may be made from a balloon repair tape.

3.2.9 Adhesive Patches TEAR AID/GEAR AID Without Overstitching (A)

A	B	C	D

TEAR-AID® Type A/Gear Aid Tenacious Tape® Repair tapes provide a simple and easy method of colourless patching of holes and tears. The limitations for adhesive repairs without overstitching are given in section 3.2.1 of this Manual. Panels damaged beyond this limit may be repaired by an adhesive patch with overstitching, a sewn patch or replacement of the panel.

Repair Patches do not withstand high temperatures. ALWAYS APPLY PATCH ON THE OUTER SURFACE OF THE ENVELOPE.

First, check the size of the rip or tear to be repaired and thoroughly clean the surrounding area to ensure maximum adhesion of the patch. The patch should be cut out with rounded corners and overlap the damaged area at least 1.3 cm (1/2 inch) on all sides. When applying the patch, start with peeling back a small portion of the patch from the backing to create an ‚anchor'. Align the patch with the tear and firmly press down the anchored section. Then gradually peel off more of the backing while pressing the patch into place as you continue the repair. This helps prevent air bubbles or wrinkles from forming under the patch.

NOTE	Envelopes are made either of polyester or polyamid, therefore TEAR-AID® Type A is to be used.

3.2.10 Adhesive Strip Repairs With Overstitching (B)

	B	C	D

The limitations for adhesive repairs with overstitching are given in section 3.2.1 of this manual. Panels damaged beyond this limit may be repaired by an adhesive patch with overstitching, a sewn patch or replacement of the panel. Tears in the envelope up to 1.5 m (5 ft) long may be repaired by using the strips of balloon fabric applied with a contact adhesive (e.g. Evo-Stik) or with a balloon repair tape. The edge of the tape must overlap the original fabric by 2.5 cm (1”), and two rows of the stitching must be sewn around the edge of the patch.



3.2.11 Repairs of graphics

	B	C	D

3.2.11.1 Onlaid graphics (B)

When the graphic is only unpicked from the envelope, straighten both layers, position the graphics on its original place and sew it with single row of stitching (3-5 mm away from the frayed edge).
When the onlaid graphics is damaged and needs replacement, contact KF for the pre-cut design. The best option is to order precut panel with the graphics already sewn on it. In this case follow the steps of panel replacement (chapt. 3.2.5).
If you need to exchange only the onlaid design, order it pre-cut from KF. Then unpick the original artwork from the envelope (if the graphics goes to the edge of panel, unpick also the French Fell Seam connecting the adjacent panel in the area of graphics and extend unpicking at least 10 cm (4”) beyond). Place new artwork on the panel and attach it with single row of stitching (3-5 mm away from the graphic's egde). If any adjacent envelope panels needed to be unpicked, sew them back using French Fell Seam.

	B	C	D

3.2.11.2 Inlaid graphics - straight (B)

For repairs of simple straight graphics, follow procedure for partial panel replacement (chapt. 3.2.6). Instead of the patch, use pre-cut panel ordered from KF.

		C	D

3.2.11.3 Inlaid graphics – curves and complex shapes (C)

For repairs of curved of complex graphics order pre-cut panels from KF. Unpick the damaged graphics (if the graphics goes to the edge of panel, unpick also the French Fell Seam connecting the adjacent panels in the area of graphics and extend unpicking at least 10 cm (4”) beyond). Pay special attention to the layers of French Fell Seam (which panel/colour is on the top?). Position the new graphics correctly to the remaining panel and start attaching it using French Fell Seam. Order of the layers (which panel/colour is on the top?) must remain unchanged to the original.
Inlaid graphics can be repaired also using pre-cut panels that were sewn together by KF. Such repair falls into category of panel replacement (chapt. 3.2.5)

		C	D

3.2.11.4 3D artwork (C)

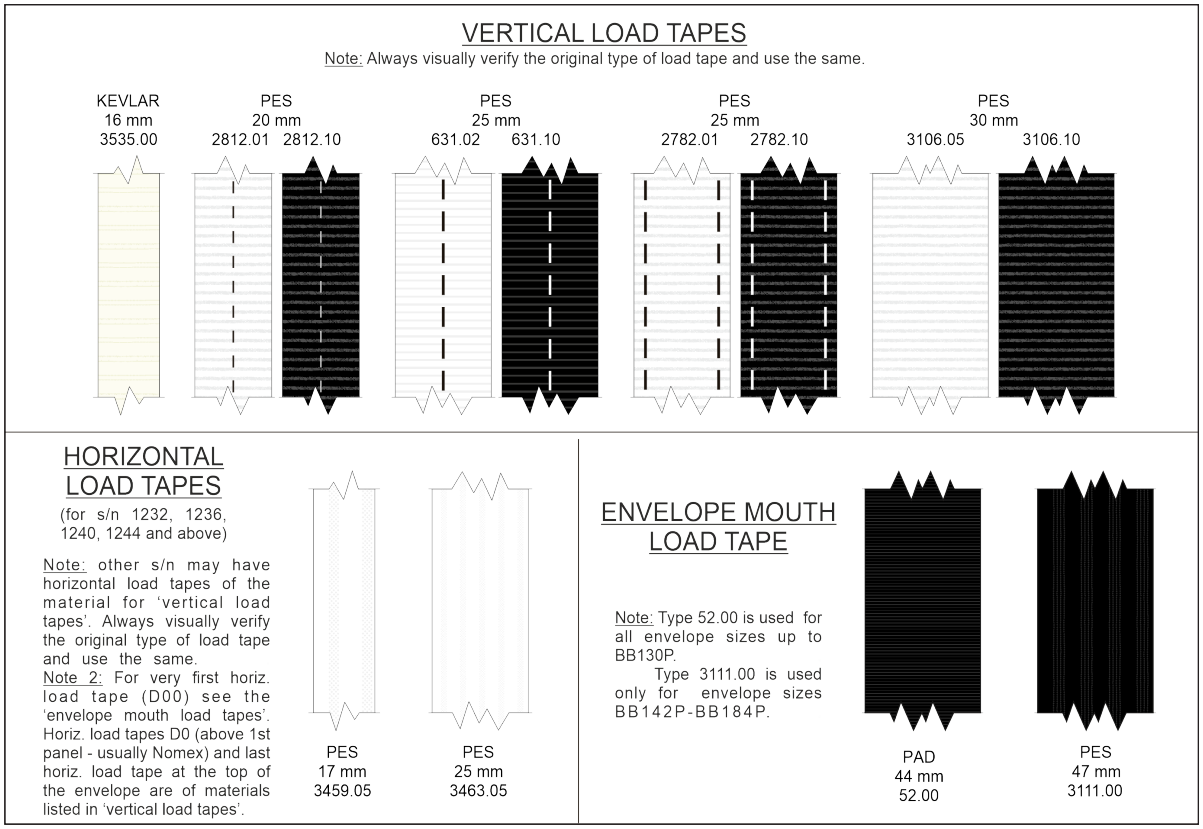
3D artoworks may be very specific. Always contact KF for details.

3.3 Load Tape Repairs

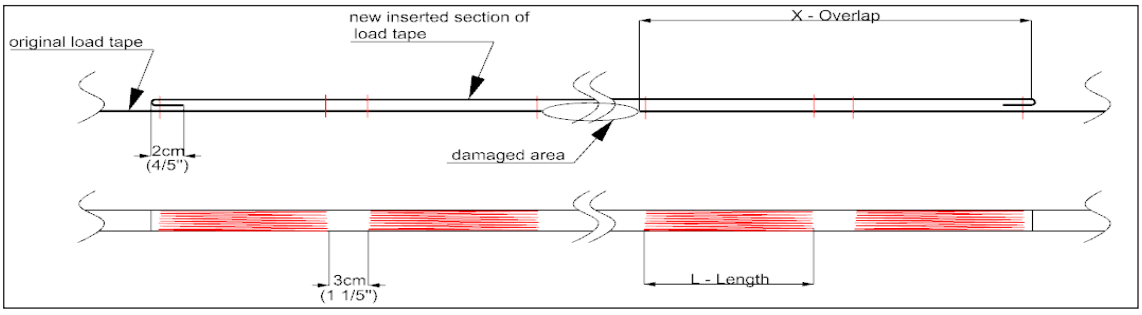
		C	D

3.3.1 Load Tape (C)

Load tapes are essential to the structure of the balloon, and the balloon may not be flown if any load tapes are damaged. Damaged load tapes must be replaced or repaired using tape of the same specification supplied by KF (for the types of load tapes see the table below). Tape ends must be heat sealed with a flame of hot-knife to prevent fraying.



The standard joint is made up from 2x overlap, secured with two sewn areas with a gap between them. Each sewn area must have exact number of rows (according to the type of load tape) of parallel stitching along the tape length. If a tape is damaged near to one of its ends, it may be better to replace the section from the damaged area to the end with a new length of load tape. The original joint can differ according to used technology. If a load tape is damaged, it may be left at a balloon, if a part of load tape is missing, the tape ends must be heat sealed and then a new section of tape must be laid. Repairs to the load tapes are to be completed before the tapes are sewn back onto the fabric of the envelope.



Type of load tapes	X - Overlap	L - Length	Number of rows
2812.00 - 20 mm	35 cm (14'')	15,5 cm (6 1/10'')	15
631.00 - 25 mm	35 cm (14'')	15,5 cm (6 1/10'')	20
2782.00 - 25 mm	45 cm (18'')	21 cm (8 2/5'')	20
3106.00 - 30 mm	65 cm (26'')	31 cm (12 2/5'')	25

3.3.2 Replacing a Damaged Crown Ring (C)

		C	D

A damaged crown ring must be replaced and may not be repaired.

All the load tapes that are attached to the crown ring must be unpicked and the crown ring replaced. Make sure that the new crown ring is of a same type as the damaged one (figure-8 descender - 80, small crown ring - 3469, large crown ring - 54269) and that it is orientated in the same way as the one that it replaces with the small rope attachment ring closest to the ground when the balloon is being inflated. The load tapes must be sewn in the same manner as the original joint.It is wise not to detach all load tapes at once but to replace the load tapes gradually one by one.

3.3.3 Replacing a Flying Wire by Opening the Turn-back (C)

		C	D

To replace a damaged envelope flying wire unpick the turn-back protector and the tape turn back. Thread on a new flying wire (use only the wires supplied by KF) and re-sewing the turn back by copying the original joint. Care must be taken not to damage the load tape loop or the turn back.

If the load tape loop requires repair then cut off the damaged section above sewing and heat seal the end. Make up a new loop with 45 cm (18") (for envelope above 14 000m3 (494 ft3) 65cm (26") overlap at the end. Thread the tape through the thimble of the flying wire and sew the two sides of the replacement tape together as described in para 3.3.1. Sew the replacement loop onto the original load tape either in the same manner as the original stitching or in accordance with the appropriate diagram shown beside.

NOTE	*The sewing is same for repairs mentioned in sec 3.3.1 and 3.3.2.*
CAUTION	*Swaging of flying wires is described in SI 2023/04 in its latest revision.*
WARNING	*This method cannot be used for replacing flying wire on envelopes with Kevlar load tapes!*

3.3.4 Replacing a Flying Wire Fastened with Quick Link Carabiner (B)

	B	C	D

Unscrew the quick link carabiner and take out the damaged wire. The quick link carabiner thread is sealed and there is a need to preheat the seal with a heat gun. Before screwing it again, apply Loctite 243 glue on the seal and only then screw tight again.

3.3.5 Replacing a Flying Wire adding Quick Link Carabiner (B)

	B	C	D

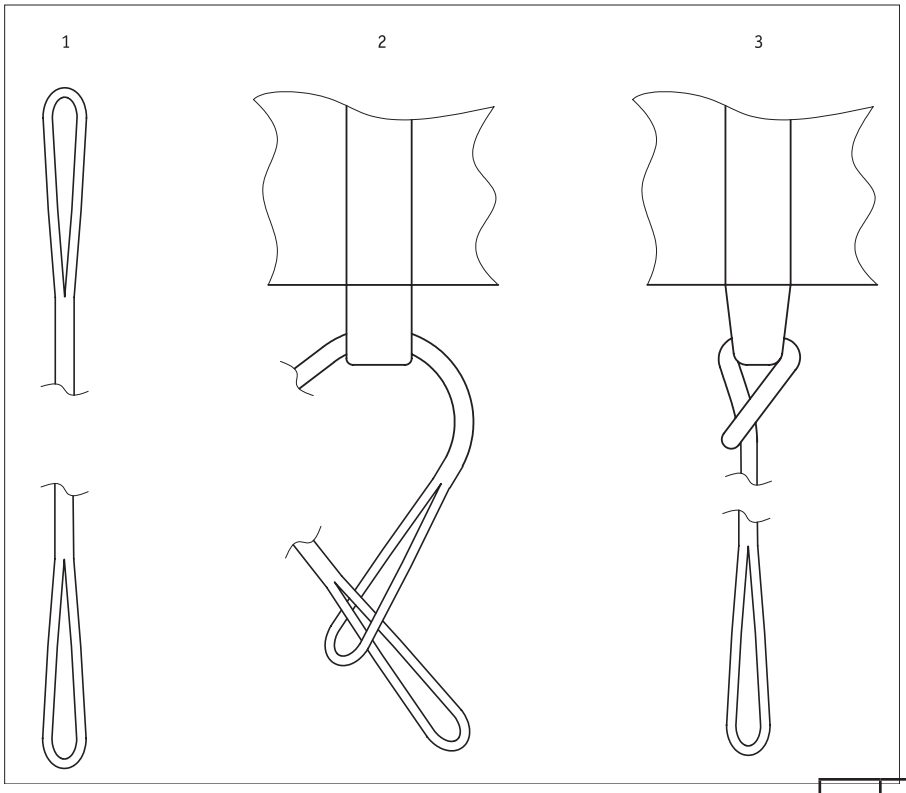
Take out the damaged wire and place the quick link carabiner into the load tape loop. Place the turn back with new wire into the carabiner and follow the instructions in sec 3.3.4. to tighten the quick link carabiner.

NOTE	*The lenght of a new wire will be shorter of the lenght of the quick link carabiner. Contact KF to request spare parts for this modification.*

3.3.6 Replacing a Kevlar Flying Wire (A)

A	B	C	D

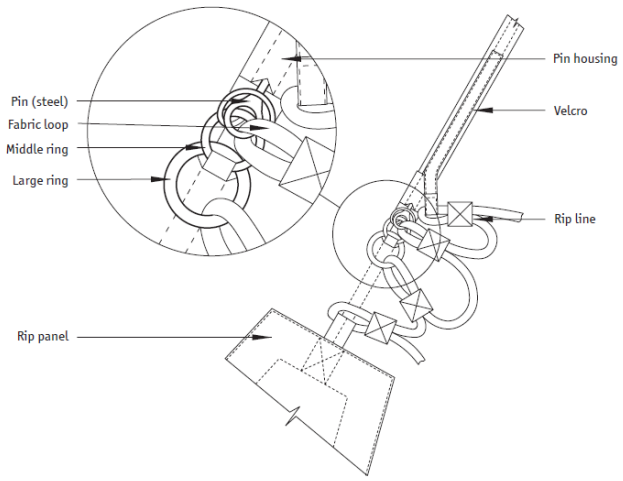
When replacing a damaged Kevlar flying wire detach its lower end from the carabiner and then untie the loop on the upper end from the load tape loop. Make sure the new wire is of the same length as the removed one. Insert the flying wire loop into the load tape loop, then pass the thimble end through the loop end. Tighten the loop by pulling the wire while arranging the joint of the loops so the bends are as least sharp as possible. Attach the thimble end to the carabiner.



		C	D

3.3.7 Rip Lock replacement (C)

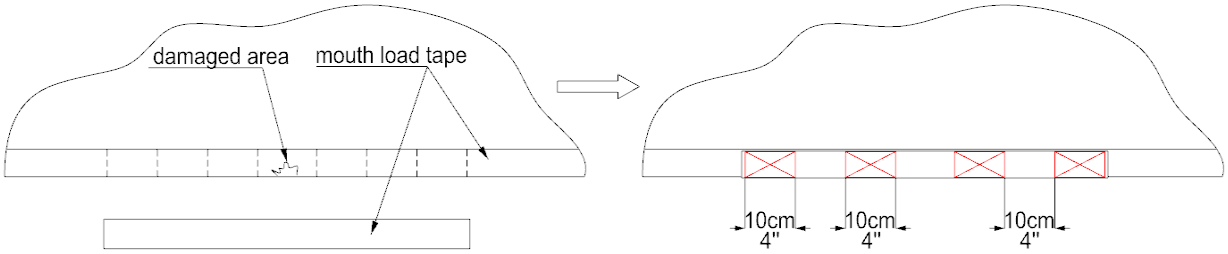
Rip Lock is a safety system of Rip Panel which is protecting it from inadvertent opening during flight. All damaged parts of Rip Lock must be replaced and not repaired. When a Rip Lock parts are replaced the string lengths and knots must be identical to the original. When changing the Velcro, same type (length and width) must be used and it must be sewn along all its edges to the load tape loop. All layers and parts of the system must remain in place and in the same order (note that sizes of metal rings differ).



3.3.8 Envelope Mouth Load Tape Repair (C)

		C	D

If the load tape at the lower rim of the envelope mouth is damaged, the affected part is recommended to be replaced by a new one. Unpick the damaged part and replace it with a new one with the use of the same stitching as used for the original joint of the tape. If the original seam is damaged or any uncertainty occurs contact KF for advice.



3.4 Melting Link (A)

A	B	C	D

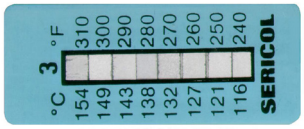
If the melting link has parted and the temperature flag fallen out replace the melting link and attach a new temperature flag to it and check the tempilabel.

3.5 Tempilabel (B)

	B	C	D

If a tempilabel shows overheating - indicated temperature reaches 138°C (280°F) - or damaged do not remove it but sew in a new one with the same temperature range alongside the original. Make an entry into the Logbook. The envelope needs to be inspected according to the para 7.19.1. of this Manual.

For correct location of temperature measuring equipment see Appendix 4.



Tempilabel

3.6 Control Lines

3.6.1 General

Damaged control lines must be replaced or repaired with identical lines. Contact KF if in doubt.

All replaced or repaired control lines are to be secured by using the Safety turnback knot. When two lines are to be secured together then the open loops should be joined together.

Damaged or broken vectran lines are to be replaced with the new ones (1011). Use a Double Fisherman's knot to join the two parts of the line and a Bowline knot to fix the vectran line to the edge of the vent panel.

WARNING	*The overall length of the control lines must not be reduced. Certain spare length allowing for envelope deformation and operational conditions must remain.*

Knots to be used:



Double Fisherman's Knot



Safety Turnback Knot



Bowline Knot

3.6.2 Parachute Centralising Lines and Shroud Lines (B)

	B	C	D

If damaged a line should either be replaced or repaired. To repair a damaged line cut out the damaged area and replacing it with new line. For a centralising line adjust the line to the correct length by using the process described below. For a shroud line adjust the line to the correct length by comparing it to an adjacent undamaged line. Heat seal all line ends.

3.6.3 Adjusting the Parachute Centralising Lines (B)

	B	C	D

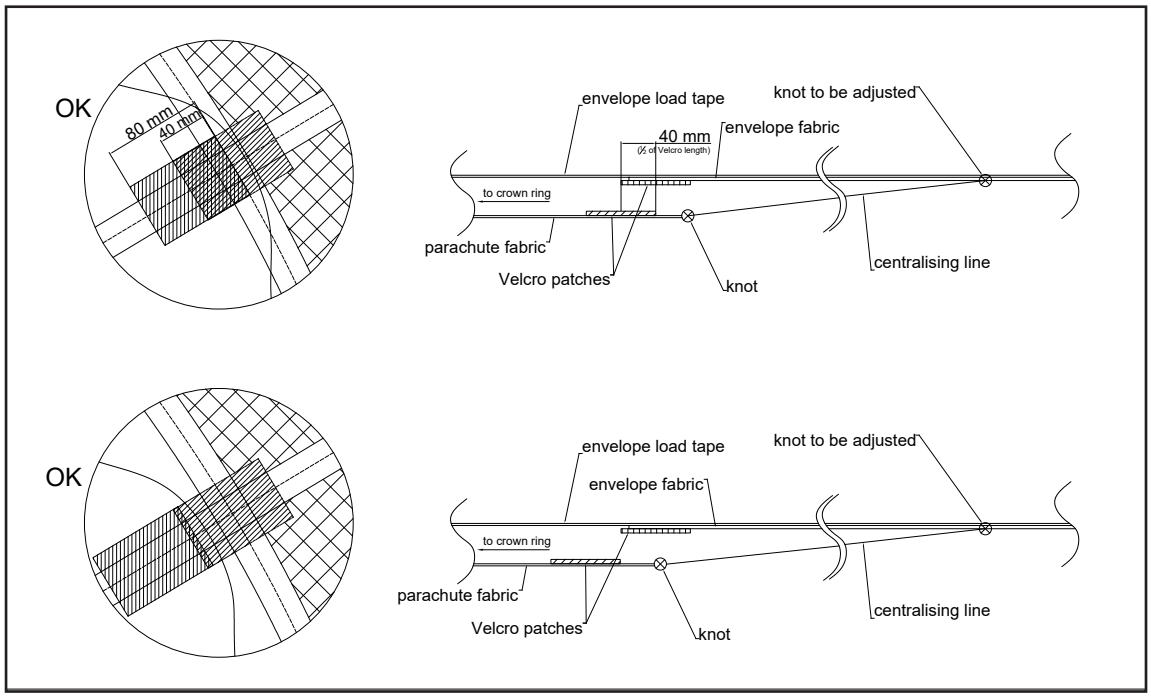
In envelopes with a parachute the centralising lines hold the parachute in the correct position so that it remains centrally beneath the vent hole. By being the correct length the centralising lines ensure that the parachute seals properly and always returns to this position when the rip line is released.

To check and adjust the length of the centralising lines:

Have one person hold the envelope where an individual centralising line attaches to the envelope.
Pull the line and the relevant load tape taught so that the Velcro on the parachute is adjacent to the equivalent Velcro patch on the envelope.

When the line is the correct length the centre of the Velcro patch on the parachute will be 6 ± 1 cm (2 1/2″ ± 3/8″) outside the centre of the equivalent Velcro patch on the envelope. On XR envelopes this is to be established by direct measuring of the centralising lines. The correct length including loops (L) is 225 cm (8 1/2″) at BB17XR and BBB20XR or 268 cm (8 3/4″) at BB22XR, BB26XR and BB30XR as shown on the picture below.

If the Velcro patches are not in this relationship on to another then the centralising line must be readjusted to the correct length by releasing and retying the attachment knot where it is tied to the envelope.
Repeat this process with each of the centralising lines in turn until they are all the correct length.
Inflate the envelope and check visually that the parachute is seated correctly.



Correct Measures for Adjusting the Parachute Centralising Lines

3.6.4 Replacing of Rotation Vent Lines (B)

	B	C	D

Damaged rotation vent lines are to be replaced. The replacement line should be attached to the original line and the line pulled through the pulley and D ring to exit from the side of the envelope in the normal way. The line can then be trimmed to match the original.

3.6.5 Repairing Deflation System Control Lines

If any deflation system control line is damaged or too heat-shrunk then it shall be replaced viz 3.6.5.1.

3.6.5.1 Replacing Deflation System Control Lines (B)

	B	C	D

Untie the damaged line from the attachment point and attach the new line to this point. As the damaged line is removed through the shroud line pulley and lower pulley replace it with the new line. Inflate the balloon and check that the lines deploys the parachute correctly. Adjust the length of the new line so that it is sufficient to allow for distortion of the envelope during inflation and in flight.

3.6.5.2 Extending Deflation System Control Lines (B)

	B	C	D

If there is spare line at the attachment point then the knot at this point may be loosened, the surplus line pulled through and the line reattached.

The now extended line may be pulled through and the line length adjusted to as same length as original.

3.6.6 Smart Vent, Slide Vent and Lite Vent Shroud Lines (B)

	B	C	D

If a line is damaged within 80 cm (32“) of the main pulley that it is attached to then the damaged section may be cut out and a new section of vectran line added. If the line is damaged elsewhere then the line must be replaced completely using vectran line. The length of the new or repaired line should be checked against an undamaged line.

3.6.7 Smart Vent, Slide Vent, Lite Vent and Paralite Centralising Lines (B)

	B	C	D

If damaged, a line should be replaced. Ensure that the replaced line is the correct length by making it the same length as an adjacent line.

3.6.8 Smart Vent, Slide Vent and Lite Vent Tapes (B)

	B	C	D

If any of these tapes are damaged or worn, then they must be replaced.

3.6.9 Lite Vent and Paralite Weight (A)

A	B	C	D

If the weight is damaged, then it must be replaced with a new, identical, weight.

3.6.10 Pulleys (B)

	B	C	D

Damaged pulleys must be replaced. If in doubt, contact KF to specify which type to use. When replacing a pulley resew the attachment tape in exactly the same way that the original was sewn, paying particular attention to any heavy back stitching that was on the original attachment.

CAUTION	*When replacing a pulley use one that is identical to the original. Never replace a pulley which can rotate about its vertical axis with one that can not, or vice versa. Only use pulleys supplied by KF.*

3.6.11 Carabiners (A)

A	B	C	D

Replace the damaged carabiners. Use only approved types of carabiners: Singing Rock (30 kN), Petzl (38 kN) and steel Stubai (30 kN/40 kN), of the same or higher load capacity and with the same dimensions (with a tolerance of ±5 mm). Refer to Service Instruction No. 2022/06 for further information.

3.6.12 Loops (C)

		C	D

The permissible cumulative damage on all loops shall not exceed 3 mm of the loop width except for flying wire loops and crown ring loops on load tapes. If the total damage (loss of width across the loop lenth) exceeds 3 mm it must be replaced. The replaced loops should be made from the same material as the original and sewn using the same method. Any damage to flying wire loops or crown ring loops on load tapes must be reported to the KF for assessment and determination of whether replacement is required.

3.7 Replacement of Smart Vent, Slide Vent and Lite Vent (C)

		C	D

For more information contact KF.

SECTION 4 - BASKET REPAIR AND MAINTENANCE

4.1 Routine Maintenance (A)

A	B	C	D

The basket sides and floor should be pressure washed with clean water without additives. Once clean the basket should be dried naturally and then stored so that it will remain dry. It is recommended to place the basket on a pallet.

If desired the cane and wicker sides may be painted with varnish or Danish oil.

The leather on the lower edge of the basket should be washed to remove dirt and grime. Once the leather is clean and dry it should be treated in the following manner:

Collapsible Baskets (K10C and K13C) and Baskets with rounded floor edge covered with leather:
The leather should be coated with two layers of a leather conserving treatment. The leather should be allowed to dry completely between coatings.

Baskets with right-angled floor edge covered with rawhide:
Whiten the rawhide using a white shoe treatment.

The suede on the upper rim of the basket should be brushed with a suede brush.

4.2 Wickerwork (B)

	B	C	D

Damage to the wicker greater than 6 cm in both horizontal and vertical dimensions is to be repaired by reweaving.

Wickerwork repairs (C)

		C	D

Wickerwork repairs which extend across more than 20% of the total woven area of the basket or more than 15% of one basket side.

4.2.1 Collapsible Basket K10C and K13C Fabric Sidewalls (B)

	B	C	D

Damage to the fabric sidewalls in both layers greater than 2 cm (crack lenght) or greater than 5 cm in one of the layers is to be repaired by resewing or replacement.

The fabric sidewalls are removable for cleaning and repair purposes. Best way to remove the fabric sidewalls is when the steps are locked, red velcros are not secured and the rods on the long sides are not inserted. Pull up the straps used for the equipment pocket through the tunnels and remove the protection plates. Open the door zipper, the bottom and upper zipper and pull the fabric sidewalls up over the upper frame of the basket. Reassembly is carried out by reversing the procedure.

4.2.2 ORIGO Basket Fabric Sidewalls (B)

	B	C	D

Damage to the fabric sidewall greater than 5 cm is to be repaired by resewing or replacement. To remove the sidewalls open the door zipper as well as the bottom and upper zippers and pull the sidewalls up over the upper frame of the basket. Reassembly is carried out by reversing the procedure.

4.3. Repair of broken vertical wickers (B)

	B	C	D

For easier, safer work and better manipulation, we recommend putting wickers into water at least one day before start of repair.

Repair contains cutting damaged wickers (if both wickers in one pair are broken, then cut and replace each from pair in different height, please see Fig. 1). Cut should be made at angle 45 °, best practice is to make cut on place of strength weaving, where thicker canes are used. Damaged wicker parts must be extracted from basket and replaced by spare wicker pieces, placed back into woven wall, to replace of damaged ones. New wickers must be inserted fully into weave, to maintain as small gap between old and new piece, as possible.

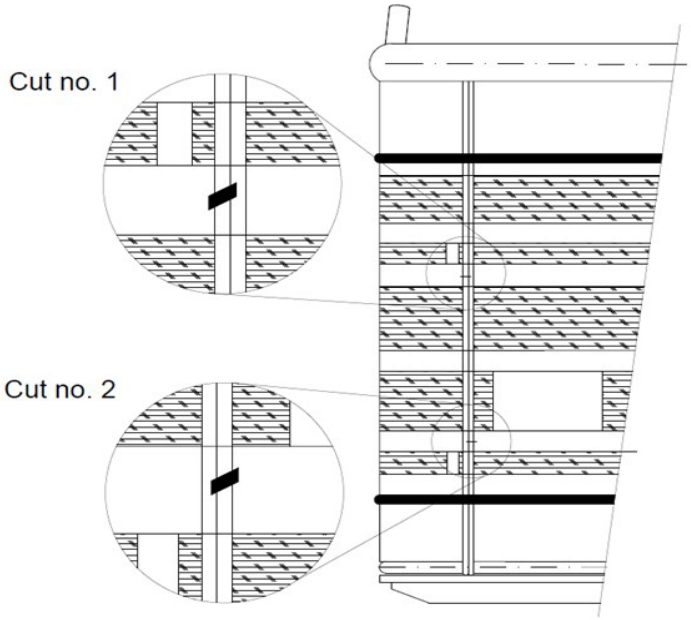


Fig. 1: Where to cut wickers

After replacing old, damaged wickers, if stiffness of basket wall is insufficient or was damage more pairs of wickers close together, is necessary to tighten together new and old wickers at least at four points in different heights (please see Fig. 3). Tightening should be made in places, where isn't strength type of weaving. For tightening use Cable ties 7.8x0.18" (200x4,8 mm) (Part No. 714.00). The example of strength type of weaving see Fig. 2.

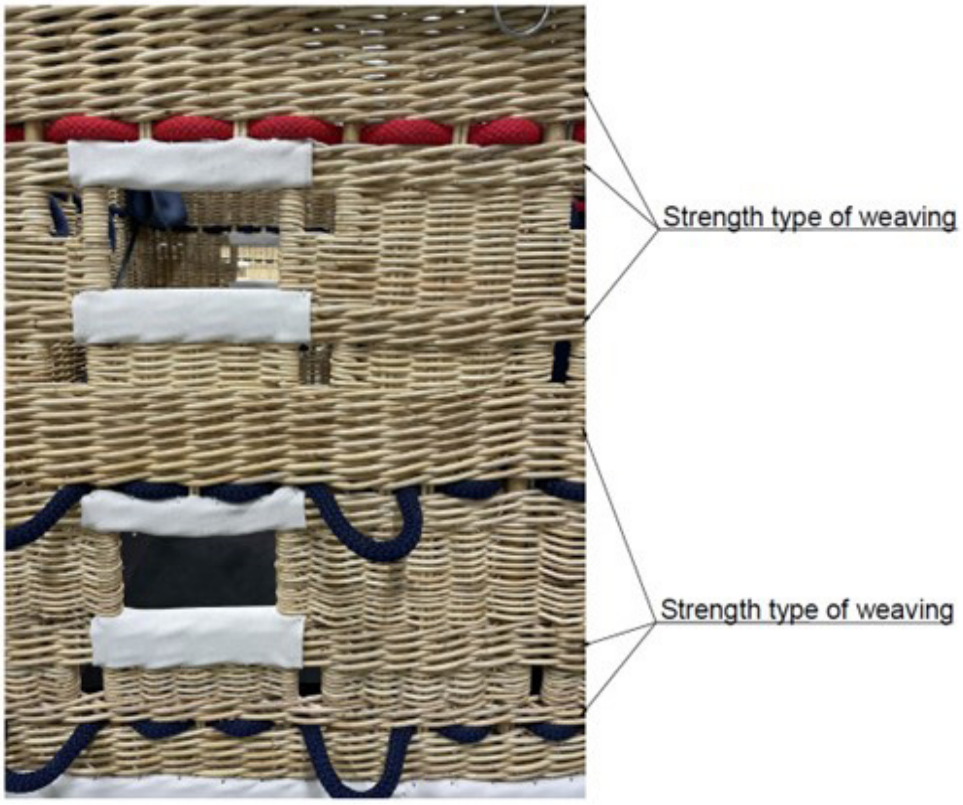


Fig. 2: Strength type of weaving example

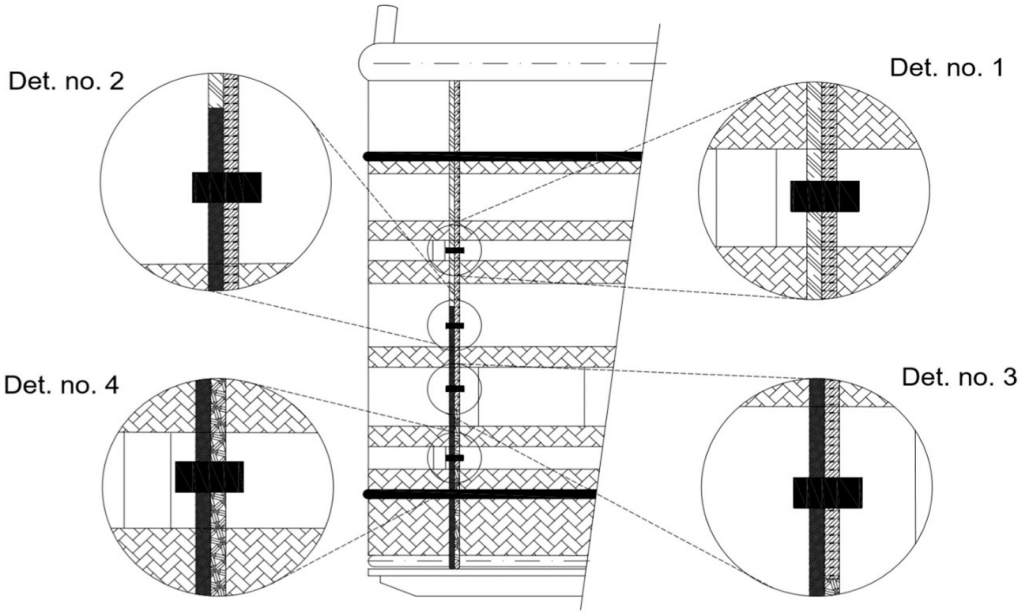


Fig. 3: Details of connection between old and new wickers

4.4. Repair of broken vertical manilas/main cane (C)

		C	D

To reach to broken vertical manilas it is necessary to remove upper upholstery, cushion profile and cut upper burner frame near broken manila (see Fig. 5). Remove all parts of broken manila and replace it with new one-piece manila. Check, that lower end of manila has chamfer, to easier slide thru woven wall. Guide replacement manila all the way down to manila socket on lower basket frame (if is present) or to touch with lower basket frame if socket is not welded on lower basket frame.

Before welding it is necessary to insert in each cut place welding insert of proper size (based on diameter of upper frame tube). Weld must be done according to Fig. 5.

Note that placement of cuts in Fig. 4 a 5 is only for reference, exact placement depends on each specific basket damage.

Contact Kubicek Factory for advice if you have any doubt about repair or need any additional information.

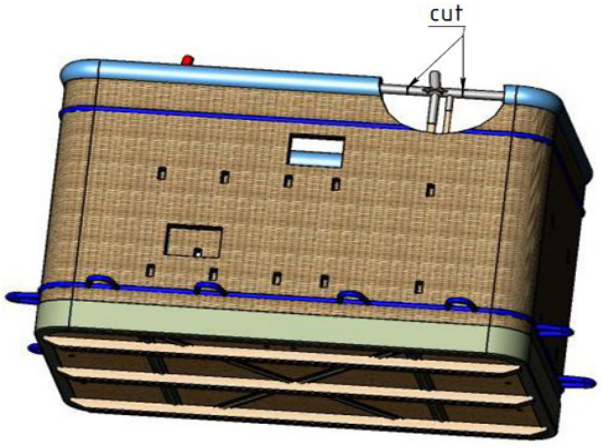


Fig. 4: Placement of cuts on example basket

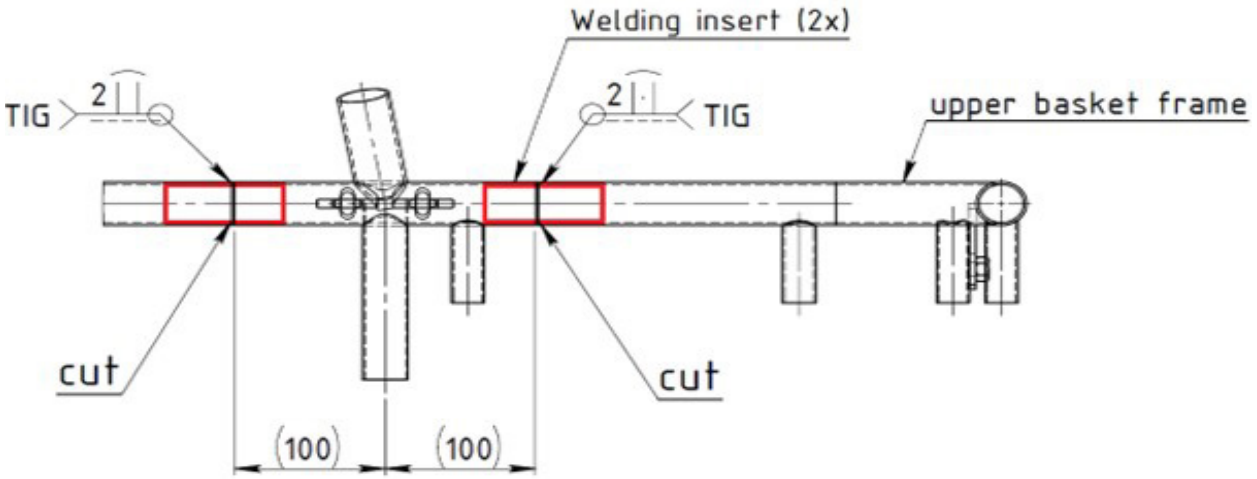


Fig. 5: Exapmle placement of cuts on upper frame basket

4.5 Rope Handles (B)

	B	C	D

Cut the damaged rope at least 50 cm beyond the damaged area in both directions and remove the damaged section. Weave in a new section of rope, overlapping the undamaged sections by at least 50 cm (20“) at either end. Heat seal all exposed rope ends. Secure the replacement rope to the undamaged sections using plastic ties or straps.

Repair of loose passenger handle line
Identify loose handles. Locate the handles that are loose and need securing. Using a 3 mm nylon line, wrap it around the thick rope where the handle begins. Secure the wrapping by tying knots at both ends of the nylon line (refer to the Service instruction 2024/03 for detailed pictures). To ensure sufficient friction between the thick rope and the wickerwork, place cable ties around the wicker near the base of the handle. Make sure to position the cable ties so that the locking mechanism is hidden within the woven structure, protecting passengers from any sharp edges (refer to Service instruction 2024/03). Cut off the excess ends of the cable ties for a neat finish. Apply the same process to all handles that need securing.

4.6 Basket PLYWOOD Floors (C)

		C	D

Floor repairs are possible, the procedure must be designed and approved by KF. Cracks that do not penetrate the floor or which penetrate the floor but are no longer than 50 cm (20“) on either side of the floor, may be covered on the upper side of the floor by a thin metal plate that is screwed to the floor to cover the damaged area. If this method is used then care must be taken to ensure that the screws do not go anywhere near the basket wires.

If there is major damage to the floor or a crack which penetrates the floor and is longer than 50 cm (20“) on either side of the floor then the floor is to be replaced with identical one. Contact KF to specify which type to use if in doubt.

4.7 Load Bearing Wooden Frames and Runners (B)

	B	C	D

Scratching and limited wearing away of the load bearing wooden frame or runners is acceptable. If the any part of the load bearing frame or a runner is cracked through more than 25% of its original thickness then it is to be removed and replaced by a similar part from the manufacturer.

After replacing a section of a load bearing wooden frame or a runner paint the new wood and the area around it with at least two coats of transparent synthetic protective wood varnish.

4.8 Upholstery and Padded Suede / Leatherwork (A)

A	B	C	D

To mend the soft parts of suede / leatherwork use common upholstery aids. Repair torn or damaged leather by sewing it together or by patching with a similar material. If the padding under the suede or leather has been damaged or rubbed away then repair the area by inserting soft upholstery padding before resewing the covering suede or leather.
Basket padding may be repaired using the same stitching as in the surrounding area or by patching.

4.9 Bottom edge Leather or Rawhide (B)

	B	C	D

Baskets with leather (dark leather):
Damaged leather on the lower edge of the basket must be replaced. Unpick the damaged section and use it as a template to create a new section. Cut the leather to shape with sheet metal shears. Punch 5 mm (3/16“) sewing holes along the upper edge of the replacement section. Impregnate the leather properly with leather conserving treatment (see para 4.1 above). Secure the lower edge of the section to the underside of the floor with upholstery staples (Alternatively tacks may be used). Sew the upper edge in place using 5mm (3/16“) diameter cord.
Baskets with rawhide (hard white):
Damaged rawhide may be replaced or patched.

If replacing a complete side then unpick the damaged section and use it as a template to create a new section. Cut the rawhide to shape using a sharp knife. Punch 3 mm (1/8“) sewing holes along the upper edge of the replacement section. Soak the rawhide in water until it is pliable. Secure the lower edge of the section to the underside of the floor with upholstery staples (Alternatively tacks may be used). Sew the upper edge in place using 3mm (1/8“) diameter cord. Leave the rawhide to dry naturally.

If a patch is to be used then remove the damaged section and sew the edges back in place. Cut a patch from rawhide that will overlap the damaged area by at least 70 mm (2,8“) on either side. Cut the rawhide to shape using a sharp knife. Punch 3 mm (1/8“) sewing holes along the upper edge of the replacement section. Soak the rawhide in water until it is pliable. Secure the lower edge of the section to the underside of the floor with upholstery staples (Alternatively tacks may be used). Sew the upper edge in place using 3mm diameter cord. Leave the rawhide to dry naturally.

NOTE	1. *Rawhide contracts as it dries so it is essential to use a patch that is large enough to cover the damaged area when the rawhide is dry.* 2. *If the basket wires are exposed when leather or rawhide is removed then inspect the exposed wires before the leather or rawhide is replaced.*

4.9.1. Bottom Edge Leather on Collapsible Baskets K10C and K13C

Damaged leather on the lower edge of the basket must be cover from the outside. Cut the leather to the desired shape, allowing a minimum of 50 mm (2,0“) over the size of the damage. Punch 5 mm (3/16“) sewing holes along the upper edge and vertical sides of the replacement part, and punch the leather part to be repaired at the same positions. Impregnate the leather properly with leather conserving treatment (see para 4.1 above). Secure the lower edge of the section to the underside of the floor with upholstery staples. Sew the upper and vertical edges in place using 5 mm (3/16“) diameter cord.

4.10 Sliding Shims (A)

A	B	C	D

Unscrew damaged sliding shims and replace with new ones.

4.11 Metal Basket frames (C)

		C	D

All welding must be made using TIG (Tungsten Inert Gas) according to an applicable national standard and must be carried out by a welder approved by the appropriate national authority. Contact KF to issue a Service instruction for the specific serial number.

4.12 Basket Wires (C)

		C	D

Damaged basket wires must be replaced and may not be repaired. For further instructions on replacement and swaging of basket wires refer to SI 2023/04 in its latest revision. Contact KF to specify which type to use.

4.13 Burner Support Rods (A)

A	B	C	D

Broken or cracked burner support rods must be replaced (50169 or 52153 according to the basket size).

4.13.1 Collapsible Baskets K10C and K13C Rods (B)

	B	C	D

Broken or cracked basket rods on the long side (with scores deeper than 2 mm) must be replaced according to the basket inner height (58074 on the short sides, 58070 on the long sides).

4.13.2 ORIGO Basket Rods (B)

	B	C	D

Broken or cracked basket rods (with scores deeper than 2 mm) must be replaced (58124).

4.14 Carabiners (A)

A	B	C	D

Replace the damaged carabiners. Use only approved types of carabiners: Singing Rock (30 kN), Petzl (38 kN) and steel Stubai (30 kN/40 kN), of the same or higher load capacity and with the same dimensions (with a tolerance of ±5 mm). Refer to Service Instruction No. 2022/06 for further information.

4.15 Cylinder Straps (A)

A	B	C	D

Replace a cylinder strap that are worn or frayed through more than 15 % of its width or which has a damaged or deformed buckle.

4.15.1 Collapsible Basket K10C, K13C and ORIGO Cylinder Harness (A)

A	B	C	D

Use Loctite 243 for securing the bolts of shackles which connect cylinder harness straps to basket frames.

4.16 Composite Floor

4.16.1 Composite Floor Repair (D)

			D

The technique of repair depends on actual damage. Contact KF for advice.

4.16.2 Composite Floor Replacement (C)

		C	D

When necessary the composite floor is to be replaced in the same way as the plywood one. However, their attachment to the basket structure is different. Composite floor is attached to lower basket frame by cord (3183.00).

4.17 Basket Door

		C	D

4.17.1 Door Frame (C)

If the door frame, hinge or hinge pin is damaged then contact KF to request a SI for the specific S/N.

4.17.2 Door Wickerwork (B)

	B	C	D

Damage to the wicker grater than 6 cm in both horizontal and vertical direction is to be repaired by reweaving.

4.18 Passenger Seat

4.18.1 Seat Trestle (C)

		C	D

If the seat structure is damaged or distorted then contact KF to request a SI for the specific S/N.

4.18.2 Basket Floor and Trestle Attachment (B)

	B	C	D

Damaged parts on the basket floor (centering nut, corner plates) are to be replaced.

4.18.3 Composite Seat and Restraint Harness (B)

	B	C	D

The composite seat is to be replaced when delamination, cracks or damage near bolts occur. Restraint harness is to be replaced when worn or frayed through more than 15% of its original width or when the buckle is damaged.

4.18.4 Seat Upholstery (A)

A	B	C	D

Use common upholstery techniques to mend worn or damaged upholstery parts.

4.19 Removable Partition

4.19.1 Removable Partition Frame and Locks (C)

		C	D

If the partition frame attachment elements or floor pins are damaged or deformed then contact KF to request a SI for the specific S/N.

4.19.2 Removable Partition Wickerwork (B)

	B	C	D

Damage to the wicker greater than 6 cm in horizontal or vertical direction is to be repaired by reweaving.

4.20 Pilot Harness (A)

A	B	C	D

Replace with a new set supplied by KF.

4.20.1 Pilot harness belt and loadtape between floor and belt

Replace with a new set supplied by KF.

4.20.2 Pilot harness fixing point

In case of damaged fixing point, screws or nuts, replace damaged part by new part supplied by KF.

4.20.3 Pilot harness fixing point for baskets with composite floor

In case of damaged fixing loop, replace loop around lower basket frame. If replacement is not possible, refer to Service Instruction No. 2019/1 and create new fixing point in composite floor according to SI.

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SECTION 5 - BURNER REPAIRS AND MAINTENANCE

5.1 Ignis Burner

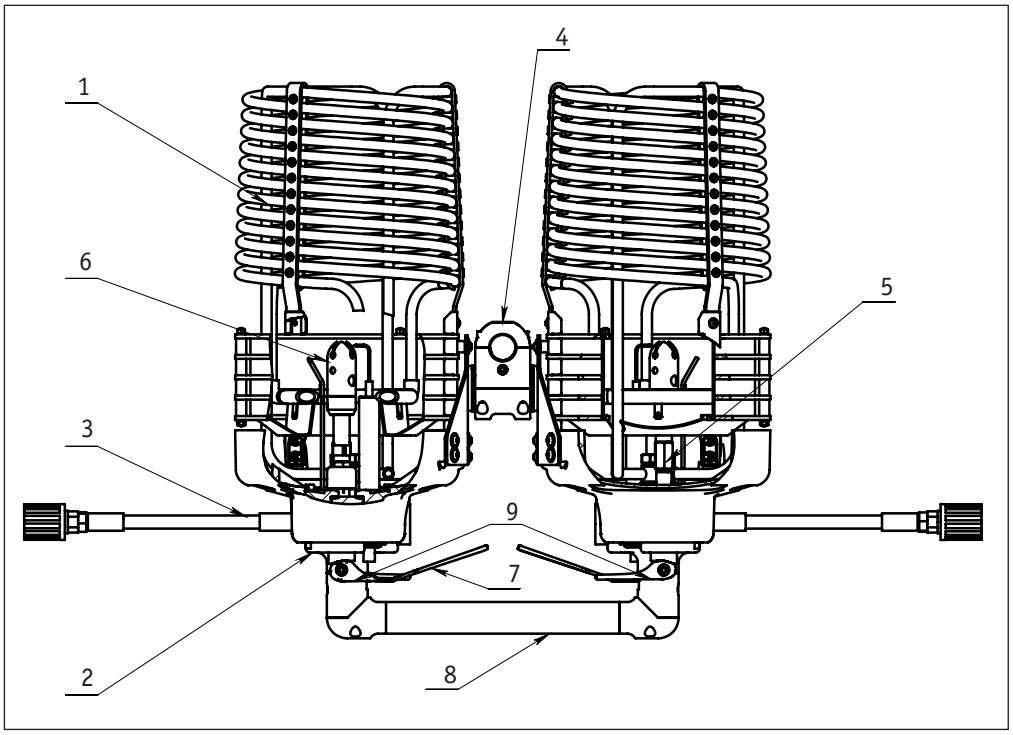
5.1.1 Ignis Burner

This chapter provides instructions for service and maintenance of the Ignis burner of serial number 471 and above. In case you deal with any older version or any other type of burner use either the respective manual or contact KF for obtaining it.

WARNING	*Before starting any maintenance or repair work disconnect the burner from all fuel supplies and vent all the fuel from the burner.*

CAUTION	*It is essential that all fuel system and burner repairs are carried out in a clean environment. The presence of dirt or chemicals may damage movable parts, rubber seals or bonded joints and cause blockage of the burner jets.*

Main burner parts:



Pic. 1

1 – Vaporising coil with jet ring
2 – Manifold block
3 – Fuel hoses with couplings
4 – Gimbals
5 – Whisper Burner (WB)
6 – Pilot Burner (PB)
7 – Main Blast valve (MBV) with lever
8 – Handle
9 – Whisper burner and Pilot burner with levers

5.1.1.1 Sealing and Threaded Joints Techniques

5.1.1.1.1 O-rings and Rubber Seals

When disassembling sliding parts with O-rings, the new O-rings must be used for reassembling. When disassembling other types of joints the O-rings and seals must be inspected and replaced if damaged or deformed. A graphite-based lubricant (graphite vaseline Attila SA 2M is recommended) is to be used for lubricating O-rings on the sliding joints except piston in pressure reducer. Piston in pressure reducer needs to be lubricated with Carbaflo 2160. Other O-rings joints (non-sliding ones) need to be lubricated with silicone grease. We recommend replacing the O-rings after 12 months of intensive service.

Leak test:
Sealed parts have to be check by leak test. Use 12 bars to pressure manifold block assembly.
There are 2 options for performing a leak test:

1) use bubble spray on assembled parts,

2) check pressure gauge during 10 mins – the value has to be the same.

5.1.1.1.2 Threaded Joints

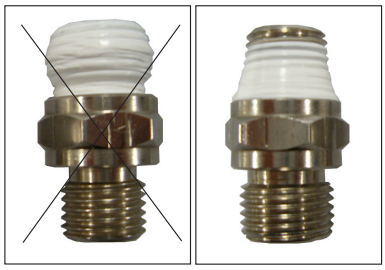
General – When assembling burner parts that are not fixed either with a sealant or sealed with PTFE tape, lubricate the threads accordingly (suitable lubricant is described in each section). Otherwise the threaded joints of the parts made of aluminium alloys may jam.

Joints secured with a sealant – Threads must be clean and free from grease, dirt and old sealant. Smear the sealant on the male thread and screw it in immediately. To shorten the drying time of sealants a spray activator may be applied to the thread before the sealant is applied. Always comply with the drying times recommended by the sealant manufacturer.

Common sealants:
- Loctite 243 – for securing threads against unintentional loosening (removable joints)
- Loctite 270 – for sealing and securing thread (non-removable joints)

Joints sealed with PTFE tape – Ensure that the threads are clean and free from grease, dirt and old tape. Burrs on the threads may be removed with emery cloth or a wire brush.
When using PTFE Tape wrap the male thread in the direction of the thread. Keep tension on the tape whilst wrapping the thread so that the tape is pulled into the thread. Use between 3 to 8 layers depending on the diameter of the thread; the greater the diameter the more layers of thread.

When the thread is correctly wrapped the tape must fill the space between each thread and form a cone as seen on the picture 2.



Pic. 2

CAUTION	*Keep the first thread free from tape to prevent tape being cut off during reassembly. Loose pieces of tape could get into the fuel system and cause a blockage.*

5.1.1.2 Standard Maintenance Techniques

5.1.1.2.1 Removing the Burner From the Burner Frame (Basic and Vario) (B)

	B	C	D

It is recommended to remove the burner from the frame prior to each maintenance or repair on burner unit or fittings.

- unscrew the bolts (7) and remove the gimbal block top (3)
- remove the both units of burner
- keep the friction saddle, washers and spring discs washer (4, 5, 6) inside the gimbal block body or store them apart

Removing the burner units from the frame:

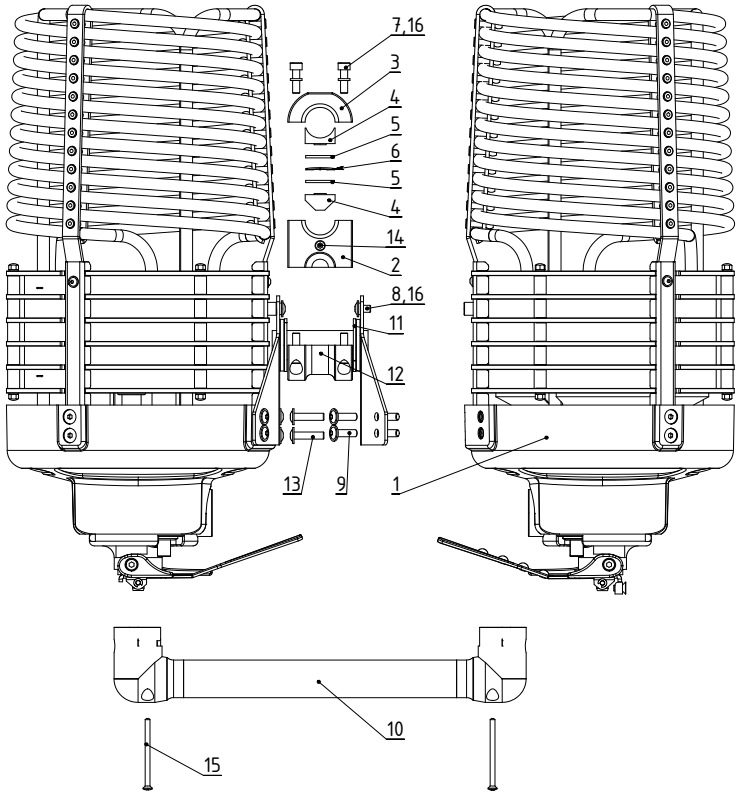
- unscrew bolts (15) and remove handle (10)
- unscrew bolts (8), (9) and (13)
- remove the burner unit

Reassembling the burner to the burner frame:

- lubricate with graphite grease all the bolts (8), (9) and (13) and tighten all the bolts until the torque [4 N·m] is reached
- screw bolts (15) and connect handle with units
- lubricate the friction surface (except surface for the friction saddle) of the gimbal block top (3) and gimbal block body (2) and insert parts in this order: friction saddle (4) – disc washer (5) – spring disc washer (6) - disc washer (5) - friction saddle (4)
- it the frame and gimbal block top, tighten the bolts (7) with spring washers and secure it with Loctite 243

NOTE	*For increase tough swinging of burner on frame is possible to change gimbal disc washers (2 – 2,5 – 3mm) (52935.00 - 52935.01 - 52935.02).* *More details about the frames find in Chapter 5.1.1.4.*

Pic. 3



1 – Ignis burner unit (53115)
2 – Gimbal block body (52926)
3 – Gimbal block top (52929)
4 – Gimbal block friction saddle (52934)
5 – Gimbal block disc washer (52935)
6 – Spring disc washer (2734)
7 – M6 x 20 Hexagon socket cap bolt (2735) with M6 spring washer (1370)
8 – M6x10 Flange Button Head Hexagon Socket Cap Bolt (2907)
9 – M6x20 Flange Button Head Hexagon Socket Cap Bolt (2839)
10 – Handle (53130.01)
11 – Gimbal friction washer (53133)
12 – Gimbal block bottom (52927)
13 - M6x25 Flange Button Head Hexagon Socket Cap Bolt (2906)
14 – M5x10 Hexagon socket cap bolt (2736)
15 – M4x60 Cross recessed countersunk flat head bolt (2834)
16 - M6 Spring washer (1370)

5.1.1.2.2 Fuel Hoses Replacement (B)

	B	C	D

- Burner hose connections with 1/4“ NPT threads (fuel hose / REGO coupling) should be assembled with PTFE tape or Everseal 183.
- Burner hoses with 3/8“ BSP and M18 x1.5 parallel threads (fuel hose / TEMA 3810 coupling and hose / burner) should be assembled with the appropriately sized bonded seal (steel washer with bonded rubber insert) and secured with Loctate 243.

Burner hoses are supplied with Everseal 183 sealant already applied (blue paste on the male connector), there is no need to use any additional sealing means and the hoses are to be installed directly.

These maximum recommended torque values should not be exceeded when replacing the following components:
• 1/4 NPT thread max. 35 Nm (check length of screwing parts together)
• 3/8 BSP thread max. 20 Nm
After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.1.1.1.1

WARNING	*Never try to repair damaged fuel hoses! Always replace the damaged hose with a new one supplied by KF.*

1-Hose burner unit system – with liquid phase only

Disassembling
- disassemble manifold block from the can (check chapter 5.1.1.2.3)
- unscrew hose (2) and blanking plug (1) and remove bonded seal (4)
- unscrew filter (3) carefully

Assembling
- screw carefully filter (3) on side of manifold block with pilot light leaver
- put new dowty seals (4) on hose and filter plug
- screw hose and filter plug and secure with Loctate 243

NOTE	*Change filter liquid phase isn't necessary during replacement of hoses just check it.*

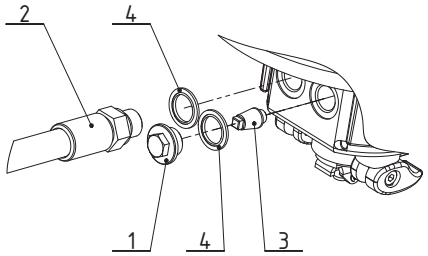
Pic.4

1 – Hose blanking plug (53209)

2 – Liquid hose (53102, 56006, 57975, 57979)

3 – Filter liquid phase (1137)

4 – Bonded seal (2765)



2-Hose burner unit system – with liquid and vapour phase

Disassembling
- disassemble manifold block from the can (check chapter 5.1.1.2.3)
- unscrew hoses (1)(2) and remove bonded seals (4)
- unscrew filter socked head plug (3)

Assembling
- screw in socked head plug (3) on side of manifold block with pilot light leaver (socked head plug has to be sealed with PTFE tape or Everseal 183)
- put new bonded seals (4) to both hoses
- screw hoses and secure with Loctate 243

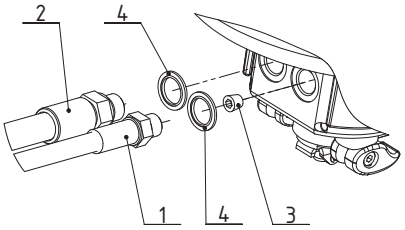
Pic. 5

1 – Vapour hose (53103)

2 – Liquid hose (53102, 56006, 57975, 57979)

3 – Socket Head Plug 1/8 BSP (3339)

4 – Bonded seal (2765)



CAUTION	*For version with vapour hose supply (without the pressure reducer) a Socket head plug (3339) must be installed in-stead of the fuel filter – liquid phase. Otherwise the liquid phase would penetrate the vapour phase circuit.* *Next variation is on piston in pressure reducer – check chapter 5.1.1.2.7 Presure reducer.*

	B	C	D

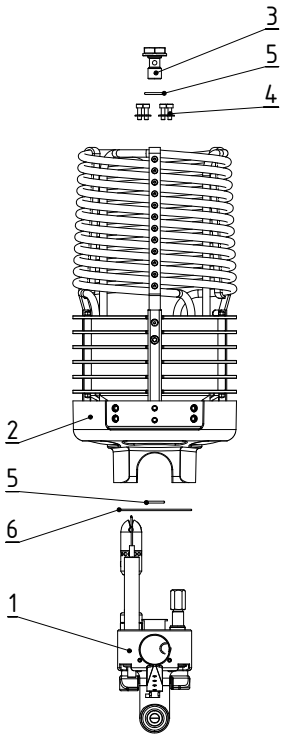
5.1.1.2.3 Removing the Manifold Block (B)

Removing the manifold block:
- unscrew the coil central bolt (3)
- unscrew the bolts (4) – 4x
- take the manifold block out of the can

Mounting the manifold block:
- lubricate the 0-ring (6) and insert it into the can (2)
- insert the 0-rings (5) -2x into the vaporiser connection ring, lubricate the bolt (3) with graphite grease and srcew it in manifold block – do not tighten
- tighten the bolts (4) and then (3)
- adjust the position of the slurper tube, its end should be right above one of the jets

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.1.1.1.1.*

Pic. 6



1 – Ignis manifold block assembly
2 – Can (53169)
3 – Coil central bolt (53264)
4 – M5 x 16 Hexagon socket cap bolt (2763)
with M5 disc spring washer (2817)
5 – O-ring 22x2.5 (3024)
6 – O-ring 96x2 (2912)

	B	C	D

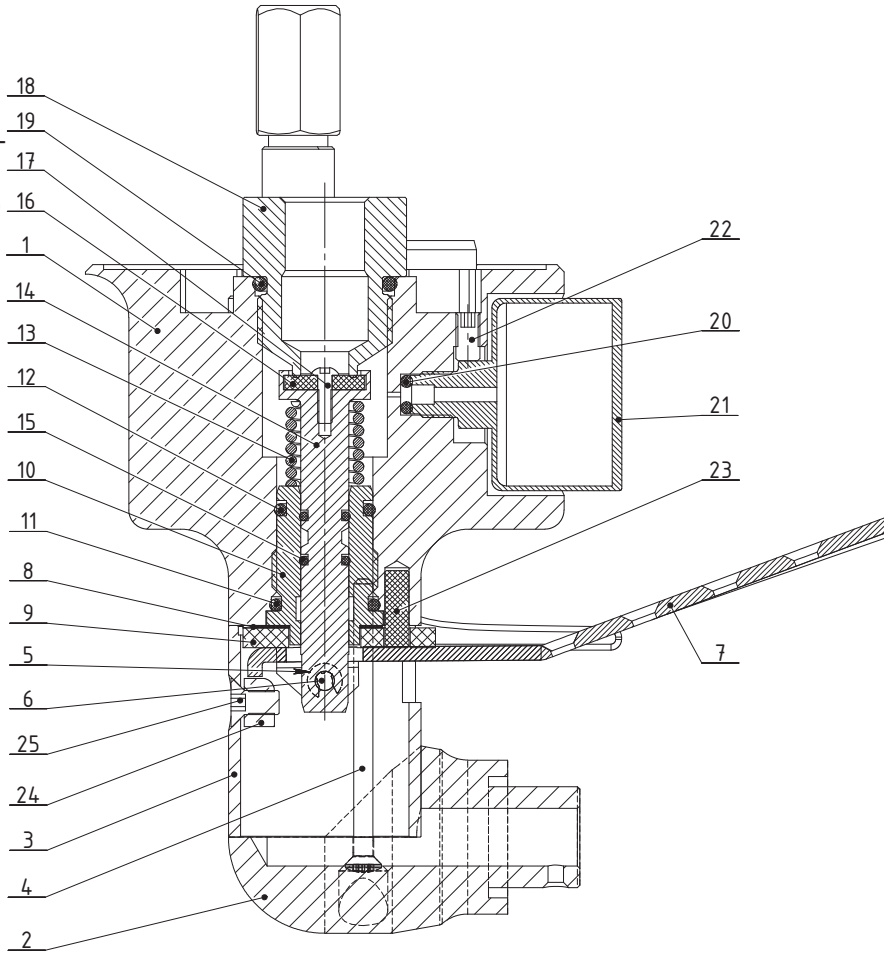
5.1.1.2.4 Disassembling the Main Blast Valve (MBV) (B)

Disassembling:
- unscrew the bolts (4) – 2x
- remove the handle (2) and handle boss (3)
- remove the shaft retaining ring (5) and push out the lever pin (6)
- remove the lever (7) and washers (8) and (9)
- unscrew the MBV body (10) and remove it together with the stem (14) and spring (13)

Assembling:
- before the re-assembly clean the dirt and old grease from all the parts
- lubricate O-rings (15) on stem (14) with the graphite vaseline Attila SA 2M and fill up the central grove
- Lubricate the friction surface on MBV body with the graphite vaseline Attila SA 2M.
- put on the spring (13) and MBV body (10) with O-rings (11, 12)
- lubricate the thread with the silicone grease and screw the prepared assembly into the manifold block (1)
- place the MBV washer (8) and MBV washer (9) if is necessary
- verify the clearance between the lever (7) and washer (9) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (8,9)
- place MBV lever (7) and push in the roll pin (6)
- secure the pin (6) with the ring (5). If the shaft retaining ring is too loose use a new one.
- put on the handle boss (3) and secure it with screws (4)

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.1.1.1.1.*

Pic. 7



1 – Ignis manifold block (53170)
2 – Handle end fitting (53142)
3 – Handle boss (53146)
4 – M4x60 Cross recessed countersunk flat head bolt (2834)
5 – Shaft retaining ring 3.2 (2984)
6 – MBV roll pin (53265)
7 – MBV lever – left/right (53287.001/53287.011)
8 – MBV washer 3 / 4mm (53258)
9 – MBV washer 0.3 / 0.5mm (53266.01/53266.02)
10 – MBV body (53257)
11 – O-ring 17.86 x 2.62 (3299)
12 – O-ring 16 x 2.5 (2930)
13 – MBV spring (53192)
14 – MBV stem (53254)
15 – O-ring 7x1,8 (3283)
16 – Stem flat sealing (51133)
17 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
18 – Saddle coil ring (53256)
19 – O-ring 24x3 (2929)
20 - O-ring 3x2,4 (2972)
21 – Pressure gauge (50524)
22 – M5 x 10 Hexagon socket set bolt (2833)
23 – Ruber stop (2866)
24 – Lever stop (53267)
25 – M5x10 Hexagon socket countersunk head cap bolt (2724)

5.1.1.2.5 Disassembling the Whisper Burner (WB) and Pilot Burner (PB) (B)

	B	C	D

NOTE	*Inner parts in manifold block for whisper burner and pilot light are same.*

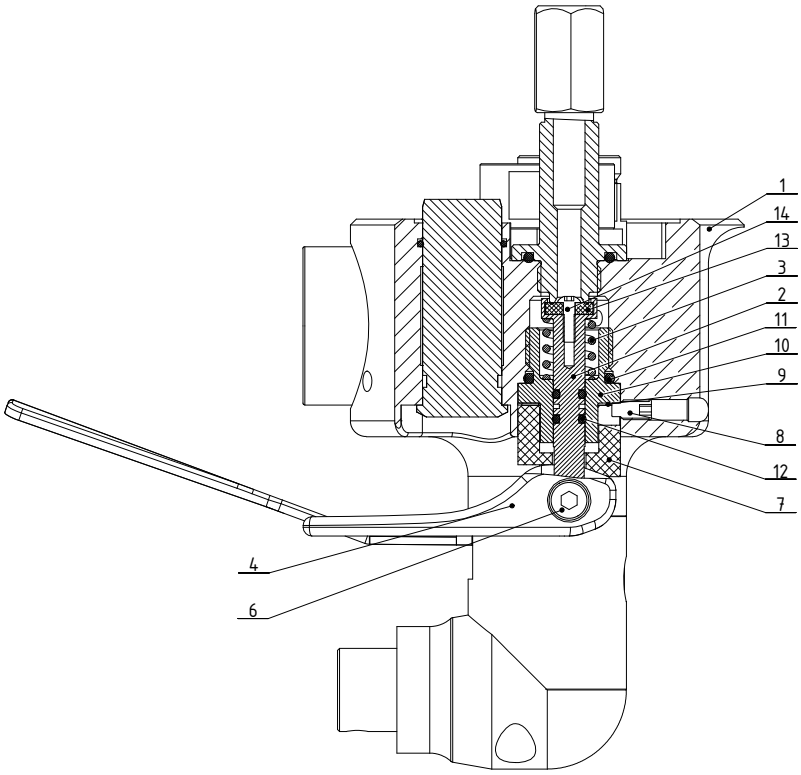
Disassembling:
- loosen the bolt (8) not necessary to unscrew it fully
- unscrew the pin (6), remove the lever (4) and pad (7) with the washer (9)
- unscrew the valve body (10) and remove it from the manifold block (1) together with the stem (2) and spring (3)
- loosen the bolt (14) and remove flat sealing (13)

Assembling:
- before the re-assembly clean the dirt and old grease from all the parts
- put the flat sealing (13) inside the stem (2) and secure the bolt (14) with the Loctite 243
- lubricate O-rings (12) with the graphite vaseline Attila SA 2M and fill up the central grove on stem
- put on the spring (3) and valve body (10) with O-ring (11)
- lubricate the friction surface on valve body with the graphite vaseline Attila SA 2M.
- lubricate the thread and O-ring (11) with the silicone grease and screw the prepared assembly into the manifold block(1)
- place the washer (9), pad (7), lever (4) and screw in the pin (6) – secure it with Loctite 243
- verify the clearance between the the lever (4) and pad (7) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (9)
- secure the pin (6) with Loctite 243
- lubricate friction surface on pad and lever

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.1.1.1.1.* *If the pilot lever or whisper leaver go to stiff, do not tight the screw (6) too much.*

Pic. 8

1 – Ignis manifold block (53170)
2 – Whisper/PL valve stem (53282)
3 – Whisper/PL valve spring (53275)
4 – Whisper lever – left / right (53273 / 53273.01)
5 – PL lever – left / right (53132 / 53132.01)
6 – Lever roll pin (53196)
7 - Lever pad (left, right) (53286.00/53286.01)
8 – M5 x 10 Hexagon socket set bolt with cone point (2974)
9 – Lever washer 0.3 / 0.5mm (53180)
10 – WB/PL valve body (53285)
11 – O-ring 17.86 x 2.62 (3299)
12 – O-ring 5x1,75 (2826)
13 – Stem flat sealing (53274)
14 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)



	B	C	D

5.1.1.2.6 Disassembling the Whisper Burner (WB), Pilot Burner (PB), Piezo Igniter and Pressure Gauge (B)

It is recommended to remove the manifold block from the burner unit for easier maintenance of the pilot light with the pressure reducer.

Whisper Burner disassembling:
- unscrew the WB body (4) from the manifold block (1) and remove O-ring (3)

Whisper Burner assembling:
- place the O-ring (3) on the WB body (4), lubricate the thread and O-ring with silicone grease
- screw the WB body (4) into the manifold block (1)

Pilot light and pressure reducer disassembling:
- remove the slurper tube
- unscrew the PL with pressure reducer (2) from the manifold block (1) and remove O-ring (3)

Pilot light pressure reducer assembling:
- place the O-ring (3) onto the the PL pressure reducer lower body (2), lubricate the thread and O-ring with silicone grease
- screw the PL assembly (2) into the manifold block (1)
- set pilot light head with securing bolt on position towards centre of manifold block.
- place the slurper tube (7)

Piezoelectric ignition disassembling:
- loosen the bolt (13) no need to unscrew it fully
- clean dirt from surface of piezoelectric ignition (5) and if necessary lubricate surface with silicone grease
- remove the piezoelectric ignition (5) from the manifold block (1)

Piezoelectric ignition assembling:

- lubricate the surface of the piezoelectric ignition (5) with silicone grease and insert it inside the manifold block
- set the position of the piezoelectric ignition (5) against the PL head, the igniter needle is to be placed 3-4 mm (approx. 1/8") from the clearance of the PL head
- screw fully bolt (13)

Pressure gauge disassembling:

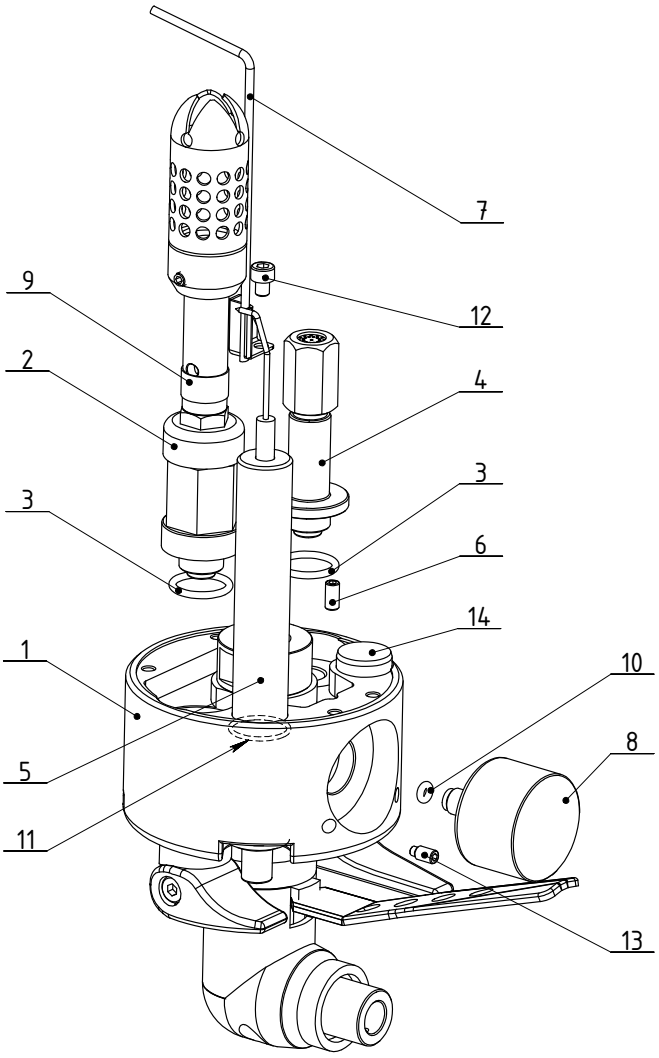
- loosen the bolt (6), no need to unscrew it fully
- unscrew the pressure gauge (8) from the manifold block (1), hold the gauge carefully on the metal side
- remove O-ring (10)

Pressure gauge assembling:

- lubricated O-ring (10) place in bottom hole in manifold block
- wrap the pressure gauge thread with PTFE tape (5-7 layers) and screw it into the manifold block
- fix the gauge in correct position with the bolt (6)

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.1.1.1.1.* *Adjust the position of the slurper tube, its end should be right above one of the jets.*

Pic. 9



1 – Ignis manifold block (53170)
2 – Pilot light and pressure reducer (assembly)
3 O-ring 17.86 x 2.62 (3299)
4 – Whisper burner body (53125)
5 – Piezoelectric ignition (assembly) (53114)
6 – M5 x 10 Hexagon socket set bolt (2833)
7 – Slurper tube (53207)
8 – Pressure gauge (50524)
9 - Pilot light setting ring (53208)
10 – O-ring 3x2,4 (2972)
11 – O-ring 19,5x1,5 (2973)
12 – M5x6 Hexagon socket cap bolt (3338)
13 – M5 x 10 Hexagon socket set bolt with cone point (2974)
14 – Plug (53149)

5.1.1.2.7 Pressure Reducer (PR) and Pilot Light (PL) disassembling (B)

	B	C	D

NOTE	*There are 2 version of pressure reducer (pic. 10a, 10b)* *Most of the parts are the same except for:* *-PR upper body (4, 20)* *-PR lower body (1, 21)* *-Piston (3, 18)* *-O-ring (19)* *-Pilot light head (9)*

These 2 versions of PR is possible to recognize by piston:

1) piston with own sealing
2) piston with separate O-ring

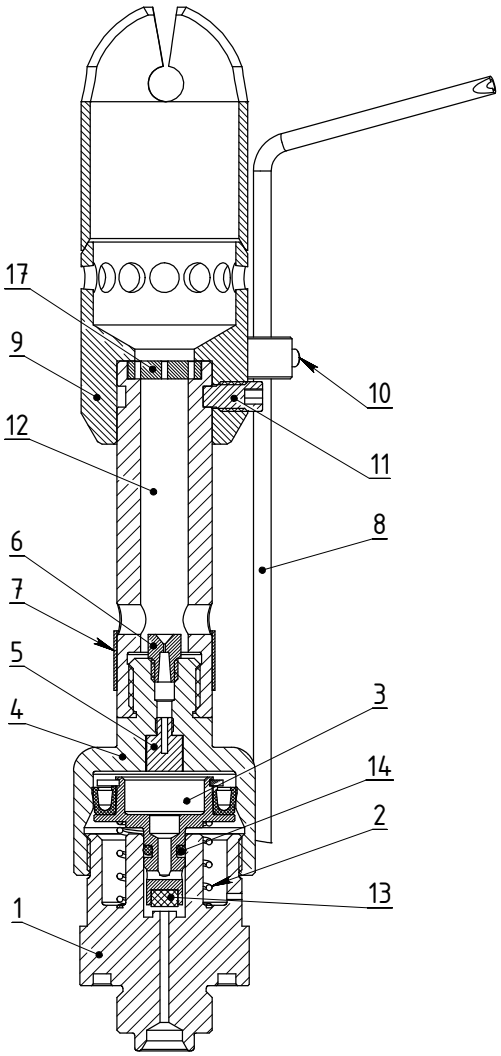
Disassembling is possible through spiral (with special tools) or by disassembling manifold block from the can and then removing of the pressure reducer (see chapter 5.1.1.2.3 Removing manifold block).

Pressure reducer and PL disassembling – both version:

- remove the pilot light head (9) by unscrew bolt (11) from the pilot light tube (12)
- remove PL jet ring (17) and PL setting ring (7)
- unscrew the PR upper body (4 or 20) from the lower body (1 or 21) and remove spring (2)
- remove the piston (3 or 18) (sealing (13) is glued in piston and isn't possible to change it separately – only all piston)
- remove O-ring (14)
- unscrew pilot light tube (12) from PR upper body (4, 20)
- unscrew PR jet (6) and PR filter (5)

Pressure reducer and PL assembling – version of piston - own sealing:

- screw in PR jet (6) and PR filter (5) inside the PR upper body
- lubricate the PTFE wiping seal on piston (3) and o-ring (14) with CARBAFLO 2160
- lubricate the hole in PR lower body (1) with CARBAFLO 2160
- insert the piston (3) into the PR upper body (4)
- place the spring (2) and screw PR upper body (4) and PR lower body (1) together
- screw PL tube (12) with PR upper body (4) and place PL setting ring (7)
- place PL jet ring (17) on PL tube (12) and screw bolt (11) with PL head (9)
- place pilot light head on position towards centre of manifold block



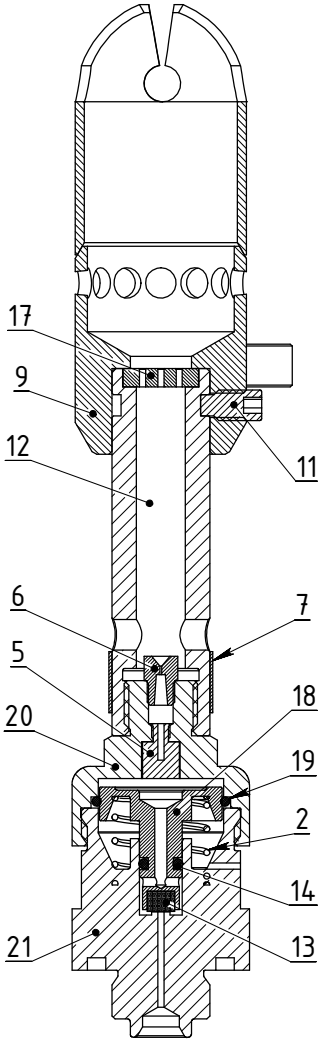
Pic. 10 a)

1 – PR lower body (53281.00novy)
2 – PR spring (53165)
3 – PR piston with own sealing (53123ND)
4 – PR upper body (53137X)
5 – PR filter (2828)
6 – PR jet (2795)
7 – Pilot light setting ring (53208)
8 – Slurper tube (53207)
9 – Pilot light head (53117.00d)
10 – M3 x 4 Hexagon socket set bolt with cone point (2853)
11 – M5 x 10 Hexagon socket set bolt with cone point (2974)
12 – Pilot light tube (53141)
13 – Top sealing (part of piston)
14 - O-ring 4 x 1,6 (2810)
17 – Pilot light jet ring (53152)

Pressure reducer and PL assembling – version of piston – separate O-ring:

- screw in PR jet (6) and PR filter (5) inside the PR upper body
- lubricate the O-ring (19) with CARBAFLO 2160 and place it to the PR upper body
- lubricate the hole in PR lower body (21) and O-ring (14) with CARBAFLO 2160
- insert the piston carefully (18) into the PR upper body (20)
- place the spring (2) and screw PR upper body (20) and PR lower body (21) together
- screw PL tube (12) with PR upper body (20) and place PL setting ring (7)
- place PL jet ring (17) on PL tube (12) and screw bolt (11) with PL head (9)
- place PL head with securing bolt (11) on position towards centre of manifold block

Pic. 10 b)



2 – PR spring (53165)
5 – PR filter (2828)
6 – PR jet (2795)
7 – Pilot light setting ring (53208)
9 – Pilot light head (53117)
11 – M5 x 10 Hexagon socket set bolt with cone point (2974)
12 – Pilot light tube (53141)
13 – Top sealing (part of piston)
14 - O-ring 4 x 1,6 (2810)
17 – Pilot light jet ring (53152)
18 –PR piston (53294.02)
19 – O-ring 19,5x1,5 (2973)
20 – PR upper body (53137)
21 – PR lower body (53281)

2-hose burner unit system
Burner unit with liquid and vapour hose has piston without top sealing (13)

NOTE	*Adjust the position of the slurper tube, its end should be right above one of the jets.*

5.1.1.3 Troubleshooting

5.1.1.3.1 Pressure Gauge Repairs (B)

	B	C	D

- If a needle doesn't point to zero pressure when fuel supply is disconnected and main blast valve open. Remove the glass and set the needle correctly.
- After adjusting the needle position make sure the pressure gauge works correctly by pressurising it to at least 0.5 MPa. Nitrogen is possible to use for pressurisation and verify the pressure with another correct pressure gauge.
- Replace a non-working pressure gauge with a new one.
- Leakage around threating – unscrew gauge and check O-ring and remove old PTFE tape and check threating. Wrap approximately 6 layer of PTFE tape and lubricate O-ring .

5.1.1.3.2 Inefficient Removal of Condensation (A)

A	B	C	D

- The upper end of slurper tube must be oriented in the axis of the burner jet and approximately one half the jet should be covered when seen from above.
- Check whether it is not blocked or has deformed ends.
- Loosen the fixing screw and push the tube just to the bottom of the manifold block.

5.1.1.3.3 Pilot Light (B)

	B	C	D

If the flame is too small, unstable or too big:

- Adjust by PL setting ring the volume of intake air. The amount of air can be regulated by moving the PL setting ring up/down which openes or closes the intake holes. Never close the holes fully.
- Clean the PL jet ring.

If the burner extinguishes despite and the fuel pressure is correct:

- Clean PR jet and check hole inside this jet
- Check the PR filter which must not be blocked with dirt or carbon deposit, if necessary change it for new one.
- Check filter liquid phase in case of 1-hose unit system.
- Clean chamber in pressure reducer and hole in lower PR body
- If the flame doesn't extinguish soon after closing the lever, spring in pressure reducer needs to be replace with new one.

5.1.1.3.4 Cleaning the Pilot Light and Pressure Reducer (B)

	B	C	D

- Remove the pressure reducer, disassemble it and clean it. When disassembling and assembling the Pressure reducer pay attention not to damage the piston seal by the thread. Never use alkalic solvents for cleaning the piston.
- A damaged piston seal is indicated by a fuel escaping from the deaerating hole in pressure reducer body. Always use a new piston instead trying to replace the damaged seal.
- Before inserting the piston into the PR lower body, lubricate the O-ring with a thin layer of PTFE lubricant CARBAFLO 2160.
- Fuel leakage on upper side of manifold block around the PR lower body:
  Check condition of the O-rings under PR lower body. Clean it and replace the damaged O-rings and lubricate it with silicone grease.
- While fed by a low-quality fuel the Pilot light function may be degraded due to blocking the pressure reducer with oil segregated from the fuel. This is indicated by a weak flame and the jet stained with oil.

NOTE	*A pressure reducer which is only little dirty can be cleaned by operating on a clean propane which forces the oil out. Let the Pilot light burn for at least 2 hours. It is recommended to adjust the flame after cleaning.*

5.1.1.3.5 Main Blast Valve (B)

	B	C	D

Main Blast Valve control is too stiff, the valve doesn't seal, the valve doesn't open enough:

- Check the movement of the valve control lever mechanism. Change the damaged parts.
- Check the condition and lubrication of the valve stem, O-rings and surface of MBV body. If something is damaged replace it. Lubricate the friction surface of the MBV body and the stem O-rings (fill up the grove between the O-rings) with the graphite vaseline Attila SA 2M.
- Check condition of the stem flat sealing and bearing on saddle coil ring. If the flat sealing is damaged replace it and clean well the bearing surfaces.
- Check the MBV spring for permanent deformation. If the valve doesn't seal while shut replace the spring with a new one.
- If the MBV valve doesn't open enough check MBV lever. Leaver can be bend. Check picture 7 in chapter 5.3.4 and compare shape of the leaver.
- If the flame doesn't extinguish soon after close lever change size of MBV washers.

5.1.1.3.6 Whisper Burner Valve and Pilot Burner Valve (B)

	B	C	D

Valve control is too stiff or the valve doesn't seal:

- Check condition of the O-rings of the WB / PL stem and guiding surfaces of the valve body. If the O-rings are damaged replace them.
- Clean the friction surfaces and lubricate the O-rings with the graphite vaseline Attila SA 2M (fill up the grove in the middle of O-rings).
- Lubricate the friction surface in valve body.
- If the flame doesn't extinguish soon after close lever change size of lever washers.
- Check stem flat sealing and bearing surface.

Fuel leakage on valve body:

- Check condition of the O-rings on valve body.
- Check the O-rings on WB / PL stem and guiding surfaces of the valve body. Clean the friction surfaces and lubricate surface on valve body and O-rings with the graphite vaseline Attila SA 2M (fill up the grove on stem in the middle of O-rings).

5.1.1.3.7 Piezoelectric Igniter (A)

A	B	C	D

- Check position of the piezo igniter needle. Clean carbon deposit from the ceramic part, needle and surface on PL head.
- Set the correct position of the needle (the clearance between needle and PL head should be 2-3mm).
- Replace the non-working igniter with a new one.

5.1.1.3.8 Repair of Leakage in Junction of the Descent Tube / Manifold Block (B)

	B	C	D

When a leakage is detected replace the O-rings with new ones. Remove the manifold block according to chapter 5.1.1.2.3. Lubricate the new O-rings with a silicon grease.

5.1.1.3.9 Vaporising Coil, Metal Covers and Lamellas (B)

	B	C	D

If deformed, consult with producer Kubíček Factory.

5.1.1.3.10 Swing Frame Socket (A)

A	B	C	D

If damaged replace the rubber washers or swing sockets with the new ones.

5.1.1.3.11 Adjustable Height Burner Frame - Vario (B)

	B	C	D

If the adjusting arm can't maintain a fixed height it is necessary to replace it for a new one.

5.1.1.4 Gimbal Block and Frames

5.1.1.4.1 Gimbal Block assembly for 3-4 Units Burner (B)

	B	C	D

Disassembling

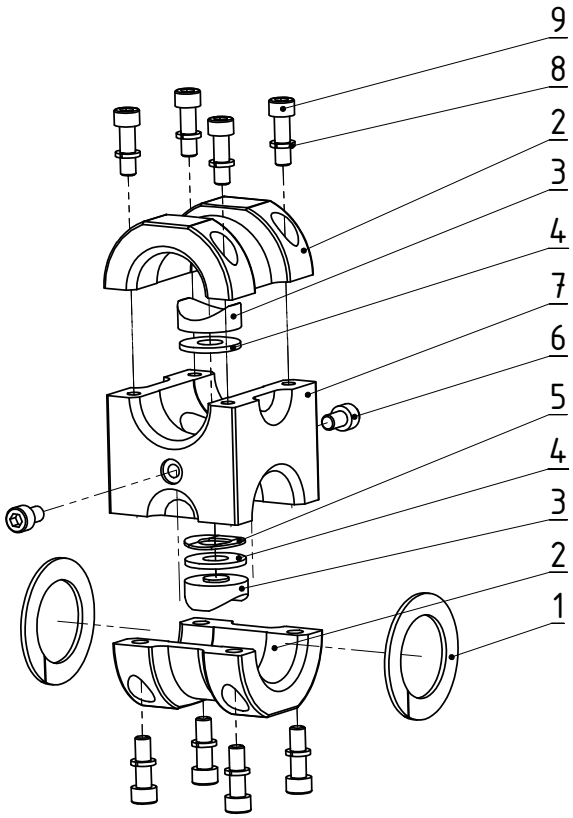
- unscrew bolts (9) and remove gimbal block bottom/top (2)
- pull out parts (3, (4) and (5)
- unscrew bolts (6)

Assembling

- lubricate hole in gimbal block body (7) with silicone grease
- screw bolts (6) and secure it with Loctite 243
- place parts (3), (4) and (5) in order as on picture
- lubricate friction surface on gimbal block body (7) and gimbal block bottom (2) with silicone grease except place for friction saddle (3)
- screw bolts (9) with washer (8) and secure it with Loctite 243

Pic. 11

1 – Gimbal friction washer (52988)
2 – Gimbal block bottom/top (52984)
3 – Gimbal block friction saddle (53031)
4 – Gimbal block disc washer (52935)
5 – Spring disc washer (2734)
6 – M6 x 10 Hexagon socket cap bolt (689)
7 – Gimbal block body (52983)
8 - M6 spring washer (1370)
9 – M6 x 20 Hexagon socket cap bolt (2735)



NOTE	*For increase tough swinging of burner on frame is possible to change gimbal disc washers (2 – 2,5 – 3mm) (52935.00 - 52935.01 - 52935.02).*

5.1.1.4.2 Disassembly of Burner Frames Gyro and Vario (B)

	B	C	D

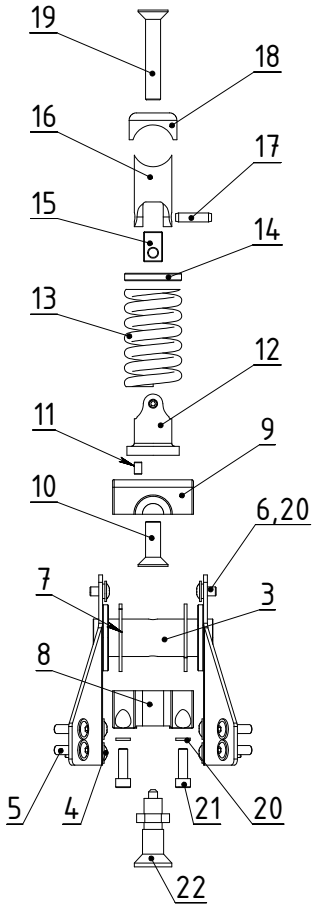
Disassembling of Gyro

- unscrew the bolt (21) and remove gimbal block bottom (8)
- unscrew the blocking pin (22)
- for loose bolts (19 and 10) has to be heat it up because it is secured by Loctite 270
- remove pin (11), spring pins (17)

Assembling of Gyro

- screw blocking pin (22) with gimbal block bottom (8) and secure with Loctite 243 - check position of the blocking pin inside the gimbal block bottom because of collision with tube on part (3)
- put together parts (12, 15, 16) with pins (17)
- place pin (11)
- screw parts together with bolts (10 and 19) and SECURE them with Loctite 270 and perform mechanical secure by dent on edge of bolt's head
- lubricate tube on centre bracket
- screw bolts with washer (21, 20) throught gimbal block bottom (8) and secure it with Loctite 243

Pic. 12



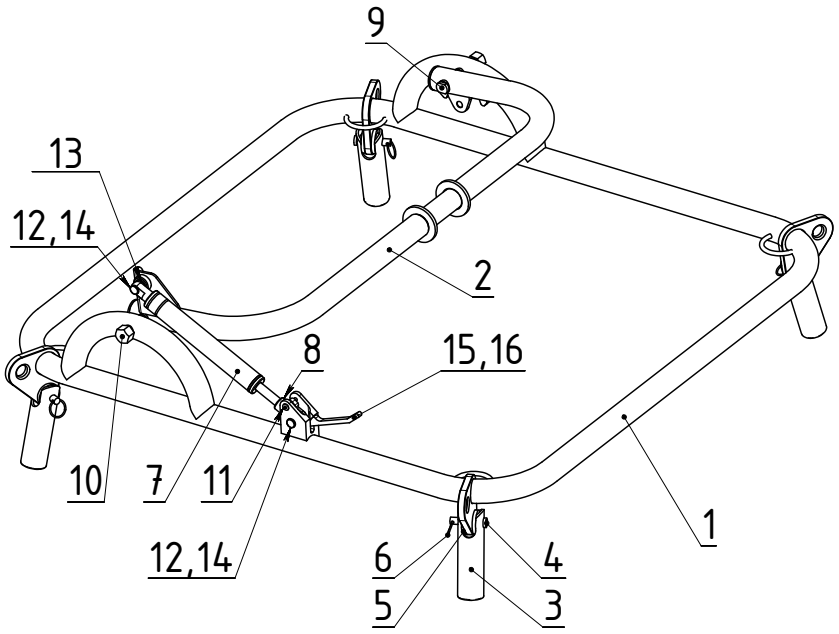
3 – Burner centre bracket (53128.01)
4 – M6x25 Flange Button Head Hexagon Socket Cap Bolt (2906)
5 – M6x20 Flange Button Head Hexagon Socket Cap Bolt (2839)
6 – M6x10 Flange Button Head Hexagon Socket Cap Bolt (2907)
8 – Gimbal block bottom (52927.02)
7 – Gimbal friction washer (53133)
9 – Gimbal block top (52926.01)
10 – M10x30 Hexagon socket countersunk head cap bolt (3472)
11 – Roll pin 5x8 (3474)
12 – Gyro Cylinder with base (56010.02)
13 – Gyro gimbal spring (56011)
14 – Gyro washer (56010.05)
15 – Gyro block (56010.03)
16 – Gyro Cylinder frame saddle (56010.01)
17 – Spring pin (3473)
18 – Gyro frame saddle (56010.04)
19 – M10x60 Hexagon socket countersunk head cap bolt (3471)
20 – M6 Spring washer (1370)
21 – M6 x 20 Hexagon socket cap bolt (2735)
22 – Blocking pin (3536)

Disassembling of Vario
- remove rivet (11), split pin (14) and pin (12)
- remove gas strut (7) and gas strut fork (8)
- remove hexagon cup nuts (10) and threaded roll pins (9)
- remove key rings (6), pins (4), swing frame sockets with rubber washers (3,5)

Assembling of Vario
- put together parts (3,5) insert pins (4) and secure with key rings (6)
- insert threaded roll pins (9) screw cup nuts (10) and secure with Loctite 243
- insert rivet (11) with lever (15) and then roll pin with split pin (12,14)
- place roll pin with flat washer (12,13) and then split pin (14)
- screw together gas strut and gas strut fork (7,8) and secure thread with Loctite 243
- finish secure with split pins (14) and rivet (11)

NOTE	*Be careful with manipulation during pressed lever (15) – fast moving of part (2).*

Pic. 13



1 – Vario frame (52961)
2 – Vario frame central tube (52962)
3 – Burner frame socket (53127)
4 – Frame pin with hole (53199)
5 – Rubber washer (53200)
6 – Key ring (408)
7 – Gas strut (2742)
8 – Gas strut fork (52978)
9 – Vario threaded roll pin (52970)
10 – Hexagon cup nut M10 (2749)
11 – Blind rivet 4x25 (3432)
12 – Vario pin with hole (53291)
13 – Flat washer M8x15 (2835)
14 – Split pin 2x16 (3247)
15 – Vario lever (52977)
16 – Lever slave (2778)

NOTE	*Parts (3,4,5,6) are the same on frame Vario, Basic and Gyro.*

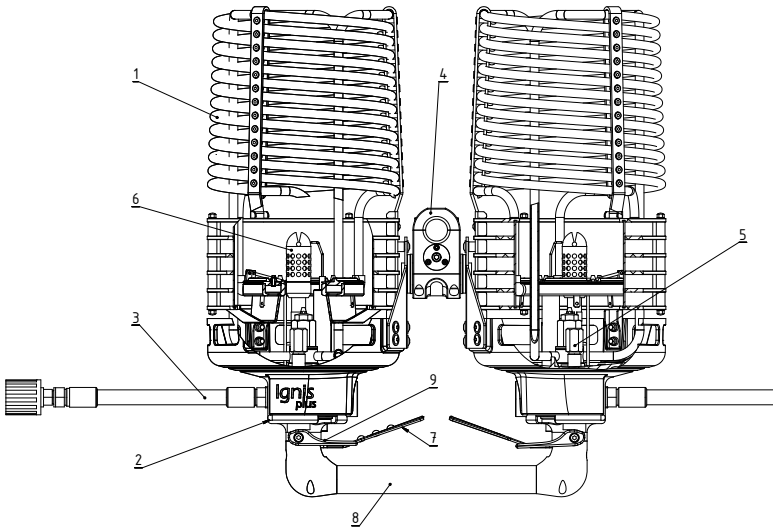
5.1.2 Ignis Plus Burner

This chapter provides instructions for service and maintenance of the Ignis Plus.

WARNING	*Before starting any maintenance or repair work disconnect the burner from all fuel supplies and vent all the fuel from the burner.*

CAUTION	*It is essential that all fuel system and burner repairs are carried out in a clean environment. The presence of dirt or chemicals may damage movable parts, rubber seals or bonded joints and cause blockage of the burner jets.*

Pic. 1



1 – Vaporising coil with jet ring (53290.001)
2 – Ignis plus manifold block assembly
3 – Fuel hose with coupling
4 – Gimbal block assembly
5 – Whisper Burner (WB) (53125)
6 – Pilot Light (PL)
7 – Main blast lever (53287.011)
8 – Handle (53130.011)
9 – Whisper burner lever (53273.01)

5.1.2.1 Sealing and Threaded Joints Techniques

5.1.2.1.1 Rubber Seals and O-rings

When disassembling sliding parts with O-rings, the new O-rings must be used for reassembling. When disassembling other types of joints, the O-rings and seals must be inspected and replaced if damaged or deformed. CARBAFLO 2160 is to be used for lubricating O-rings. We recommend replacing the O-rings after 12 months of intensive service. Clean the dirt and old grease from all parts before the re-assembly.

Leak test:

Sealed parts have to be checked by leak test. Use 12 bars to pressurize manifold block assembly.
There are 2 options for performing a leak test:

1) use bubble spray on assembled parts,
2) check pressure gauge during 10 mins – the value has to be the same.

5.1.2.1.2 Threaded Joints

General – When assembling burner parts that are not fixed either with a sealant or sealed with PTFE tape, lubricate the threads accordingly (suitable lubricant is described in each section). Otherwise the threaded joints of the parts made of aluminium alloys or stainless steel may jam.

Joints secured with sealant – Threads must be clean and free from grease, dirt and old sealant. Smear the sealant on the male thread and screw it in immediately. To shorten the drying time of sealants a spray activator may be applied to the thread before the sealant is applied. Always comply with the drying times recommended by the sealant manufacturer.

Common sealants:

- Loctite 243 – for securing threads against unintentional loosening (removable joints)
- Loctite 270 – for sealing and securing thread (irremovable joints)

Joints sealed with PTFE tape – Ensure that the threads are clean and free from grease, dirt and old tape.
When using PTFE tape, wrap the male thread in the direction of the thread. Keep tension on the tape whilst wrapping the thread so that the tape is pulled into the thread. Use between 3 to 8 layers depending on the diameter of the thread; the greater the diameter the more layers of thread.
When the thread is correctly wrapped, the tape must fill the space between each thread and form a cone as seen on the picture 2.

Pic. 2



CAUTION	*Keep the first thread free from tape to prevent tape being cut off during reassembly. Loose pieces of tape could get into the fuel system and cause a blockage.*

5.1.2.2 Standard Maintenance Techniques

5.1.2.2.1 Removing of the Burner from the Burner Frame (Basic and Vario) (B)

	B	C	D

It is recommended to remove the burner from the frame prior to each maintenance or repair on burner unit or fittings.

Disassembling burner frame:

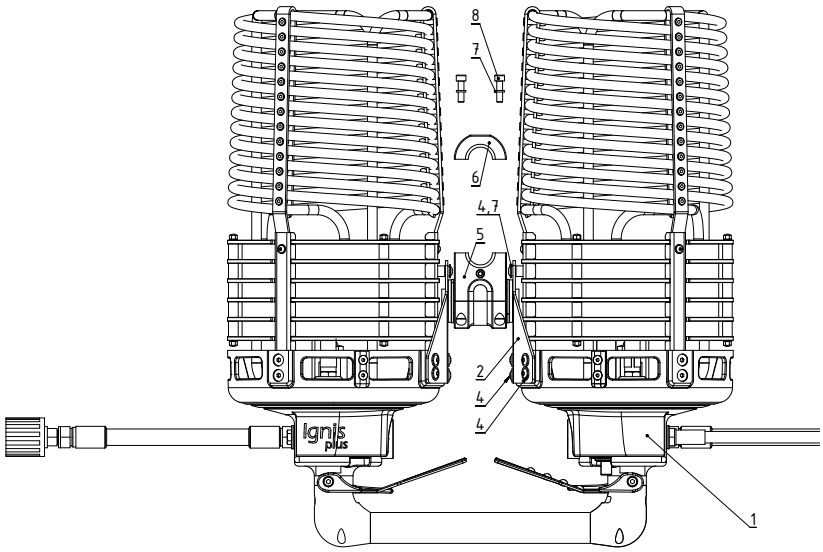
- unscrew the bolts (8) and remove the gimbal block top (6)
- remove the frame

Assembling burner frame:

- lubricate the friction surface (except surface for the friction saddle) of the gimbal block top (6) and gimbal block body (5)
- loose the bolt (2 – 3 turns) on opposite side of gimbal block body (5) (the brass part needs to be under edge)
- fit the frame and gimbal block top (6), secure it with Loctite 243 and tighten the bolts (8) [6 N·m] with spring washers (7)
- set up the toughness of swing by bolt on opposite side of gimbal block body.

Pic. 3

1 – Ignis burner unit
2 – Burner Basic bracket (53128)
4 – M6x20 Flange Button Head Hexagon Socket Cap Bolt (2839)
5 – Gimbal block body (57694)
6 – Gimbal block top (57708)
7 – M6 spring washer (1370)
8 – M6 x 20 Hexagon socket cap bolt (2735)



NOTE	*More details about the frames find in Chapter 5.1.2.4.*

5.1.2.2.2 Disassembling of the Gimbal block (2-units burner) (B)

	B	C	D

Disassembling

- unscrew bolts (14) and remove gimbal block top (1) and gimbal block bottom (9)
- pul out parts (3), (7) and (8)
- unscrew bolts (10) and remove gimbal ring
- unscrew bolt (12), (11) and (6)
- bolt (11) is glued in part (4) with Loctite 270 and is not necessary to disassemble it

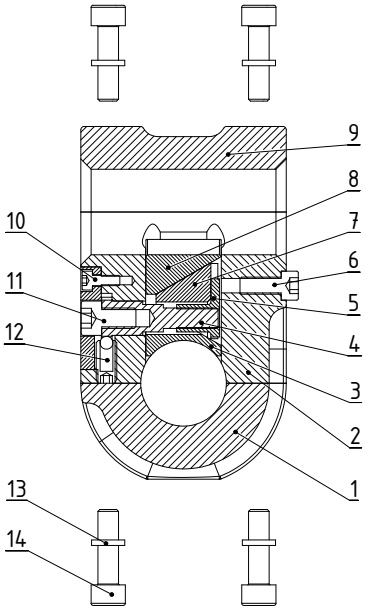
Assembling

- lubricate sliding surface on parts (3), (7) and (8) with Carbaflo 2160 except sliding rounded surface on parts (3) and (8)
- lubricate thread and cylindrical shape on bolt (4) with the graphite vaseline Attila SA 2M, screw together parts (4) and (5)
- screw bolt (12) and secure it with Loctite 243 – check position of the ball by turning the bolt (11)
- place gimbal ring and screw bolts (10)[1 N·m] and secure it with Loctite 243
- Lubricate friction surface on parts (1), (2) and (9) with Carbaflo 2160 except sliding rounded surface on parts (3) and (8)
- setup parts (3) and (8) under edge on the gimbal block body (11) by turning bolt [3 N·m]
- screw bolts (14) [6 N·m] with washer (13) and secure it with Loctite 243

NOTE	*By turning of screw (11) is possible to increase tough of swinging the burner units.* *Bolt (6) is not in gimbal body if gimbal block is with frame Vario.*

Pic. 4

1 – Gimbal block bottom (57695)
2 – Gimbal block body (57694)
3 – Bottom wedge (57696)
4 – Gimbal bolt (57699)
5 – Gimbal slider (57700)
6 – M5x10 Hexagon socket cap bolt (2736)
7 – Middle wedge (57697)
8 – Top wedge (57696)
9 – Gimbal block top (57708)
10 – M3x8 Hexagon socket cap bolt (3509)
11 – M6x10 Hexagon socket cap bolt (3510)
12 – M6 bolt with spring ball (3511)
12 – Gimbal ring (57701)
13 – M6 spring washer (1370)
14 – M6 x 20 Hexagon socket cap bolt (2735)



	B	C	D

5.1.2.2.3 Fuel Hoses Replacement and Disassembling Filter liquid phase (B)

WARNING	*Never try to repair damaged fuel hoses! Always replace the damaged hose with a new one supplied by Kubíček Factory s.r.o.*

- Burner hose connections with 1/4“ NPT threads (fuel hose / REGO coupling) should be assembled with PTFE tape or Everseal 183.
- Burner hoses with 3/8“ BSP and M18 x1.5 parallel threads (fuel hose / TEMA 3810 coupling and hose / burner) should be assembled with the appropriately sized bonded seal (steel washer with bonded rubber insert) and secured with Loctate 243.

Burner hoses are supplied with Everseal 183 sealant already applied (blue paste on the male connector), there is no need to use any addi¬tional sealing means and the hoses are to be installed directly.

NOTE	*These maximum recommended torque values should not be exceeded when replacing the following components:* *• 1/4 NPT thread max. 35 Nm (check the length of screwing parts together)* *• 3/8 BSP thread max. 20 Nm* *Burner hoses for Rego coupling are supplied from Kubíček Factory with Everseal 183 sealant already applied (blue paste on the male connector), there is no need to use any addiïonal sealing means and the hoses are to be installed directly.*

1-Hose burner unit system – with liquid phase only

Disassembling

- unscrew hose (2) and blanking plug (1) and remove bonded seal (4)
- unscrew filter (3) carefully

Assembling

- screw carefully filter (3) [0,5 N·m] on side of manifold block with pilot light leaver
- put new dowty seals (4) on hose and filter plug
- screw hose (2) and filter plug (1) [8 N·m] and secure with loctate 243

NOTE	*Change filter liquid phase isn't necessary during replacement of hoses just check it.*

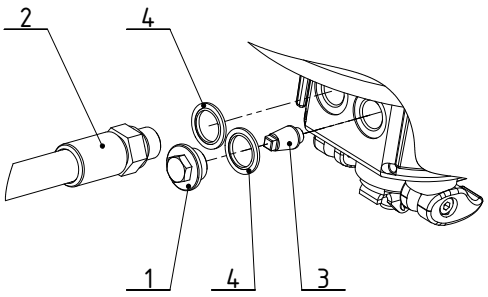
Pic. 5

1 – Hose blanking plug (53209)

2 – Liquid hose (53102,56006, 57975, 57979)

3 – Filter liquid phase (1137)

4 – Bonded seal (2765)



2-Hose burner unit system – with liquid and vapour phase

Disassembling

- unscrew hoses (1)(2) and remove bonded seals (4)
- unscrew filter socked head plug (3)

Assembling

- screw in socked head plug (3) [6 N·m] on side of manifold block with pilot light leaver (socked head plug has to be sealed with PTFE tape or Everseal 183)
- put new bonded seals (4) to both hoses
- screw hoses and secure with Loctate 243

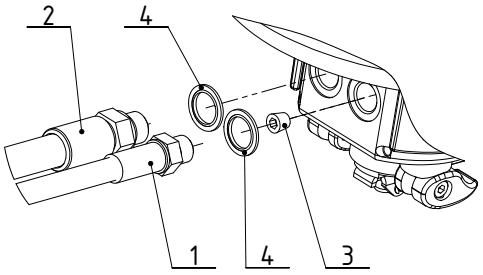
Pic. 6

1 – Vapour hose (53103)

2 – Liquid hose (53102, 56006, 57975, 57979)

3 – Socket Head Plug 1/8 BSP (3339)

4 – Bonded seal (2765)



CAUTION	*For version with vapour hose supply (without the pressure reducer) a Socket head plug (3339) must be installed in-stead of the fuel filter – liquid phase. Otherwise the liquid phase would penetrate into the vapour phase circuit.* *Next variation is on piston in pressure reducer – check chapter: Pressure reducer.*

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: Rubber Seals and O-rings – Leak test.*

5.1.2.2.4 Removing the Handle, Manifold Block and Coil (B)

	B	C	D

Disassembling the handle:

- unscrew the bolt (5) and remove handle
- unscrew bolt (7) and (3) and disassemble all parts

Assembling the handle:

- place parts (1), (2) and (4)
- screw together lever stop (6) with bolt (7) and secure it with Loctite 243
- place prepared assamble on manifold blocks and screw bolts (5) [2 N·m] and then bolts (3) [1 N·m] and secure it with Loctite 243

Pic. 7

1 – Foam handle grip (3321)

2 – Handle tube (53177)

3 – M4x8 Hexagon socket countersunk head cap bolt (2860)

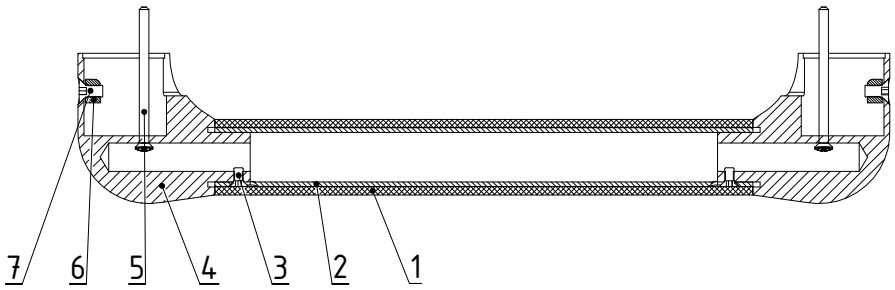
4 – Handle end (57693.03)

5 – M4x50 countersunk flat head Torx bolt (T20) (54464.00)

6 – Lever stop (53267)

7 – M5x10 Hexagon socket countersunk head cap bolt (2724)

Removing the manifold block:



- unscrew the bolt (10)
- pull out the slurper tube (5) from the slurper jet (6)
- unscrew the bolts (9) – 4x
- take out the manifold block (1) from the can (4)
- there may be a foam slurper block (12) and a slurper cover grid (13) in the can - replace when needed
- O-ring (2) is glued to can – do not remove if it is not necessary

Mounting the manifold block:

- place the O-rings (3) - 2x into the vaporiser connection ring, lubricate the bolt (10) with graphite grease and screw it in manifold block – do not tighten
- tighten the bolts (9)[3 N·m] with washer (8) and then (10) [10 N·m]
- insert the slurper tube to the slurper jet, tube's end should cover one half jet's hole when seen from above

Removing the coil:

- pull out the slurper tube (5) from the slurper jet (6)
- loose bolt (10) and bolts (11)
- loose bolts holding coil and can together (number (5) - on picture 14 in chapter 5.1.2.4.2. Disassembling of Gyro
- remove coil from can (4)

Mounting the coil:

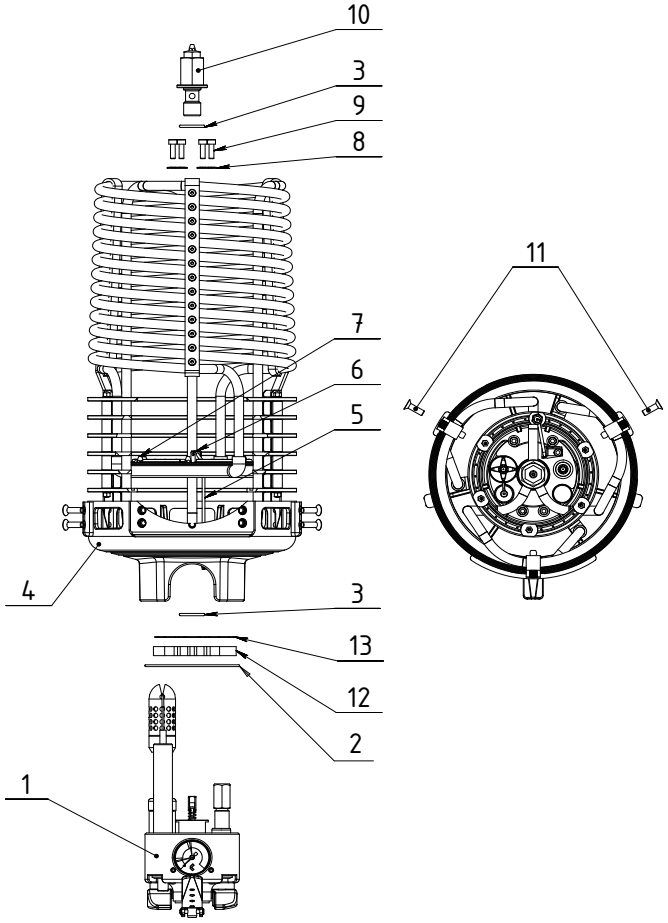
- place two O-ring (3) on the bottom of the coil
- place coil to the can (4)
- lubricate the bolts (10,11,4,5) and (6) on picture in chapter: Disassembling of Gyro) with the graphite vaseline Attila SA 2M
- screw bolt (10) – not fully
- screw bolts (11) [2 N·m] carefully with respect to the paint

- lubricate bolts holding coil and can together (number (5) - on picture 14 in chapter 5.1.2.4.2. Disassembling of Gyro) and screw them into position [4 N·m]
- screw bolt (10) [10 N·m]
- on threads of the jets (6) and the slurper jet (7) apply Loctite 243 and screw them into the jet ring [1,5 N·m]
- insert the slurper tube to the slurper jet, tube's end should cover one half jet's hole when seen from above

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.1.2.1.1 – Leak test.*

Pic. 8

1 – Ignis manifold block assembly
2 – O-ring 96x2 (2912)
3 – O-ring 22x2.5 (3024)
4 – Can (53169)
5 – Slurper tube (53207)
6 – Slurper jet (53176.03)
7 – Jet Ř 2mm (53176.02)
8 – M5 disc spring washer (2817)
9 – M5 x 16 Hexagon socket cap bolt (2763)
10 – Fuel supply bolt (assembly)
11 – M6x20 Hexagon socket countersunk head cap bolt (2816)
12 - slurper block (57703.00 - right, 57704.00 - left) - *optional*
13 - slurper cover grid (57705.00 - right, 57706.00 - left) - *optional*



	B	**C**	**D**

5.1.2.2.5 Disassembling the Main Blast Valve (MBV) (B)

Disassembling:

- remove handle (check chapter: Removing the Handle)
- remove the shaft retaining ring (13) and push out the lever pin (14)
- remove the lever (16) and washers (11) and (12)
- unscrew the MBV body (9) and remove it together with the stem (5)
- remove sadle (23) with spring
- unscrew center rod (20) and remove flat sealing (4)
- unscrew fuel supply bolt (25), center jet (27) and jet (28)

Assembling:

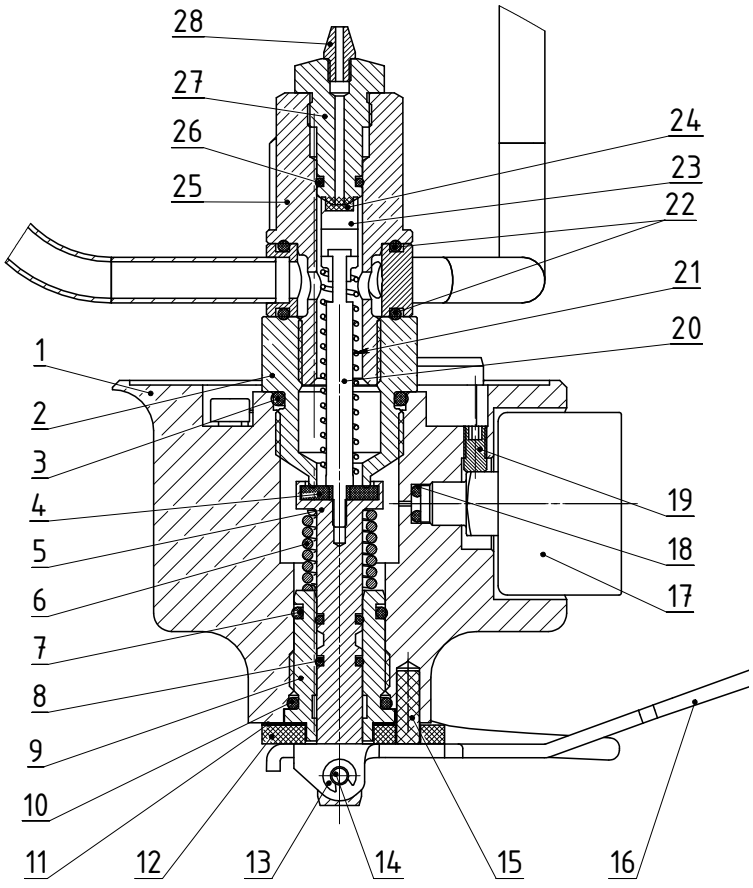
- place flat sealing (4) to the stem (5) and screw center rod (20) – secure it with Loctite 243
- place spring (21) and saddle (23)
- lubricate O-rings (8) on stem (5) with CARBAFLO 2160 and fill up the central grove
- lubricate the friction surface in MBV body with CARBAFLO 2160
- put on the spring (6) and MBV body (8) to the stem (5)

- lubricate the thread and O-rings (7), (9) with CARBAFLO 2160 and screw the prepared assembly [6 N·m] into the manifold block (1)
- place the MBV washer (12) and MBV washer (11) - if it is necessary. Verify the clearance between the lever (16) and washer (12) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (11), (12)
- secure the pin (14) with the ring (13)
- place O-ring (26) and lubricate it with Carbaflo 2160
- screw jet (28) [1,5 N·m] and secure it with Loctite 243
- lubricate the thread on part (27) and (25) with CARBAFLO 2160 and screw (25) [10 N·m] and (27) [7 N·m] together and then to the saddle coil ring (2) [10 N·m]

NOTE	*-Saddle coil ring (2) is not necessary to dissemble during maintenance main blast valve. For disassemble this part has to be removed manifold block (check chapter: Removing the manifold block 5.1.2.2.4) and then it is possible to unscrew it.* *-After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.1.2.1.1 – Leak test.*

Pic. 9

1 – Ignis manifold block (53170)
2 – Saddle coil ring (53256)
3 – O-ring 24x3 (2929)
4 – Stem flat sealing (51133)
5 – MBV stem (53254)
6 – MBV spring (53192)
7 – O-ring 16 x 2.5 (2930)
8 – O-ring 7x1,8 (3283)
9 – MBV body (53257)
10 – O-ring 17.86 x 2.62 (3299)
11 – MBV washer 0.3 / 0.5mm (53266.01/53266.02)
12 – MBV washer 3 / 4mm (53258.01)/(53258.02)
13 – Shaft retaining ring 3.2 (2984)
14 – MBV roll pin (53265)
15 – Ruber stop (2866)
16 – MBV lever – left/right (53287.001/53287.011)
17 – Pressure gauge (50524)
18 – O-ring 3x2,4 (2972)
19 – M5 x 10 Hexagon socket set bolt (2833)
20 – Center rod (57685.001)
21 – Center spring (3507)
22 – O-ring 22x2,5 (3024)
23 – Saddle of center jet (57685.002)
24 – Sealing (part of Saddle of center jet)
25 – Fuel supply bolt (57683)
26 – O-ring 7x1,8 (3283)
27 – Center jet (57684)
28 – Jet-diam.1,5mm (53176.15)



NOTE	*Unit with MBV lever-long (54254) on Triple ignis plus has center jet washer (3532) between Center jet (27) and Fuel supply bolt (25). This washer is not on picture.*

5.1.2.2.6 Disassembling the Whisper Burner Valve and Pilot Light Valve (B)

	B	C	D

NOTE	*Inner parts in manifold block for whisper burner and pilot light are same.*

Disassembling:

- remove handle – (check chapter: Removing the Handle)
- loosen the bolt (4) not necessary to unscrew it fully
- unscrew the pin (2), remove the lever (1) and pad (17) with the washer (16)
- unscrew the valve body (5) and remove it from the manifold block (10) together with the stem (6) and spring (7)
- loosen the bolt (8) and remove flat sealing (9)

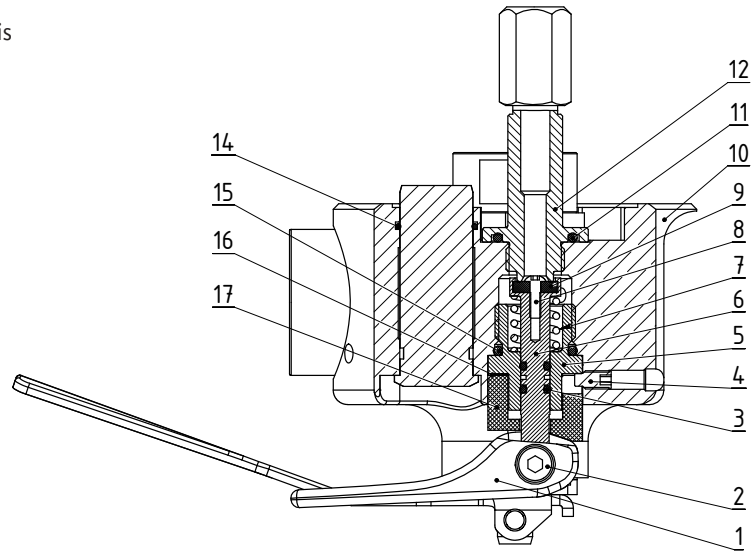
Assembling:

- put the flat sealing (8) inside the stem (6) and secure the bolt (8) with the Loctite 243
- lubricate O-rings (3) with CARBAFLO 2160 and fill up the central grove on stem
- put on the spring (7) and valve body (5) with O-ring (15)
- lubricate the friction surface in valve body with CARBAFLO 2160
- lubricate the thread and O-ring (15) with CARBAFLO 2160 and screw the prepared assembly [6 N·m] into the manifold block (10)
- place the washer (16), pad (17), lever (1) and screw in the pin (2)[1 N·m]– secure it with Loctite 243
- verify the clearance between the the lever (1) and pad (17) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (16)
- secure the pin (2) with Loctite 243
- lubricate friction surface on pad (17) and lever (1)

NOTE	*After assembling it is necessary to check the parts which have to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.1.2.1.1– Leak test.*

Pic. 10

1 – Whisper lever – left / right (53273 / 53273.01)
PL lever – left / right (53132 / 53132.01) (lever is not visible in the picture)
2 – Lever roll pin (53196)
3 – O-ring 5x1,75 (2826)
4 – M5 x 10 Hexagon socket set bolt with cone point (2974)
5 – WB/PL valve body (53285)
6 – Whisper/PL valve stem (53282)
7– Whisper/PL valve spring (53275)
8 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
9 – Stem flat sealing (53274)
10 – Ignis manifold block (53170)
11 – O-ring 17,86x 2,62 (3299)
12 – Whisper burner body (53125)
14 – O-ring 19,5x1,5 (2973)
15 – O-ring 17,86x 2,62 (3299)
16 – Lever washer 0.3 / 0.5mm (53180.01)/(53180.02)
17 - Lever pad (left/ right) (53286.00/53286.01)



	B	C	D

5.1.2.2.7 Disassembling the Whisper Burner (WB), Pilot light (PL), Piezoelectric Ignition and Pressure Gauge (B)

It is recommended to remove the manifold block from the burner unit for easier maintenance.

Whisper Burner disassembling:

- unscrew the WB body (7) from the manifold block (1) and remove O-ring (2)

Whisper Burner assembling:

- place the O-ring (2) on the WB body (7), lubricate the thread and O-ring with CARBAFLO 2160
- screw the WB body (7) [8 N·m] into the manifold block (1)

Pilot light and pressure reducer disassembling:

- remove the slurper tube (5)
- unscrew the PL with pressure reducer (3) from the manifold block (1) and remove O-ring (2)

Pilot light pressure reducer assembling:

- place the O-ring (2) onto the the PL pressure reducer lower body (3), lubricate the thread and O-ring with Carbaflo 2160
- screw the PL assembly (3) [8 N·m] into the manifold block (1)
- set pilot light head with securing bolt on position towards centre of manifold block
- place the slurper tube (5) and secure the bolt (6) [2 N·m] with Loctite 243

Piezoelectric ignition disassembling:

- loosen the bolt (14) no need to unscrew it fully
- clean dirt from surface of piezoelectric ignition (9) and if necessary lubricate surface with CARBAFLO 2160
- remove the piezoelectric ignition (9) from the manifold block (1)

Piezoelectric ignition assembling:

- lubricate the surface of the piezoelectric ignition (9) with CARBAFLO 2160 and insert it inside the manifold block
- set the position of the needle on piezoelectric ignition (9) against the PL head, the igniter needle is to be placed 3-4 mm (approx. 1/8") from the clearance of the PL head
- screw fully bolt (14)

Pressure gauge disassembling:

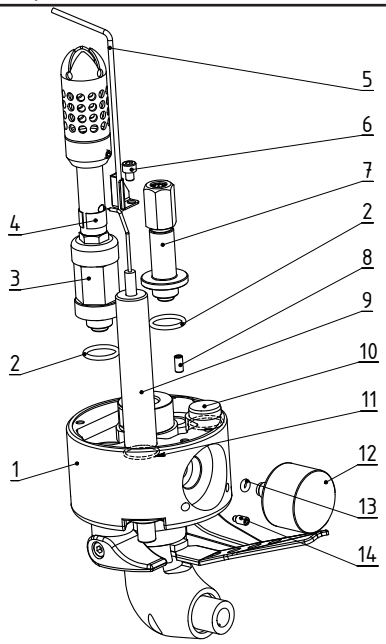
- loosen the bolt (8), no need to unscrew it fully
- unscrew the pressure gauge (12) from the manifold block (1), hold the gauge carefully on the metal side
- remove O-ring (13)

Pressure gauge assembling:

- lubricated O-ring (13) with CARBAFLO 2160 place in bottom hole in manifold block
- wrap the pressure gauge thread with PTFE tape (5-7 layers) and screw it into the manifold block
- fix the gauge in correct position with the bolt (8) [1,5 N·m]

NOTE	*After assembling it is necessary to check the parts which have to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.1.2.1.1 – Leak test.*

Pic. 11



1 – Ignis manifold block (53170)
2 – O-ring 17.86 x 2.62 (3299)
3 – Pilot light and pressure reducer (assembly)
4 - Pilot light setting ring (53208)
5 – Slurper tube (53207)
6 – M5x6 Hexagon socket cap bolt (3338)
7 – Whisper burner body (53125)
8 – M5 x 10 Hexagon socket set bolt (2833)
9 – Piezoelectric ignition (assembly) (53114)
10 – Plug (53149)
11 – O-ring 19,5x1,5 (2973)
12 – Pressure gauge (50524)
13 – O-ring 3x2,4 (2972)
14 – M5 x 10 Hexagon socket set bolt with cone point (2974)

5.1.2.2.8 Pressure Reducer (PR) and Pilot Light (PL) disassembling (B)

	B	C	D

Pressure Reducer and Pilot Light disassembling:

- remove the pilot light head (12) by loosening the bolt (14)
- remove the PL jet ring (13) and the PL setting ring (10)
- unscrew the PR upper body (7) from the lower body (1) and remove the spring (4)
- remove the piston (6) – sealing (2) is glued in piston and isn't possible to change it separately – only the whole piston
- remove the O-ring (3)
- unscrew the pilot light tube (11) from the PR upper body
- unscrew the PR jet (9) and the PR filter (8)

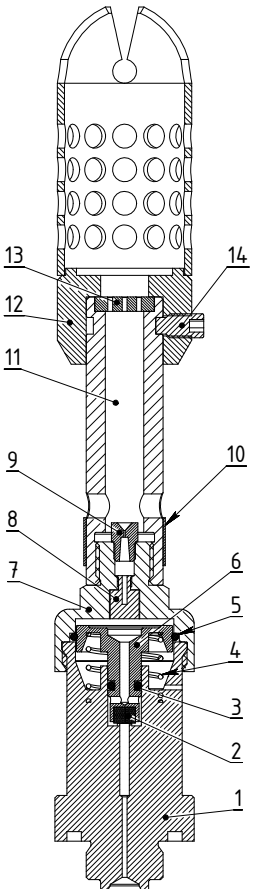
Pressure Reducer and Pilot Light assembling:

- screw in the PR jet (9) [1 N·m] and PR filter (8) inside the PR upper body
- lubricate the O-ring (5) with CARBAFLO 2160 and place it to the PR upper body
- lubricate the hole in PR lower body and O-ring (3) with CARBAFLO 2160
- insert the piston carefully into the PR upper body (7)
- place the spring (4) and screw the PR upper body (7) [8 N·m] and the PR lower body (1) together. Using excessive force may result in cracks appearing in the upper body of the PR.
- screw the PL tube (11) [8 N·m] with the PR upper body (7) and place the PL setting ring (10)
- place the PL jet ring (13) on the PL tube (11) and screw the bolt (14) [1 N·m] inside the PL head (13) (set the PL head with the securing bolt (14) on position towards the centre of the manifold block)

NOTE	*After assembling it is necessary to check the parts which have to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.1.2.1.1 – Leak test.*

Pic. 12

1 – PR lower body (53281.001)
2 – Top sealing (part of piston)
3 – O-ring 4 x 1,6 (2810)
4 – PR spring (53165)
5 – O-ring 19,5x1,5 (2973)
6 – PR piston (53294.02)
7 – PR upper body (53137)
8 – PR filter (2828)
9 – PR jet (2795)
10 – Pilot light setting ring (53208)
11 – Pilot light tube (53141)
12 – Pilot light head (53117.001)
13 – Pilot light jet ring (53152)
14 – M5 x 10 Hexagon socket set bolt with cone point (2974)



2-hose burner unit system
Burner unit with liquid and vapour hose has piston without top sealing (13) and then the part number is (53294.01).

5.1.2.3 Troubleshooting

5.1.2.3.1 Pressure Gauge Repairs (B)

	B	C	D

If a needle doesn't point to zero pressure when fuel supply is disconnected and main blast valve open:

- Remove the glass and set the needle correctly. After adjusting the needle position make sure the pressure gauge works correctly by pressurising it to at least 0.5 MPa. It is possible to use a nitrogen for pressurisation and verifying the pressure with another correct pressure gauge.
- Replace a non-functional pressure gauge with a new one.

Leakage around the thread

- Unscrew the gauge and check the O-ring, remove the old PTFE tape and check the thread. Wrap with approximately layers of PTFE tape and lubricate the O-ring.

5.1.2.3.2 Inefficient Removal of Condensation (A)

A	B	C	D

- The upper end of slurper tube must be oriented in the axis of the burner jet and approximately one half the jet should be covered when seen from above.
- Check the tube whether it is not blocked or has deformed ends.

5.1.2.3.3 Pilot light (B)

	B	C	D

If the flame is too small, unstable or too big:

- Check the pressure in a tank by the pressure gauge on a manifold block.
- Adjust by the PL setting ring the volume of air intake. The amount of air can be regulated by moving the PL setting ring up/down which opens or closes the intake holes. Never close the holes fully.
- Clean the PL jet ring.
- A spring in the pressure reducer should be replaced with a new one.

If the flame extinguishes:

- Clean the PR jet and check the hole inside this jet.
- Check the PR filter which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Clean a chamber in the pressure reducer and a hole in the PR lower body.
- Check the piston with the flat sealing and the O-rings.
- Check and lubricate both the O-rings on the piston with CARBAFLO 2160.

NOTE	*-While fed by a low-quality fuel the Pilot Light function may be degraded due to blocking the pressure reducer with oil segregated from the fuel. This is indicated by a weak flame and the jet stained with oil.* *-A pressure reducer, which is only little dirty, can be cleaned by operating on a clean propane which forces the oil out. Let the Pilot Light burn for at least 2 hours. It is recommended to adjust the flame after the cleaning.*

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Clean the PR jet and check the hole inside this jet.
- Check the PR filter, which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Check the PL valve and especially a lubrication on the stem.

5.1.2.3.4. Whisper Burner Valve, Pilot light Valve Main Blast Valve (B)

	B	C	D

Valve control is too stiff, or the valve doesn't seal:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the condition of the O-rings of the stem and guiding surfaces of the valve body. If the O-rings are damaged, replace them.
- Clean the friction surfaces and lubricate the O-rings with CARBAFLO 2160 (fill up the grove in the middle of O-rings).
- Lubricate the friction surface in the valve body.

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the stem flat sealing. If the flat sealing is damaged, replace it and clean well the bearing surfaces.
- Check the clearance between lever, pad and washer. The leaver should have clearance in close position of the lever.
- Check the spring for permanent deformation, in such a case replace the spring with a new one.

The MBV valve doesn't open enough:

- If the MBV valve doesn't open enough, check the MBV lever. Leaver can be bend. Check the picture in chapter Disassembling the Main Blast Valve and compare the shape of the leaver.

5.1.2.3.5 Piezoelectric Igniter (A)

A	B	C	D

- Check position of the piezo igniter needle. Clean carbon deposit from the ceramic part, needle and surface on PL head.
- Set the correct position of the needle (the clearance between needle and PL head should be 2-3mm).
- Moisture or water can cause non-working igniter can be caused by moisture or water in inner parts. Dry it well and check the spark.
- Replace the non-working igniter with a new one.

5.1.2.3.6 Repair of Leakage in Junction of the Descent Tube / Manifold Block (B)

	B	C	D

When a leakage is detected replace the O-rings with new ones.

5.1.2.3.7 Vaporising Coil, Metal Covers and Lamellas (B)

	B	C	D

If deformed, consult with producer Kubíček Factory s.r.o.

5.1.2.3.8 Swing Frame Socket (A)

A	B	C	D

Damaged parts replace with a new ones.

5.1.2.3.9 Adjustable Height Burner Frame - Vario (B)

	B	C	D

If the adjusting arm can't maintain a fixed height it is necessary to replace it for a new one.

5.1.2.4 Gimbal Block and Frames

	B	C	D

5.1.2.4.1 Gimbal Block assembly for 3-4 Units Burner (B)

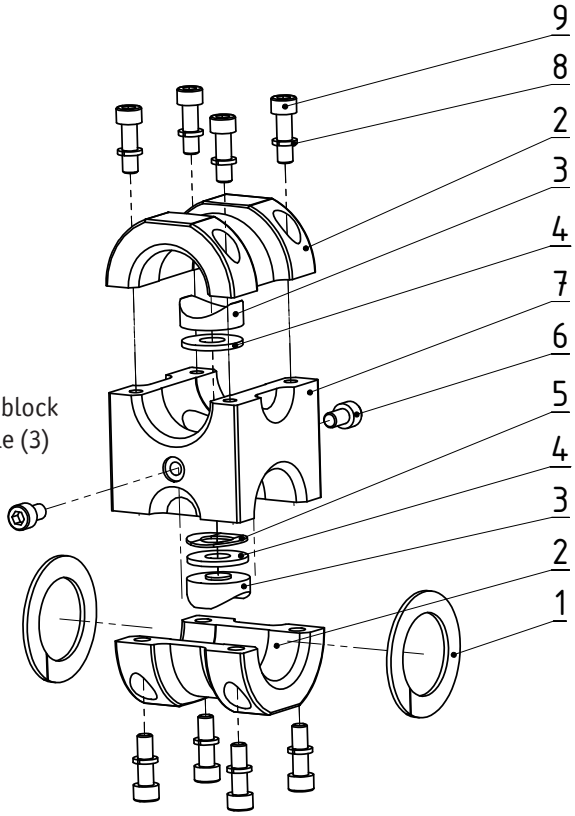
Disassembling

- unscrew bolts (9) and remove gimbal block bottom/top (2)
- pull out parts (3, (4) and (5)
- unscrew bolts (6)

Assembling

- lubricate hole in gimbal block body (7) with CARBAFLO 2160
- screw bolts (6)[2 N·m]and secure it with Loctite 243
- place parts (3), (4) and (5) in order as on picture
- lubricate friction surface on gimbal block body (7) and gimbal block bottom (2) with CARBAFLO 2160 except place for friction saddle (3)
- screw bolts (9) with washer (8) and secure it with Loctite 243

Pic. 13



1 – Gimbal friction washer (53031)
2 – Gimbal block bottom/top (52984)
3 – Gimbal block friction saddle (52988)
4 – Gimbal block disc washer (52935)
5 – Spring disc washer (2734)
6 – M6 x 10 Hexagon socket cap bolt (689)
7 – Gimbal block body (52983)
8 - M6 spring washer (1370)
9 – M6 x 20 Hexagon socket cap bolt (2735)

NOTE	*For increase tough swinging of burner on frame is possible to change gimbal disc washers (2 – 2,5 – 3mm) (52935.00 - 52935.01 - 52935.02).*

5.1.2.4.2 Disassembly of Burner Frames Gyro and Vario (B)

	B	C	D

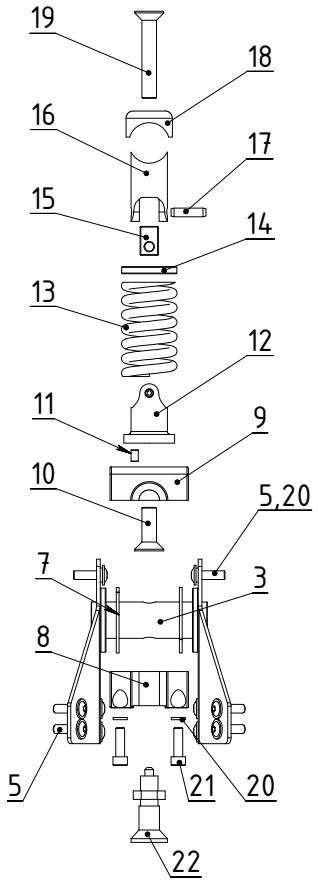
Disassembling of Gyro

- unscrew the bolt (21) and remove gimbal block bottom (8)
- unscrew the blocking pin (22)
- for loose bolts (19 and 10) has to be heat it up because it is secured by Loctite 270
- remove pin (11), spring pins (17)

Assembling of Gyro

- screw blocking pin and nut (22) [6 N·m] with gimbal block bottom (8) and secure with Loctite 243 - check position of the blocking pin inside the gimbal block bottom because of collision with tube on part (3)
- put together parts (12, 15, 16) with pins (17)
- place pin (11)
- screw parts together with bolts (10 and 19) [8 N·m] and SECURE them with Loctite 270 and perform mechanical secure by dent on edge of bolt's head
- lubricate tube on centre bracket
- screw bolts (21) [6 N·m] with washer (20) throught gimbal block bottom (8) and secure it with Loctite 243

Pic. 14



3 – Burner centre bracket (53128.01)
5 – M6x20 Flange Button Head Hexagon Socket Cap Bolt (2839)
8 – Gimbal block bottom (52927.02)
7 – Gimbal friction washer (53133)
9 – Gimbal block top (52926.01)
10 – M10x30 Hexagon socket countersunk head cap bolt (3472)
11 – Roll pin 5x8 (3474)
12 – Gyro Cylinder with base (56010.02)
13 – Gyro gimbal spring (56011)
14 – Gyro washer (56010.05)
15 – Gyro block (56010.03)
16 – Gyro Cylinder frame saddle (56010.01)
17 – Spring pin (3473)
18 – Gyro frame saddle (56010.04)
19 – M10x60 Hexagon socket countersunk head cap bolt (3471)
20 – M6 Spring washer (1370)
21 – M6 x 20 Hexagon socket cap bolt (2735)
22 – Blocking pin (3536)

Disassembling of Vario

- remove rivet (11), split pin (14) and pin (12)
- remove gas strut (7) and gas strut fork (8)
- remove hexagon cup nuts (10) and threaded roll pins (9)
- removing the frame socket - unscrew the screws (6), slide out the pin (4), remove the frame socket (3) and rubber washers (5)

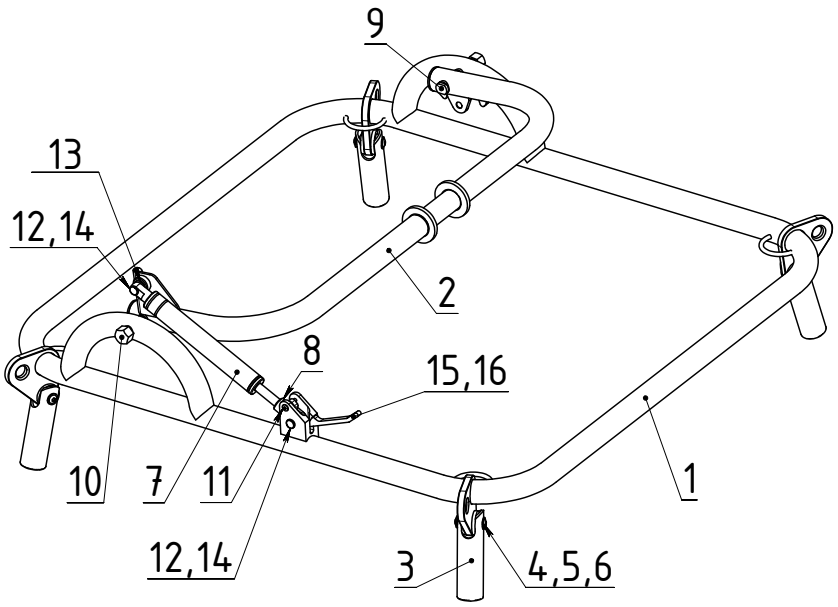
Assembling of Vario

- insert rubber washers (5), slide on the frame socket (3), insert pin (4), screw in the screws (6) and secure thread with Loctite 270
- insert threaded roll pins (9) screw cup nuts (10) [6 N·m] and secure with Loctite 243
- insert rivet (11) with lever (15) and then roll pin with split pin (12,14)
- place roll pin with flat washer (12,13) and then split pin (14)
- screw together gas strut and gas strut fork (7,8) and secure thread with Loctite 243
- finish secure with split pins (14) and rivet (11)

NOTE	*Be careful with manipulation during pressed lever (15) – fast moving of part (2).*

Pic. 15

1 – Vario frame (52961)
2 – Vario frame central tube (52962)
3 – Burner frame socket (53127)
4 – Frame pin with hole (53199)
5 – Rubber washer (53200)
6 – M6x10 Flange button head hexagon socket cap bolt (2907)
7 – Gas strut (2742)
8 – Gas strut fork (52978)
9 – Vario threaded roll pin (52970)
10 – Hexagon cup nut M10 (2749)
11 – Blind rivet 4x25 (3432)
12 – Vario pin with hole (53291)
13 – Flat washer M8x15 (2835)
14 – Split pin 2x16 (3247)
15 – Vario lever (52977)
16 – Lever slave (2778)



NOTE	*Parts (3,4,5,6) are the same on frame Vario, Basic and Gyro.*

5.2 Sirius Burner

This chapter provides instructions for service and maintenance of the Sirius burner.

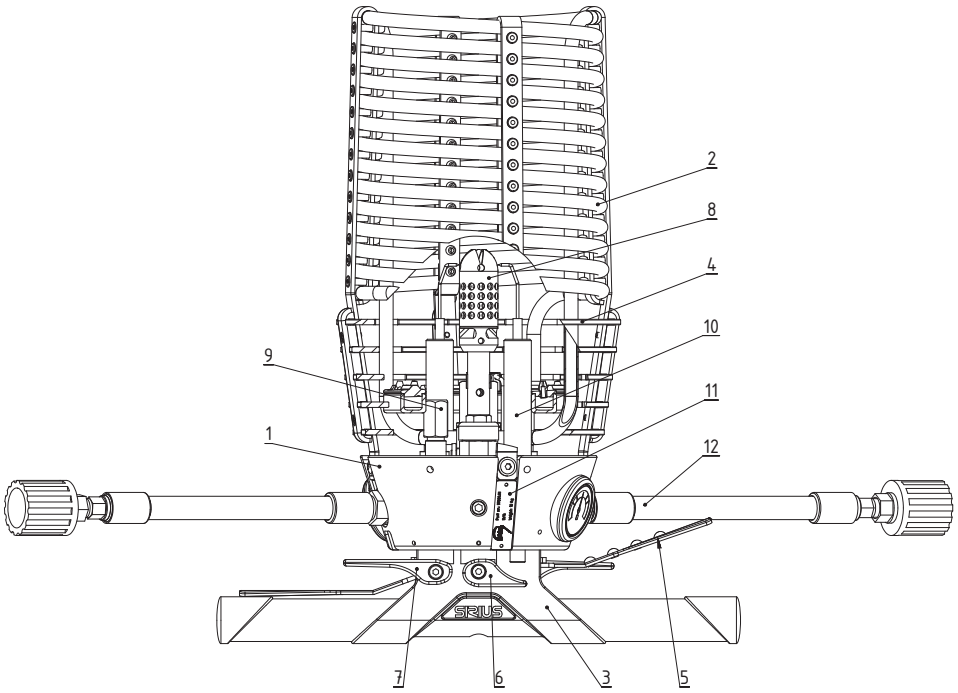
WARNING	*Before starting any maintenance or repair work disconnect the burner from all fuel supplies and vent all the fuel from the burner.*

CAUTION	*It is essential that all fuel system and burner repairs are carried out in a clean environment. The presence of dirt or chemicals may damage movable parts, rubber seals or bonded joints and cause blockage of the burner jets.*

Main burner parts:

Picture 1

1 - Sirius manifold block
2 – Vaporising coil with jet ring
3 – Handle
4 – Disk assembly
5 – MBV Lever
6 – Pilot light lever
7 – Whisper burner lever
8 – Pilot light (PL)
9 – Whisper burner (WB)
10 – Piezoelectric ignition
11 – Registration plate
12 – Liquid hose



5.2.1 Sealing and Threaded Joints Techniques

5.2.1.1 Rubber Seals and O-rings

When disassembling sliding parts with O-rings, the new O-rings must be used for reassembling. When disassembling other types of joints, the O-rings and seals must be inspected and replaced if damaged or deformed. CARBAFLO 2160 is to be used for lubricating O-rings. We recommend replacing the O-rings after 12 months of intensive service. Clean the dirt and old grease from all parts before the re-assembly.

Leak test:
Sealed parts have to be checked by leak test. Use 12 bars to pressurize manifold block assembly.
There are 2 options for performing a leak test:
1) use bubble spray on assembled parts,

2) check pressure gauge during 10 mins – the value has to be the same.

5.2.1.2 Threaded Joints

a) General – When assembling burner parts that are not fixed either with a sealant or sealed with PTFE tape, lubricate the threads accordingly (suitable lubricant is described in each section). Otherwise the threaded joints of the parts made of aluminium alloys may jam.

b) Joints secured with sealant – Threads must be clean and free from grease, dirt and old sealant. Smear the sealant on the male thread and screw it in immediately. To shorten the drying time of sealants a spray activator may be applied to the thread before the sealant is applied. Always comply with the drying times recommended by the sealant manufacturer.

Common sealants:

- Loctite 243 – for securing threads against unintentional loosening (removable joints)
- Loctite 270 – for sealing and securing thread (irremovable joints)

c) Joints sealed with PTFE tape – Ensure that the threads are clean and free from grease, dirt and old tape. Burrs on the threads may be removed with emery cloth or a wire brush.
When using PTFE tape, wrap the male thread in the direction of the thread. Keep tension on the tape whilst wrapping the thread so that the tape is pulled into the thread. Use between 3 to 8 layers depending on the diameter of the thread; the greater the diameter the more layers of thread.
When the thread is correctly wrapped, the tape must fill the space between each thread and form a cone as seen on the picture 2.

Picture 2



CAUTION	*Keep the first thread free from tape to prevent tape being cut off during reassembly. Loose pieces of tape could get into the fuel system and cause a blockage.*

5.2.2 Standard Maintenance Techniques

	B	C	D

5.2.2.1 Removing of the Burner from the Burner Frame (B)

It is recommended to remove the burner from the frame prior to each maintenance or repair on a burner unit.

Disassembling

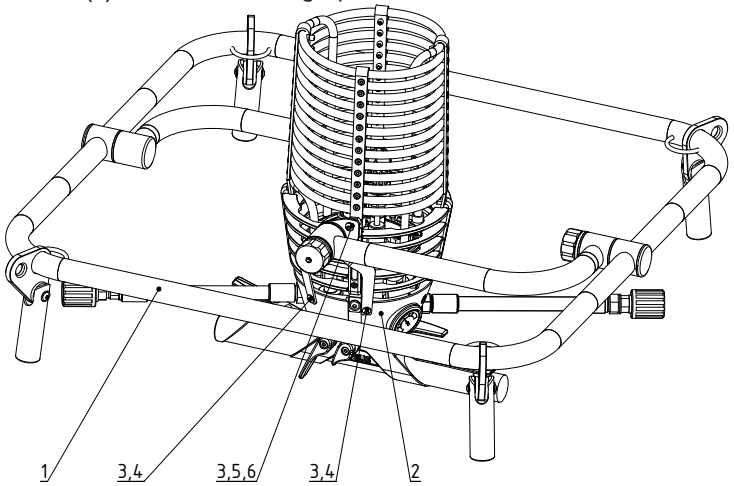
- place the frame with the burner on handle and support frame and arms of the frame in horizontal position
- unscrew the bolts (3) and remove burner unit

Assembling

- put the frame with arms on support and place the burner in the correct position
- screw the bolts (3) [4 N·m] at the bottom of the hanger screw (3) and lubricate them with Loctite 243, and at the top of the hanger screw (3) with the flexible washer (5) and Attila SA 2M graphite vaseline

Pic 3

1 – Sirius frame
2 – Sirius burner unit
3 – M6 x 12 Hexagon socket rounded bolt (1140)
4 - Loctite 243
5 - Spring washer M6 DIN 7980 (1370)
6 - Graphite vaseline Attila SA 2M (2844)



5.2.2.2 Removing of the Disc set and the Coil (B)

	B	C	D

Maintenance on pressure reducer and whisper burner is possible without removing a coil. It is possible to carry a maintenance through the coil from above or from the side of coil by removed disc set.

Disassembling of disc set

- unscrew the bolts (11) and remove a disc holder (10)
- remove the separate discs (9)

Assembling of disc set

- insert the disc set (9) with a disc holder (10) on a coil base. Connection of the disc sets have to be under a frame hanger – the same orientation like in the picture.
- screw in the bolts (11) [2 N·m] and lubricate them with the graphite vaseline Attila SA 2M

Disassembling of coil

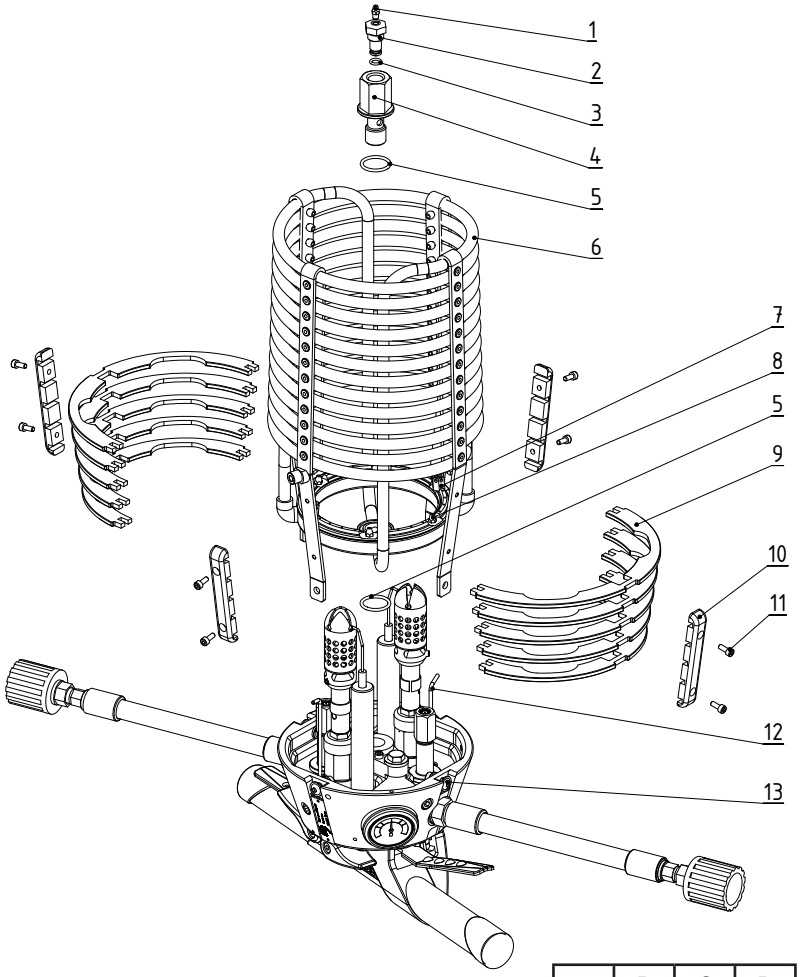
- unscrew the fuel supply bolt (4) with screwed parts
- unscrew the jet (1), the central jet (2) and remove O-ring (3)
- remove the slurper tube (12) from the slurper jet (7)
- unscrew the bolts (13) and remove the coil with O-rings (5)
- unscrew the jets (7)(8)

Assembling of coil

- screw the jets (7)(8) [max 2 N·m] and secure them with Loctite 243
- lubricate O-rings (3) and (5) with CARBAFLO 2160 and place them on an appropriate place
- lubricate the thread on parts (2) and (4) with the graphite vaseline Attila SA 2M
- screw together the parts (1) [1,5 N·m] , (2) [8 N·m] and (4) and the jet (1) secure with Loctite 243
- place the coil and slightly screw the bolt (4)
- screw the bolts (13) and lubricate them with the graphite vaseline Attila SA 2M
- screw the fully bolt (4) [10 N·m]
- place the slurper tube (12) and insert it to the slurper jet (7) Caution: the upper end of slurper tube must be oriented in the axis of the jet and approximately one half the hole of the jet should be covered when seen from above – otherwise the slurper tube doesn‘t work.

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter: 5.2.1.1 Rubber Seals and O-rings – Leak test.*

Pic 4



1 – Jet - 1,2mm (53176.12)
2 – Central jet (57684)
3 – O-ring 7x1,8 (3283)
4 – Fuel supply bolt (57683)
5 – O-ring 22x2,5 (3024)
6 – Coil (57914)
7 – Slurper jet (53176.03)
8 – Jet – diam. 1,2mm (53176.12)
9 – Disk assembly (57912)
10 – Disk holder (57913)
11 – M4 x 10 Hexagon socket cap bolt (3563)
12 – Slurper tube (57926)
13 – M6x20 Flange Button Head Hexagon Socket Cap Bolt (2839)

5.2.2.3 Removing of the Handle (B)

	B	C	D

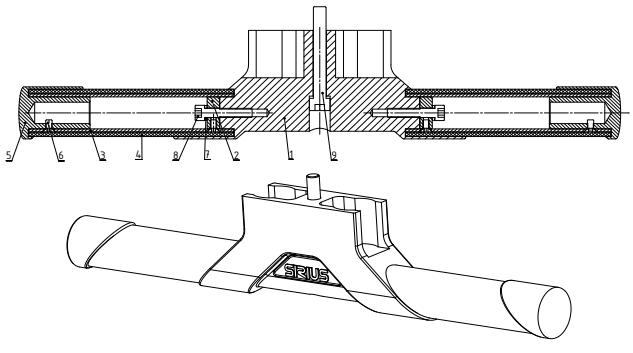
Disassembling

- unscrew the bolt (9) and remove the handle from a manifold block
- move out the grip (4) and unscrew the bolt (6), remove the ending (5) and the grip (4)
- unscrew the bolt (8) and move out the tube (3)
- unscrew the bolt (6) and then remove the connection ring (2)

Assembling

- screw the bolt (6) [1 N·m] with the connection ring (2) and secure it with Loctite 243
- slide the grip (4) on a handle tube, screw the bolt (8) [6 N·m] with the washer (7) and secure it with Loctite 243
- place the handle ending (5) and screw the bolt (6) [1 N·m] - secure it with Loctite 243
- screw the bolt (9) [8 N·m] and secure it with Loctite 243

Pic 5



1 – Handle body (57921)
2 – Connection ring (57922)
3 – Handle tube (57923)
4 – Handle grip (35670)
5 – Handle ending (57925)
6 – M4x8 Hexagon socket countersunk head cap bolt (2860)
7 – M6 Spring washer (1370)
8 – M6 x 30 Hexagon socket cap bolt (2961)
9 – M8 x 60 Hexagon socket cap bolt (3566)

5.2.2.4 Fuel Hoses Replacement (B)

	B	C	D

WARNING	*Never try to repair damaged fuel hoses! Always replace the damaged hose with a new one supplied by Kubíček Factory s.r.o.*

Disassembling

- unscrew the hose (2)(4) and remove the bonded seal (1)
- unscrew the coupling (3)(5)

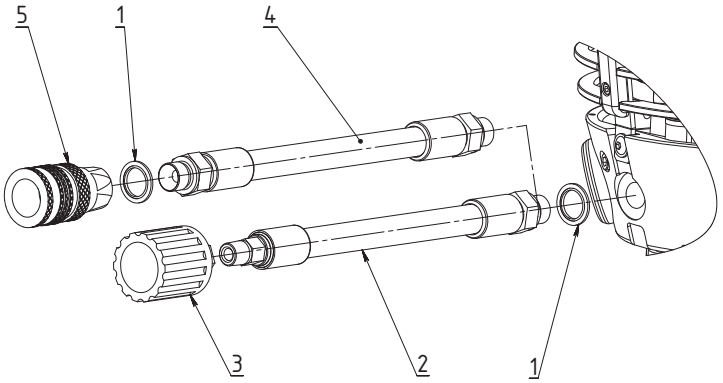
Assembling

- screw the hose (2)(4) to a manifold block with the bonded seal (1) and secure it with Loctite 243
- the burner hose connections with 1/4“NPT threads (fuel hose / Rego coupling) should be assembled and sealed with Everseal 183 or PTFE tape
- the burner hoses connections with 3/8“BSP parallel threads (fuel hose / Tema coupling and hose / manifold block) should be assembled with the appropriately sized bonded seal and secured with Loctite 243.

NOTE	These maximum recommended torque values should not be exceeded when replacing the following components: • 1/4 NPT thread max. 35 Nm (check the length of screwing parts together) • 3/8 BSP thread max. 20 Nm Burner hoses for Rego coupling are supplied from Kubíček Factory with Everseal 183 sealant already applied (blue paste on the male connector), there is no need to use any additional sealing means and the hoses are to be installed directly.

Pic 6

1 – Bonded seal (2765)
2 – Liquid hose – Ignis x Rego (53102.01)
(53102.X1, 56006.X1, 57975.X1, 57979.X1)
3 – Rego coupling (3523)
4 – Liquid hose – Ignis x Tema
(53102.X2, 56006.X2, 57975.X2, 57979.X2)
5 – Tema coupling (2698)



NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.2.1.1 Rubber Seals and O-rings – Leak test.*

5.2.2.5 Disassembling the Main Blast Valve (MBV) (B)

	B	C	D

Disassembling:

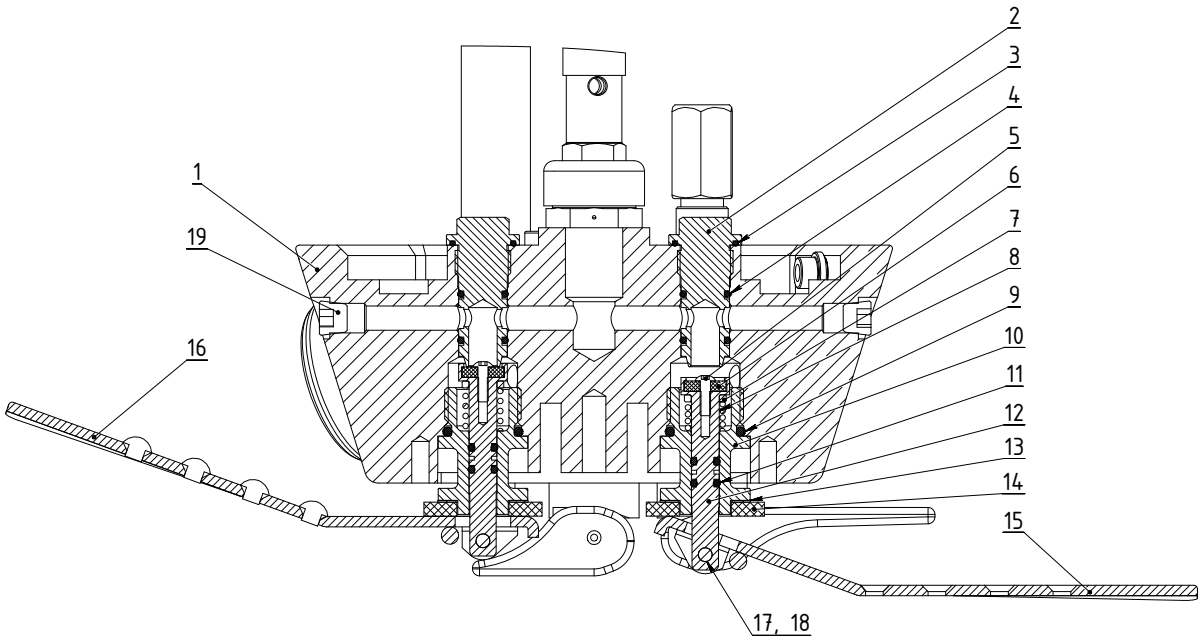
- remove the handle: check the chapter 5.2.3.3 Removing of the handle
- remove the retaining ring (17) and push out the lever pin (18)
- remove the lever (15)(16) and the washers (13)(14)
- unscrew the MBV body (10) and remove it together with the stem (12), spring (8) and spring washer (7)
- unscrew the bolt (5) and remove the flat sealing (6) and the O-rings (11)

Assembling:

- insert the flat sealing (6), the screw bolt (5) and secure it with Loctite 273
- place the O-rings (11) and the washer (7)
- lubricate the O-rings (11) on the stem (12) with CARBAFLO 2160 and fill up the central grove
- lubricate the friction surface inside the MBV body with CARBAFLO 2160
- put on the spring (8) and MBV body (10) with O-ring (9)
- lubricate the thread with CARBAFLO 2160 and screw the prepared assembly [6 N·m] into the manifold block (1)
- place the MBV washers (13,14) if is it necessary

- verify the clearance between the lever (15,16) and washer (14) – it should be approximately 0.3 mm (0.012”) (if necessary, remove or replace the washer (13,14))
- place MBV lever (15,16) and push in the roll pin (18)
- secure the pin with the retaining ring (17) (if the retaining ring is too loose, use a new one)

NOTE	*Parts (19) and (2) don’t need to be disassembled during the maintenance, just in case of leaking.* *- Socket Head Plug (19) is sealed by Everseal 183 (it is possible to seal by PTFE tape alternatively)* *- MBV Plug (2) with O-rings (3) and (4) – during the maintenance check the O-rings and lubricate the thread and the O-rings with* CARBAFLO 2160.



Pic 7

1 – Sirius manifold block (57901)
2 – MBV plug (57902)
3 – O-ring 16x1,5 (3562)
4 – O-ring 11x1,8 (3561)
5 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
6 – Stem flat sealing (53274)
7 – Washer (57885)
8 – MBV spring (3565)
9 – O-ring 17.86 x 2.62 (3299)
10 – MBV body (57883)
11 – O-ring 5x1,75 (2826)
12 – Valve stem (53282)
13 – MBV washer 0.3 / 0.5mm (53266.01/53266.02)
14 – MBV washer 3 / 4mm (57887.01/57887.02)
15 – MBV lever (green side) – (53287.001)
16 – MBV lever (red side) – (53287.002)
17 – Shaft retaining ring 3.2 (2984)
18 – MBV roll pin (53265)
19 – Socket Head Plug 1/8 BSP (3339)

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.2.1.1 Rubber Seals and O-rings – Leak test.*

5.2.2.6 Disassembling the Whisper Burner Valve (WBV) and Pilot Light Valve (PLV) (B)

	B	C	D

NOTE	*Inner parts in manifold block for whisper burner valve and pilot light valve are same.*

Whisper burner valve

Disassembling:

- unscrew the pin (15), remove the lever (13)(14) and the pad (12) with the washer (9)
- loosen the bolt (10) - no need to unscrew it fully
- unscrew the valve body and remove it from the manifold block together with the stem (11) and the spring (6)
- loosen the bolt (4) and remove the flat sealing (5)

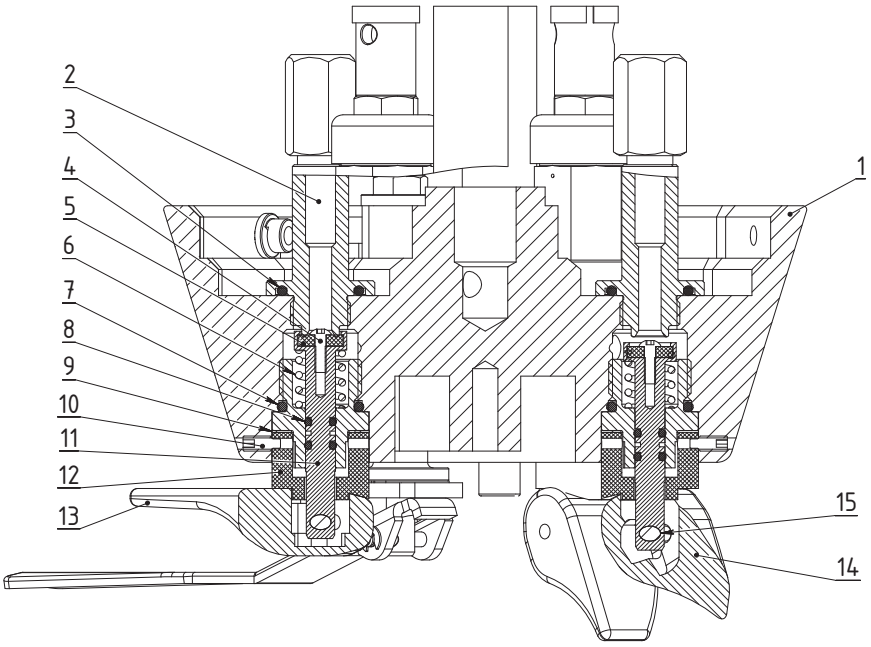
Assembling:

- place the flat sealing (5) inside the stem (11) and secure the bolt (4) with the Loctite 243
- lubricate the O-rings (8) with the graphite vaseline Attila SA 2M and fill up the central grove on the stem
- put on the spring (6) and the valve body with O-ring (7)
- lubricate the friction surface inside the valve body with CARBAFLO 2160.
- lubricate the thread and the O-ring (7) with CARBAFLO 2160 and screw the prepared assembly into the manifold block
- place the washer (9), pad (12), lever (13)(14) and screw in the pin (15) [1 N·m] – secure it with Loctite 243
- verify the clearance between the lever and the pad (12) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (9) (secure the pin (15) with Loctite 243)
- screw in the bolt (10) – don’t screw it fully but secure with Loctite 243
- lubricate the friction surface on the pad and the lever with CARBAFLO 2160

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.2.1.1 Rubber Seals and O-rings – Leak test.*

Pic 8

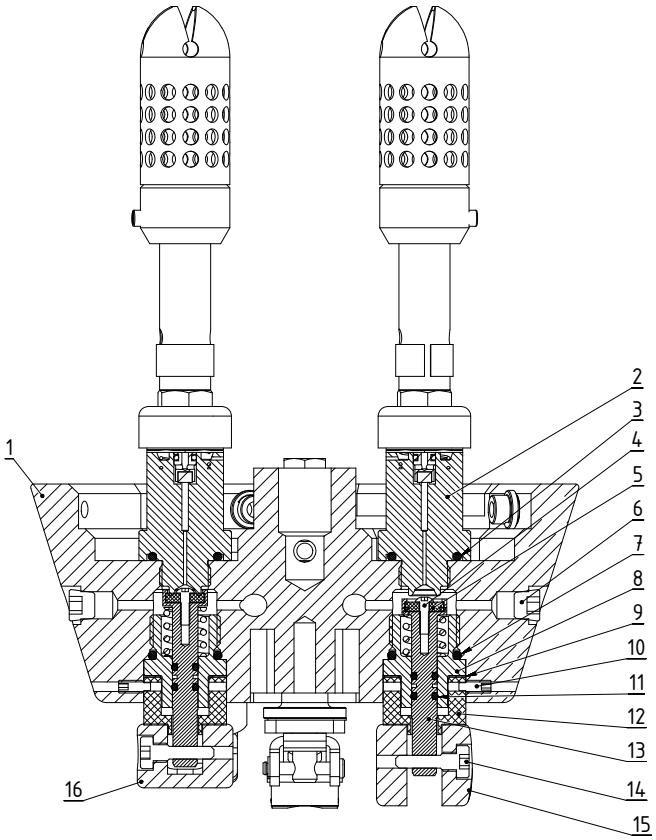
1 – Sirius manifold block (57901)
2 – Whisper burner body (53125)
3 – O-ring 17.86 x 2.62 (3299)
4 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
5 – Stem flat sealing (53274)
6 – WB/PL valve spring (53275)
7 – O-ring 17.86 x 2.62 (3299)
8 – O-ring 5x1,75 (2826)
9 – Lever washer 0.3/0.5mm (53180.01/53180.02)
10 – M4 x 10 Hexagon socket set bolt with cone point (3564)
11 – Valve stem (53282)
12 - Lever pad (57905)
13 – Whisper lever - red (57907.02)
14 – Whisper lever -green (57907.01)
15 – Lever roll pin (53196)



Pilot light valve

The procedure of disassembling and assembling the pilot light valve is the same as the procedure on whisper burner valve.

Pic 9



1 – Sirius manifold block (57901)
2 – PR lower body (53281.001)
3 – O-ring 17.86 x 2.62 (3299)
4 – M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
5 – Stem flat sealing (53274)
6 – Socket Head Plug 1/8 BSP (3339)
7 – O-ring 17.86 x 2.62 (3299)
8 – WB/PL valve body (53285)
9 – Lever washer 0.3/0.5mm (53180.01/53180.02)
10 – M4 x 10 Hexagon socket set bolt with cone point (3564)
11 – O-ring 5x1,75 (2826)
12 - Lever pad (57905)
13 – Valve stem (53282)
14 – Lever roll pin (53196)
15 – PL lever - red (57906.02)
16 – PL lever -green (57906.01)

NOTE	*Socket head plug (6) don't need to be disassembled during maintenance, just in case of leaking. Plug (6) is sealed by Everseal 183 (it is possible to seal by PTFE tape alternatively).*

	B	C	D

5.2.2.7 Disassembling the Whisper Burner (WB), Pilot light (PL), Piezoelectric Ignition and Pressure Gauge (B)

It is recommended to remove the disc set from the burner for maintenance or repair – check chapter 5.2.3.2 Removing of the disc set and coil.

Whisper Burner disassembling:

- unscrew the WB body (2) from the manifold block and remove the O-ring (3)

Whisper Burner assembling:

- place the O-ring (3) on the WB body (2), lubricate the thread and O-ring with CARBAFLO 2160
- screw the WB body (8) [8 N·m] into the manifold block

Pilot light and pressure reducer disassembling:

- unscrew the assembly - PL with the pressure reducer (1) from the manifold block and remove the O-ring (3)

Pilot light pressure reducer assembling:

- place the O-ring (3), lubricate the thread and O-ring with CARBAFLO 2160
- screw the assembly - PL with the pressure reducer (1) into the manifold block
- set the pilot light head into position of securing bolt towards the centre of manifold block (that allows later disassembly of the PL head and pressure reducer through the coil – without removing the coil)

Piezoelectric igniter disassembling:

- loosen the bolt (6) - no need to unscrew it fully
- clean the dirt from the surface of piezoelectric ignition (4) and if necessary, lubricate the surface with CARBAFLO 2160

- remove the piezoelectric ignition (4) from the manifold block
- remove the O-ring (5)

Piezoelectric igniter assembling:

- place the O-ring (5)
- lubricate the surface of the piezoelectric ignition (4) with CARBAFLO 2160 and insert it inside the manifold block
- set the position of the piezoelectric ignition against the PL head, the igniter needle is to be placed 3-4 mm (approx. 1/8") from the clearance of the PL head
- screw fully the bolt (6) [1 N·m]

Pressure gauge disassembly:

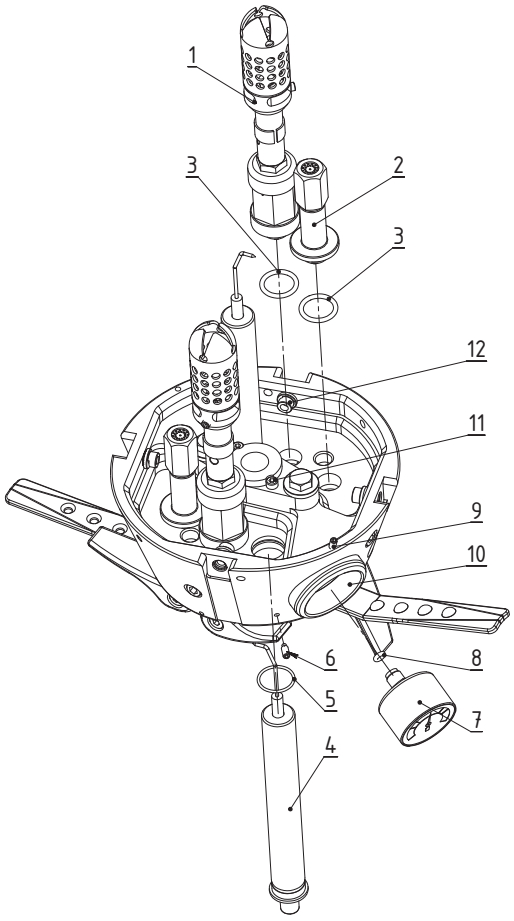
- loosen the bolt (9), no need to unscrew it fully
- remove the gauge case (10)
- unscrew the pressure gauge (10) from the manifold block, hold the gauge carefully from its metal side
- remove the O-ring (8)

Pressure gauge assembling:

- place the lubricated O-ring (8) in the bottom hole in the manifold block
- insert the gauge case
- wrap the pressure gauge thread with PTFE tape (5-7 layers) and screw it into the manifold block
- set the gauge in correct position
- fix the gauge case with the bolt (10)

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.2.1.1 Rubber Seals and O-rings – Leak test.*

Pic 10



1 – Pilot light and pressure reducer (assembly)
2 – Whisper burner body (53125)
3 – O-ring 17.86 x 2.62 (3299)
4 – Piezoelectric ignition (assembly) (53114)
5 – O-ring 19,5x1,5 (2973)
6 – M5 x 10 Hexagon socket set bolt with cone point (2974)
7 – Pressure gauge (50524)
8 – O-ring 3x2,4 (2972)
9 – M4 x 10 Hexagon socket set bolt with cone point (3564)
10 – Gauge case (57908)
11 – M4x10 Hexagon socket cap bolt (3563)
12 – Threaded insert M6 (53181)

5.2.2.8 Pressure Reducer (PR) and Pilot Light (PL) disassembling (B)

	B	C	D

Pressure Reducer and Pilot Light disassembling:

- remove the pilot light head (12) by loosening the bolt (14)
- remove the PL jet ring (13) and the PL setting ring (10)
- unscrew the PR upper body (7) from the lower body (1) and remove the spring (4)
- remove the piston (6) – sealing (2) is glued in piston and isn't possible to change it separately – only the whole piston
- remove the O-ring (3)
- unscrew the pilot light tube (11) from the PR upper body
- unscrew the PR jet (9) and the PR filter (8)

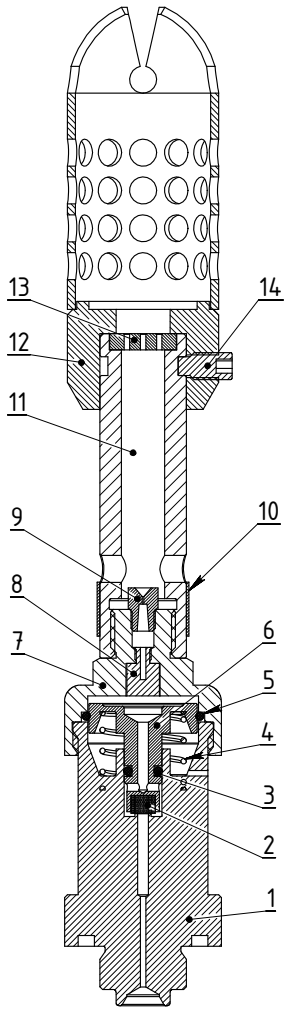
Pressure Reducer and Pilot Light assembling:

- screw in the PR jet (9) [1 N·m] and PR filter (8) inside the PR upper body
- lubricate the O-ring (5) with CARBAFLO 2160 and place it to the PR upper body
- lubricate the hole in PR lower body and O-ring (3) with CARBAFLO 2160
- insert the piston carefully into the PR upper body (7)
- place the spring (4) and screw the PR upper body (7) [8 N·m] and the PR lower body (1) together. Using excessive force may result in cracks appearing in the upper body of the PR.
- screw the PL tube (11) [8 N·m] with the PR upper body (7) and place the PL setting ring (10)
- place the PL jet ring (13) on the PL tube (11) and screw the bolt (14) [1 N·m] inside the PL head (13) (set the PL head with the securing bolt (14) on position towards the centre of the manifold block)

NOTE	*After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.2.1.1 Rubber Seals and O-rings – Leak test.*

Pic 11

1 – PR lower body (53281.001)
2 – Top sealing (part of piston)
3 – O-ring 4 x 1,6 (2810)
4 – PR spring (53165)
5 – O-ring 19,5x1,5 (2973)
6 – PR piston (53294.02)
7 – PR upper body (53137)
8 – PR filter (2828)
9 – PR jet (2795)
10 – Pilot light setting ring (53208)
11 – Pilot light tube (53141)
12 – Pilot light head (53117.001)
13 – Pilot light jet ring (53152)
14 – M5 x 10 Hexagon socket set bolt with cone point (2974)



5.2.3 Troubleshooting

5.2.3.1 Pressure Gauge Repairs (B)

	B	C	D

If a needle doesn't point to zero pressure when fuel supply is disconnected and main blast valve open:

- Remove the glass and set the needle correctly. After adjusting the needle position make sure the pressure gauge works correctly by pressurising it to at least 0.5 MPa. It is possible to use a nitrogen for pressurisation and verifying the pressure with another correct pressure gauge.
- Replace a non-functional pressure gauge with a new one.

Leakage around the thread

- Unscrew the gauge and check the O-ring, remove the old PTFE tape and check the thread. Wrap with approximately 6 layers of PTFE tape and lubricate the O-ring.

5.2.3.2 Inefficient Removal of Condensation (A)

A	B	C	D

- The upper end of the slurper tube must be oriented in the axis of the burner jets and approximately one half of the jet should be covered when seen from above.
- Check whether it is not blocked or has deformed ends.
- Loosen the fixing screw and push the tube just to the bottom of the manifold block.

5.2.3.3 Pilot Light (B)

	B	C	D

If the amount of flame is too small, unstable or too big:

- Check the pressure in a tank by the pressure gauge on a manifold block.
- Adjust by the PL setting ring the volume of air intake. The amount of air can be regulated by moving the PL setting ring up/down which opens or closes the intake holes. Never close the holes fully.
- Clean the PL jet ring.
- A spring in the pressure reducer should be replaced with a new one.

If the burner extinguishes despite:

- Clean the PR jet and check the hole inside this jet.
- Check the PR filter which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Clean a chamber in the pressure reducer and a hole in the PR lower body.
- Check the piston with the flat sealing and the O-rings.
- Check and lubricate both the O-rings on the piston with CARBAFLO 2160.

NOTE	*While fed by a low-quality fuel the Pilot Light function may be degraded due to blocking the pressure reducer with oil segregated from the fuel. This is indicated by a weak flame and the jet stained with oil. A pressure reducer, which is only little dirty, can be cleaned by operating on a clean propane which forces the oil out. Let the Pilot Light burn for at least 2 hours. It is recommended to adjust the flame after the cleaning.*

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Clean the PR jet and check the hole inside this jet.
- Check the PR filter, which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Check the PL valve and especially a lubrication on the stem.
- Loosen the bolt M4, which holds the position of the lever pad on the side of manifold block.

5.2.3.4 Whisper Burner Valve, Pilot light Valve Main Blast Valve (B)

	B	C	D

Valve control is too stiff, or the valve doesn't seal:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the condition of the O-rings of the stem and guiding surfaces of the valve body. If the O-rings are damaged, replace them.
- Clean the friction surfaces and lubricate the O-rings with CARBAFLO 2160 (fill up the grove in the middle of O-rings).
- Lubricate the friction surface in the valve body.

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the stem flat sealing. If the flat sealing is damaged, replace it and clean well the bearing surfaces.
- Check the clearance between lever, pad and washer. The leaver should have clearance in close position of the lever.
- Check the spring for permanent deformation, in such a case replace the spring with a new one.
- WB/PL - loosen the M4 securing bolt, which keeps position of the lever pad.

The MBV valve doesn't open enough:

- If the MBV valve doesn't open enough, check the MBV lever. Leaver can be bend. Check the picture in chapter Disassembling the Main Blast Valve and compare the shape of the leaver.

5.2.3.5 Piezoelectric Igniter (A)

A	B	C	D

- Check the position of the piezo igniter needle. Clean carbon deposit from the ceramic part, needle and surface on the PL head.
- Set the correct position of the needle (the clearance between needle and PL head should be 2-3mm).
- The malfunction can occur due to condensation and moisture inside the igniter, dry it well.
- Replace the non-working igniter with a new one.

5.2.3.6 Repair of Leakage in Junction of the Descent Tube / Manifold Block (B)

	B	C	D

When a leakage is detected replace the O-rings with the new ones. Remove the coil according to chapter Removing of the Disc set and the Coil. Lubricate the new O-rings with a silicon grease.

5.2.3.7 Vaporising Coil, Metal Covers and Lamellas (B)

	B	C	D

If deformed, consult with the manufacturer - Kubíček Factory s.r.o.

5.2.3.8 Swing Frame Socket (A)

A	B	C	D

If damaged, replace the rubber washers or swing sockets with the new ones.

5.3 ORIGO Burner

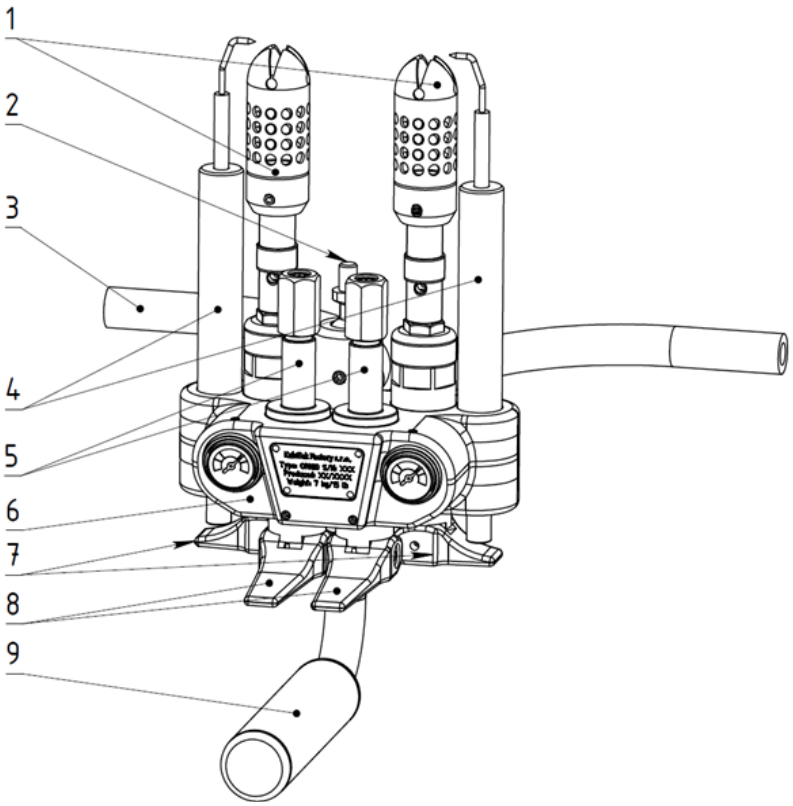
This chapter provides instructions for service and maintenance of the ORIGO burner.

WARNING	*Before starting any maintenance or repair work disconnect the burner from all fuel supplies and vent all the fuel from the burner.*

CAUTION	*It is essential that all fuel system and burner repairs are carried out in a clean environment. The presence of dirt or chemicals may damage movable parts, rubber seals or bonded joints and cause blockage of the burner jets.*

Main burner parts:

Pic 1



1. Pilot burner (53118.001)
2. Gimbal (4123)
3. Fuel hoses with couplings (57997.01 REGO or 57997.02 TEMA)
4. Piezoelectric ignition (53114)
5. Main whisper burner (53125)
6. Manifold block (58128)
7. Pilot burner levers - left/right (58133.00/58133.01)
8. Main whisper burner levers - left/right (58133.10/58133.11)
9. Handle (58134)

5.3.1 Sealing and Threaded Joints Techniques

5.3.1.1 Rubber Seals and O-rings

When disassembling sliding parts with O-rings, the new O-rings must be used for reassembling. When disassembling other types of joints, the O-rings and seals must be inspected and replaced if damaged or deformed. CARBAFLO 2160 is to be used for lubricating O-rings. We recommend replacing the O-rings after 12 months of intensive service. Clean the dirt and old grease from all parts before the re-assembly.

Leak test:

Sealed parts have to be checked by leak test. Use 12 bars to pressurize manifold block assembly. There are 2 options for performing a leak test:

1) use bubble spray on assembled parts,

2) check pressure gauge during 10 mins – the value has to be the same

5.3.1.2 Threaded Joints

a) General – When assembling burner parts that are not fixed either with a sealant or sealed with PTFE tape, lubricate the threads accordingly (suitable lubricant is described in each section). Otherwise the threaded joints of the parts made of aluminium alloys may jam.

b) Joints secured with sealant – Threads must be clean and free from grease, dirt and old sealant. Smear the sealant on the male thread and screw it in immediately. To shorten the drying time of sealants a spray activator may be ap plied to the thread before the sealant is applied. Always comply with the drying times recommended by the sealant manufacturer.

Common sealants:

- Loctite 243 – for securing threads against unintentional loosening (removable joints)
- Loctite 270 – for sealing and securing thread (irremovable joints)

c) Joints sealed with PTFE tape – Ensure that the threads are clean and free from grease, dirt and old tape. Burrs on the threads may be removed with emery cloth or a wire brush. When using PTFE tape, wrap the male thread in the direction of the thread. Keep tension on the tape whilst wrapping the thread so that the tape is pulled into the thread. Use between 3 to 8 layers depending on the diameter of the thread; the greater the diameter the more layers of thread. When the thread is correctly wrapped, the tape must fill the space between each thread and form a cone as seen on the picture 2.

Pic 2



CAUTION	*Keep the first thread free from tape to prevent tape being cut off during reassembly. Loose pieces of tape could get into the fuel system and cause a blockage.*

5.3.2 Standard Maintenance Techniques

	B	C	D

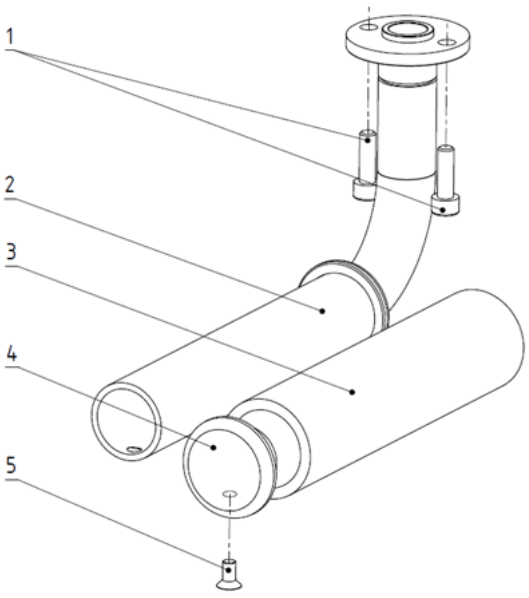
5.3.2.1 Removing the Handle (B)

Disassembling

- unscrew the bolts (1) and remove the handle from a manifold block
- unscrew the bolt (5), remove the handle end (4) and move out the grip (3)

Assembling

- slide the grip (3) on the handle body (2)
- place the handle end (4) and screw the bolt (5) [1 N.m] secure it with Loctite 243
- screw the bolts (1) [5 N.m] into a manifold block - secure it with Loctite 243



Pic 3

1. M5x16 hexagon socket head cap bolts (2763)
2. Handle body (58134.00 - weldment)
3. Handle grip (3321)
4. Handle end (58134.20)
5. M4x8 Hexagon socket countersunk head cap bolt (2860)

5.3.2.2 Removing the Burner from the Burner Frame (B)

	B	C	D

It is recommended to remove the burner from the frame prior to each maintenance or repair on a burner unit.

Disassembling

- unscrew the bolts (11) and remove the handle from the manifold block (7)
- unscrew the bolt (9) and remove the burner from the burner frame
- unscrew the ball joint pin (4) from the burner frame
- unscrew the bolt (3) and disassemble all parts of the gimbal (2, 4, 5)

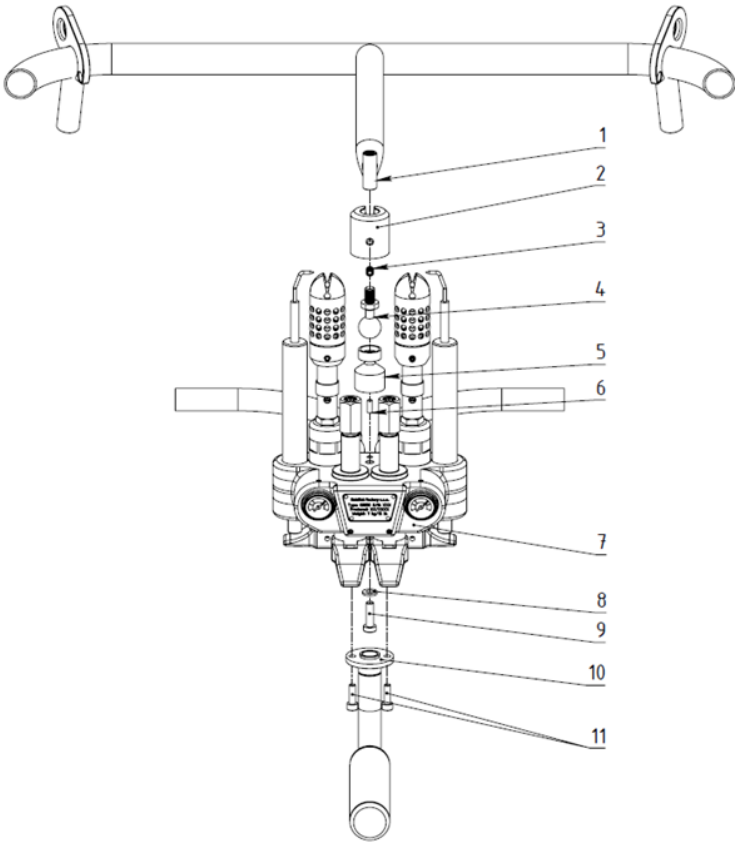
NOTE	Be careful not to let the pin (6) fall out.

Assembling

- clean the dirt and old grease from the ball joint pin (4), gimbal body (2) and gimbal spacer insert (5) before the reassembly
- lubricate the friction surface of the gimbal body (2) and gimbal spacer insert (5) with the graphite vaseline Attila SA 2M
- place ball joint pin (4) and gimbal spacer insert (5) into the gimbal body (2)
- screw the bolt (3) and set up the toughness of swing - secure it with Loctite 243
- screw the ball joint pin (4) with burner frame - secure it with Loctite 243
- place pin (6) in the manifold block (7)
- place the burner in the correct position with gimbal
- screw the bolt (9) [6 N.m] with the spring washer (8) and secure it with Loctite 243
- screw the handle bolts (11) [5 N.m] into a manifold block - secure it with Loctite 243
- if necessary, adjust the toughness setting using the bolt (3)

Pic 4

1. Mounting thread
2. Gimbal body (4123 – assembly)
3. Gimbal adjustment bolt
4. Ball joint pin
5. Gimbal spacer insert
6. M4x10 dowel pin (4127)
7. Manifold block (58128)
8. M6 spring washer (1370)
9. M6x20 socket head cap bolt (2735)
10. Handle (58134)
11. M5x16 socket head cap bolts (2763)



5.3.2.3 Fuel Hoses Replacement (B)

	B	C	D

WARNING	*Never try to repair damaged fuel hoses! Always replace the damaged hose with a new one supplied by Kubíček Factory s.r.o.*

Disassembling

- unscrew the hose (1)(4) and remove the bonded seal (2)
- unscrew the coupling (3)(5)

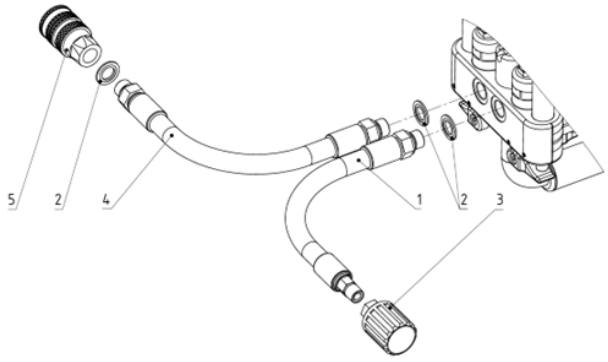
Assembling

- screw the hose (1)(4) to a manifold block with the bonded seal (2) and secure it with Loctite 243
- the burner hose connections with 1/4"NPT threads (fuel hose / Rego coupling) should be assembled and sealed with Everseal 183 or PTFE tape
- the burner hoses connections with 3/8"BSP parallel threads (fuel hose / Tema coupling and hose / manifold block) should be assembled with the appropriately sized bonded seal and secured with Loctite 243

NOTE	These maximum recommended torque values should not be exceeded when replacing the following components: • 1/4 NPT thread max. 35 Nm (check the length of screwing parts together) • 3/8 BSP thread max. 20 Nm Burner hoses for Rego coupling are supplied from Kubíček Factory with Everseal 183 sealant already applied (blue paste on the male connector), there is no need to use any additional sealing means and the hoses are to be installed directly.

Picture 5

1. Fuel hose – ORIGO x Rego (57997.01)
2. Bonded seal (2765)
3. Rego coupling (3523)
4. Fuel hose – ORIGO x Tema (57997.02)
5. Tema coupling (2698)



NOTE	After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.3.1.1 Rubber Seals and O-rings – Leak test.

5.3.2.4 Disassembling the Whisper Burner Valve (WBV) and Pilot Light Valve (PLV) (B)

	B	C	D

NOTE	Inner parts in manifold block for whisper burner valve and pilot light valve are same.

Whisper burner valve

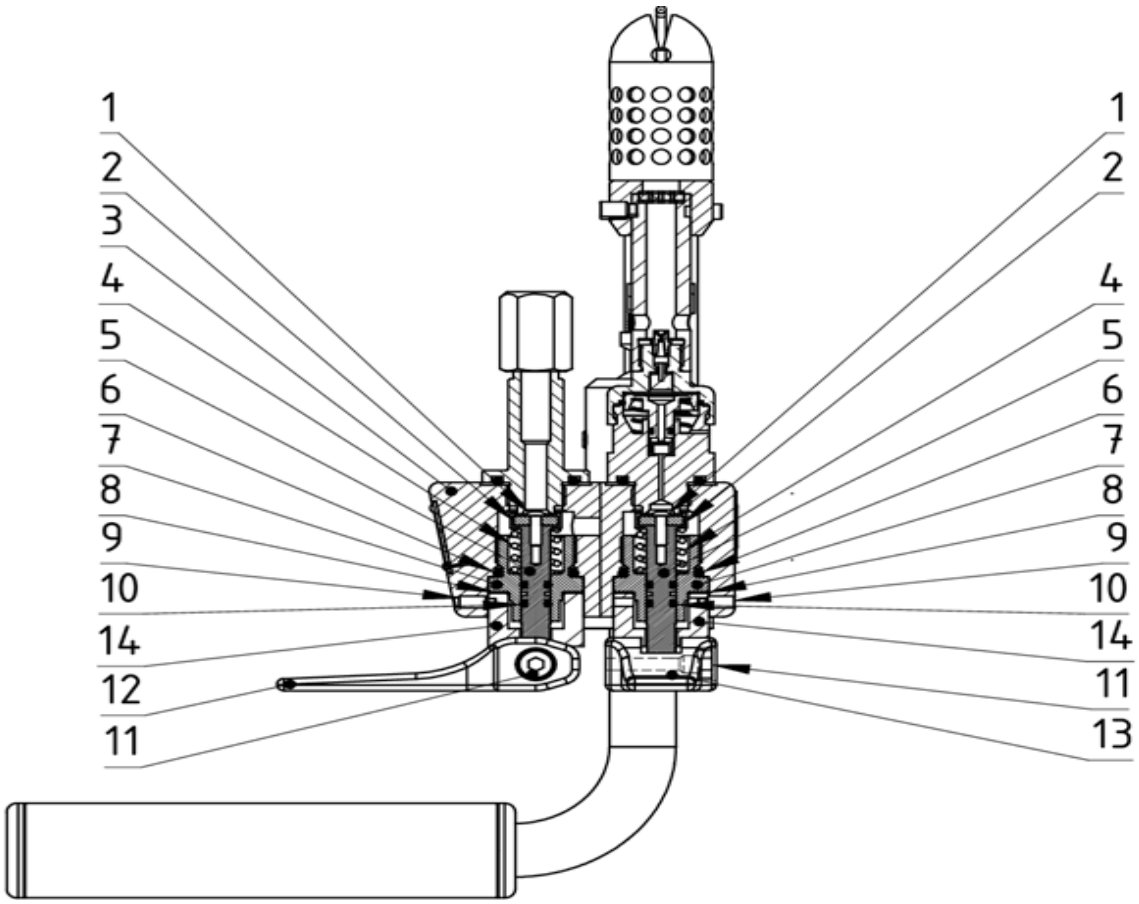
Disassembling

- unscrew the pin (11), remove the lever (12)(13) and the pad (14) with the washer (8)
- loosen the bolt (9) - no need to unscrew it fully
- unscrew the valve body and remove it from the manifold block together with the stem (5) and the spring (4)
- loosen the bolt (1) and remove the flat sealing (2)

Assembling

- place the flat sealing (2) inside the stem (5) and secure the bolt (1) with the Loctite 243
- lubricate the O-rings (10) with the graphite vaseline Attila SA 2M and fill up the central grove on the stem
- put on the spring (4) and the valve body with O-ring (6)
- lubricate the friction surface inside the valve body with CARBAFLO 2160
- lubricate the thread and the O-ring (6) with CARBAFLO 2160 and screw the prepared assembly into the manifold block
- place the washer (8), pad (14), lever (12)(13) and screw in the pin (11) [1 N.m] – secure it with Loctite 243
- verify the clearance between the lever and the pad (14) it should be approximately 0.3 mm (0.012”). If necessary, remove or replace the washer (8) (secure the pin (11) with Loctite 243)
- screw in the bolt (9) – don’t screw it fully but secure with Loctite 243
- lubricate the friction surface on the pad and the lever with CARBAFLO 2160

NOTE	After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized manifold block (pressure of 12 bars is to be used) – see chapter 5.3.1.1 Rubber Seals and O-rings – Leak test.



Picture 6

1. M3x10 Flange Button Head Hexagon Socket Cap Bolt (1116)
2. Stem flat sealing (53274)
3. Manifold block (58128)
4. Main whisper/PL valve spring (53275)
5. Main whisper/PL valve stem (53282)
6. O-ring 17.86 x 2.62 (3299)
7. WB/PL valve body (53285)
8. Lever washer 0.3 / 0.5mm (53180)
9. M4x10 Hexagon socket set bolt with cone point (3564)
10. O-ring 5x1,75 (2826)
11. Lever roll pin (53196)
12. Main whisper burner lever - left/right (58133.10/58133.11)
13. Pilot burner lever - left/right (58133.00/58133.01)
14. Lever pad (58132)

Pilot light valve

The procedure of disassembling and assembling the pilot light valve is the same as the procedure on whisper burner valve.

5.3.2.5 Disassembling the Whisper Burner (WB), Pilot light (PL), Piezoelectric Ignition and Pressure Gauge (B)

	B	C	D

Whisper Burner

Disassembling

- unscrew the WB body (3) from the manifold block and remove the O-ring (4)

Assembling

- place the O-ring (4) on the WB body (3), lubricate the thread and O-ring with CARBAFLO 2160
- screw the WB body (3) [8 N.m] into the manifold block

Pilot light and pressure reducer assembly

Disassembling

- unscrew the assembly - PL with the pressure reducer (2) from the manifold block and remove the O-ring (4)
  Assembling
- place the O-ring (4), lubricate the thread and O-ring with CARBAFLO 2160
- screw the assembly - PL with the pressure reducer (2) into the manifold block [8 N.m]

Piezoelectric igniter

Disassembling

- loosen the bolt (9) - no need to unscrew it fully
- clean the dirt from the surface of piezoelectric ignition (12) and if necessary, lubricate the surface with CARBAFLO 2160
- remove the piezoelectric ignition (12) from the manifold block
- remove the O-ring (11)

Assembling

- place the O-ring (11)
- lubricate the surface of the piezoelectric ignition (12) with CARBAFLO 2160 and insert it inside the manifold block
- set the position of the piezoelectric ignition against the PL head, the igniter needle is to be placed 3-4 mm (approx. 1/8”) from the clearance of the PL head
- screw fully the bolt (9) [1 N.m]

Pressure gauge

Disassembling

- loosen the bolt (5), no need to unscrew it fully
- remove the gauge case (8)
- unscrew the pressure gauge (7) from the manifold block, hold the gauge carefully from its metal side
- remove the O-ring (6)

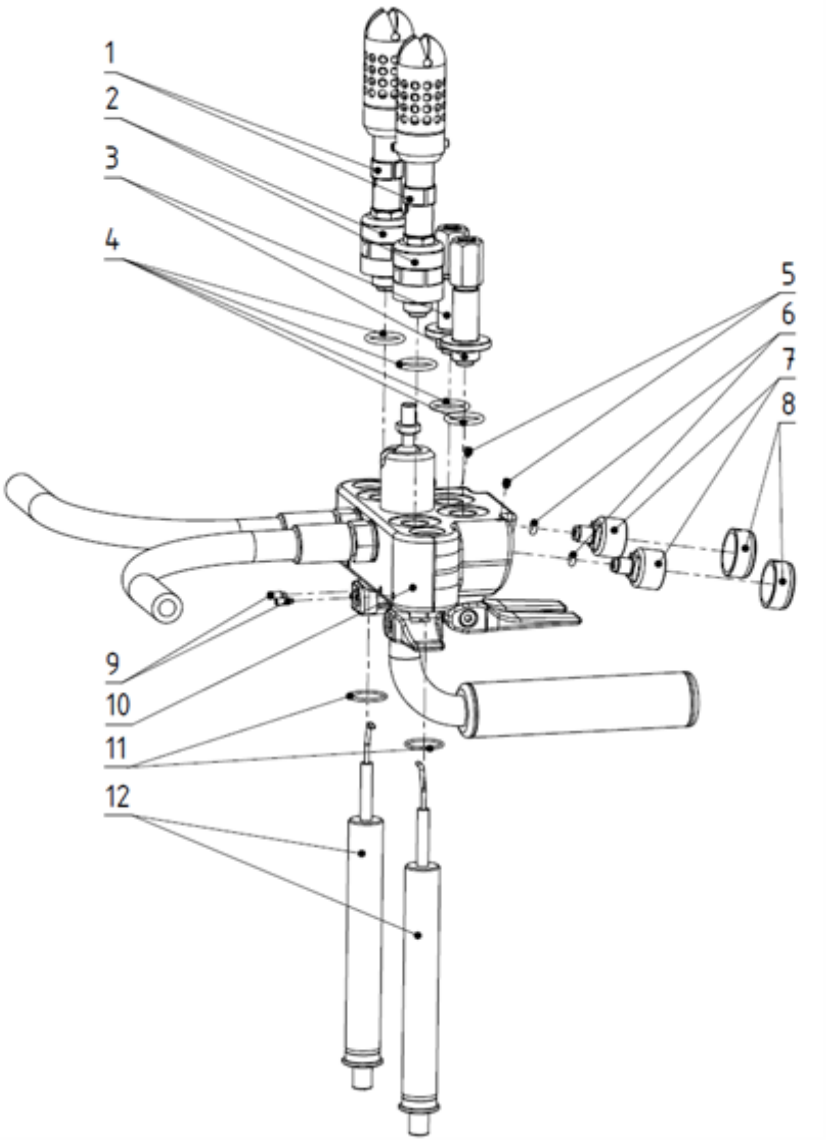
Assembling

- place the lubricated O-ring (6) in the bottom hole in the manifold block
- wrap the pressure gauge thread with PTFE tape (5-7 layers) and screw it into the manifold block
- set the gauge in correct position
- insert the gauge case (8)
- fix the gauge case with the bolt (5)

NOTE	After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized man ifold block (pressure of 12 bars is to be used) – see chapter 5.3.1.1 Rubber Seals and O-rings – Leak test.

Picture 7

1. Pilot light setting ring (53208)
2. Pilot light and pressure reducer (assembly)
3. Whisper burner body (53125)
4. O-ring 17.86 x 2.62 (3299)
5. M4x6 socket head cap bolt (3367)
6. O-ring 3 x 2.4 (2972)
7. Pressure gauge (4108)
8. Pressure gauge cover (58131)
9. M4x10 Hexagon socket set bolt with dog point (3564)
10. Manifold block (58128)
11. O-ring 19.5 x 1.5 (2973)
12. Piezoelectric ignition (53114 - assembly)



	B	C	D

5.3.2.6. Pressure Reducer (PR) and Pilot Light (PL) disassembling (B)

Disassembling

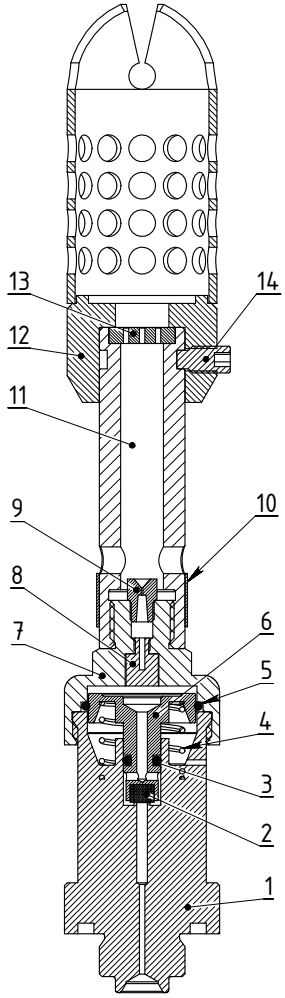
- remove the pilot light head (12) by loosening the bolt (14)
- remove the PL jet ring (13) and the PL setting ring (10)
- unscrew the PR upper body (7) from the lower body (1) and remove the spring (4)
- remove the piston (6)
- sealing (2) is glued in piston and isn't possible to change it separately – only the whole piston
- remove the O-ring (3)
- unscrew the pilot light tube (11) from the PR upper body (7)
- unscrew the PR jet (9) and the PR filter (8)

Assembling

- screw in the PR jet (9) [1 N.m] and PR filter (8) inside the PR upper body (7)
- lubricate the O-ring (5) with CARBAFLO 2160 and place it to the PR upper body
- lubricate the hole in PR lower body (1) and O-ring (3) with CARBAFLO 2160
- insert the piston carefully into the PR upper body (7)
- place the spring (4) and screw the PR upper body (7) [8 N.m] and the PR lower body (1) together
- screw the PL tube (11) [8 N.m] with the PR upper body (7) and place the PL setting ring (10)
- place the PL jet ring (13) on the PL tube (11) and screw the bolt (14) [1 N.m] inside the PL head (13)

NOTE	After assembling it is necessary to check the parts which has to be sealed by leak test on pressurized man ifold block (pressure of 12 bars is to be used) – see chapter 5.3.1.1 Rubber Seals and O-rings – Leak test.

Picture 8



1 – PR lower body (53281.001)

2 – Top sealing (part of piston)

3 – O-ring 4 x 1,6 (2810)

4 – PR spring (53165)

5 – O-ring 19,5x1,5 (2973)

6 – PR piston (53294.02)

7 – PR upper body (53137)

8 – PR filter (2828)

9 – PR jet (2795)

10 – Pilot light setting ring (53208)

11 – Pilot light tube (53141)

12 – Pilot light head (53117.001)

13 – Pilot light jet ring (53152)

14 – M5 x 10 Hexagon socket set bolt with cone point (2974)

5.3.3 Troubleshooting

	B	**C**	**D**

5.3.3.1 Pressure Gauge Repairs (B)

<u>If a needle doesn't point to zero pressure when fuel supply is disconnected and main whisper burner lever open:</u>

- Remove the glass and set the needle correctly. After adjusting the needle position make sure the pressure gauge works correctly by pressurising it to at least 0.5 MPa. It is possible to use a nitrogen for pressurisation and verifying the pressure with another correct pressure gauge.
- Replace a non-functional pressure gauge with a new one.

<u>Leakage around the thread</u>

- Unscrew the gauge and check the O-ring, remove the old PTFE tape and check the thread. Wrap with approximately 6 layers of PTFE tape and lubricate the O-ring.

	B	**C**	**D**

5.3.3.2 Pilot Light (B)

If the amount of flame is too small, unstable or too big:

- Check the pressure in a fuel cylinder by the pressure gauge on a manifold block
- Adjust by the PL setting ring the volume of air intake. The amount of air can be regulated by moving the PL setting ring up/down which opens or closes the intake holes. Never close the holes fully.
- Clean the PL jet ring.
- A spring in the pressure reducer should be replaced with a new one.

If the burner extinguishes despite:

- Clean the PR jet and check the hole inside this jet.
- Check the PR filter which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Clean a chamber in the pressure reducer and a hole in the PR lower body.
- Check the piston with the flat sealing and the O-rings.
- Check and lubricate both the O-rings on the piston with CARBAFLO 2160.

NOTE	While fed by a low-quality fuel the Pilot Light function may be degraded due to blocking the pressure reducer with oil segregated from the fuel. This is indicated by a weak flame and the jet stained with oil. A pressure reducer, which is only little dirty, can be cleaned by operating on a clean propane which forces the oil out. Let the Pilot Light burn for at least 2 hours. It is recommended to adjust the flame after the cleaning.

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Clean the PR jet and check the hole inside this jet.
- Check the PR filter, which must not be blocked with dirt or carbon deposit, if necessary change it for a new one.
- Check the PL valve and especially a lubrication on the stem.

5.3.3.3 Whisper Burner Valve, Pilot light Valve (B)

	B	**C**	**D**

Valve control is too stiff, or the valve doesn't seal:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the condition of the O-rings of the stem and guiding surfaces of the valve body. If the O-rings are damaged, replace them.
- Clean the friction surfaces and lubricate the O-rings with CARBAFLO 2160 (fill up the grove in the middle of O-rings).
- Lubricate the friction surface in the valve body.

If the flame doesn't extinguish soon after closing the lever:

- Lubricate the friction surface on lever and pad with CARBAFLO 2160 and keep it clean.
- Check the stem flat sealing. If the flat sealing is damaged, replace it and clean well the bearing surfaces.
- Check the clearance between lever, pad and washer. The leaver should have clearance in close position of the lever.
- Check the spring for permanent deformation, in such a case replace the spring with a new one.

5.3.3.4 Piezoelectric Igniter (A)

A	**B**	**C**	**D**

- Check the position of the piezo igniter needle. Clean carbon deposit from the ceramic part, needle and surface on the PL head.
- Set the correct position of the needle (the clearance between needle and PL head should be 3-4 mm).
- The malfunction can occur due to condensation and moisture inside the igniter, dry it well.
- Replace the non-working igniter with a new one.

SECTION 6 – INSTRUMENT REPAIRS AND MAINTENANCE

6.1. Maintenance

Kubíček Factory is not manufacturer of balloon instruments, therefore their repairs and maintenance are not included in this Manual.
In case of any malfunction contact the instrument manufacturer.

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SECTION 7 – INSPECTION SCHEDULE

7.1 General

This section describes inspection schedule for all KF and Aerotechnik balloons.

7.2 Scheduled Inspections (B)

	B	C	D

1. Balloons: 100 hour/annual inspection - Sec. 7.4
2. Fuel tanks: 10- year inspection - Sec. 7.16.3

NOTE	*Parts manufactured by other manufacturers must be inspected in accordance with the inspection schedule defined by this manufacturer.*

7.3 Unscheduled Inspections (B)

	B	C	D

Unscheduled inspections are inspections which must be performed as the conditions dictates. They are as follows:

1.	Pre-flight Check	Flight Manual B.3102 - Chapt. 4
2.	Envelope Overheat Inspections	Sec. 7.19.1
3.	Powerline Contact Inspections	Sec. 7.19.2
4.	Hard Landing Inspection	Sec. 7.19.3
5.	Test Inflation After Repair	Sec. 7.19.4

7.4 100 Hour/Annual Inspection (B)

	B	C	D

Each balloon must be inspected every 100 hours of operation, or annually, whichever comes first.
Such an inspection must be accomplished by a properly certified and rated inspector under national authority of the country of a registration.

NOTE	*The inspector, when approving a balloon for return to service after annual/100 hour inspection, is assuming responsibility for the complete system. He is certifying that the aircraft meets all applicable regulations and directives and all applicable manufacturer's standards, to include the airworthiness of all prior repair work. This is an important point, particularly if repairs have been made without proper documentation and entries in the aircraft records. If the inspector finds that prior repairs were not made in a legal and safe manner, the repairs must be redone.*

NOTE	*There is no difference in the parts inspected during an annual or 100 hour inspection .*

The 100 hour/annual inspection must include all items listed in the 100 Hour/Annual Inspection Checklist - see Appendix 3.

7.4.1 Documentation of the 100 Hour/Annual Inspection

Each 100 hour/annual inspection must include:
1. Total flight time on the balloon
2. Any Service Instruction/Service Bulletin/Airworthiness Directive that have been complied with
3. Any repairs, installations, modifications or alterations made

7.5 - 7.14 Not Used

7.15 Inspection Criteria / Techniques (B)

	B	C	D

7.15.1 Documentation

Before starting the physical inspection of the equipment first confirm that all the serial numbers of the component parts of the balloon are the same as those that are listed in the balloon's log book. If there are any differences then the list of equipment in the log book is to be revised by the inspector. Aircraft compatibility must be verified in accordance with the Flight Manual and, for combinations according to SB22b-1.

Studying the balloon's log book and previous inspections will give an indication of the balloons age, the number of flying hours that it has made, any previous grab tests and recent repairs.

Check that all applicable service bulletins and ADs have been made and recorded in the balloon's log book. A list of Service Bulletins which may apply to the balloon can be found on the KF website. If there is no mention in the logbook of a relevant Service Bulletin having been completed then contact KF.

Ensure that repairs conform to the manufacturer's recommendations and have been made by a repairer considered competent by the authorities and in accordance with this Manual (see chapt. 1.3. Maintenance Categories) to make such repairs.

When inspecting the balloon have the manufacturer's manuals to hand so that any repairs or modifications can be checked against those approved by the manufacturer.

7.15.2 Envelopes

7.15.2.1 General

An inspector may consider that a grab test is required under the terms of 'at inspectors discretion' if any one of the following is present: fabric porosity, fading of the fabric, fungal attack or a suspicion that the logbook does not accurately reflect the hours that the envelope looks as though it has flown.

7.15.2.2 Envelope Fabric

All fabric repairs, other than permitted damage (see FM Chap. 2), must be within the specified limitations (see MM Chap 3.2) and have been made using approved methods. Indications for a grab test at inspectors discretion include fabric porosity, fading, fungal attack or a suspicion that the logbook does not accurately reflect the hours flown. If substantial porosity is suspected a flight test should be performed but only after a grab test has demonstrated that the balloon is airworthy.

All the seams on the envelope should be inspected with particular emphasis on parachute edges and all areas adjacent to the points were pulleys, parachute centralising lines and rip lines are attached.

Wear or abrasion of the tape is permissible providing the stitching remains intact and the longitudinal yarns have not come away from the main body of the tape.

7.15.2.3 Crown Ring

The crown ring should be free from damage or corrosion. Light surface corrosion or minor surface damage that could abrade the load tapes may be removed with fine sandpaper. Note any damage or corrosion in the balloon logbook. Damaged or more seriously corroded crown rings must be replaced.

7.15.2.4 Load Tapes

All load tapes should be inspected **along the entire length** with particular emphasis on the points of highest potential wear; these are crown ring and flying wire attachment loops and the points where load tapes cross above the parachute, Smart, Slide or Lite Vent. If the balloon has been tethered extensively then the load tapes on the underside of the envelope should be carefully inspected.

7.15.2.5 Steel Flying Wires

Flying wires must be made from stainless steel. The ferrules and thimbles on each flying wire must be in good condition and there may be no more than eight broken or damaged strands in each wire. Discolouration of the wires is acceptable provided that the wire has not lost its springiness. Wires that do not meet these criteria must be replaced.

To test a flying wire for acceptable springiness, take hold of a 300mm section of flying wire between finger and thumb at each of the section. Bend the wire so that the sections you are holding touch each other. Release the wire and hold the section vertically. If the wire does not hang straight and has taken up a permanent bend at this section after the test, the wire should be replaced and scrapped.

If inspecting the envelope after power line contact look particularly at the flying wires. There must be no electrical damage to the wires and the attachment loops on the envelope must be undamaged.

7.15.2.6 Kevlar Flying Wires (if fitted)

If used, inspect the Kevlar flying wires. Their elasticity must not be reduced along the entire length, all wires must be free of heat or mechanical damage, the Nomex cover must not be excessively worn so that the yellow rope core would be exposed.

7.15.2.7 Carabiners

Inspect the carabiners to make sure that they are not distorted, that their hinges work correctly, that the gates close correctly and that they have no scores in them that are deeper than 1 mm (0.04“). Damaged carabiners must be replaced. Only light surface corrosion is acceptable.

7.15.2.8 Titanium Rings (if fitted)

Inspect the titanium rings to make sure that they are not distorted and that they have no scores in them that are deeper than 1 mm (0.04“). Damaged rings must be replaced. Only light surface corrosion is acceptable.

7.15.2.9 Quick Link Carabiner (if fitted)

Inspect the carabiners to make sure that they are not distorted, that their thread is screwed tight and sealed, and that they have no scores in them that are deeper than 1 mm (0.04“). Damaged carabiners must be replaced. Only light surface corrosion is acceptable.

7.15.2.10 Envelope Windows (if fitted)

Any damage that penetrates the transparent material is not acceptable. The stitching should be undamaged and the stitch holes must not be elongated.

7.15.2.11 Control Line Pulleys

All the pulleys should be inspected for wear, condition, security and damage. No damage or wear is acceptable.

Pulleys should be in good condition, free to rotate and be securely attached to the envelope. Check the pulley for axle wear by attempting to move the pulley sheave within the body of the pulley. Excessive movement indicates a worn axle. Where pulleys are attached with a twisted shackle, ensure that the wire tie is present and the shackle pin is secure.

7.15.3 Baskets

7.15.3.1 Basket Wicker

Inspect the sides of the basket for damage and the area where the woven sides join the solid floor. Damage to the wicker, greater than 10 cm (4“) in both horizontal and vertical dimensions, is to be repaired by reweaving. There may be no sharp protrusions inside the basket that might cause injury .The weave should be sound and without rot, fungal attack or woodworm. The wicker should be flexible and not so dry that it breaks easily.

It is acceptable for two adjacent upright canes to be broken, provided the next three uprights on either side of the damaged area are intact. However, no damage is allowed on a vertical cane or manila forming the edges of step holes or the holes for tank straps. Also no damage is allowed to big manilas along the basket wires and those located at the connections of inner walls and side walls. There should be no areas larger than 10cm x 10cm (4“ x 4“) in both the horizontal and vertical dimensions in which the weave is worn below to 60% of its original thickness.

7.15.3.1.1 Collapsible Basket K10C, K13C and ORIGO Fabric Sidewalls

Inspect the inner and outer sides of the basket, zippers and all sidewalls components. Damage to the fabric greater than 2 cm (crack lenght) or greater than 5 cm in one of the layer is to be repaired by resewing or replacement. No damage to the zipper spirals or to threads that attaches the zipper spirals is allowed. In such case the zipper must be replaced.

7.15.3.2 Basket Frames

Inspect the frames of the basket for cracks, distortion or splits in the metal. Look particularly at all the metal joints. In order to inspect some areas fully it may be necessary to peel back or remove the suede or leather covering.

7.15.3.3 Basket wires

Inspect the basket wires throughout their visible length concentrating particularly on the points where the wires enter metal frames. Throughout the length of the wires not more than 8 individual strands may be broken or damaged. Check that the thimbles and ferrules are in good condition and that the wire turn back is protruding correctly and that there is no sign of the wires pulling through the ferrule.

Rig the burner and basket in the normal way, connect the basket wires and check that they are not slack. Pull the centre of each basket wire in turn in the centre away from its burner rod. The maximum distance that the wire can be pulled away from the pole should be not greater than 16.5 cm (6.5 in).

If inspecting the basket after the balloon has been in contact with power lines then all the wires must be replaced.

7.15.3.4 Basket Floor

Inspect the floor and load bearing frame or skids on the underside of the basket. Minor damage limited to one side of the floor is acceptable. Cracks that penetrate the floor may not exceed 50 cm (20“) on either side of the floor. Any repairs to the basket floor must have been made in accordance with this manual. No part of the load bearing frame or basket runners may be broken or cracked through more than 25% of its original thickness.

7.15.3.5 Basket Leather and Rawhide

Inspect the leather or rawhide on the lower edge of the basket. Scratching and scuffing to the leather is acceptable but there should be no holes where the edge of the basket floor or basket wires can be seen.

7.15.3.6 Cylinder Straps

Check the straps for wear or damage. Metal locks must be undamaged and securely attached to the strap. Webbing may not be worn through more than 15% of its original width or thickness.

7.15.3.7 Pilot Restraint Harness (if fitted)

Check the condition and function of all buckles, quick release and fittings. Check the condition of the belt and its stitching. No damage on the belt is allowed.

7.15.3.8 Basket Wall Straining Beams (if fitted)

Check the tapes and metal for wear and damage. No more than 15% of the original tape width may be worn. If the straps are too loose, tighten the turnbuckles in the lower part. Adjust tension of both tensioners accordingly to keep correct shape of the basket.

7.15.3.9 Basket Door

Inspect the door mitel parts for cracks, distortion, splits or corrosion. Check condition and function of hinges, hinge pins and securing carabiners.
Check the condition of the wickerwork and upholstery. The same criteria as for respective parts elsewere on the basket apply.

7.15.3.10 Passenger Seat

Steel trestle:
Inspect the structure for deformation, cracks and corrosion. Check the condition of the corner attachment pins.

Floor attachment parts:
Inspect he condition of corner plates and center nut. Check the function of the center bolt. Check tightening of self locking nuts on corner plates (if fitted).

Composite seat:
With the upholstery removed as possible inspect the seat. Pay particular attention to the area near the bolts. Minor surface wear such as scratches are acceptable, but not delamination or cracks exposing the glassfibre.

Restraint harness:
Check the restraint harness for wear or damage. The buckle must be functional correctly and the straps may not be worn through more than 15% of their original width.

7.15.3.11 Removable Partition

Inspect the removable partition in the same way as a basket door, pay particular attention to deformations and the function of attachment elements.
Inspect the entire structure of the partition for permanent deformation, mainly the longitudinal partition and upper edges in general. In case of excessive deformation that precludes proper locking of hinges or floor locks the partition needs to be repaired or replaced.

7.15.3.12 Collapsible Baskets K10C and K13C hinge joints

Disassemble the pins of upper and lower frames. Inspect the pins and hinges. Lubricate pins and flat surfaces of the hinges with the graphite vaseline Attila SA 2M and assemble them back.

7.15.4 Burner and Frame

7.15.4.1 Burner Frame

Check that the burner frame is undamaged and that it has not been repaired. Pay particular attention to the welds that should be undamaged and show no signs of cracking - pay attention to the gimbal block attachment point. Check that the burner gimbals correctly and that there is no damage to the Cardan joint. Inspect the pivoting burner frame sockets, securing bolts and rings.

7.15.4.2 Liquid and Vapour Hoses

Check that the hoses are to the correct specification (EN 853 or EN 857). Inspect them both visually and by flexing them along their entire length. Look for damage, abrasion, cuts, and cracking; a visible sign of ageing. No steel braiding should be visible and the hose must be flexible. Kinks, bulges and dents in a hose are not acceptable and the hose must be replaced. Check the condition of the end fittings damaged or corroded fittings must be replaced. If the swagged end of a hose is damaged then the hose must be replaced. Check the 10-year lifetime limitation is not exceeded.

7.15.4.3 Burner – Functional Checks

Inspect the condition of the burner. Check for corrosion on the top surfaces of the burner manifold block, if necessary, clean top surface of burner from dirt. The burner should be complete and undamaged. Pay particular attention to the burner coil – make sure that there is no damage. Check that the burner jets are secure and that the burner pivots correctly.

Connect fuel supplies to the burner. Before turning the fuel and with all the burner controls turned off, check that the fuel gauge on the burner reads zero. Check that, as the fuel supply is turned on, the fuel gauge reads correctly and that there are no visible leaks in the system. Check all hose connections, manifold joints and valves for leaks.

On the first burner unit:

Open the pilot light and ignite it using the piezo igniter. A maximum of 5 piezo presses should be sufficient to achieve ignition. The flame should burn steadily once lit. Close the pilot light and make sure that the flame extinguishes within 5 seconds after closure. Check for leaks around the pilot light. Repeat the operation three times to ensure repeatable operation.

Open the main blast valve. Check that the flame pattern is correct and that there are no leaks from the coil or the manifold block. The ideal flame is yellow/orange with a blue base, stable, without deflection or side flare, and sufficiently long to extend beyond the mouth of the envelope. The flame pattern may vary depending on factors such as the type of fuel, pressure in the fuel cylinder, ambient temperature, altitude etc.

Run the burner for long enough to check that there is fuel coming from all the jets.
With the main blast valve closed open the whisper valve completely. Check that the flow of propane does not strike the burner coil, that its flame pattern is parallel to burner coil and that there are no leaks. Close the valve and check that the flame stops completely.

Turn off the fuel supply and vent the fuel lines.

Repeat these checks for each burner unit.

7.15.4.4 Adjustable Height Burner Frames

Check that the adjustable height system works correctly and that it ‘locks’ in a variety of positions. Inspect that the gas damper is not leaking.

7.15.4.5 Fuel Manifolds

Although not forming a part of the equipment of a certified aircraft, fuel manifolds (if fitted) should be inspected to the same standards as fuel hoses and tested in the same way. Check all joints for leaks.

7.15.5 Ancillary Equipment

7.15.5.1 Quick Release

Check the condition of the latch mechanism. Inspect for signs of distortion or wear. Check the operation of the latch and locking pin. Inspect the webbing strap for signs of wear, cuts, heat damage or degradation. If the webbing has any defects it must be replaced. Check the condition of the restraint rope for wear or damage.

7.15.5.2 Instruments

The best practice is to proceed according to the instructions of the instrument's manufacturer. If there are no specific instructions from the manufacturer available conduct the basic checks as follows:

Check the altimeter against the site elevation or against a calibrated reference altimeter. Change the position +/- 5m in up/down position to see the change on the display.

Check the variometer for initial needle deflection when switched on/off. Whilst on check, monitor that the needle deflects in the correct direction when moved sharply up or down. If a digital display is available check that the number changes when moving up/down.

If fitted, check the sensor (for electronic thermometer) by exposure to temperature above 40°C (104°F). If the sensor is not fitted, a temperature streamer with melting link must be in place and intact.

Check the display of instrument that it is clear to read.

Check the conditions of the batteries for self-contained instrument. If necessary, replace or recharge the batteries.

7.16 Fuel Cylinders (B)

	B	C	D

7.16.1 General

If there is any doubt whether damage or a defect found on a cylinder during an inspection is acceptable then KF or the manufacturer of the cylinder must be contacted and advice sought.

If a cylinder is unsuitable for further service as part of a hot air balloon then this means that it is also unsuitable for the safe storage of liquefied gases separate from the balloon.

If a cylinder is passed as acceptable as part of a hot air balloon this does not exempt the owner or operator from any other national or international regulations or legal obligations regarding propane cylinders in storage or transit.

7.16.2 Annual / 100 hour inspection

The inspection is to be carried out on a cylinder containing the fuel or pressurized to min. 7 bar so that a correct function and leakproofness can be verified.

7.16.2.1 Validity of the Last Inspection

Verify the date of the last 10-year inspection, the date is marked on the data plate.

7.16.2.2 Cylinder Body

Remove the outer jacket and protective padding.

Thoroughly inspect the entire outer surface of the cylinder. Pay attention to possible dents, scratches, bulges and corrosion. The dents may not be deeper than 25% of their diameter and without any sharp edges. The eventual minor scratches may not be deeper than 0.2 mm (0.008“) No sharp notches are allowed. No bulges are allowed. An eventual minor corrosion can be removed by polishing the surface with fine sandpaper.

Remove the rubber handhold from the upper rim annular tube. Inspect both upper and lower rims and annular tubes. Minor deformation is acceptable as long as the cylinder can stand stably, easy access and operation of upper fittings is not limited or no intrusion od rims to the upper or lower bottom is present.

WARNING	*The lower surface also must not get to contact with the surface!* *Carefully inspect all welds along their entire length. No damage is acceptable.*

7.16.2.3 Valves and Fittings

Carefully inspect all valves and fittings. No damage or modification is allowed.

Pressure regulator: Make sure the regulator is correctly tightened, eventually tighten its union nut if necessary.

7.16.2.4 Take Off Bosses

Inspect all couplings for damage and presence of dirt. No part of any fitting may protrude above the upper protecting ring.

Liquid phase take-off: Open the handle by 45° and verify tightness. If a Rego coupling is fitted, inspect its rubber seals for damage, wear or impurities. If necessary, replace them. (Face seal 3300.00, Rear seal 3305.00)

7.16.2.5 Tightness of joints

Apply a leak detector on all threaded joints, connectors, seals, valves and welds around bosses. A possible leak is indicated by bubbles.

7.16.2.6 Fuel Contents Gauge

Inspect the glass and needle for damage and verify readability of the dial. Check a correct function of the inner mechanism by rolling and leaning the cylinder - the needle should move.

NOTE	*Some cleaning agents containing agrressive substances may damage the fuel gauge glass.*

7.16.2.7 Functional Check

Liquid Take Off

Remove the dust cover if one is fitted. Carefully partly open the cylinder valve, be aware of possible propane leak. Check that there is no flow of liquid from the valve. Close the valve. Vent the liquid connector by depressing the central spigot with a plastic rod. Attach a burner hose to the cylinder valve. Check that all the burner valves are closed and then open the tank valve and using the leak detector check that there are no leaks from the hose to tank connection, from the valve operating mechanism or the valve stem where it enters the cylinder. Operate the burner for at least 15 seconds and check that the burner pressure remains constant. Turn the cylinder valve off and operate the burner until no more gas flows – this should take just a few seconds. Disconnect the burner hose, repeatedly (in 5 minutes) vent the liquid connector. After a short while (1 minute at least) check the tightness of the main tank valve by pressing of the central spigot (e.g. by using a plastic pin).

Maxfill Valve

Check for leaks around the base of the valve and the valve outlet. Open and close the valve to check that it operates correctly.

Vapour Take Off (if fitted)

Without a vapour hose connected open the vapour valve and check that no gas comes out. With the valve open check that there are no leaks from the joint between the regulator and the boss or around the base of the boss.

Connect a vapour hose, turn the vapour valve on, light the pilot flame and, whilst the vapour is flowing check that there is no leak from the vapour hose quick release using a leak detector. Turn the vapour valve on the cylinder off and make sure that the flame goes out and the flow of vapour stops. Check the correct function of flow reductor.

7.16.3 10-year Inspection (C)

		C	**D**

7.16.3.1 Cylinder Body Check

Check the cylinder body in the range of 100 hour/annual inspection.

7.16.3.2 Liquid Take-off check Valve

On the Rego coupling replace both rubber seals (Face seal 3300.00, Rear seal 3305.00). The Tema coupling has no replaceable parts.

Pressurize the cylinder with the air to 7 bar (100 psi). Verify the correct function of the check valve at the Rego or Tema coupling and the correct sealing and function of the check valve. In case the valve is defective, the entire coupling is to be replaced (Rego coupling 180.00, Tema coupling 2710.00). Secure the thread by Loctite 270.

7.16.3.3 Removal and Maintenance of Fittings

Remove the fuel contents gauge and inspect its correct function and condition of the float and gear mechanism. Verify the mechanism moves freely in the entire range.

Liquid phase take-off: Dismantle the ball cock assembly and replace the PTFE set of seal (3500.00), the new seals are to be lubricated with PTFE Carbaflo 2160 (2901.00). Inspect all parts and replace if any damage or wear is found.

7.16.3.4 Hydraulic pressure test

Remove the pressure relief valve. If fitted, remove the vapour phase take-off and install the blindening plug instead. Fill the cylinder through the fuel contents gauge hole with water in its maximum possible volume. Then install blindening plug onto the fuel contents hole.

Using a flexible measuring tape measure the circumference of the cylinder body in a half of its height. Connect the nitrogen pressurization to the liquid take-off fitting, open the valve and pressurize the cylinder to 30 bar (435 psi). Check all fittings for leakage and repeat measuring of the circumference. Note and compare both distances. The increment of circumference during pressuriation may not be greater than 0.5% of the circumference measured prior to pressurization. Release the pressure, disconnect nitrogen hose and remove both blindening plugs. Empty the cylinder and blow the inner space dry with hot air.

Inspect the inside of the cylinder using a suitable light for dirt and corrosion.

7.16.3.5 Re-installation of Fittings

Fuel contants gauge: Use a new gasket (3085.00) and re-install the contents gauge, secure the threads with Loctite 243.
Pressure relief valve: Install a new one. The pressure relief valve is either a stand-alone item (3466, on Standard cylinders) incorporated in the vapour valve (3188, on Master cylinders).
Vapour phase valve with pressure relief valve: No maintenance is required, the new valve with pressure relief valve is to be installed. The new valve may not be older than 5 years. The coupling may not protrude above the upper protecting rim.
Pressure regulator: Inspect all parts and replace by new ones if damaged. Then reinstall onto the cylinder.
Liquid phase take-off: Inspect the Rego or Tema coupling and replace if damaged (secure the threads with Loctite 270).

7.16.3.6 Pressure Test

Pressurize the completed cylinder with the air to min 7 bar (100 psi) and verify a propper sealing of all joints and couplings using a leak detecting spray. Then disconnect the air hose and maintain the inner pressure. Re-install the outer protective padding and its jacket.

7.16.3.7 Data Plate Marking

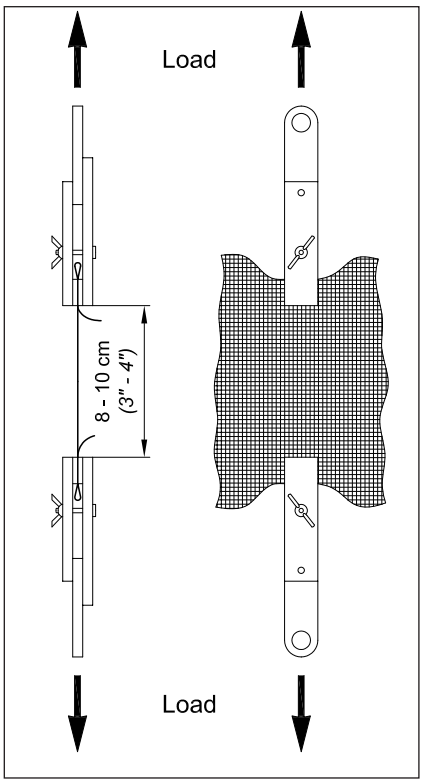
Engrave the mark and date of the 10-year inspection on the data plate. The details of the marking are determined by the requirements of the relevant authority of respective country. By performing the 10-year inspection the requirement for an annual/100 hr inspection is met.

7.17 Grab Testing (B)

	B	C	D

Perform the grab test:

1. For envelopes with more than 260 hrs
2. For significantly overheated envelopes (tempilabel indicates 138°C or more)
3. At inspector's discretion



Grab Test

7.17.1 General Practice

Standardly the envelope fabric is to be tested in these locations:

- About 2 m (6.5 ft) below the deflation system aperture rim, at 3 positions minimum, one time over a seam.
- If more fabric colours are used in this part of envelope, test each of them.
- If more than one type of fabric are used anywhere on the envelope (such as heavy fabric in addition to standard rip-stop), test each of them in its uppermost row of panels.

Besides the tests listed above the following envelope models require additional testing in these locations:

Envelope model XR, GP	Minimum three different locations below the deflation system aperture rim in the row of pannel/s No.:
All GP models	10-11
BB14XR, BB17XR, BB18XR, BB22XR	6
BB16XR	5
BB20XR BB20XR (up to S/N 2160 including)	6 5-6
BB26XR	7
BB30XR	6-7

For BB-S envelopes the standard grab test locations are to be tested. Additional testing is required at:

- The inner load ribs fabric.
- The panel at its widest part of the envelope.

For envelopes with 3D add-ons the standard grab test locations are to be tested. Additional testing is required on the fabric inside the envelope below the 3D add-ons.

When grab testing fabric it is important to apply the stress evenly over a specific area of fabric. The fabric must be gripped with the jaw edges carefully aligned so that the same fibres are being pulled from each end.

At O, E, N, Z, P, GP and XR envelope models the load is to be applied in horizontal direction, i.e. parallel to the horizontal load tapes.

At D and ED envelope models the load is to be applied in both directions of fibers (i.e. warp and weft) in each tested location. If the direction of fibers is diffucult to find just make the test in directions 45 degrees from a horizontal load tape on both sides.

The distance between the jaws must be 8 - 10 cm (3" - 4"). The edges of the clamp must be parallel to the fabric so that the fibres are loaded evenly. The jaws must be tightened so that the fabric does not move. One clamp should be held stationary and the other pulled away from it with a spring balance.

The load applied on the tested fabric: **13 kg (28.6 lb)**.

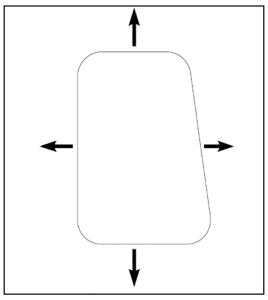
If the fabric withstands a pull of **13 kg (28.6 lb)** then it may be passed as airworthy.
If the fabric fails between **10 and 13 kg (22 and 28.6 lb)** then it may be passed as airworthy with the following limitations:

- The Maximum Take Off Weight (MTOW) is reduced by 10% from that published in the Flight Manual for the balloon.
- The balloon may only be flown under favourable weather conditions.
- Maximum wind speed for XR/M-type models take-off reduced to 5 m/s (10 kts)
- Maximum rate of climb and descent for XR/M-type models reduced to 5 m/s (1 000 fpm)
- The grab test must be repeated annually or after each 50 flying hours, whichever is the sooner
- The old fabric label (on the edge of bottom mouth) must be replaced with a new one indicating the reduction of the strength of the fabric. Contact KF to order new fabric label for the specific serial number.

If the fabric fails **below 10 kg (22 lb)** then all the weak fabric must be replaced.

7.17.2 Envelopes with Windows

On envelopes fitted with transparent windows the load test also need to be performed over the entire window both in horizontal and vertical direction to inspect strength of the transparent foil and the seam. The clamps are to be attached to the surrounding fabric, not the window itself.



Grab Test of the Window

7.18 Flight Test (B)

	B	C	D

If a Flight Test is to be carried out then a careful record of the weather conditions must be made along with all the parameters included in the test form. Contact KF before conducting a flight test and discuss with them whether there is any information that they will require in addition to that contained on the standard form.

A flight test must be made in stable air conditions and at a weight close to the MTOW for the size of envelope being tested. Unless otherwise directed by KF follow the instructions and record the details as specified in the Flight Test Report (see Appendix 1).

The balloon must only be test flown by a pilot holding an appropriate licence according to the requirements of the operator's local aviation authority.

7.19 Non-scheduled Inspections (B)

	B	C	D

Pre flight inspections are contained in the KF Flight Manual (document no. B3102), Section 4.

7.19.1 Envelope Overheat Inspection

If the maximum temperature indicated on the tempilabel is below than 138°C (280°F) then no further inspection is required. Replace the streamer in the balloon using a new melting link. For the correct location of temperature measuring equipment please see Appendix 4.

If the maximum temperature indicated is 138°C (280°F) or higher then:

1. Sew a new tempilabel alongside the original. Do not remove the original.
2. Inspect the envelope fabric in the top half of the envelope for signs of heat damage and grab test the top of the envelope as described in para 7.17.
3. Inspect the lines for heat damage and replace any that are damaged.
4. Record the dropping of the temperature streamer, the inspection of the envelope, the max temperature recorded on the old tempilabel, the fitting of a new tempilabel, the results of the grab test and any remedial repairs in the balloon's log book.

7.19.2 Powerline Contact Inspections

After contact with power lines the balloon must be inspected thoroughly as for an annual/100 hour inspection.
If any metal component of the envelope were affected, including flying wires extending downwards, all potentially impacted parts must be inspected and replaced as necessary (see Chapter 7.15.2.5).
Basket cables must **ALWAYS** be replaced if they have been in contact with electrical power lines (see Chapter 7.15.3.3).

7.19.3 Hard Landing Inspection

After a hard landing following items must be inspected for mechanical damage or malfunction according to instructions stated above:

- basket floor and floor runners
- nylor rods
- basket upper rim
- fuel cylinder straps
- burner frame
- fuel contents gauges on each fuel cylinder

7.19.4 Test Inflation After Envelope Repair

Whilst cold inflated an internal inspection of the envelope must be performed to make sure that the control lines are not tangled.
The test inflation should include a full hot inflation and cycling of all the envelope controls to confirm that they function correctly. For this inflation the balloon must be loaded to a minimum of 50% of its MTOW.

7.20 Life Limited Items (B)

	B	C	D

See section 2.5 Life Limited Items of this manual.

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SECTION 8 - APPENDICES

Appendix 1 - Flight Test Record

Date	Launch field	Altitude (AMLS)	Air temperature	QNH	Wind direction/speed

Time of climbing to 100 m (300 ft)		Empty weight (without fuel cylinders)	
Envelope air temperature during steady level flight		Full weight of cylinders	
Temperature after 30s		Load weight	
Descent after 30s		Take - off weight	
Fuel pressure			

Altitude AGL with the balloon descending 2 m/sec (400 ft/min) when heating was started		Altitude loss	
Altitude AGL with the balloon climbing at the 1 m/sec (200 ft/min) when heating was completed		Time of heating:	

Operation of the deflation system:	Operation of the rotation vent:	Operation of the rip panel:

Further observations, notices or found out failures:		
Take - off time:	Landing field and time:	Flight time:

Conclusion

The balloon flight test has been conducted in compliance with the approved scheme. Considering the balloon performance and the function of all components the requirements of airworthiness were:

☐ a/ met

☐ b/ met after correcting the identified failure

☐ c/ not met

Pilot in command

technical inspector

Record received on behalf of: Date: Signature: _ _ _ _ _ _ _ _ _ _

Appendix 2 - Kubíček Fuel Cylinders Maintenance and Repairs

A2.1. General

This chapter provides instructions for service and maintenance of fuel cylinders Kubíček KB72L, KB85L and KB97L, both Master and Standard variant. All techniques and procedures described below apply to KB72L, KB85L and KB97L that only differ in the length of cylindrical section, therefore in the volume.

A2.2 Precautions

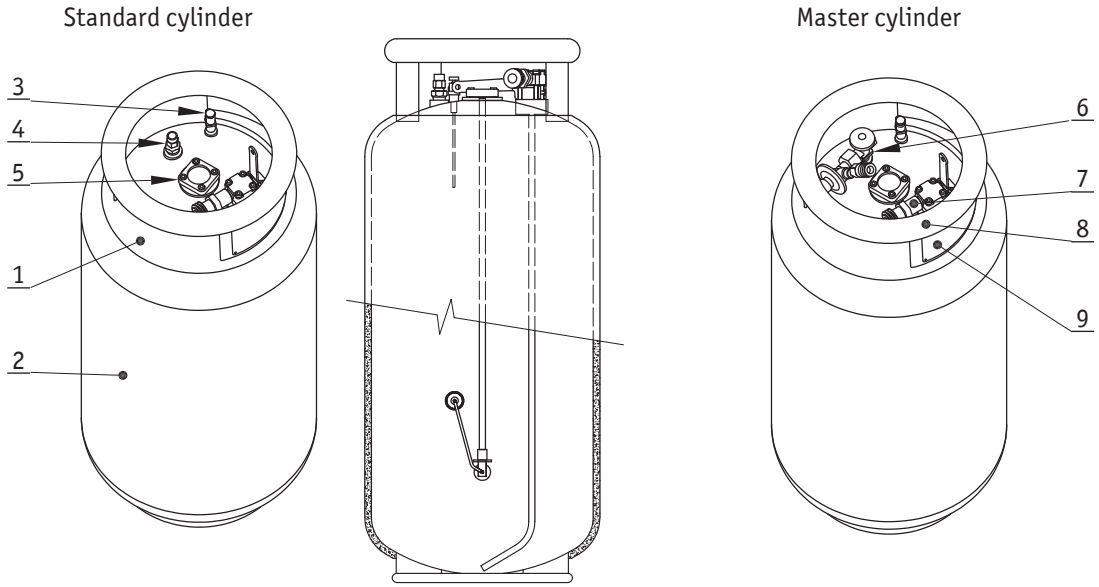
WARNING	*Prior to loosening any of the threaded joints on the cylinder fittings, the cylinder must be emptied from residual fuel:* *1. If possible, burn the maximum fuel by the burner, then disconnect the fuel hoses.* *2. Place the fuel tank in the ventilated outdoor area and vent the residual fuel by opening the maxfill valve.* *3. Purge the cylinder with nitrogen*

CAUTION	*It is essential that fuel cylinder burner repairs and inspections are carried out in a clean environment. The presence of dirt or chemicals may damage movable parts, rubber seals or bonded joints and cause contamination of the fuel, fuel leakage due to improper sealing.*

A2.3 Thread Sealing Means

The male conical threads are sealed either by EverSeal 183 sealant or by PTFE tape. If supplied as spare parts the EverSeal is already pre-applied, cured and prepared for installation. In case of re-installation of a removed part, clean the residual of the EverSeal with a soft steel brush and apply the EverSeal 183 on the male thread and let it cure before installation. Follow the instructions for the EverSeal 183. If the EverSeal is not available, use PTFE tape according to instruction provided in section 5.2.2.

A2.4 Main Parts of Fuel Cylinder



Main Parts of Fuel Cylinder

1 - Steel cylinder body
2 - Protective padding with outer jacket (55137 for KB72L, 55138 for KB97L, 55144 for KB85L)
3 - Maxfill valve (55133.01 for KB72L, 55133.02 for KB97L, 55133.03 for KB85L)
4 - Pressure relief valve (3466.00+55130.00)
5 - Fuel content gauge
6 - Vapour take-off including pressure relief valve (Master cylinders)
7 - Liquid take-off
8 - Rubber handhold (55136.00)
9 - Data plate

A2.5 Standard Maintenance Techniques

A2.5.1 Replacement of Rubber Handhold (A)

A	B	C	D

If damaged or worn the rubber handhold can be easily pulled out from the upper steel ring and a new rubber handhold ring put on without any tools.

A2.5.2 Replacement of Protective Padding (A)

A	B	C	D

Untie the cords in the upper and lower edge of the fabric jacket, loosen the edges and pull the jacket upwards to remove it from the cylinder. Then remove the protective foam upwards.

The re-installation is made in reverse order.

A2.5.3 Replacement of seals in Rego coupling (A)

A	B	C	D

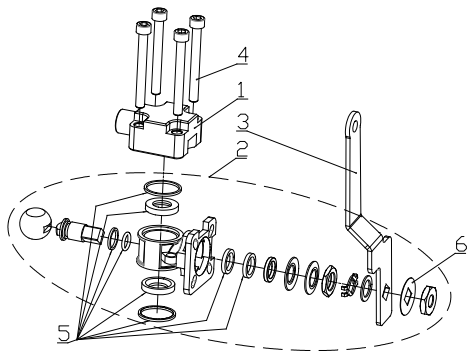
If damaged or worn the rubber seals in the male coupling of the liquid phase take-off can be easily removed for replacement. Use a flat screwdriver to extract the seals. Install the new seals. (Face seal 3300.00, Rear seal 3305.00).

A2.5.4 Replacement of Liquid Take-off (B) and New style of ball valve (B)

	B	C	D

Disassembly:
- unscrew the bolts (4) and remove the cock top (1)
- extract the PTFE seals (5) from the ball cock body
- if necessary, remove the handle after releasing its nut

Assembly:
- proceed in the reverse order as at disassembly
- install a new set of PTFE seals, pay attention not to damage the edges
- assemble in position 'Open'
- use Loctite 243 to secure the bolts on the ball valve and block adapter, and tighten them to 8 Nm in a criss-cross pattern.



Liquid Take-off Assembly

1 - Liquid phase ball cock top (*55115.01* for Rego coupling, *55115.02* for Tema coupling)
2 - Liquid phase ball cock set (*55134.00*)
3 - Liquid phase cock handle (*55135.00*)
4 - 4 x bolt M6x55 A2 DIN 912 (*3314.00*)
5 - Set of PTFE seals (3500.00)
6 - Ball valve lever securing washer 0,3 mm (57713.00)

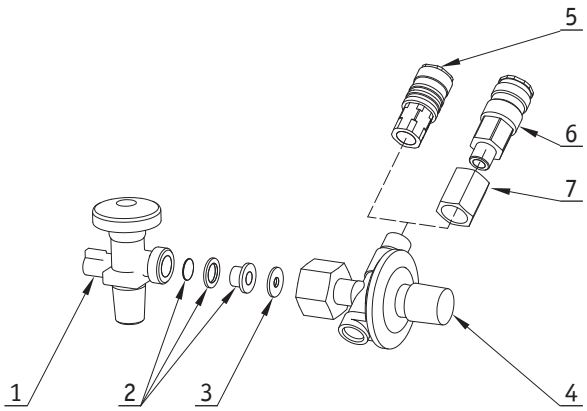
Liquid Take-off Assembly - New style of ball valve

1 - Liquid phase ball cock top (*55115.01* for Rego coupling, *55115.02* for Tema coupling)
2 - Liquid phase ball cock set (*55146.00*)
3 - N/A
4 - 4 x bolt M6x55 A2 DIN 912 (*3314.00*)
5 - Set of PTFE seals (3500.00)
6 - Ball valve lever securing washer 0,3 mm (55147.00)

A2.5.5 Replacement of Vapour Take-off (Master cylinders) (B)

	B	C	D

The entire assembly can be dismantled by unscrewing any of the threaded joints. The vapour valve including pressure relief valve is subjected to a mandatory replacement.



Vapour Take-off Assembly

1 - Vapour phase valve including pressure relief valve (*3188.00*)
2 - Set of seals (*3056.00*)
3 - Sealing ring (*3057.00*)
4 - Pressure regulator (*3352.00*)
5 - Tema coupling (*3133.00*)
6 - Dynaquip coupling (*3061.00*)
7 - Dynaquip coupling fitting (*3060.00*)

During a reassembly the threads on vapour phase valve and couplings are to be sealed with the Everseal.

Re-tightening the thread for the pressure reducing valve
Leaks may occur between the pressure regulator and the vapour phase valve under certain operating conditions, due to the force acting on the vapour hose via the long leverage of the couplings. Retighten the pressure regulator nut. Please note that the nut has a left-hand thread.

A2.5.6 Replacement of Pressure Relief Valve (Standard cylinders) (B)

	B	C	D

The pressure relief valve is an indivisible part with no replaceable items. If required, unscrew it from the cylinder body or adaptor and install a new one. The thread is sealed with the Everseal.

A2.5.7 Replacement of Maxfill valve (B)

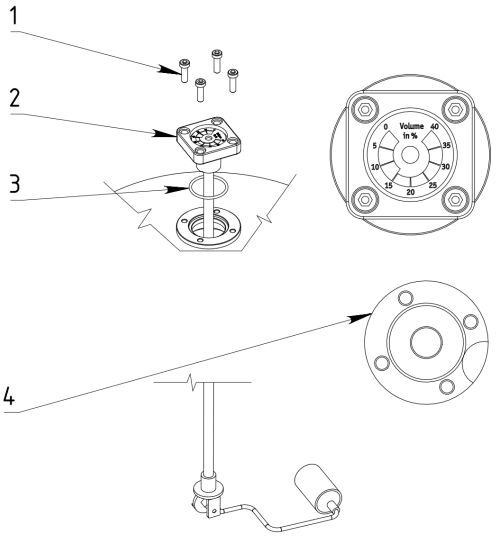
	B	C	D

The maxfill valve is an indivisible part with no replaceable items. If required, unscrew it from the cylinder body and install a new one. The thread is sealed with Everseal. The output nozzle is to be oriented towards an opening in the upper protecting sleeve.

A2.5.8 Replacement of Fuel Concents Gauge (B)

	B	C	D

Orientation of fuel contents gauge - top view



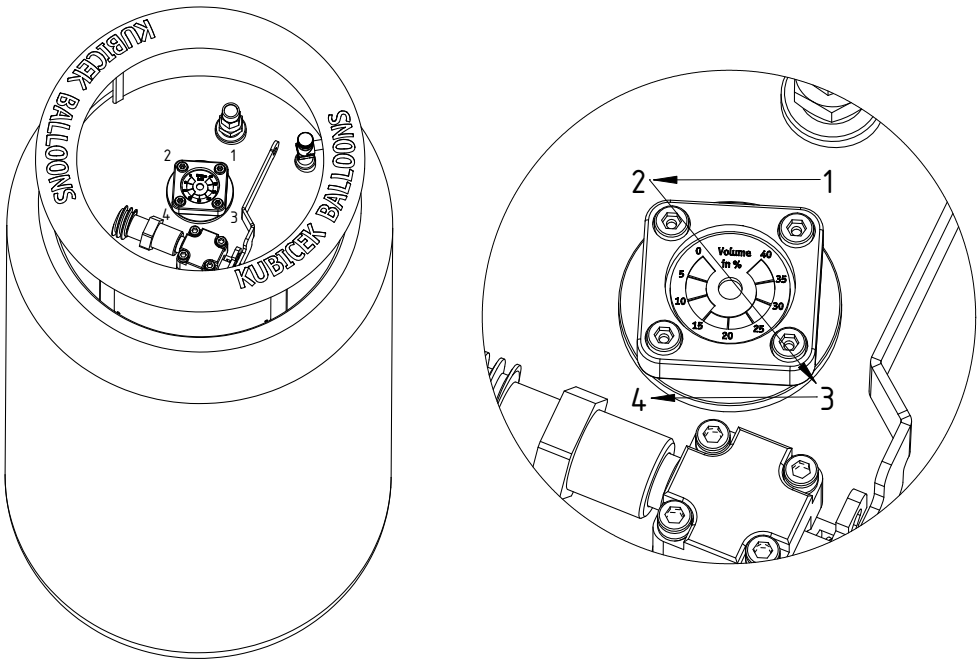
Fuel Contents Gauge Installation

1 - 4 x bolt M6x20 DIN 912 A2 (*2735.00*)
2 - Fuel Contents Gauge (*55132.01 for KB72L, 55132.02 for KB97L, 55132.03 for KB85L*)
3 - Fuel gauge sealing (*3499.00*)
4 - Liquid phase flange

The fuel contents gauge can be removed after unscrewing its screws (1). During reinstallation pay attention to a correct alignment of its sealing ring and correct orientation - the upper part ot the dial (“Volume“) must aim towards the liquid phase outlet as demonstrated at the picture. Use Loctite 243 for securing the bolts.

Tightening Procedure

1. Screw the screw (as shown in the picture below) into place using fingers only. Repeat the procedure with other screws. It is vitally important to **keep the order of tightening** presented in the picture! Other ways may disable the fuel gauge functionality!
2. Tighten the screws until feeling growing resistance using a torque wrench or standard hex key **with respect to previously presented tightening order**!
3. Tighten the screws properly using a torque wrench until the torque 8 [N·m] is reached. Again, **the tightening order must be respected**!



Appendix 3 - 100 Hour/Annual Inspection Checklist

Total Flight time:	Flight time since the last inspection:	Inspection date:	Inspector's signature:
Final result: The balloon is considered airworthy: YES / NO			

1. Balloon Parts Identification

	Type	S/N		Type	S/N
Envelope			Fuel Tank 1		
Basket			Fuel Tank 2		
Burner			Fuel Tank 3		
Instrument			Fuel Tank 4		
Remarks:			Fuel Tank 5		
			Fuel Tank 6		
			Fuel Tank 7		
			Fuel Tank 8		

2. Paperwork (Balloon Documentation)

Document	Check/Inspect	Pass /Fail ✓ / ✗ N/A
Balloon Logbook	Equipment listed; balloon age and hours flown; maintenance repairs and modifications since last revision	
Certification of Airworthiness	Present	
Registration Certificate	Present	
Flight Manual	Present. The latest issue mandatory for the balloon	
Maintenance Manual	The latest issue is mandatory for performing the inspection	
Applicable Service Bulletins / AD	Check that all applicable service bulletins and ADs applicable for the balloon have been carried out	
Findings / Remarks:		

3. Envelope

Part	Check/Inspect	Pass /Fail ✓ / ✗ N/A
ID plate	Present, numbers match logbook	
Fabric panels (incl. parachute and turning vent, if fitted	Gore-by-gore inspection completed, any discrepancies/repairs noted in the logbook	
	Unacceptable holes, cuts, melt damage and abrasions repaired. Unrepaired damage is within tolerance given by Flight manual sec. 2.6.	
	Previous repairs are performed correctly and according to maintenance manual	
	No un-repaired stitching damage / seam separations	
	No substantial fabric porosity is suspected	
	Note: If substantial fabric porosity is suspected then a flight test should be performed, but only after a grab test has demonstrated that the balloon is safe to fly (sec. 7.17).	
Fabric strength (grab testing)	Perform the grab test (see sec. 7.17) 1. For envelopes with more than 260 hrs. 2. For significantly overheated envelopes (tempilabel indicates 138°C or more) 3. At inspector's discretion.	
Crown ring	In place; no corrosion; no burrs	
	Note: Minor surface roughness, burrs or abrasiveness can be removed by careful filing or sanding with fine emery cloth.	
Crown line	In place, undamaged and has appropriate length.	
Vertical load tapes	Gore-by-gore load tape inspection completed	
	No damage or errors to load tapes along entire length (bottom-to-top inspection performed)	
	All load tape stitching and joins secured	
	No damage to load tape /envelope wire connection	
	No damage to load tape /crown ring connection	
Horizontal load tapes, parachute edge tape, base tape	No damage or errors to load tapes along entire length	
	All load tape stitching and joins secured	
	No damage to joins between base tape and vertical load tape	
Flying wires	No heat damage, no reduction of flexibility. *Note: discoloration of the wires is acceptable provided that the wires have not lost their springiness*	
	Wire attachment sewing intact.	
	Wire attachment covers undamaged	
	Steel wire - No abrasion, damage or kinks	
	Steel wire - Maximum 8 broken strands	
	Steel wire - No distortion of thimbles or ferrules, no sharp edge. Wire swaging in the good condition. Thimbles secured.	
	Kevlar wire – yellow core is not visible	
	Kevlar wire – splice undamaged	

Part	Check/Inspect	Pass /Fail ✓ / ✗ N/A
Carabiners	No damage than scores up to the depth of 1 mm (0.04“)	
	No distortion; no corrosion or rust	
	Spring-gate returns to the closed position	
	Threaded lock functions properly	
Titanium rings (if fitted)	All rings in place (if used, titanium rings have to be used at all attachement points	
	No damage than scores up to the depth of 1 mm (0.04“)	
	No distortion; no corrosion or rust	
Quick link carabiners (if fitted)	No damage than scores up to the depth of 1 mm (0.04“),	
	No distortion; no corrosion or rust	
	Threads sealed up and screwed tight	
Melting link	Melting link and temperature streamer correctly attached	
Tempilabel	Tempilabel checked.	
	If the maximum temperature indicated is 138°C or more, perform overheating inspection (par. 7.19.1), install a new tempilabel and note in the Log book	
Envelope window (if fitted)	Window material without any tears and cracking	
	The surrounding tape on the envelope inner side undamaged	
Finding/remarks:		

4. Deflation System and Rotation Vents

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
Velcro tabs	In good condition	
Free tapes	Inspect condition of stitching at ends of tapes	
Centralizing/shroud lines	No damage, flexible	
	Correct length	
	Envelope and parachute attachment points undamaged and stitching secured.	
	Knots secured	
Parachute fit	Overlap equal around circumference. Visible seal between parachute and hole edge. No daylight visible.	
Top lines (FDS, paralite only)	In good conditions, all knots secured, no abrasive damage	
FDS pulleys	In good conditions, roller spins freely	
Control lines	Correct length (including enough reserve for windy inflation)	
	Core not visible, line flexible	
	Knot secured, free end in good condition	
Control lines attachement loops	Tapes undamaged	
	Stitching secured and undamaged.	
Control lines pulleys	In good conditions, roller spins freely	
Lite Vent/Paralite weight (if fitted)	Present, not damaged. Attachment secured.	
Rip panel lock (if fitted)	Fully functional	
Rotation vents pulling triangles	Stitching in good condition	
Findings/remarks:		

5. Basket

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
ID plate	Present, mounting secured	
Wicker	No hole exceeding 100 mm (4 in)	
	No sharp protrusion inside/outside the basket	
	No sign of rot, fungal attack or infestation	
	Number of broken vertical strands acceptable - see Sec. 7.15.3.1	
Basket upper frame	Not severely bent	
	Securely attached to the walls	
	Integrity not affected, no cracks / fracture (if there are any doubts, the trim must be removed)	
	No sign of unauthorized repair	
Basket lower frame	Not severely bent	
	Securely attached to the walls	
	Integrity not affected, no cracks / fracture	
	No weld cracks	
	No sign of unauthorized repair	
Basket wires	No evidence of abrasion or corrosion	
	Maximum 8 broken strands	
	Correct length	
	No distortion of thimbles or ferrules, no sharp edge. Wire swaging in the good condition. Thimbles secured	
	Rawhide protection in the good condition. Wire is not exposed	
Carabiners	No damage than scores up to the depth of 1 mm (0.04“),	
	No distortion; no corrosion or rust	
	Spring-gate returns to the closed position Threaded lock functions properly	
Basket floor	In good condition (only surface cracks permitted), both sides checked	
	Lacing/frame bolts in good condition and secured	
Floor skids	In good condition, bolts tight. Good integrity of floor and skids	
Rawhide	In good condition, lacing secure, no basket structure exposed	
Rope handles	In good condition, not excessive wear	
Cylinder straps	In good condition. No excessive wear damage.	
	Buckles fully functional	
	Note: minimum required – 4 for 1 or 2 unit, 6 for 3-units, 8 for 4-unit burner	
Basket trim	In good condition, lacing secure	
Burner rod covers	In good condition	
	Zippers functioning	
Burner rods	No damage, no cracks, no bends, functional	
Basket equipment	Drop line	
	First aid kit present, valid	
	Fire blanket present, in good condition	
	Fire extinguisher present and functional, test date valid	

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
Basket padding (if fitted)	In good condition, secured to the basket wall	
Pilot restrain harness (if fitted)	Present and undamaged	
	Buckles fully functional	
	Attachment point secured	
Cross bracing (if fitted)	Straps in good condition	
	Turnbuckles and snap links not damaged and functional	
	Tight	
Additional basket equipment (if fitted)	In good condition	
	Forms no sharp edges inside the basket	
Basket door (if fitted)	See Maintenance manual Supplement B.2202-D&S, par. 7.14.4.8	
Basket seat (if fitted)	See Maintenance manual Supplement B.2202-D&S, par. 7.14.4.9	
Removable partition (if fitted)	See Maintenance manual Supplement B.2202-D&S, par. 7.14.4.10	
Collapsible baskets K10C and K13C parts:		
Fabric sidewalls	No damage to the protection plates	
	No damage to zippers and their sliders	
	Not excessive wear of the fabric	
Rods, steps, locking pins, velcros and carabiners	In good condition	
Hinge joints	In good condition	
	Lubricated	
	No scores	
Cylinder harness (1 harness in each corner of the basket)	In good condition, no excessive wear damage	
	No twist of straps	
	Buckles fully functional	
	Shackles tight well	
ORIGO basket parts:		
Fabric sidewalls	No damage to zippers and their sliders	
	Not excessive wear of the fabric	
Rods, steps, velcros and carabiners	In good condition	
Cylinder harness (1 harness in each corner of the basket)	In good condition, no excessive wear damage	
	No twist of straps	
	Buckles fully functional	
	Shackles tight well	
Findings/remarks:		

6. Burner

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
Burner frame	All welds in perfect conditions, no cracks	
	Not severely bent	
	Integrity not affected, no cracks / fracture in tubing	
	Corner plates in good condition	
	No sign of unauthorized repair	
Gimbal block	Friction force adjusted	
	All bolts secured and in good condition	
Manifold block	Check for corrosion on the top surfaces of the burner manifold block.	
Hoses	Less than 10 years in the service (than replaced)	
	No cuts or abrasions, no bulging or swelling	
	NO EXPOSE OF THE INNER STEEL	
Hoses connectors	Good overall conditions, no dents or corrosion	
	Fully functional, self-sealing checked	
	No leaks	
	Lubricated	
	Seals in good conditions	
Pressure gauges	Function correctly	
	Needle zeros	
Pilot valves/flame	Pilot light cup secure (check set screw) and aligned with piezo ignitor	
	Check the tightness of the cap bolt that holds the pilot light head in place by firmly pulling the head of the pilot light upwards.	
	Pilot jet free of obstruction (check fuel flow, sound and flame appearance)	
	If obstructed, remove and clean jet and filter of pressure reducer	
	Valve handle turns freely, no leaks	
Piezo igniter	Piezo igniter electrode in good condition	
	Piezo igniter actuator button in good condition	
	Piezo igniter actuator set screw secure	
	Check for strong spark to pilot light cup	
	Inspect damage to the piezo igniter body, piezo body top cap is clean	
Main and liquid flame/ valves	Smooth operation, no leaks	
	Reasonable allowance checked	
Sluper tubes	Present, secured and correctly positioned, functional	
Coil assembly	In good conditions	
	No missing stainless-steel rivets	
	No crack in welds	
	Supports in good condition	
	Jets – present, tight and not blockaded	
	No sign of unauthorized repair	

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
Functional check	Performed, all features are functional. Each burner unit with each tank	
	All valves, fittings and connections leak tested	
Height adjustment (if fitted)	Dumper functional and securely attached, not leaking	
Ignis Gyro (if fitted)	Top bolt secured, centralising pin functional	
Findings/remarks:		

7. Fuel tanks

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A							
		1	2	3	4	5	6	7	8
Tank inspections	10 years inspection within date								
	Cylinders manufacturers maintenance manual checked for any further checks required								
Cylinder steel body	Tank body free of dents or gouges or any unacceptable damage (sec. 7.16.2.2)								
	Welds in good condition								
Liquid valve	No damage or corrosion								
	Liquid valve outlet (Rego/Tema) self-seal not leaking and lubricated								
	Seals in good conditions								
	Liquid valve handle tight								
	Ball valve sealing is not leaking								
	Screws tight								
Fixed liquid level gauge	No damage or corrosion								
	Correct operation checked								
Contents gauge	Freedom of movement checked								
	Screws tight								
Vapor valve and regulator (master tank only)	No damage or corrosion								
	Correct operation checked. Vapor regulator function checked at extremes								
	Self-seal not leaking and lubricated								
	Vapor quick release function and good sealing checked								
Padded cover	In good condition								
Pressure relief valve	Clean, not damaged or corroded								
	Does not indicate over pressuring								
Functional test	All valves and gauges checked for leaks								
	Test Liquid and vapor valve with the burner connected to assure function								
Findings/remarks:									

8. Additional equipment

Part	Check/Inspect	Pass / Fail ✓ / ✗ N/A
Instruments	Functional test	
Quick release	Fully functional	
	Latch, bridle and ropes does not show signs of excessive wear and deterioration.	
	Carabiners undamaged and has correct function	
T-couplings	Hoses - less than 10 years in the service (than replaced)	
	Hoses - No cuts or abrasions, no bulging or swelling	
	Hoses - NO EXPOSE OF THE INNER STEEL	
	Hoses connectors - Good overall conditions, no dents or corrosion	
	Hoses connectors - Fully functional, self-sealing checked	
	Hoses connectors - No leaks	
	Hoses connectors - Lubricated	
	Hoses connectors - Seals in good conditions	
Findings/remarks:		

Appendix 4: Location of temperature measuring equipment

In case of certain customer modifications of the envelope, location of the temperature measuring equipment (Tempilabel, Temperature Streamer and Electronic Thermometer attachment point) may differ to the one stated in the chart below. When in doubt about the correct location, contact the manufacturer.

Envelope	Number of gores	Tempilabel		Temperature Streamer		Electronic Thermometer attachment point	
		Gore number	Number of panels from vent hole	Gore number	Number of panels from vent hole	Load tape number	Distance from envelope top edge
BB9E	8	7	2	7	2	6	1 m (3.3 ft)
BB12E	8	7	2	6	2	6	1 m (3.3 ft)
BB16E	8	7	2	6	2	6	1 m (3.3 ft)
BB18E	12	10	2	9	2	9	1 m (3.3 ft)
BB20E	12	10	2	9	2	9	1 m (3.3 ft)
BB22E	12	10	2	9	2	9	1 m (3.3 ft)
BB26E	12	10	2	9	2	9	1 m (3.3 ft)
BB30E	12	10	2	9	2	9	1 m (3.3 ft)
BB34E	12	10	2	9	2	9	1 m (3.3 ft)
BB9EF	12	10	2	10	2	9	1 m (3.3 ft)
BB12EF	12	10	2	10	2	9	1 m (3.3 ft)
BB16EF	12	10	2	10	2	9	1 m (3.3 ft)
BB20ED	12	9	2	9	2	9	1 m (3.3 ft)
BB22ED	12	9	2	9	2	9	1 m (3.3 ft)
BB26ED	12	9	2	9	2	9	1 m (3.3 ft)
BB30ED	12	9	2	9	2	9	1 m (3.3 ft)
BB34ED	12	9	2	9	2	9	1 m (3.3 ft)
BB22Z	24	21	4	18	4	20	1 m (3.3 ft)
BB26Z	24	21	3	18	3	20	1 m (3.3 ft)
BB30Z	24	21	3	18	3	20	1 m (3.3 ft)
BB34Z	24	21	4	18	4	20	1 m (3.3 ft)
BB37Z	24	21	3	18	3	20	1 m (3.3 ft)
BB40Z	24	21	3	19	3	20	1 m (3.3 ft)
BB42Z	24	21	3	18	3	20	1 m (3.3 ft)
BB45Z	24	21	4	18	4	20	1 m (3.3 ft)
BB51Z	24	21	4	18	4	20	1 m (3.3 ft)
BB60Z	24	21	3	18	3	20	1 m (3.3 ft)
BB64Z	24	21	3	19	3	20	1 m (3.3 ft)
BB70Z	24	21	3	19	3	20	1 m (3.3 ft)
BB74Z	24	21	3	19	3	20	1 m (3.3 ft)
BB78Z	24	21	3	19	3	20	1 m (3.3 ft)
BB85Z	28	24	4	21	4	23	1 m (3.3 ft)
BB92Z	28	24	2	21	2	23	1 m (3.3 ft)
BB100Z	28	24	3	21	3	23	1 m (3.3 ft)

Envelope	Number of gores	Tempilabel		Temperature Streamer		Electronic Thermometer attachment point	
		Gore number	Number of panels from vent hole	Gore number	Number of panels from vent hole	Load tape number	Distance from envelope top edge
BB22D	24	21	3	18	3	20	1 m (3.3 ft)
BB26D	24	21	3	18	3	20	1 m (3.3 ft)
BB30D	24	21	3	18	3	20	1 m (3.3 ft)
BB34D	24	21	4	18	4	20	1 m (3.3 ft)
BB37D	24	21	3	18	3	20	1 m (3.3 ft)
BB40D	24	21	3	19	3	20	1 m (3.3 ft)
BB42D	24	21	3	18	3	20	1 m (3.3 ft)
BB45D	24	21	4	18	4	20	1 m (3.3 ft)
BB51D	24	21	4	18	4	20	1 m (3.3 ft)
BB60D	24	21	3	18	3	20	1 m (3.3 ft)
BB70D	24	21	3	19	3	20	1 m (3.3 ft)
BB85D	28	24	3	21	3	23	1 m (3.3 ft)
BB100D	28	24	3	21	3	23	1 m (3.3 ft)
BB105P	28	24	4	21	4	23	1 m (3.3 ft)
BB106P	28	24	4	21	4	23	1 m (3.3 ft)
BB113P	28	24	3	19	3	23	1 m (3.3 ft)
BB120P	28	24	4	21	4	23	1 m (3.3 ft)
BB130P	28	24	4	21	4	23	1 m (3.3 ft)
BB142P	32	25	4	23	4	25	1 m (3.3 ft)
BB150P	32	25	4	23	4	25	1 m (3.3 ft)
BB184P	32	25	3	23	3	25	1 m (3.3 ft)
BB14XR	16	13	2	12	2	12	1 m (3.3 ft)
BB16XR	16	13	2	12	2	12	1 m (3.3 ft)
BB17XR	16	13	2	12	2	12	1 m (3.3 ft)
BB18XR	16	13	2	12	2	12	1 m (3.3 ft)
BB20XR	16	13	2	12	2	12	1 m (3.3 ft)
BB20XR (UP TO AND INCLUDING S/N 2160)	20	14	2	14	2	14	1 m (3.3 ft)
BB22XR	24	20	2	20	2	20	1 m (3.3 ft)
BB26XR	24	20	2	20	2	20	1 m (3.3 ft)
BB30XR	24	20	3	20	3	20	1 m (3.3 ft)
BB22M	12	11	2	10	2	10	1 m (3.3 ft)
BB26M	12	11	3	10	3	10	1 m (3.3 ft)
BB30M	12	11	2	10	2	10	1 m (3.3 ft)
BB9	8	7	2	7	2	6	1 m (3.3 ft)
BB12	8	6	2	7	2	6	1 m (3.3 ft)
BB16	8	7	2	6	2	6	1 m (3.3 ft)
BB20	12	9	3	7	3	9	1 m (3.3 ft)

Envelope	Number of gores	Tempilabel		Temperature Streamer		Electronic Thermometer attachment point	
		Gore number	Number of panels from vent hole	Gore number	Number of panels from vent hole	Load tape number	Distance from envelope top edge
BB22	12	10	2	9	2	9	1 m (3.3 ft)
BB26	12	10	2	9	2	9	1 m (3.3 ft)
BB22N	24	20	1	17-18	1	20	1 m (3.3 ft)
BB26N	24	20	1	17-18	1	20	1 m (3.3 ft)
BB30N	24	20	1	17-18	1	20	1 m (3.3 ft)
BB37N	24	20	1	17-18	1	20	1 m (3.3 ft)
BB45N	24	20	1	17-18	1	20	1 m (3.3 ft)
BB60N	32	25	1	22-23	1	25	1 m (3.3 ft)
BB17GP	16	14	3	12	3	13	1 m (3.3 ft)
BB20GP	24	21	2	18	2	20	1 m (3.3 ft)
ORIGO 15	8	7	2	6	2	6	1 m (3.3 ft)
ORIGO 18	8	7	2	6	2	6	1 m (3.3 ft)
BB60W	20	14	3	13	3	14	1 m (3.3 ft)
BB70W	20	14	3	13	3	14	1 m (3.3 ft)
BB85W	20	14	3	13	3	14	1 m (3.3 ft)
BB92W	20	14	3	13	3	14	1 m (3.3 ft)
BB105W	20	14	3	13	3	14	1 m (3.3 ft)
BB120W	20	14	3	13	3	14	1 m (3.3 ft)
BB130W	20	14	3	13	3	14	1 m (3.3 ft)

Appendix 5: Position of the equator and the limitations for repairs

Series	*Envelope*	*Number of gores*	*Rows of panels (including Nomex)*	*Position of equator (panel number counted from the top)*	*Limit for Cat. B repair (above equator)*	*Limit for Cat. B repair (below equator)*		*Limit for Cat. C repair (above equator)*	*Limit for Cat. C repair (below equator)*	
					max. number of damaged panels	*max. number of damaged panels*		*max. number of damaged panels*	*max. number of damaged panels*	
E-type	**BB9E**	8	13	7	16	*32*	*+ nomex*	24	*24*	*+ nomex*
	BB12E	8	14	7	16	*32*	*+ nomex*	24	*28*	*+ nomex*
	BB16E	8	15	7	16	*32*	*+ nomex*	24	*32*	*+ nomex*
	BB18E	12	15	7	24	*48*	*+ nomex*	36	*48*	*+ nomex*
	BB20E	12	15	7	24	*48*	*+ nomex*	36	*48*	*+ nomex*
	BB22E	12	16	8	24	*48*	*+ nomex*	42	*48*	*+ nomex*
	BB26E	12	17	8	24	48	*+ nomex*	42	*54*	*+ nomex*
	BB30E	12	18	8	24	*48*	*+ nomex*	42	*60*	*+ nomex*
	BB34E	12	19	9	24	*48*	*+ nomex*	48	*60*	*+ nomex*
EF-type	**BB9EF**	12	13	6	24	*48*	*+ nomex*	30	*42*	*+ nomex*
	BB12EF	12	14	7	24	*48*	*+ nomex*	36	*42*	*+ nomex*
	BB16EF	12	15	7	24	*48*	*+ nomex*	36	*48*	*+ nomex*
ED-type	**BB20ED**	12	12	5	24	48	*+ nomex*	24	42	*+ nomex*
	BB22ED	12	13	6	24	48	*+ nomex*	30	42	*+ nomex*
	BB26ED	12	14	7	24	48	*+ nomex*	36	42	*+ nomex*
	BB30ED	12	14	6	24	48	*+ nomex*	30	48	*+ nomex*
	BB34ED	12	15	7	24	48	*+ nomex*	36	48	*+ nomex*
Z-type	**BB22Z**	24	16	7	48	*96*	*+ nomex*	72	*108*	*+ nomex*
	BB26Z	24	17	7	48	*96*	*+ nomex*	72	*120*	*+ nomex*
	BB30Z	24	18	8	48	*96*	*+ nomex*	84	*120*	*+ nomex*
	BB34Z	24	19	8	48	*96*	*+ nomex*	84	*132*	*+ nomex*
	BB37Z	24	19	8	48	*96*	*+ nomex*	84	*132*	*+ nomex*
	BB40Z	24	20	9	48	*96*	*+ nomex*	96	*132*	*+ nomex*
	BB42Z	24	20	8	48	*96*	*+ nomex*	84	*144*	*+ nomex*
	BB45Z	24	21	9	48	*96*	*+ nomex*	96	*144*	*+ nomex*
	BB51Z	24	22	9	48	*96*	*+ nomex*	96	*156*	*+ nomex*
	BB60Z	24	23	10	48	96	*+ nomex*	108	*156*	*+ nomex*
	BB64Z	24	24	10	48	*96*	*+ nomex*	108	*168*	*+ nomex*
	BB70Z	24	24	10	48	*96*	*+ nomex*	108	*168*	*+ nomex*
	BB74Z	24	24	10	48	*96*	*+ nomex*	108	*168*	*+ nomex*
	BB78Z	24	25	11	48	*96*	*+ nomex*	120	*168*	*+ nomex*
	BB85Z	28	26	11	56	*112*	*+ nomex*	140	*210*	*+ nomex*
	BB92Z	28	26	11	56	*112*	*+ nomex*	140	*210*	*+ nomex*
	BB100Z	28	27	11	56	*112*	*+ nomex*	140	*224*	*+ nomex*

Series	Envelope	Number of gores	Rows of panels (including Nomex)	Position of equator (panel number counted from the top)	Limit for Cat. B repair (above equator)	Limit for Cat. B repair (below equator)		Limit for Cat. C repair (above equator)	Limit for Cat. C repair (below equator)	
					max. number of damaged panels	max. number of damaged panels		max. number of damaged panels	max. number of damaged panels	
D-type	BB22D	24	13	6	48	96	+ nomex	60	84	+ nomex
	BB26D	24	14	6	48	96	+ nomex	60	96	+ nomex
	BB30D	24	14	6	48	96	+ nomex	60	96	+ nomex
	BB34D	24	15	6	48	96	+ nomex	60	108	+ nomex
	BB37D	24	16	7	48	96	+ nomex	72	108	+ nomex
	BB40D	24	16	7	48	96	+ nomex	72	108	+ nomex
	BB42D	24	16	7	48	96	+ nomex	72	108	+ nomex
	BB45D	24	16	7	48	96	+ nomex	72	108	+ nomex
	BB51D	24	17	7	48	96	+ nomex	72	120	+ nomex
	BB60D	24	18	8	48	96	+ nomex	84	120	+ nomex
	BB70D	24	19	8	48	96	+ nomex	84	132	+ nomex
	BB85D	28	20	8	56	112	+ nomex	98	168	+ nomex
	BB100D	28	22	9	56	112	+ nomex	112	182	+ nomex
P-type	BB105P	28	28	12	56	112	+ nomex	154	224	+ nomex
	BB106P	28	28	12	56	112	+ nomex	154	224	+ nomex
	BB113P	28	28	12	56	112	+ nomex	154	224	+ nomex
	BB120P	28	29	13	56	112	+ nomex	168	224	+ nomex
	BB130P	28	30	13	56	112	+ nomex	168	238	+ nomex
	BB142P	32	31	14	64	128	+ nomex	208	272	+ nomex
	BB150P	32	31	14	64	128	+ nomex	208	272	+ nomex
	BB184P	32	34	15	64	128	+ nomex	224	304	+ nomex
XR-type	BB14XR	16	15	7	32	64	+ nomex	48	64	+ nomex
	BB16XR	16	15	7	32	64	+ nomex	48	64	+ nomex
	BB17XR	16	16	7	32	64	+ nomex	48	72	+ nomex
	BB18XR	16	16	7	32	64	+ nomex	48	72	+ nomex
	BB20XR (S/N 2161 AND HIGHER)	16	17	7	32	64	+ nomex	48	80	+ nomex
	BB20XR (UP TO AND INCLUDING S/N 2160)	20	17	7	40	80	+ nomex	60	100	+ nomex
	BB22XR	24	17	7	48	96	+ nomex	72	120	+ nomex
	BB26XR	24	19	8	48	96	+ nomex	84	132	+ nomex
	BB30XR	24	20	9	48	96	+ nomex	96	132	+ nomex

Series	*Envelope*	*Number of gores*	*Rows of panels (including Nomex)*	*Position of equator (panel number counted from the top)*	*Limit for Cat. B repair (above equator)*	*Limit for Cat. B repair (below equator)*		*Limit for Cat. C repair (above equator)*	*Limit for Cat. C repair (below equator)*	
					max. number of damaged panels	*max. number of damaged panels*		*max. number of damaged panels*	*max. number of damaged panels*	
M-type	**BB22M**	12	17	7	24	48	*+ nomex*	36	60	*+ nomex*
	BB26M	12	18	8	24	48	*+ nomex*	42	60	*+ nomex*
	BB30M	12	18	9	24	48	*+ nomex*	48	54	*+ nomex*
O-type	**BB9**	8	13	6	16	32	*+ nomex*	20	28	*+ nomex*
	BB12	8	14	6	16	32	*+ nomex*	20	32	*+ nomex*
	BB16	8	15	7	16	32	*+ nomex*	24	32	*+ nomex*
	BB20	12	17	8	24	48	*+ nomex*	42	54	*+ nomex*
	BB22	12	16	7	24	48	*+ nomex*	36	54	*+ nomex*
	BB26	12	17	8	24	48	*+ nomex*	42	54	*+ nomex*
ORIGO	**ORIGO 15**	8	14	7	16	32	*+ nomex*	24	28	*+ nomex*
	ORIGO 18	8	15	8	16	32	*+ nomex*	28	28	*+ nomex*
N-type	**BB22N**	24	6	3	24	24	*+ nomex*	24	36	*+ nomex*
	BB26N	24	6	3	24	24	*+ nomex*	24	36	*+ nomex*
	BB30N	24	6	3	24	24	*+ nomex*	24	36	*+ nomex*
	BB37N	24	7	3	24	24	*+ nomex*	36	36	*+ nomex*
	BB45N	24	8	4	24	24	*+ nomex*	36	48	*+ nomex*
	BB60N	32	8	4	32	32	*+ nomex*	48	64	*+ nomex*
GP-type	**BB17GP**	16	16	7	32	64	*+ nomex*	48	72	*+ nomex*
	BB20GP	24	16	7	48	96	*+ nomex*	72	108	*+ nomex*
W-type	**BB60W**	20	23	10	40	80	*+ nomex*	90	130	*+ nomex*
	BB70W	20	23	10	40	80	*+ nomex*	90	130	*+ nomex*
	BB85W	20	25	11	40	80	*+ nomex*	100	140	*+ nomex*
	BB92W	20	26	12	40	80	*+ nomex*	110	140	*+ nomex*
	BB105W	20	27	12	40	80	*+ nomex*	110	150	*+ nomex*
	BB120W	20	29	13	40	80	*+ nomex*	120	160	*+ nomex*
	BB130W	20	30	13	40	80	*+ nomex*	120	170	*+ nomex*

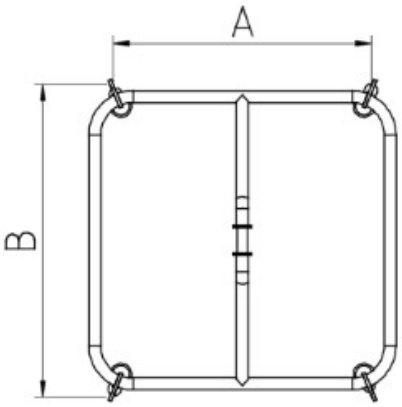
Appendix 6: Compatibility Questionnaire for Components from Other Manufacturers

E-mail			
First and last name			
Phone number (int. format +420 xxx xxx xxx)			
Country			
Company			
Envelope			
Envelope Type (e.g. BB30Z)			
Envelope Serial Number			
Burner			
Burner Manufacturer			
Burner Type			
Burner Serial Number			
Burner Part No.			
No. of Burner Units			
Basket			
Basket Manufacturer			
Basket Type			
Basket Serial Number			
Basket Part No.			
4 burner support rods		8 burner support rods	

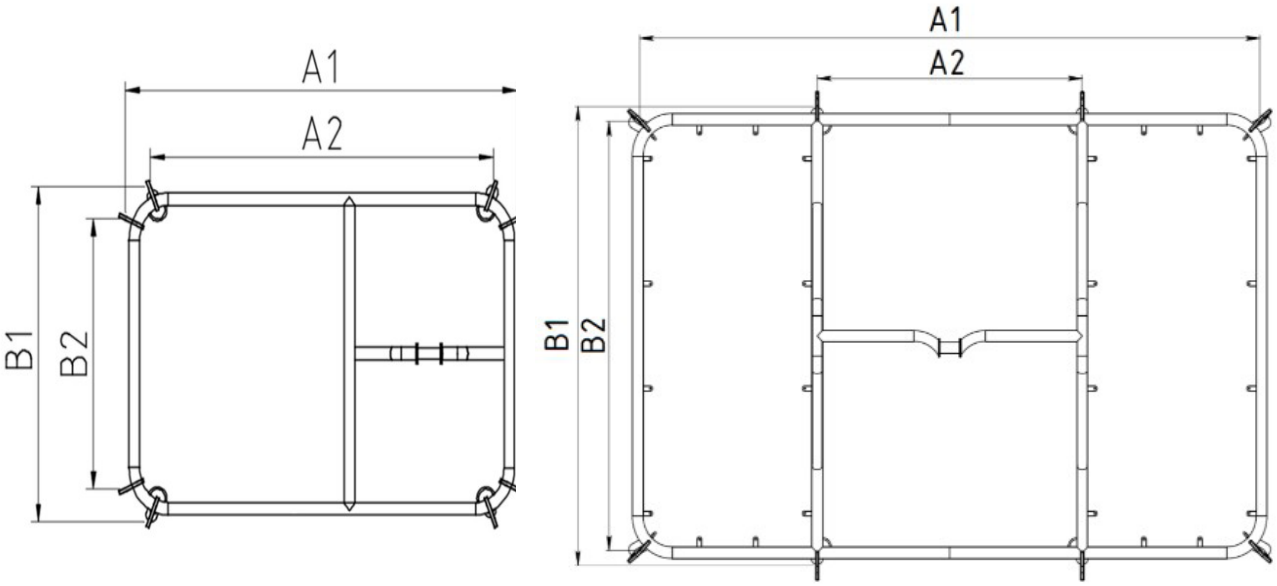
Compatibility Questionnaire for Components from Other Manufacturers

(continued, page 2/3)

4 attachment points - Scoop side



8 attachment points - Scoop side

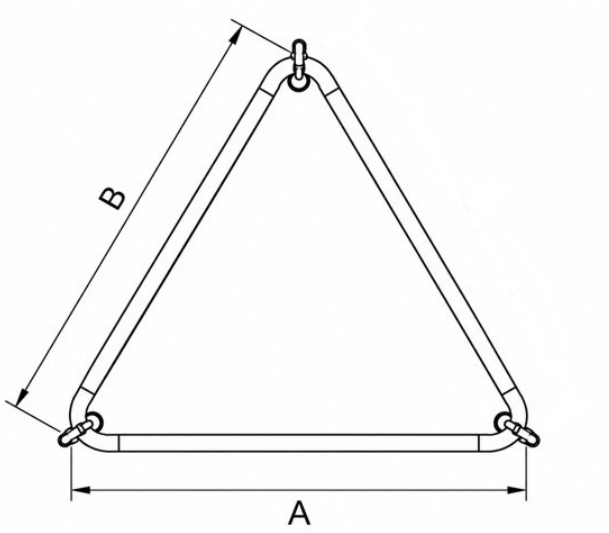


Burner frame			
Burner Frame Manufacturer			
Burner Frame Type or Part Number			
Burner Frame Serial Number			
Burner Frame Dimensions (4 points) A,B			
Burner Frame Dimensions (8 points) A1, A2, B1, B2			
Burner Frame Dimensions (for example 12, 16, 18, etc. points)*		Number of points	
Approved modifications (to flying wires, etc.)			

*Clarification or additional relevant information regarding the dimensions and location of the attachment points may be requested.

Compatibility Questionnaire for Components from Other Manufacturers (continued, page 3/3)

3 attachment points (Firefly)



Burner frame	
Burner Frame Manufacturer	
Burner Frame Type or Part Number	
Burner Frame Serial Number	
Burner Frame Dimensions (3 points) A,B	

LET US HELP YOU!

In case that you have any suggestion, difficulty, problem or comment, please contact our technical department at:

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+420 545 422 642

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