AIPS
Airbus Process Specification
Installation of bleed air system (ducts, duct connections, soft insulation sleeves, sense lines, OHDS)

Contents

1 Scope

This Airbus Process Specification defines the Engineering requirements for installation of Bleed air system (ducts, duct connections, soft insulation sleeves, sense lines, OHDS).
This specification does not give detailed instructions; these are given in the Process Instructions (PI) / Airbus Process Instruction (AIPI) and the Work Instructions.
This specification shall not be used as an inspection document.
It shall be applied when mentioned in the relevant standard, material specification or Definition Dossier.

2 Normative references

Only normative references cited in the text are listed hereafter. The latest issue of the publication referenced shall be used.

EN9103	Aerospace series - Quality management systems - Variation management of key characteristics
A1091	Airbus requirements for the management of hazardous substances.
ABD 0003	Identification and marking
AIPS01-02-008	Torque tightening of screws, bolts and nuts
AIPS03-01-003	Assembly and installation of V-flange coupling
AIPS03-01-010	Manufacturing of pipes
AIPS03-01-015	Blanking of pipes, hoses and components
AIPS03-06-003	Locking using wire
AIPS03-06-008	Installation of rigid hydraulic pipes and flexible hoses
AIPS03-06-021	Installation of cooling / water / anemometric / rain repellent / extinguishing / draining circuit pipes
AIPS07-01-006	Electrical bonding
AIPS09-01-002	Cleaning with liquid non aqueous agents
AIPS09-01-003	Cleaning with aqueous agents
AP2091	Airbus banned substances
NSA 2017	Torque tightening
NSA 9011	PLACARD – AIR CONDITIONING PIPE
TNA007-10050	Non-metallic Anti-corrosive coatings

3 Definition, applicability and limitations

3.1 Definition

3.1.1 Engineering requirements

Engineering requirements are minimum requirements specified by Responsible Engineering to ensure optimal performance of the installation process.
All Engineering requirements have to be met and controlled before, during and after installation when applicable.

3.1.2 Nomenclature / Abbreviations

According to table 1.

Table 1: Nomenclature/ Abbreviations

Abbreviation	Meaning
ABS	Airbus Standard
ABD	Airbus Directives
A/C	Aircraft
AIPI	Airbus Process Instruction
AIPS	Airbus Process Specification
ANPT	Aeronautical National Pipe Taper
AP	Airbus Procedures
ATA	Aircraft Transport Association
BALDS	Bleed air leakage detection system
CRES	Corrosion-Resistant Steel
e.g.	For example
EIRD	Equipment Installation Requirement Dossier
EN	European Norm
GTR	Ground Test Requirements
LR	Long Range
MIL or M	Military
MS	Military Standard
NA	Not applicable
NSA	Norme Sud Aviation
OHDS	Overheat detection system
PADS	Pneumatic Air Distribution System
PI	Process Instructions
PTFE	Poly Tetra Fluoro Ethylene
SA	Single Aisle
SE	Sensing element
SIDP	System installation design principles
TN	Technical Note
WIP	Wing Ice Protection

3.2 Applicability and limitations

This Airbus process specification is applicable when invoked by the drawing directly or through another document for the purpose given in the scope. When processing to AIPS03-06-022 is required, it shall be invoked on the drawing by the words “AIPS03-06-022 – Installation of Bleed air system (ducts, duct connections, soft insulation sleeves, senses lines, OHDS)”.
The purpose of this AIPS is to define the installation requirements for the Bleed Air system and temperature control installation on the following Airbus aircraft programs: A380, A400M and A350.

This document covers the following sub-systems:

- Pneumatic Air Distribution System (PADS),
- Overheat Detection System (OHSD),
- Trim Air,
- Wing Ice Protection (WIP).

For the aircraft Hot Air system, this AIPS03-06-022 is defining reference requirements.

4 Engineering requirements

4.1 System requirements

All sytem components shall be referenced and qualified according to Airbus qualification procedure.
System components containing mechanical linkage like rods, bellows, shall be preadjusted before installed into the A/C and adjusted in situ.
Unless otherwise specified on the drawing, all torqued connections used for connection must be tightened according to NSA2017 and AIPS01-02-008 for pipe clamping, with torque wrenches and calibrated screwgun.
Greatest care shall be taken when installing hot air pipes and hoses. It is not permitted to place objects on or to suspend objects from ducts and hoses, to draw or pull parts over the ducts and hoses or to hang, lie, sit or stand on ducts and hoses.

4.2 Cleanliness requirements

4.2.1 System components

Pipes and hoses taken from storage shall be protected by caps/plugs according to AIPS03-01-015 in order to prevent moisture, surface damage and dust, shall have an inspection stamp and should be wrapped in protective foil. If they are not protected by caps/plugs, or in case of damaged packing they shall be rejected.
Pipes and hoses shall not show any signs of damage or corrosion.
The internal surfaces and the mating flanges of all air system components and ducting shall be completely free of residues of any unwanted material, e.g.

- dust,
- grease,
- oil,
- Corrosion Protection Material,
- Anti-Seizing Compound,
- Adhesive Particles,
- manufacturing and process residue,
- Swarf and Wear Debris,
- Remains of Cleaning Agent,
- contamination caused by incorrect handling.

Following cleanliness precaution has to be considered:

- Never use any kind of lubrication or preservation material if there is no demand in the drawing or on the work order.

The cleanliness shall be checked:

- at component level: The selected check method shall guarantee that all unwanted material is detected,
- at component integration level:
  - Visual Check: Do a visual check for cleanliness,
  - Wipe-off Check: if you rub off the surface with a new, lint-free, white cotton cloth, no contamination shall be visible.

If necessary, cleaning procedure according to AIPS09-01-002 or AIPS09-01-003 shall be applied.

4.2.2 Workshop requirements

Workshop shall be clean as even the smallest traces of foreign particles can endanger the tightness of connections.
Workshop cleanliness shall be optimised in order to avoid any pollution of pipes during the installation.
All dust raising actions shall be avoided or at least limited in the workshop.
Only qualified operators are allowed to work on installation of piping.

4.2.3 Tools and clothes

Tools shall be clean, as even the smallest traces of foreign particles can endanger the tightness of connections.
Only standard and calibrated tools (when applicable) have to be used.
If applicable, calibration valid/expiry dates shall not be exceeded at the time of use.
Clothes shall be made with material which shall not lead to pollution onto pipes.

4.3 Preparation for installation

All ducts and circuits have to be in conformity with existing documents.
Before installation, all pipes and ducts shall be in conformity with the following quality criteria:

- Its identification,
- Its covering (sound/heat insulation),
- Its storage blanking caps,
- Its connecting end fittings, expansion joints, flanges and couplings,
- Its inner conduit and for absence of foreign bodies,
- Its system attachments (rods, supports, fittings).

All duct positions have to be checked before final attachment tightening.
All torque wrenches and screw guns shall be correctly calibrated.
Make sure that the components have not been damaged during storage and that their dust-proof plastic bags are correctly sealed.

4.3.1 Expiry date conditions

When applicable, the expiry date must be checked and must not be exceeded at time of installation (installation phase). If this date has been exceeded, refer to quality department.

4.3.2 Handling of components

All precautions shall be taken during the transportation of parts to the installation location. Large and/or complex components shall be transported by 2 persons. Appropriate protective measures shall be taken to avoid damaging of the hot air ducts.
After being removed from stores parts shall not be stored at any place except at the final work station. All precautions shall be taken to protect ducts when parts are temporary stored.
No damage (e.g. shock, crack, bending, scratch) or contamination shall occur during the manipulation of parts from the storage area.
Any damaged part shall be adressed to the relevant quality departement.

4.3.3 Lubrication rules

Unless otherwise specified in the instruction, no addition of any lubricant is needed.
In case of lubricant application according to the drawing, utmost care shall be taken when applying lubricant on seals, pipe connections, grooves, threads, etc…
O-ring installation shall be done by qualified operator.

4.3.4 Free end protections

All free-ends shall be blanked by a clean and waterproof end-cap as shown for example in figure 1.
The end-caps shall be exterior to the duct, prevent duct from all potential local pollution and their dimension shall avoid any introduction of the end-cap into its dedicated pipe.
The protective caps/plugs shall be removed from the side of pipe/hose being connected just prior to installation. If work is interrupted or if the pipes/hoses have to be stored temporarily after preliminary operations, the clean caps/plugs shall be refitted.
If for special reasons, end-caps have to be replaced before the installation, there shall be no damage, scratch, shock on components.

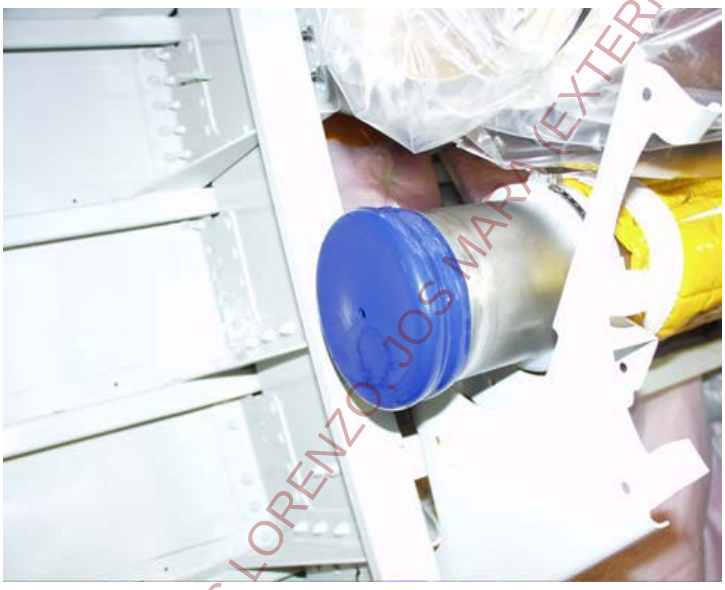


Figure 1: Protective cap on titanium tube

4.3.5 Electrical bonding

Prior to the installation, bonding point positions shall be checked and in line with installation drawings.
In case of any deviations, report to the relevant quality department.

4.3.6 Identification

All ducts and components should be identified as specified in NSA9011 or ABD0003.

4.4 Installation requirements

During installation and handling of pipes, utmost attention shall be done in order to avoid any damage or scratching of the parts. It is forbidden to fix or suspend tools or any equipement on pipes.

4.4.1 Applicable documents

When applicable, documentation shall be taken into account at the last issue.

4.4.2 Minimal clearances to be clarified and harmonized

Routing of the pipes and hoses shall be fitted as they do not interfer with another pipe or adjacent components.
Unless otherwise specified in definition dossier, minimal clearances that the final installation shall fulfill are shown in table 2.

Table 2: Minimum clearances for ATA36 and 21 (hot air only)

Dimensions in millimeters

ATA 36 and 21 (hot air) minimum clearance	A380	A350	A400M
Between ducts and fixed structure or equipment to which it is attached.	15,0 6,25*	15,0 6,25*	6,25
Between two elements of the following types: - Duct - Sense line - Static equipment - Structural part	12,7	12,7	12,7
Between ducts and other system components.	25,4	25,4	25,4
Between “movable” duct and other moving parts of system components (after movement i.e. actuators)	38,1 50,8*	38,1 50,8*	38,1 50,8*
Between ducts and flammable fluids carrying components	200,0	200,0	200,0
* For ATA 21 hot air.			

NOTE: Any deviation to the required clearances shall be agreed by Air conditioning and bleed system responsible.

All these distances are given as information. For details, refer to the relevant mechanical and electrical Airbus design directives.

4.4.3 Pipe/ duct clamping

Care shall be taken to avoid damage or deformation during installation of pipes.
Reworking of pipe bent is not allowed for pipes installed in the aircraft, if necessary see AIPS03-01-010 Manufacturing of pipes.
An dismantle after pipe connection shall be avoided.
Prior to using a wrench, tighten the nut by hand a minimum of one turn.
When brackets fitted with clamp blocks or saddle clamps are located with slotted holes, adjustment of the brackets position shall be carried out using the slotted holes in order to achieve a stress free installation of supported pipes or hoses. All adjustable duct support shall be re-adjusted in order to achieve an installation which is free of tension.
Duct installation shall be such that no torsion or tension force shall be introduced during the installation (i.e. the installation shall be as stress-free as possible).
Contamination of the outer duct surface with fuel, oil, hydraulic or other fluids shall be cleaned as mentioned in subclause 4.2.1.

4.4.4 Installation of sense line piping

Sense lines are small diameter rigid and flexible piping, suppling air pressure to actuators and sensors.
Sense lines and hydraulic lines follow similar technologies (small diameters and rigid couplings).

4.4.4.1 Installation of spacers

Refer to AIPS03-06-021.

4.4.4.2 Installation of clamps

4.4.4.2.1 Torque tightening

Refer to AIPS03-06-021.

4.4.4.2.2 Marking

Refer to AIPS03-06-021.

4.4.4.3 Installation of clamp blocks

Refer to AIPS03-06-008.

4.4.4.4 Installation of pipes with permanent connections

Refer to AIPS03-06-008.

4.4.4.5 Installation of pipes with removable connections (swaged in-situ)

Refer to AIPS03-06-008.

4.4.4.6 Installation of pipes with permanent connections (swaged in situ)

Refer to AIPS03-06-008.

4.4.4.7 Flexible hose assembly connections

Flexible hose assemblies are provided to accommodate tolerances, vibrations or further connection planned afterwards.
Never step or stand on the hose. Never use the hoses as a handle when accessories or components are removed from engines or in any other instance.
For correct flexible hoses assembly installation and in order to ensure system performances, the following rules shall be applied. Even if they are mainly conditionned by the design, a check during their installation shall be made:

- At least one bend in the hose routing shall be provided in order to accommodate length changes.
- Hoses shall be installed in such a way that motion shall be in a single plane only.
- If there is a risk of friction.
- A reciprocal contact between flexible hoses shall be avoided.
- An uncontrolled oscillation of the flexible hoses shall be avoided.
- The connection of pipes shall be stress free.
- All issues shall be repported to the relevant quality authorities.

4.4.4.7.1 Installation of hoses assembly with permanent end-fitting

Refer to AIPS03-06-008.

4.4.4.7.2 Installation of hoses assembly supported by clamps

Refer to AIPS03-06-008.

4.4.4.7.3 Flexible Hose assembly kinking

Refer to AIPS03-06-008.

4.4.4.7.4 General requirements for flexible hose assembly support

Refer to AIPS03-06-008.

4.4.4.7.5 Flexible hose assembly torque tightening

Refer to AIPS03-06-008.

4.4.4.7.6 Flexible hose assemmbly marking

Refer to AIPS03-06-008.

4.4.5 Flexible connection (Gimbal joint)

Several types of standard flexible couplings are available to meet a range of installation and operational requirements. Selection will depend on:

- Degrees of freedom/restraint required (angular, axial, rotation),
- acceptable leakage rates (bellows or elastomeric seals),
- structural constraints and associated duct support arrangements,
- thermal constraints.

Specific tooling may be used when specified in the installation drawing. It will allow a correct pipe positionning prior the connection.

4.4.5.1 Principle

The Gimbal Restrained Bellows Joint (see Figure 2) is a flexible junction/connection with two Universal joints. The material is titanium and CRES for the fastener parts and Universal joints. The joint end can be designed for a rolled or machined flange (male or female). Several interface (V-flange welded) are available to suit particular applications (same or different each end). The angular deflection of the gimbal assembly is mechanically controlled with limits. Rotation is not possible after assembly.

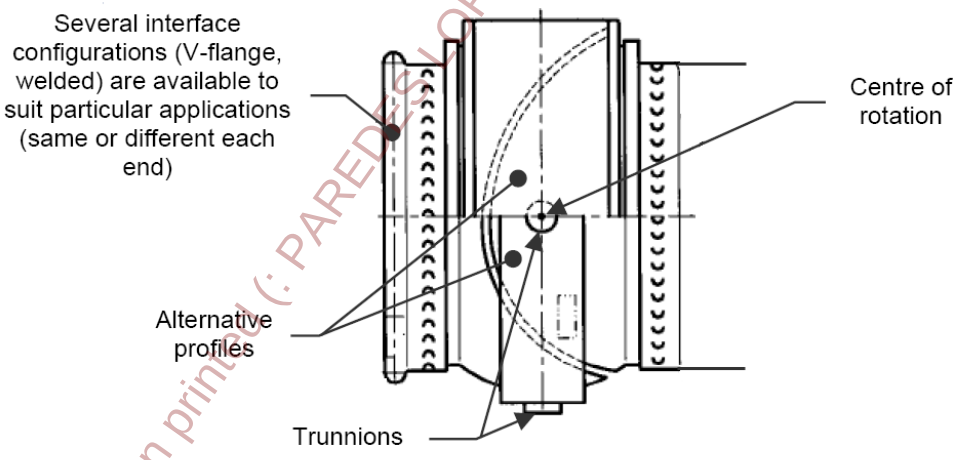


Figure 2: Gimbal joint

4.4.5.2 Flange alignement prior the connection

Prior the connection special care shall be taken on flange alignment to ensure a good in-service performance of the Gimbal.
Utmost care shall be taken in order to avoid any stressed installation. The gimbal must not be installed on its extreme angular position. Optimal adjustement of interfaces thanks to adjustable pipe rods shall be done in order to ensure a minimal angular deflexion on the installed gimbal joint.

4.4.5.3 V-clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.6 Flexible connection (Rotational ball joint)

4.4.6.1 Principle

Rotational ball joints (see figure 3) feature a spherical flange (inner race) attached to the end of one duct located in between a pair of opposing seals fitted in a seal carrier (support) attached to the other duct. The spherical inner race is clamped onto the support with a threaded outer ring. Several interface (V-flange welded) are available to suit particular applications (same or different each end).

The captive spherical inner race permits angular and rotational movement but prevents axial deflection.

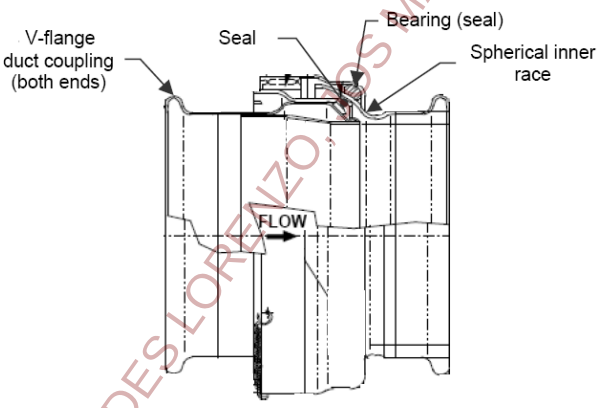


Figure 3: Rotational ball joint

4.4.6.2 Flange alignement prior the connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the Rotational ball joint. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The Rotational ball joint must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed Rotational ball joint.

4.4.6.3 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.7 Flexible connection (V-breaker)

Vibreakers (see Figure 4) feature a elastomeric seal located in a housing which fits over a sleeve. The housing and sleeve are attached to the ends of the two ducts or components to be joined.
Different end-fittings (V-flange, welded etc) are available to suit particular applications.
The housing is able to move relatively to the sleeve in an axial and angular direction. Some Vibreakers allow rotational movement while others contain an anti-rotation clocking device.

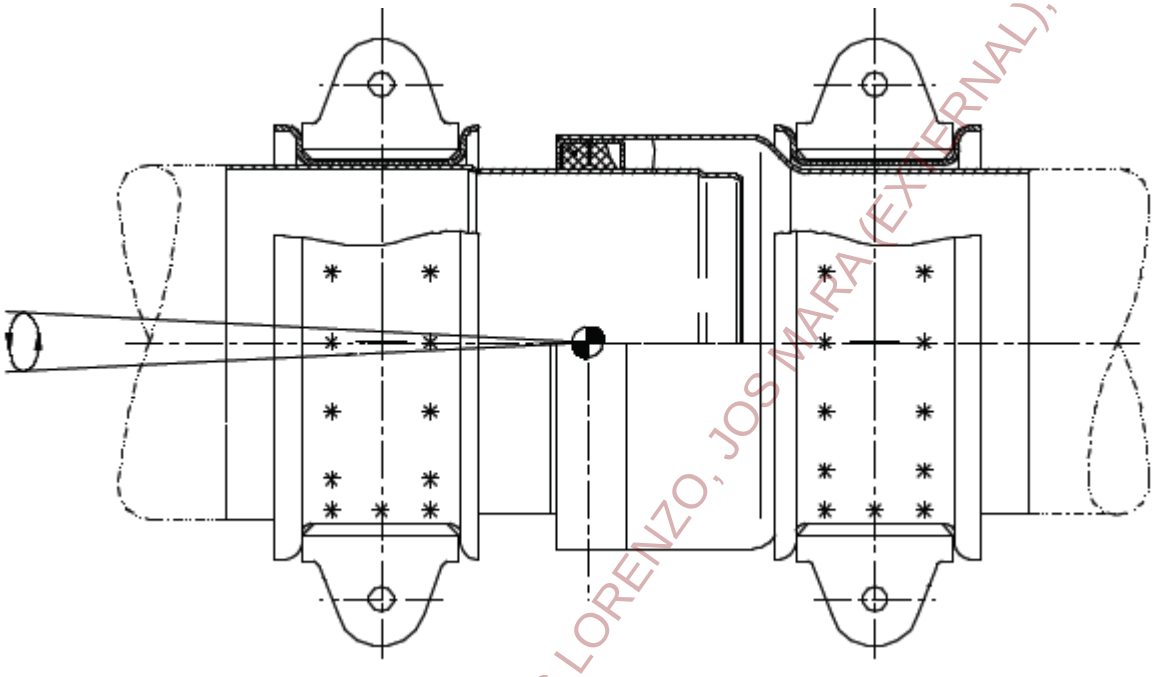


Figure 4: V-breaker Coupling

4.4.7.1 Flange alignement prior the connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the V-breaker. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The V-breaker must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed V-breaker.

4.4.7.2 Seal installation (circumferential seal)

Before installation, check that the ducting has been made according to drawing requirements and that the ends are of correct diameter, square, chamfered and that the chamfer has a smooth finish.
Check that ducts are prepared and cleaned and inspection clearance shall be performed.
All parts should have blanking caps removed and should be checked for cleanliness and if necessary degreased according to AIPS09-01-002 or AIPS09-01-003.
The nominal installation gap shall be checked prior the installation and shall be in accordance with the standard used.
During all seal manipulation, special care shall be taken to avoid a contamination or damage on the seal. The seals are pre-lubricated so require no further lubrication on installation or in service.
The seal shall be carefully inserted into the groove(s) in the housing and the retaining clamp(s) slipped over the sleeve or end of the duct.
Special care shall be taken when sleeves are being inserted in order to prevent any seal damage.
The ducts should be lined up with the least deviation from the theoretical line.
The nominal installation dimensions (see figure 5 and 6) should be checked and it should be verified that, with these dimensions maintained, the ends of the connectors or housing are within the band between the etched lines (when used) on the sleeve.

When achieved the duct mounting clips shall be tightened.
The dimensions mentionned above on this subclause should be rechecked and if found correct the retaining clamp(s) used with the seal couplings can be tightened.

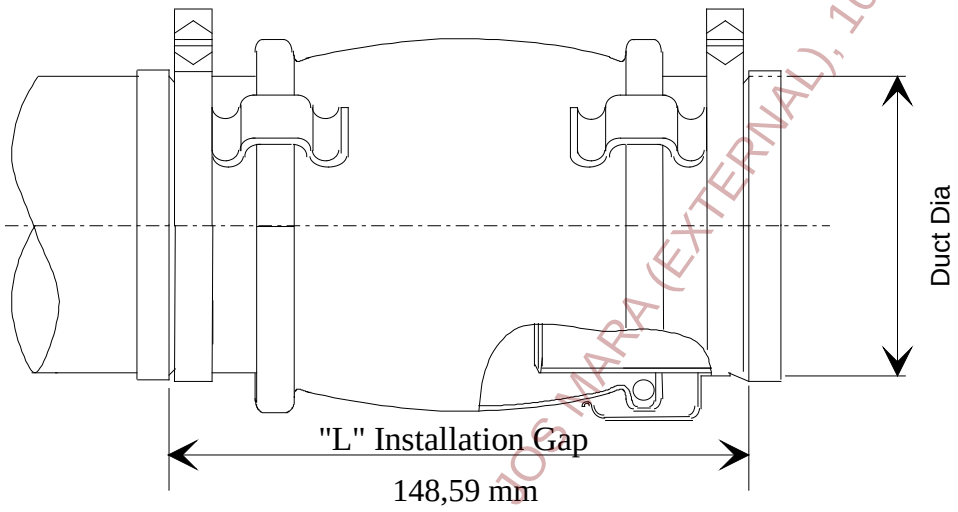


Figure 5: Peri-seal Coupling

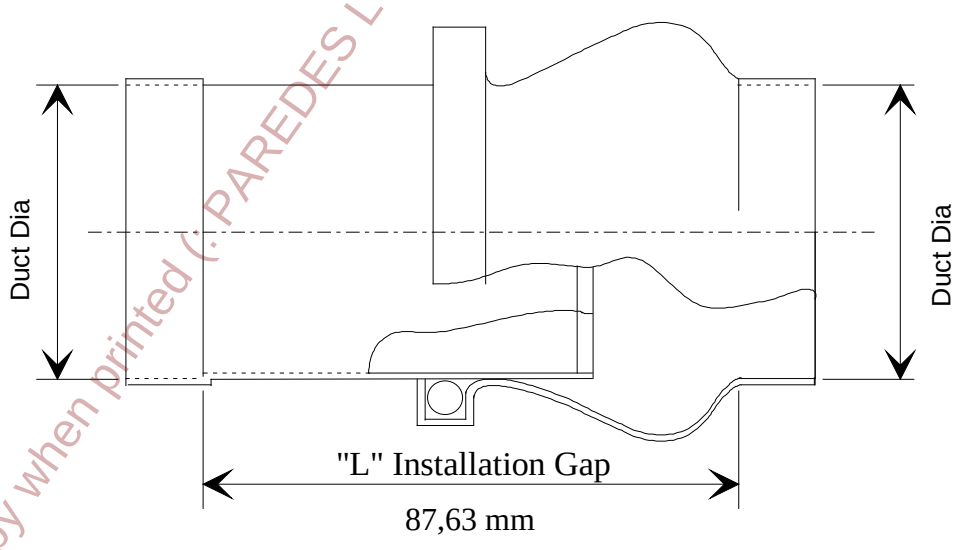


Figure 6: Peri-seal V-breaker

When “Peri-seal” Couplings are used the axial offset and the angular deviation (mentionned in the standard) must not be exceeded.
The end of the connector shall be in the band between the etched lines on the sleeves (when used).
Note, on long distance lines the etched lines may be omitted to allow for the tolerance build-up. In this case the “Peri-seal” connector shall be centered between the clips and each Vibreaker Coupling shall be as near the nominal installation gap as possible.
The retaining clamp(s) shall be fitted in accordance with the drawing and that the attachment bolts shall be fully tightened.

4.4.8 Pressure balanced compensator

4.4.8.1 Description

Pressure balanced compensators (see figure 7) feature an internal balance chamber such that internal pressure does not result in joint expansion.
Several interface (V-flange welded) are available to suit particular applications (same or different each end).

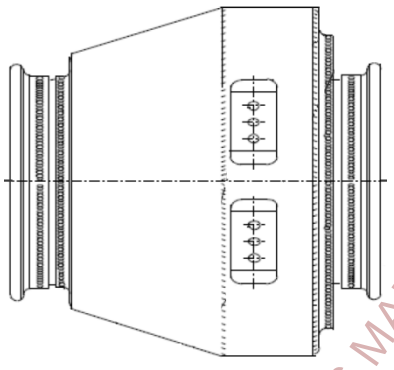


Figure 7: Pressure balanced compensator

4.4.8.2 Flange alignement prior the connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the compensator. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The compensator must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed compensator.

4.4.8.3 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.9 Flexible duct connection (Free Bellow)

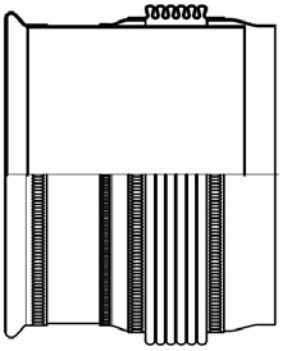


Figure 8: Single free bellow example

Bellows couplings (see figure 8) feature a flexible convoluted metallic or elastomeric section which is able to accommodate angular and axial deflections, but not relative rotational movement.
Free bellows couplings, where the flexible element is unrestrained, also result in end loads on the interfacing components due to the internal air pressure acting on the convoluted surfaces.
Several interfaces (V-flange welded) are available to suit particular applications (same or different each end).

4.4.9.1 Flange alignement prior to connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the free bellow. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The free bellow must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed free bellow.

4.4.9.2 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.10 Flexible connection (Fixed Bellow)

Fixed bellows (see figure 9) featuring an integrated flange allow the bellows assembly to be rigidly attached to the structure.
Several interface (V-flange welded) are available to suit particular applications (same or different each end).

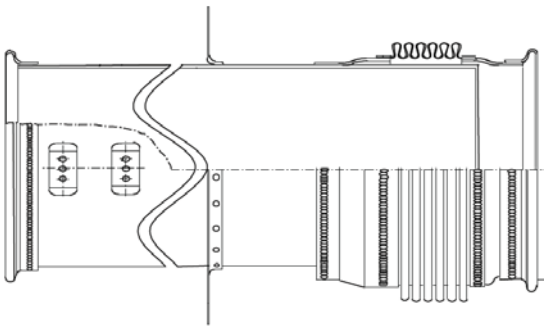


Figure 9: Single fixed bellow example

4.4.10.1 Flange alignement prior to connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the fixed bellow. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The fixed bellow must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed fixed bellow.

4.4.10.2 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.11 Flexible connection (grooves + PTFE seal + sleeve)

This particular connection principle is applied on small ducts (Trim Air Area).

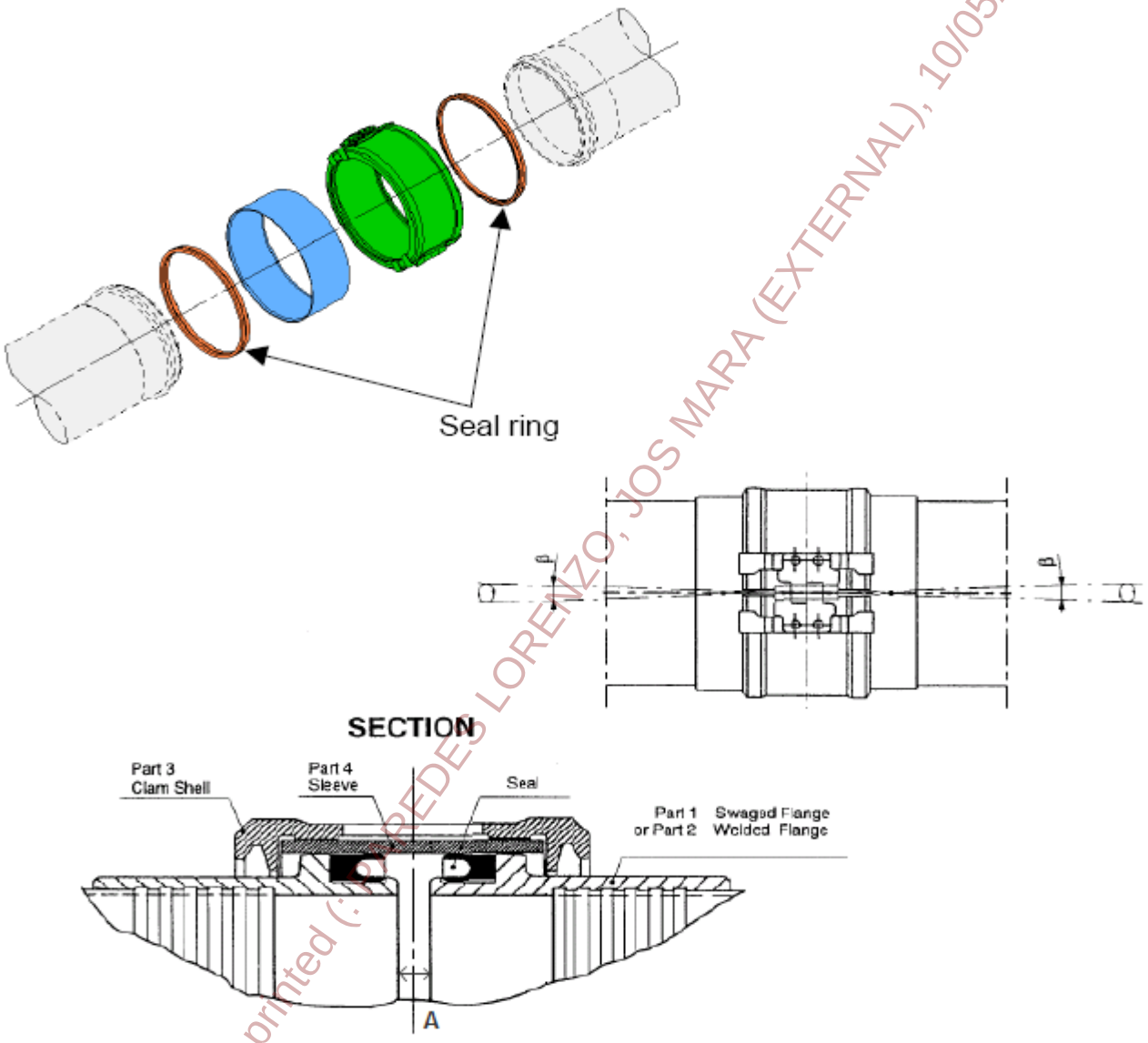


Figure 10: Flexible Coupling for High Pressure Ducts

Part 1: Swaged Flange
Part 2: Welded Flange
Part 3: Clam Shell
Part 4: Sleeve
Seal-Ring, high temperature resistant.

4.4.11.1 Flange alignement prior to connection

Prior to connection special care shall be taken on flange alignment to ensure a good in-service performance of the flexible coupling. This alignement shall be done using the adjustable rods when provided.
After installation there shall be no stress in the couplings. The flexible coupling must not be installed on its extreme angular position. Optimal adjustement of interfaces using the adjustable rods shall be done in order to ensure a minimal angular deflexion on the installed flexible coupling.
The axes of the air ducts should be aligned with each other. Distance ”A” max. (see figure 10) between the two duct ends and the flanges must not exceed the value given on the coupling standard.

4.4.11.2 Seal installation

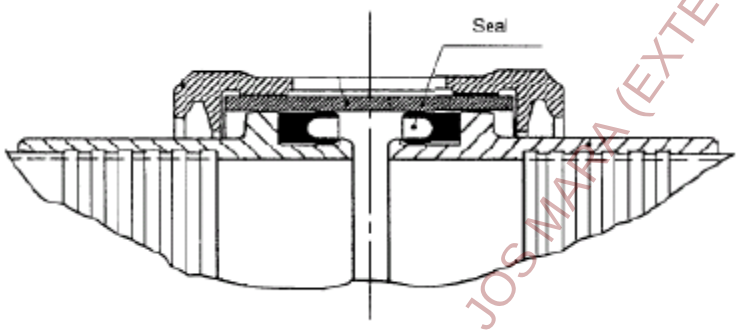


Figure 11: Seal positionning

As shown in the figure 11, seals must be installed on their nominal position. An oposite positionning would lead to non-functional coupling.
No lubricant is needed with PTFE seals.

4.4.12 Machined flanges

4.4.12.1 Principle

Machined Connecting Flange (see figure 12) requires an O-ring or seal to accommodate movement between the two machined connecting flanges when they are adjusted. It also reduces the risk of leakage. A combination of machined flange and sheet metal flange is possible.

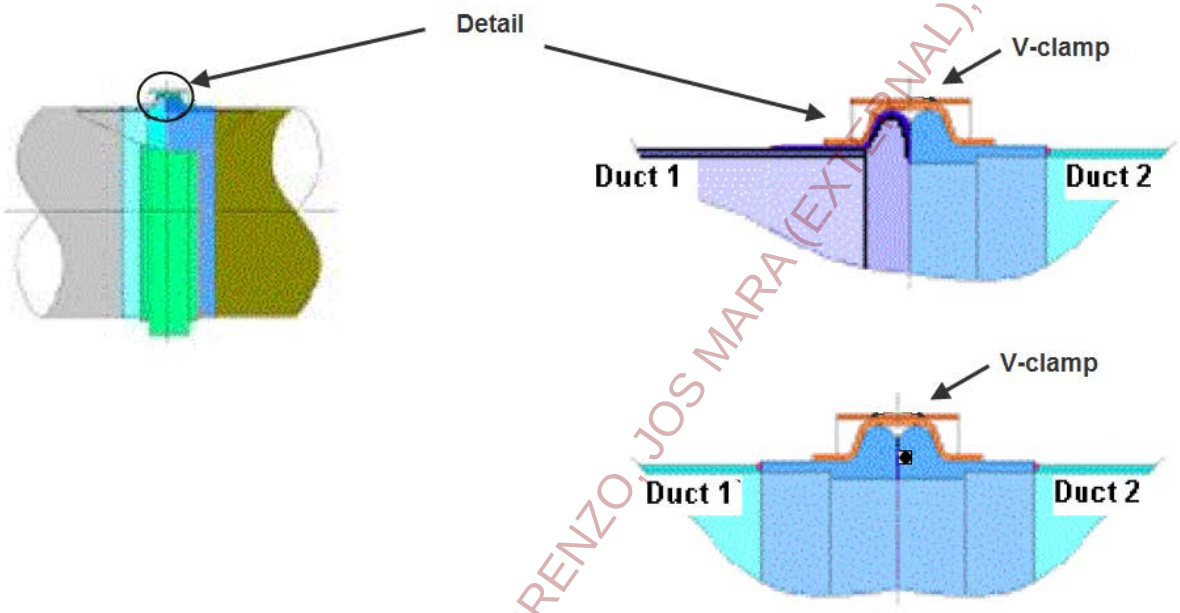


Figure 12: Machined flange principle

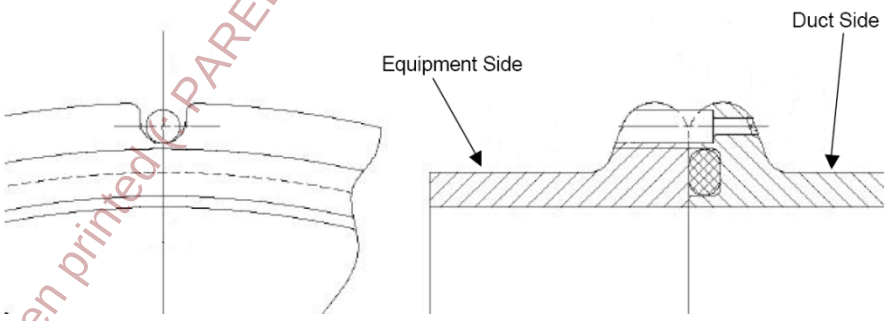


Figure 13: Example of clocking device in flange coupling

4.4.12.2 Pipe alignement

Prior to the connection, pipes shall be aligned according to the following tolerances.

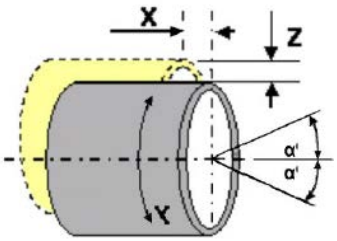


Figure 14: Pipe alignement before connection (without clocking device on connection)

Radial misalignment, Z = 0 mm.
Angular misalignment, α = 0,5°.
Axial misalignment, x = 0 mm.
Rotational misalignment, y = 360°.
These alignements shall be done using the adjustable rods when provided.
In case of presence of clocking device on flanges (see figure 13), then **y = 0°**. It means that pipes shall be angulary positionned in order to plug the clocking device into its location.

4.4.12.3 Seal installation

Expiry date shall be later than the time of installation.
Unless otherwise specified on the drawing, no lubricant is applied.
There must be no damage on flange surfaces.
Seal shall be correctly positionned and centered before connection.
Special care shall be taken in order to avoid any seal damage.

4.4.12.4 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing.
After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.13 V-flanges (classic profile)

V-flange couplings (see figure 15) feature an angled formed flange fitted on the end of each duct, held together with a V-clamp.
Sealing is achieved through metal-to-metal contact between the two flanges. 2 clamp profiles can be used. Square and V profile. There is no functional difference and the two principles are interchangeable concerning form, fit and function.

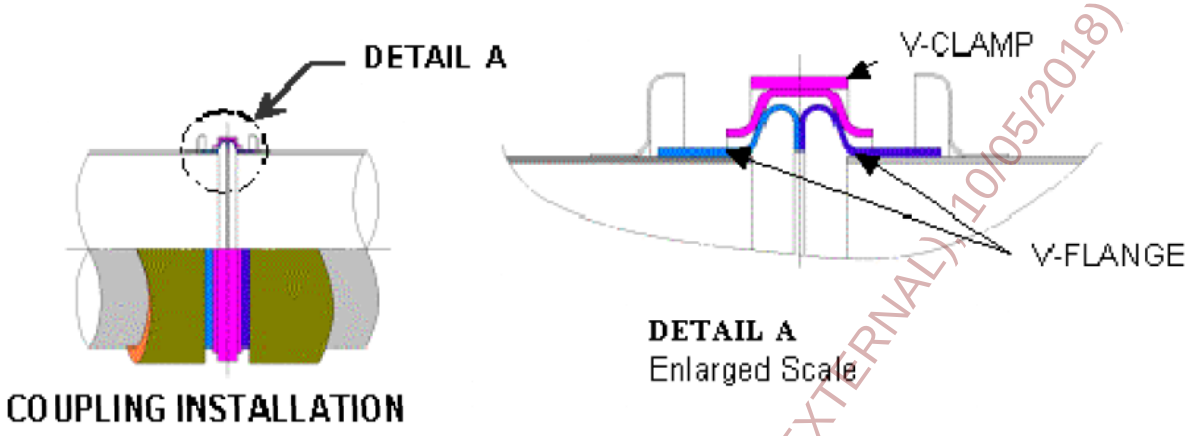


Figure 15: V-flange connection

Installation requirements are specified in AIPS03-01-003.

4.4.14 V-flanges (auto-centered machined profile)

4.4.14.1 Principle

Machined profile V-flange couplings (see figure 16 and 17) feature an angled machined flange on the end of each duct held together with a V-profile clamp. Sealing is achieved through the use of a compressible elastomeric U-profile or metallic E-profile seal.

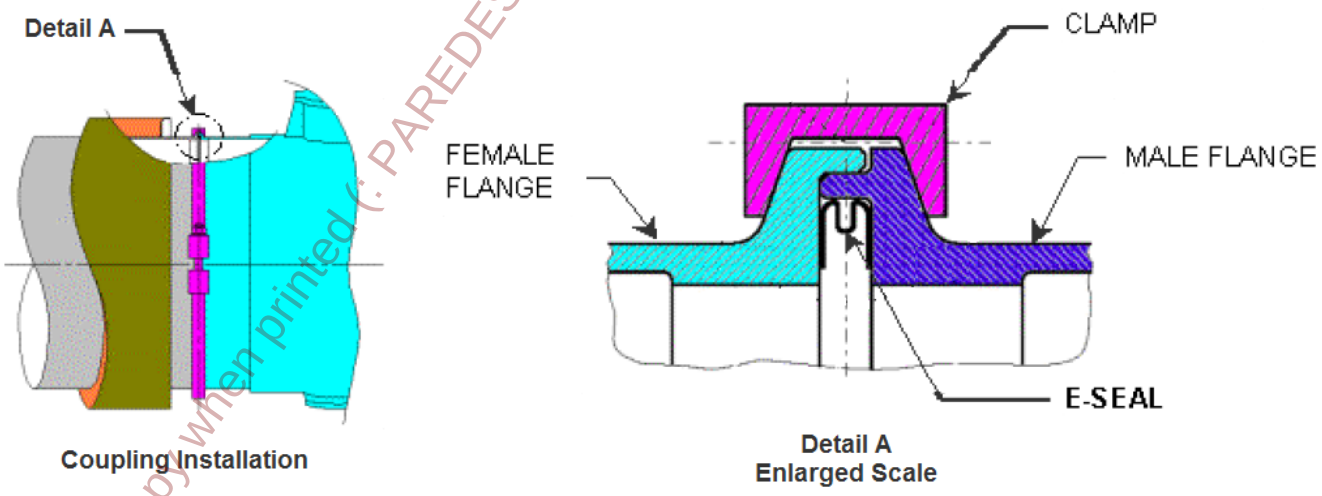


Figure 16: V-Flange, reduced profile

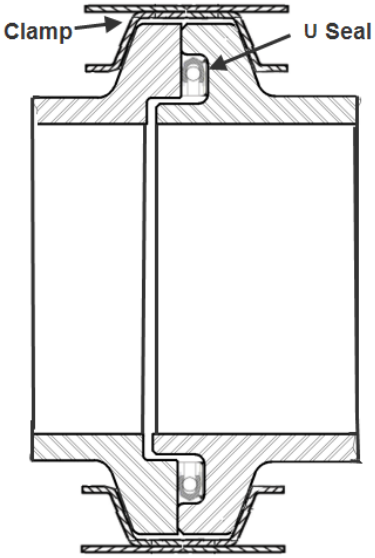


Figure 17: Auto centered machined flange connection

4.4.14.2 Pipe alignement

Prior the connection, pipes shall be aligned according to the tolerances specified in figure 18.

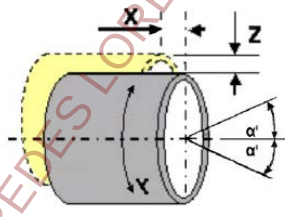


Figure 18: Pipe alignement before connection

Radial misalignment, Z = 0 mm.
Angular misalignment, α = 0°.
Axial misalignment, x = 0 mm.
Rotational misalignment, y = 360°.

This alignement shall be done thanks the adjustable rods when provided.
There is a potential reduced loading capacity risk, if flanges are not correctly installed.

4.4.14.3 Seal installation

For non-metallic seals, expiry date shall be after the time of installation.
Seal does not require any lubricant.
There must be no damage on flange surfaces.
Seal shall be correctly positionned and centered before connection.
Special care shall be taken in order to avoid any seal damage.

4.4.14.4 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing. After clamp positionning, torque tightening shall be applied as detailled on subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.15 Self Aligning Duct Joint

4.4.15.1 Principle

Self-aligning rigid duct joints (see figure 19) feature machined V-flanges with spherical mating surfaces and a compressible seal, held together with a V-clamp. The spherical surfaces allow small angular misalignments between duct centrelines on assembly.

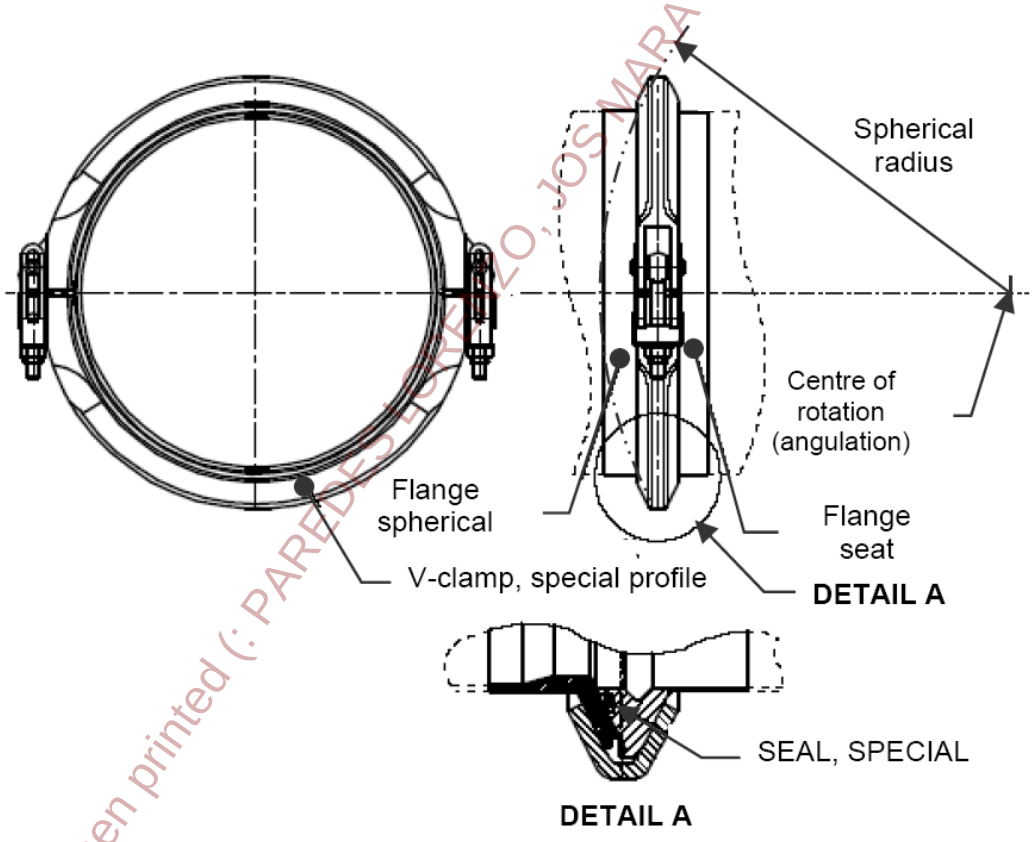


Figure 19: Self aligning duct joint

4.4.15.2 Pipe alignment

Prior to the connection, pipes shall be aligned according to the tolerances specified in figure 20.

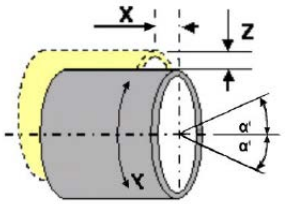


Figure 20: Pipe alignement before connection

Radial misalignment, Z = 0 mm.
Angular misalignment, α = ± 1,25°.
Axial misalignment, x = 0 mm.
Rotational misalignment, y = 360°.

This alignement shall be done thanks the adjustable rods when provided.

4.4.15.3 Seal

Only a metallic seal shall be used with this coupling.
There must be no damage on flange surfaces.
Seal shall be correctly positionned and centered before connection.
Special care shall be taken in order to avoid any seal damage.
No lubricant is applied.

4.4.15.4 Clamp torque tightening

Before clamp positionning, flanges must be in contact. Clamp locking feature orientation shall be fitted as specified on the drawing.
After clamp positionning, torque tightening shall be applied as detailled in subclause 4.4.20.
Special attention shall be taken to equally distribute the torquing load all around the connection (see AIPS03-01-003).
Never use the V-retainer coupling to pull flanges into alignment.

4.4.16 Coupling insulation (Soft insulation sleeves)

4.4.16.1 Presentation

Soft insulation sleeves (see figure 21) is used where hard insulation can not be installed.
By its design (venting hole or venting grid), these insulation sleeves lead hot air leakage through a venting hole/grid, located in front of OHDS sensing element which is in charge of the leakage detection.

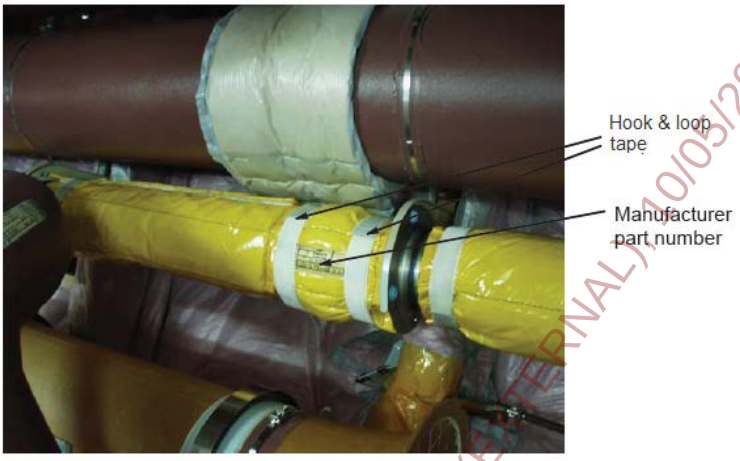


Figure 21: Complete insulated titanium pipe

4.4.16.2 Installation requirements

If specified in installation documents, air ducts shall be provided with insulating sleeves at the connections.
Prior to installation, soft insulation sleeves shall be compliant with installation drawings and/or standard or technical specification.
Soft insulations shall be installed in good condition and at the exact position specified on the installation drawing in agreement with the reference given on its identification label. The venting hole/grid shall be installed so that it is well aligned with the sensing elements line of OHDS. The soft insulation shall be blocked in rotation.
In some cases, it is possible that the insulation sleeve partially covers the seven-oval holes of the air ducts (see figure 22). This covering can be due to either installation/manufacturing tolerances issue or design issue. An acceptable rate of 4/7 holes totally clear from obstruction is allowed and shall not be considered as a rejection criterion. For the inner fixed leading edge (IFLE), a rate of 6/7 holes totally clear from obstruction is accepted.

Figure 22: Insulation sleeve partially covering the seven-oval holes

4.4.16.2.1 Longitudinal overlapping position

When installed on horizontally installed air ducts, soft insulation shall be installed as shown in figure 23 (overlapping pointing down). Any condensation water formed may thus drain off easier.

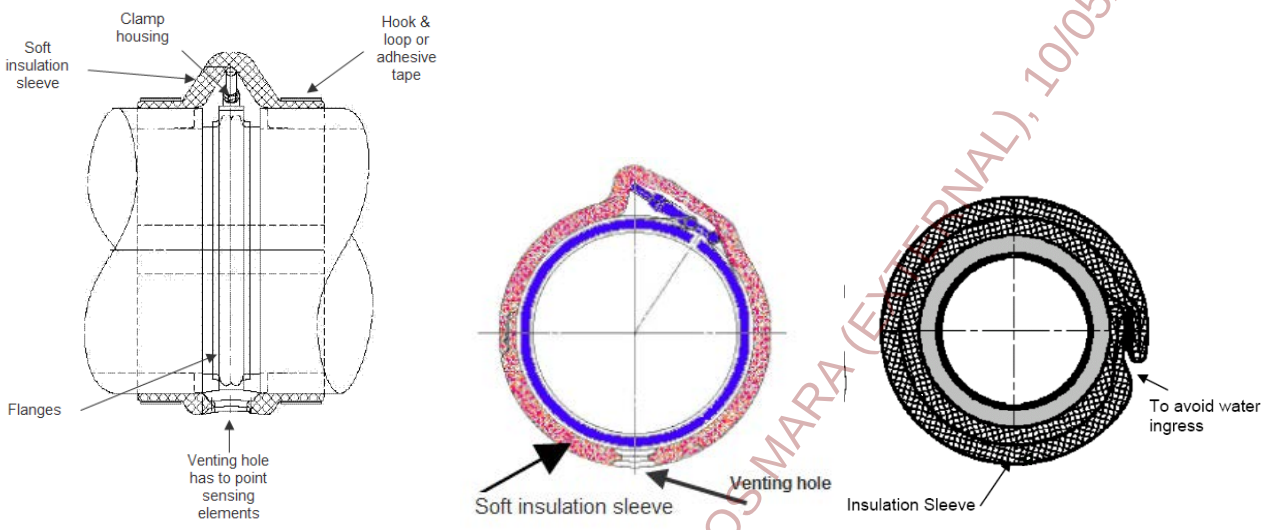


Figure 23: Insulation sleeve over duct connection

If air ducts are installed vertically, the position of the overlapping hook & loop tape or adhesive tape fastener is of no importance.

4.4.16.2.2 Venting hole/ grid installation

A six o'clock installation is not allowed for A350. In this case, venting hole shall be positioned between 3 and 5 o'clock and between 7 and 9 o'clock.
Utmost care shall be taken in order to ensure that venting holes/grids have to be located exactly in front of the sensing elements. When light color labels (yellow/beige) are stuck on both sides of the venting grid, to ease the installation of the sleeve, and to ensure a good alignment of the venting grid with the sensing elements. These guiding labels shall not be removed, even after the sleeve installation (see figure 24).

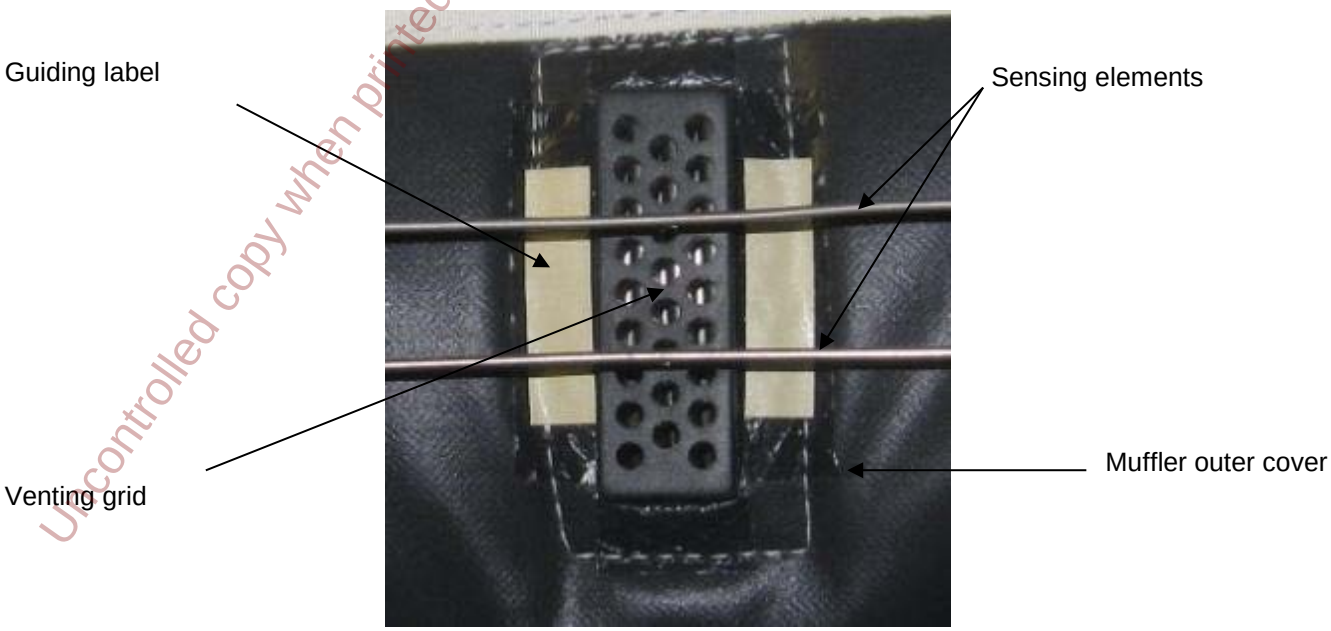


Figure 24: Example of light color label meant to guide the installation

Unless otherwise is specified in the installation drawings, and when it is possible, the screw of the clamp must be located on the opposite of the venting hole/grid, so on the opposite of the sensing elements. It shall neither be located “in” nor “under” the venting hole/grid.

4.4.16.2.3 Fastening requirements

To ensure a leak proof installation each sleeve sides shall be tightened as tightly as possible around the connections, avoiding any damage. When cords are used, they shall be installed in accordance with Figure 25.
Any excess of cord shall be cut off to approximately 20mm.

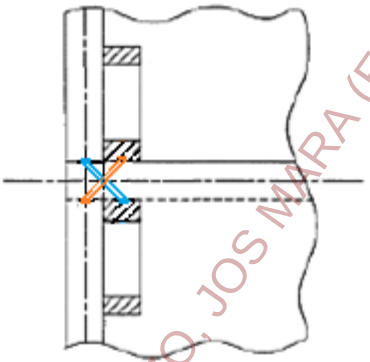


Figure 25: Cords tightened on the soft insulation sleeve

4.4.16.2.4 Anti-rotation devices

To prevent the insulation to rotate around the duct and to ensure a good installation of the venting hole/grid, some insulation sleeves are equipped with anti-rotation devices.
These anti-rotation devices shall be installed using a feature of the system like spacer, omega bracket,screw…(see relevant standards or installation drawings for more details). The soft insulation shall be blocked in rotation.
In some cases, it is possible that the anti-rotation device partially covers the seven-oval holes of the air ducts (see figure 26). An acceptable rate of 4/7 holes totally clear from obstruction is allowed and shall not be considered as a rejection criterion.

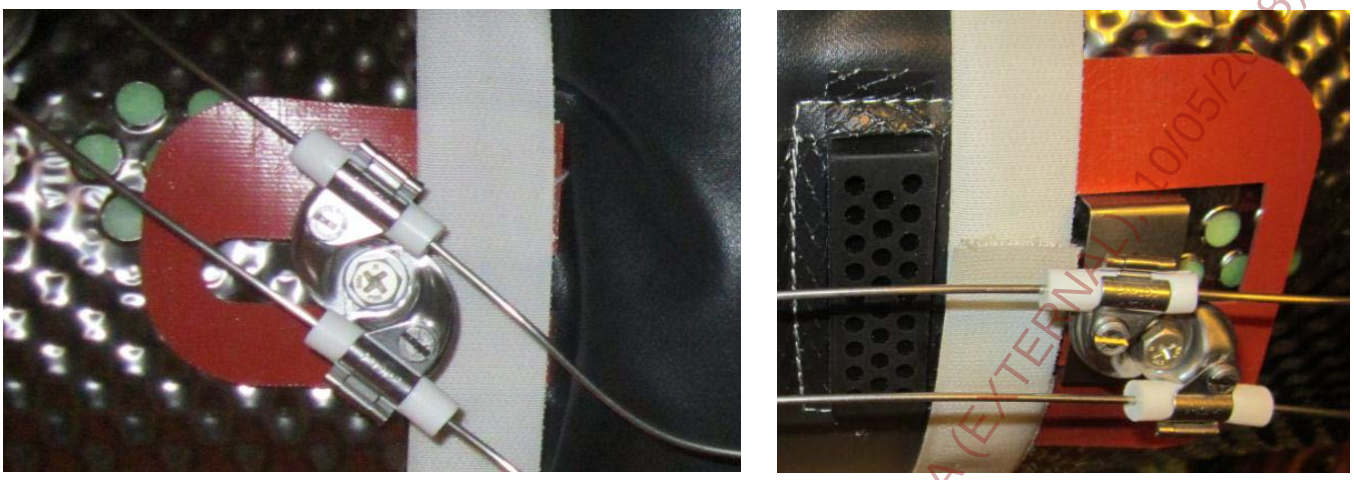


Figure 26: Anti-rotation devices partially covering the seven-oval holes

4.4.17 Over Heat Detection System (OHDS)

4.4.17.1 Presentation

The Overheat Detection System is a safety critical system. It is mandatory to respect the corresponding installation rules in order to ensure a proper function.
The venting holes/grids (in soft insulation sleeves and hard duct insulation covers) shall always be directed towards the overheat detection sensing elements; otherwise a possible hot air leakage flow might not be properly detected.
It is strictly forbidden to hang anything (e.g. equipment like lamps or other objects) on the sensing element lines.
If protection of heat sensitive structures is also required, the OHDS can be installed between the venting-holes/grids of the insulation cover and the heat sensitive structures.
After sensing element installation, a complete check shall be performed in order to verify that the following requirements are met.

4.4.17.2 Distances from sensing elements to surrounding components

The minimal and nominal clearances between wire and structure shall be as specified on the table 3.

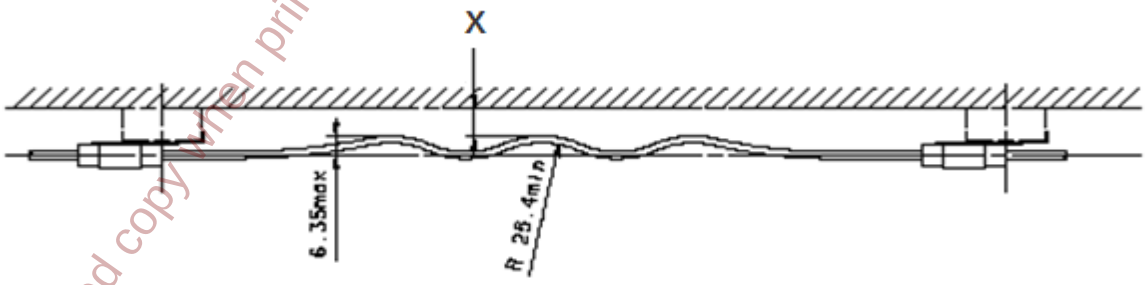


Figure 27: Minimal distance between structure and sensing element

Table 3: Clearances between sensing element and structure

Dimensions in millimeters

(see figure 24)	A400M	A380	A350
Minimal distance X	12,7	9,52	12,7
Maximal distance X	N/A	N/A	N/A
Nominal distance X	N/A	15,0	15,0

The minimum, maximum and nominal distance between the venting holes/ grids of the hard and soft insulation covers and the sensing elements (see figure 28) shall be as specified in the following table 4.

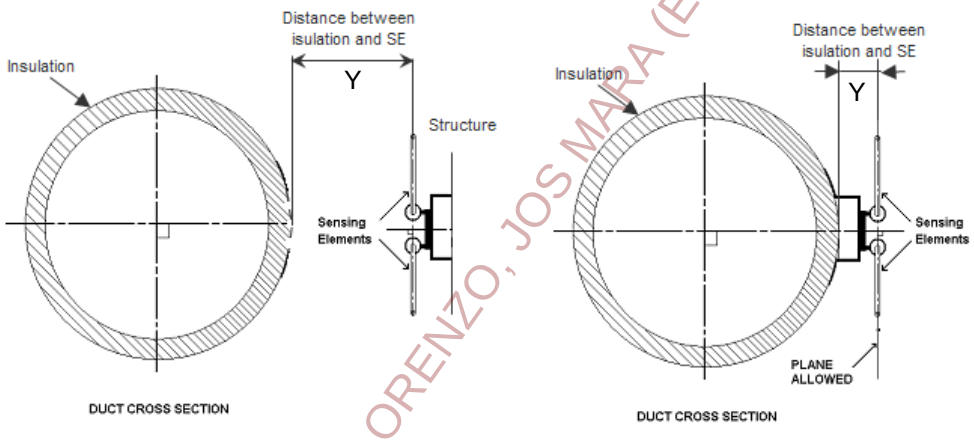


Figure 28: Distance Y between Sensing Elements and ducts insulation

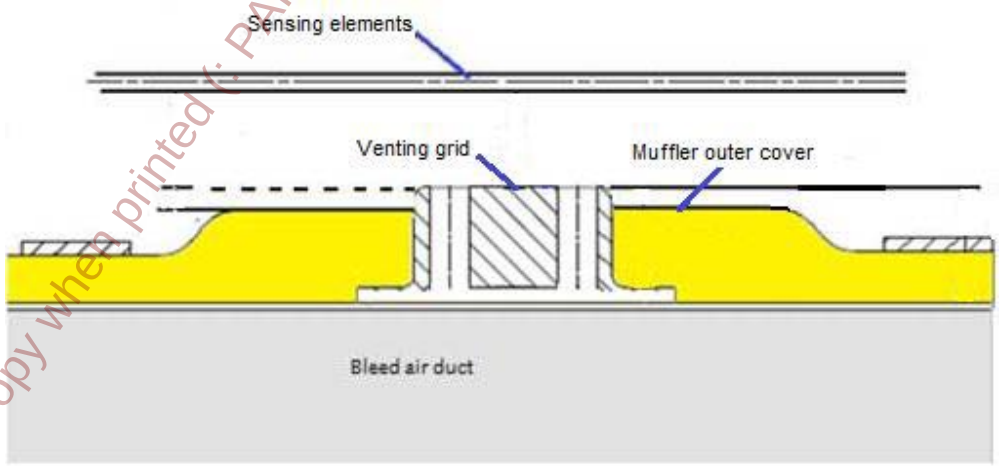


Figure 29: Sketch of Hard and Soft insulation

Table 4: Distances between hot air duct insulations and sensing elements (see figure 27)

Dimensions in millimeters

	A400M		A380			A350	
Insulation type	**Soft**	**Hard**	**Soft**		**Hard**	**Soft**	**Hard**
			Muffler outer cover	**Venting grid**			
Minimal clearance Y	12,7	12,7	15,0	10,0	12,7	15,0	12,7
Maximal distance Y	156,35	156,35	35,0(1)	30,0(1)	150,0	30,0	40,0
Nominal distance Y	N/A	N/A	25,0	15,0	N/A	25,0	35,0

Note (1): 150,0 mm distance is allowed when sensing elements are installed on the structure.

Bend Radii to Sharp Edges:

Where wires are routed close to sharp edges on structure, a minimum clearance of 12,7 mm between the wire and the sharp edge should be maintained.

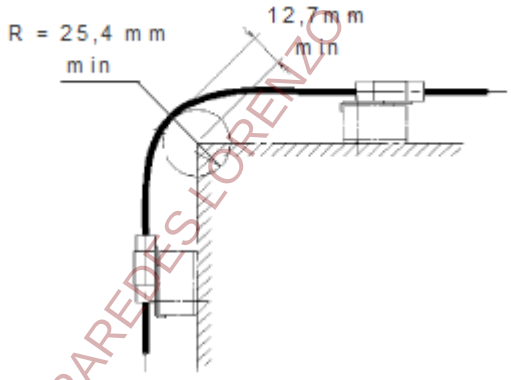


Figure 30: Bend radii to sharp edges

Maximum spacing between the two sensing elements (see figure 31) should as specified in table 5.

Figure 31: Distance between 2 sensing elements on the same route

Table 5: Distances between 2 sensing elements in dual loop configuration

Dimensions in millimeters

(see Figure 30)	A400M	A380	A350
Nominal distance Z	22,7	23,0	23,0
Maximal distance Z	35,4	38,1	38,1

In dual loop system, both sensing elements shall be routed in such a way to ensure a minimum constant segregation of 12,7 mm/ 0.5 inch (see Figure 32).

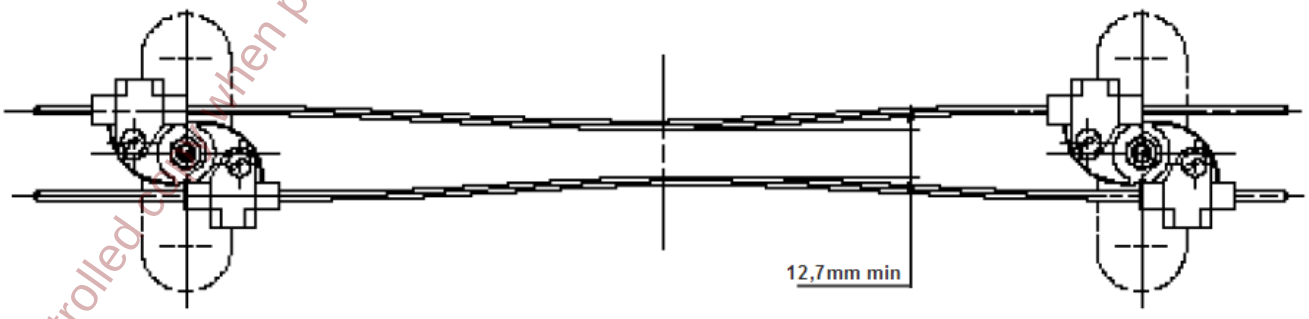


Figure 32: Minimal clearance between 2 sensing elements on the same routing

The maximal distance between 2 sensing elements on dual loop configuration is given by adding 12,7 mm (2 x 6,35 mm) to the nominal distance specified in table 5.
The minimum bend radius throughout the element length (see figures 33, 34 and 35) shall be not less than 25,4 mm (1 inch) with a maximum waviness of 6,35 mm (0.25 inch).

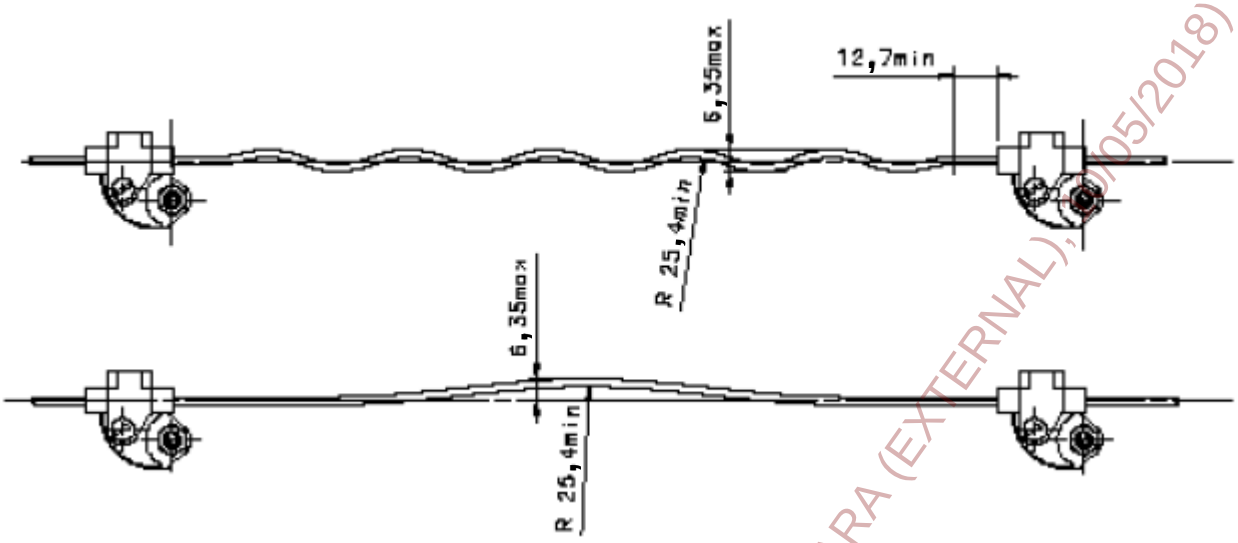


Figure 33: Bend dimensions in milimeters

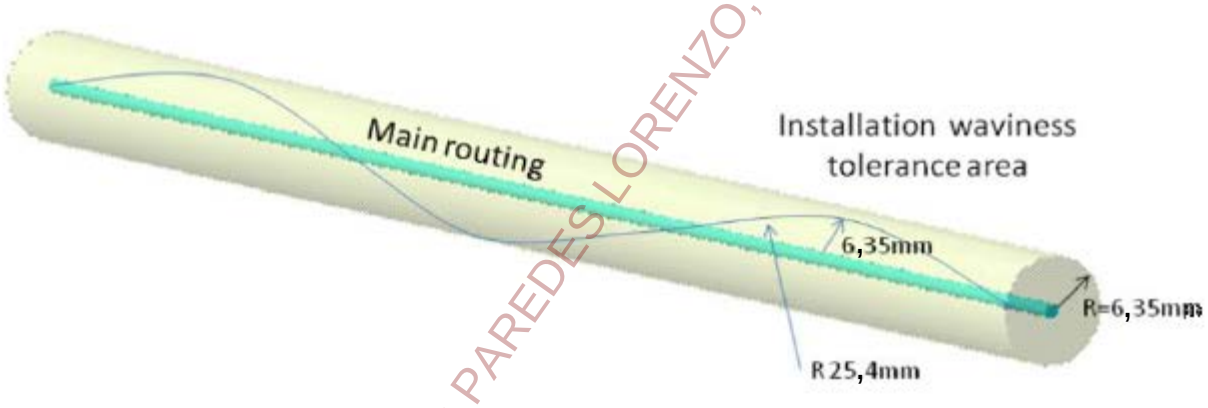


Figure 34: Maximal waviness tolerated

Sensing elements shall remain straight and free from bends for a minimum of 12,7 mm (0.5 inch) adjacent to mounting clips (see figure 35).

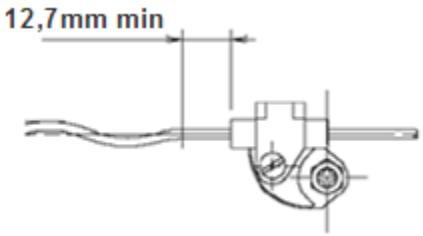


Figure 35: Minimal straight length of sensing element after a clamp

When mounted clips are installed perpendiculary to each other, the routing of the sensing elements shall fulfill the following figure 36.

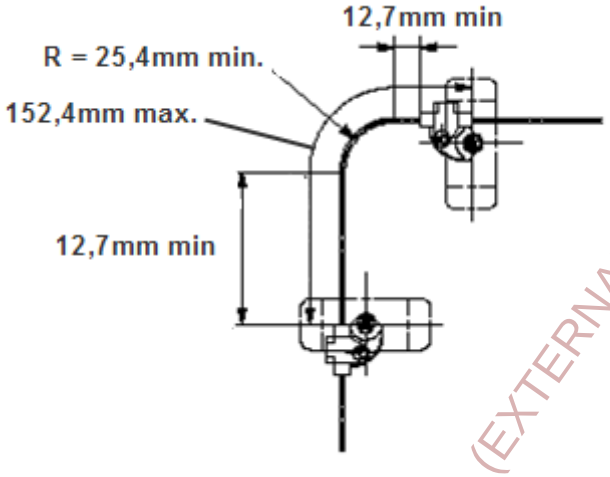


Figure 36: Minimal straight length near clamps

Sensing elements shall remain straight and free from bends for a minimum of 25,4 mm (1 inch) adjacent to the hex nuts of the connector (see figure 37).

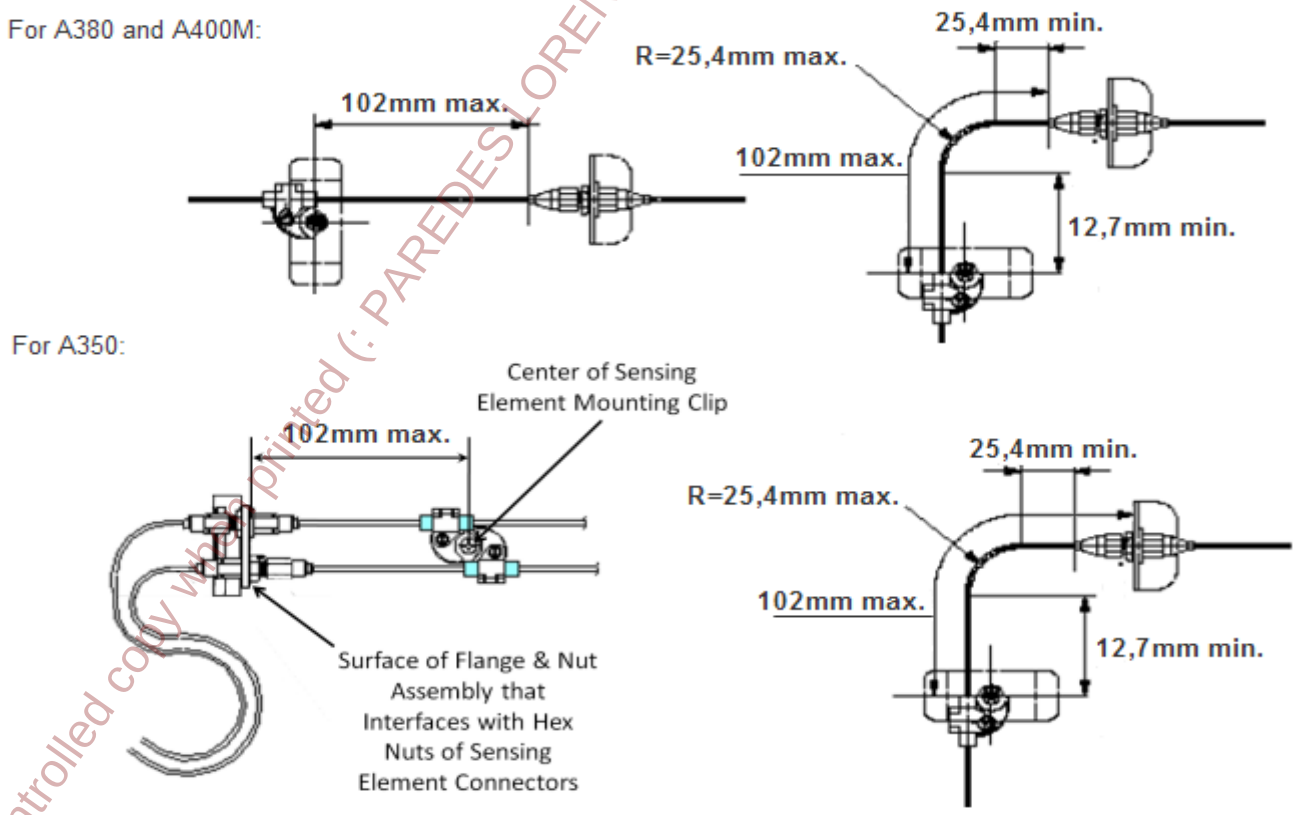


Figure 37: Minimal straight length near termination connector

For A350, maximum bend before a termination connector (as shown in Figure 37) shall be 90°.

4.4.17.3 Routing

4.4.17.3.1 Face to venting holes

The sensing elements shall be installed in the A/C perpendicular to and in front of the venting holes/grids of the ducts and soft insulation sleeves as specified in figure 38.

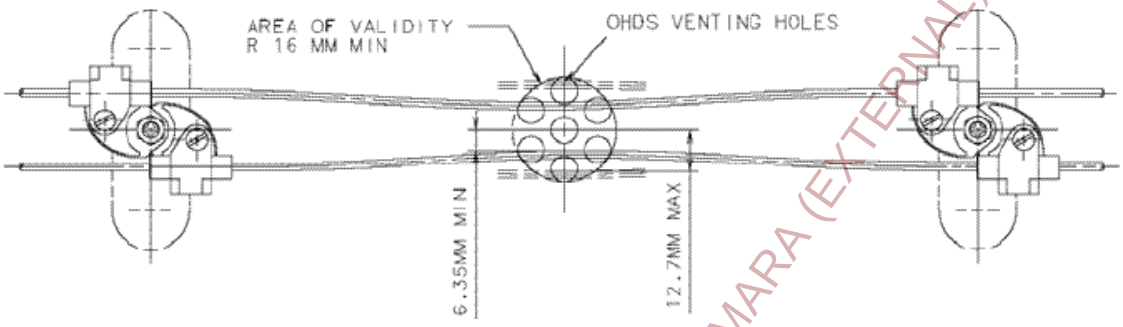


Figure 38: Position of Sensing element in front of ventilation hole

Figure 39: Position of sensing element in front of soft insulation hole

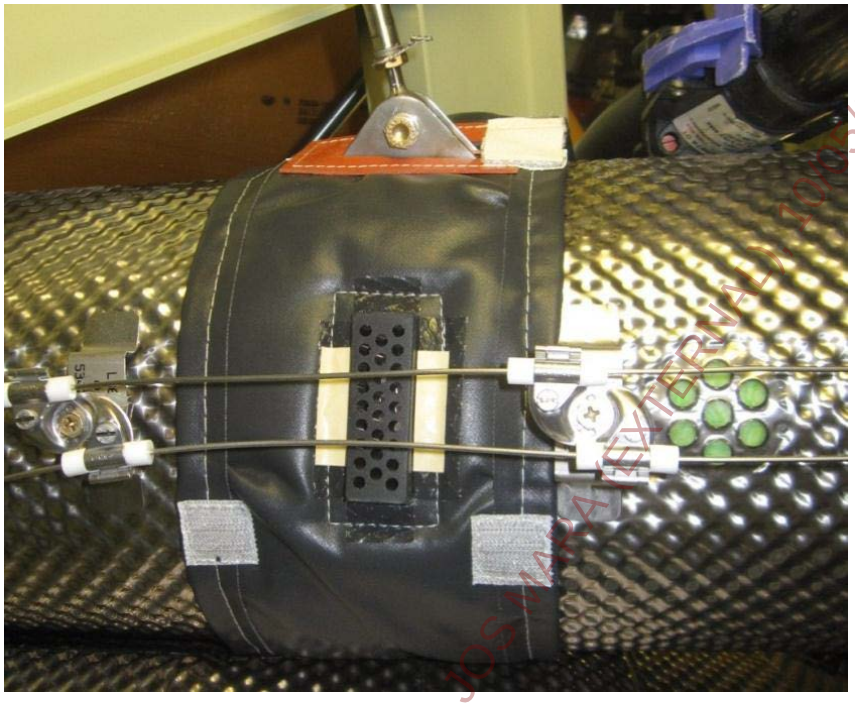


Figure 40: Position of sensing element in front of soft insulation grid (through the guiding label)

4.4.17.3.2 Termination of loop

If the sensing element loop ends at an isolation valve or a bulkhead (see figure 40), the element shall be turned 180° away from the isolation valve or bulkhead before terminating. The installation shall be performed according to the principle shown in figure 41 and 42 (example valve) taking into consideration the indicated dimensions and radii:

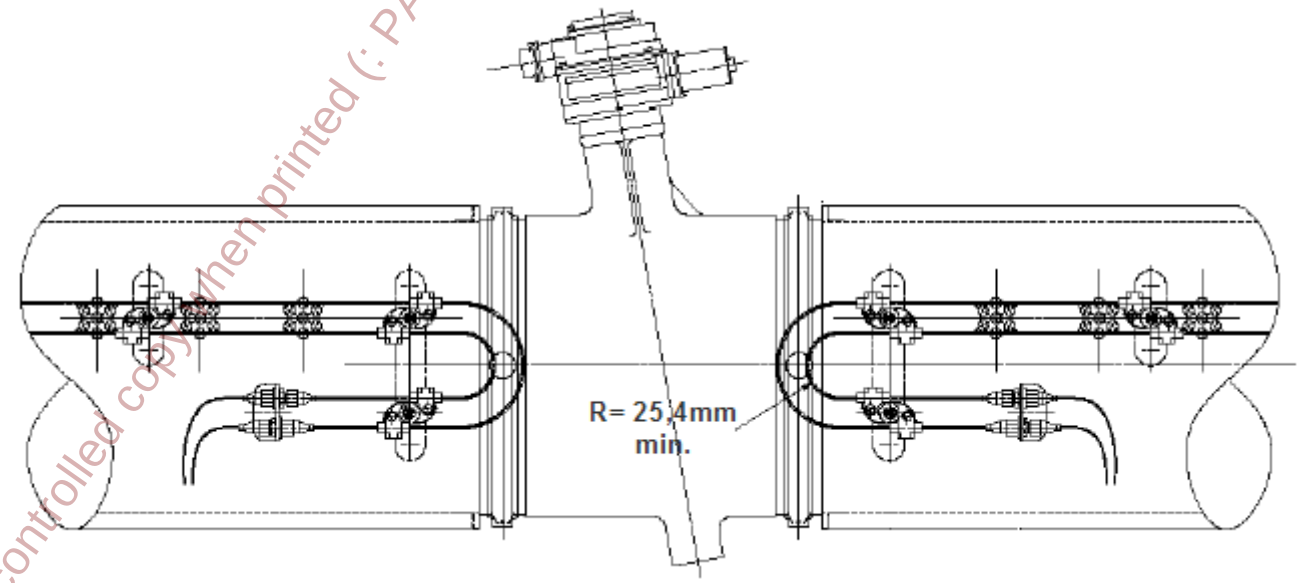


Figure 41: Termination loop radii requirement

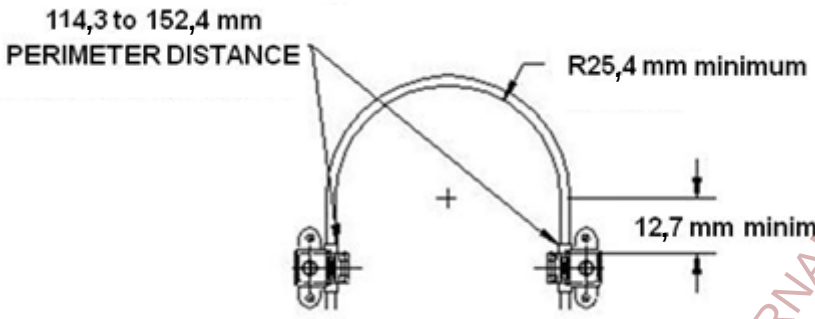


Figure 42: Requirements for bends over 90° for A350 only

Only for A350, specific dimensions shall be taken into consideration when the bend routing is over 90° up to 180° as shown in figure 42. Sensing element shall be routed aligned with venting hole or venting grid.

4.4.17.3.3 Compensation devices

Where sensing elements are run over compensating devices without additional brackets on the structure (see figure 43), the installation shall be performed according to the principle drawing in addition of the indicated dimensions and radii for A380 and A350:

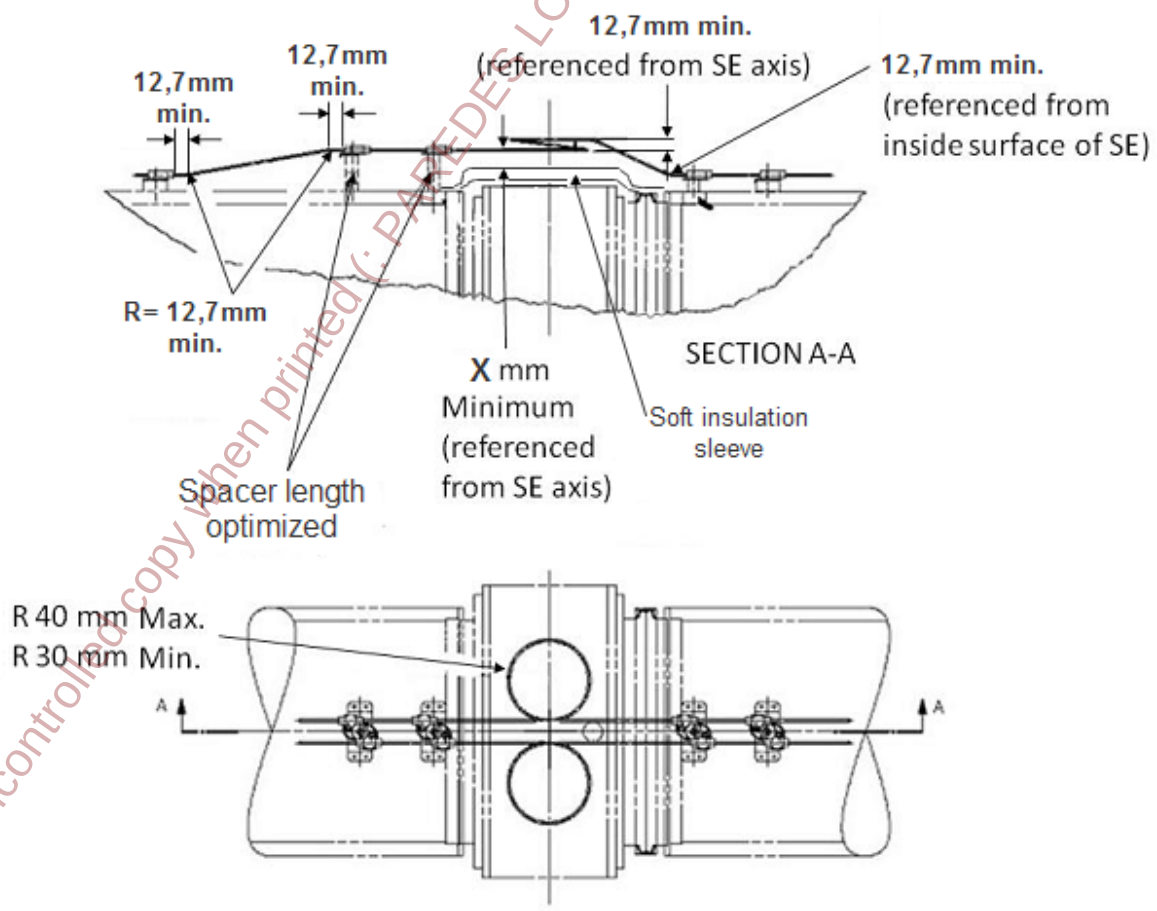


Figure 43: Compensation loop on connection – valid for A350 and A380

Table 6: Dimension X and Y for Figure 42

	X (mm)
A380	15,0
A350	25,0

Dimensions in table 6 are minimal dimensions acceptable between SE and soft insulation sleeve for A380 and A350.
Sensing elements length compensation shall not be located in front of the venting holes/ grids.
Concerning A400M installation requirements are different from A350 and A380.
SE routing on conpensation devices shall be as specified in figure 44.

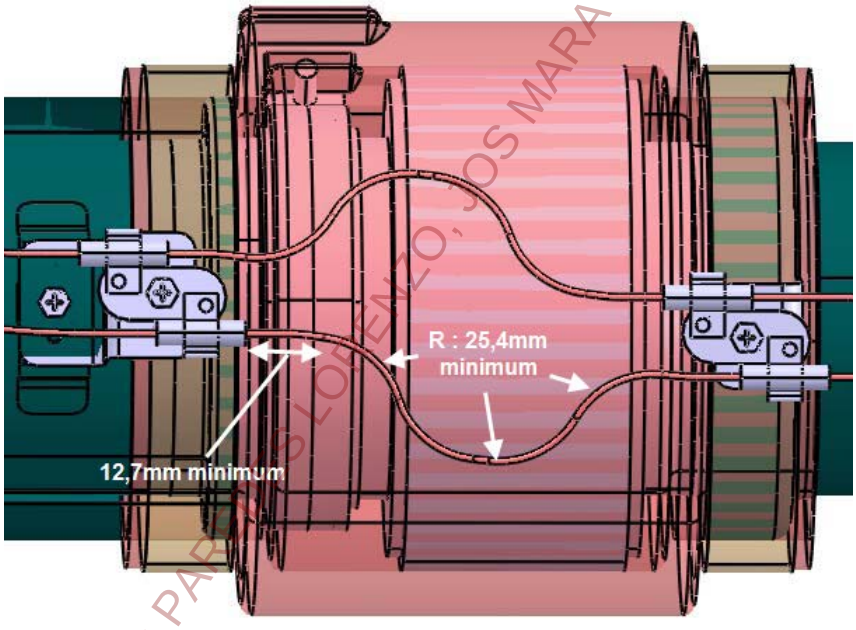


Figure 44: Routing of SE on compensating devices for A400M

In addition, distance from sensing element to soft insulation sleeve shall be maintained above 12,7 mm.
This SE installation principle over the compensating devices shall not be done in front of any venting hole.

4.4.17.3.4 Across the structure

Where sensing elements pass through the structure with the help of connectors or a bulkhead connection (see figure 45), the installation shall be performed according to the below shown principle drawing under consideration of the indicated dimensions and radii:

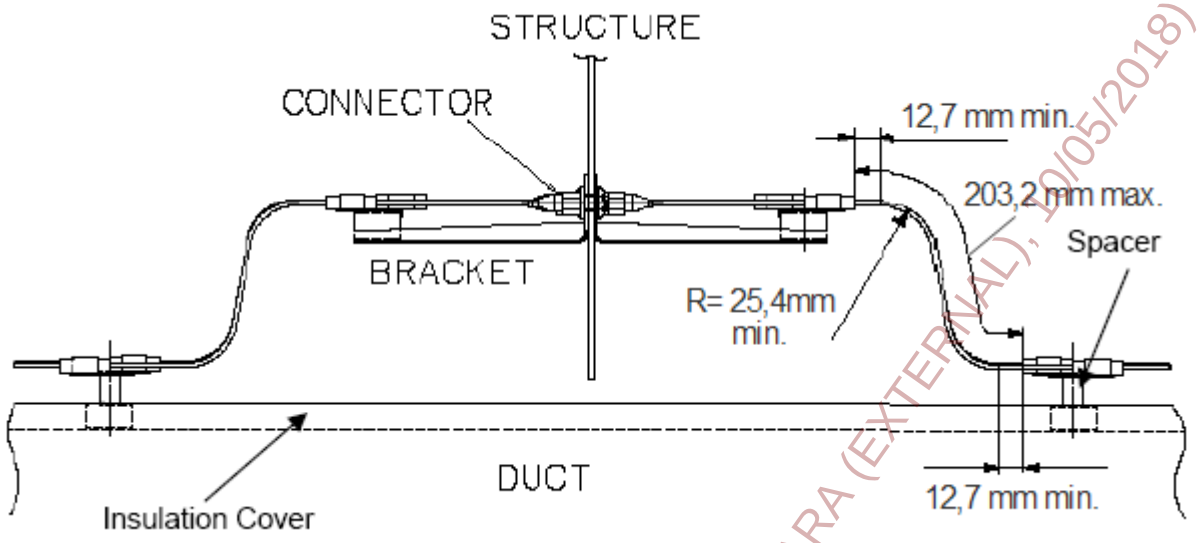


Figure 45: Routing cross the structure

Where sensing elements pass through the structure with the help of grommets, the routing shall be performed acc. to figure 46 under consideration of the indicated dimensions and radii.

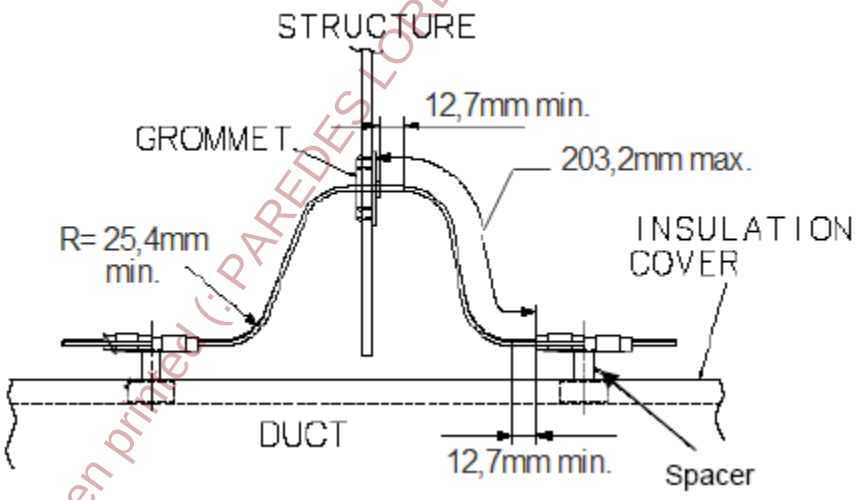


Figure 46: Routing cross the structure with grommet

In order to accommodate differences between calculated and supplied element lengths, a deviated route as shown below shall be performed (see figure 47). Special care shall be taken in order to fulfil straight lengths and bend radii on the SE. Deviated route as shown shall never be in the area of venting hole/grid (no venting hole/grid between the 2 clamps surrounding the deviated route).

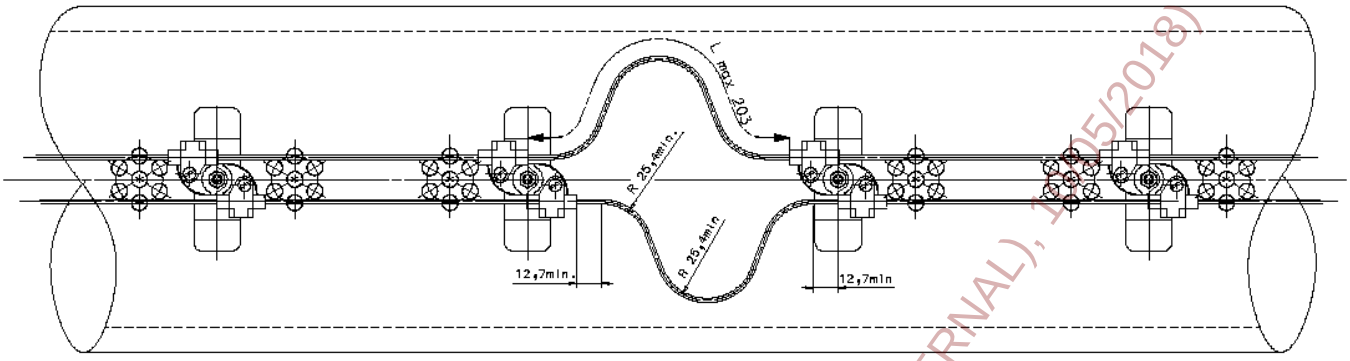


Figure 47: Installation tolerances compensation

4.4.17.3.5 Permitted tolerances for Sensing Element wave height

The waviness concept (see figure 48) defined in previous chapters of this document shall be interpreted as the allowed regulation of the sensing elements from the installation neutral centreline.

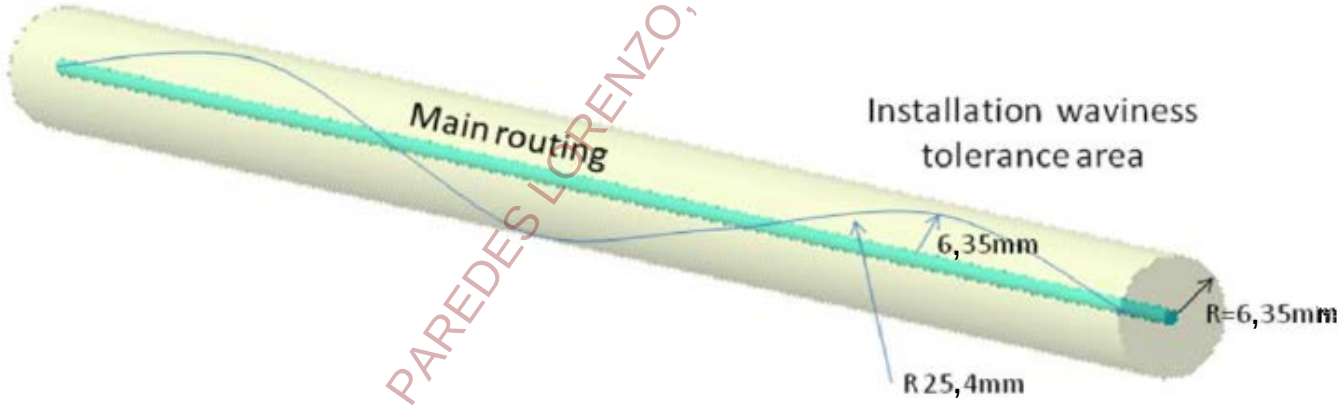


Figure 48: Waviness concept

On the other hand, it shall not be misunderstood with a route deviation from the straight installation centreline used when compensating over length. The “deviated routing” is the change of the routing regarding the straight installation.
In particular cases, it is allowed to have a sensing element with a deviated route (figure 47) and waviness deviation (figure 48) at the same time, as shown in figure 49.

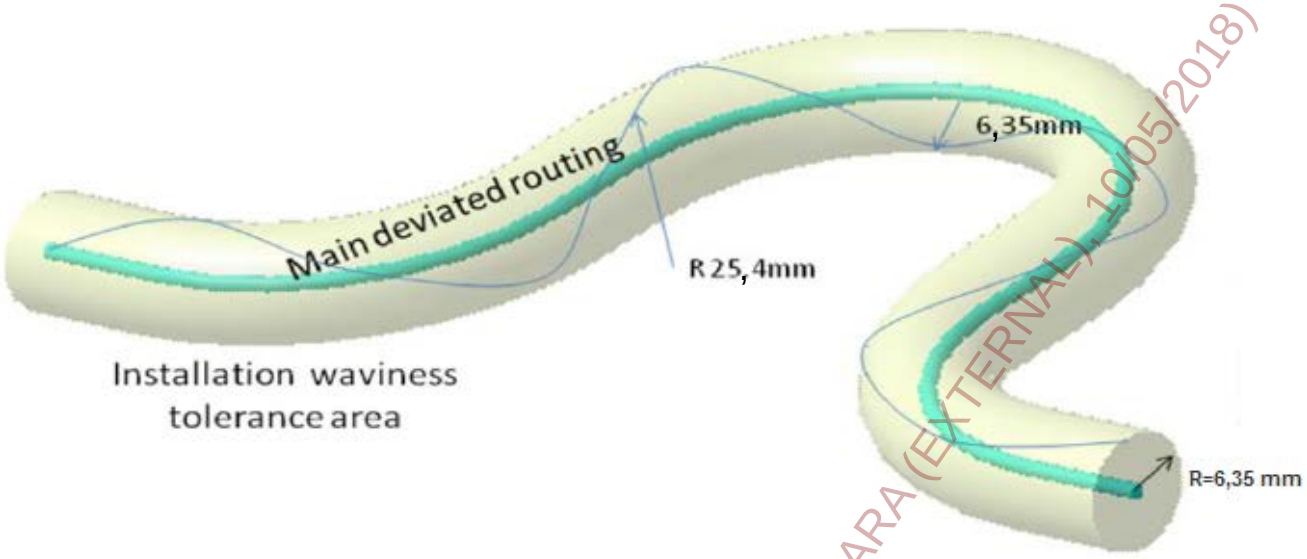


Figure 49: Over length compensation plus waviness

4.4.17.3.6 Over length compensation priciples

For the description of the over length compensation (subclause 4.4.17.3.3), two scenarii can be identified regarding the allocation of the sensing element.

4.4.17.3.6.1 When sensing elements are mounted on the structure

Installation in any direction is allowed as long as the other distances and gaps requirements (SE-SE distance, SE-structure distance and SE-other equipment distance) are accomplished (figure 50).

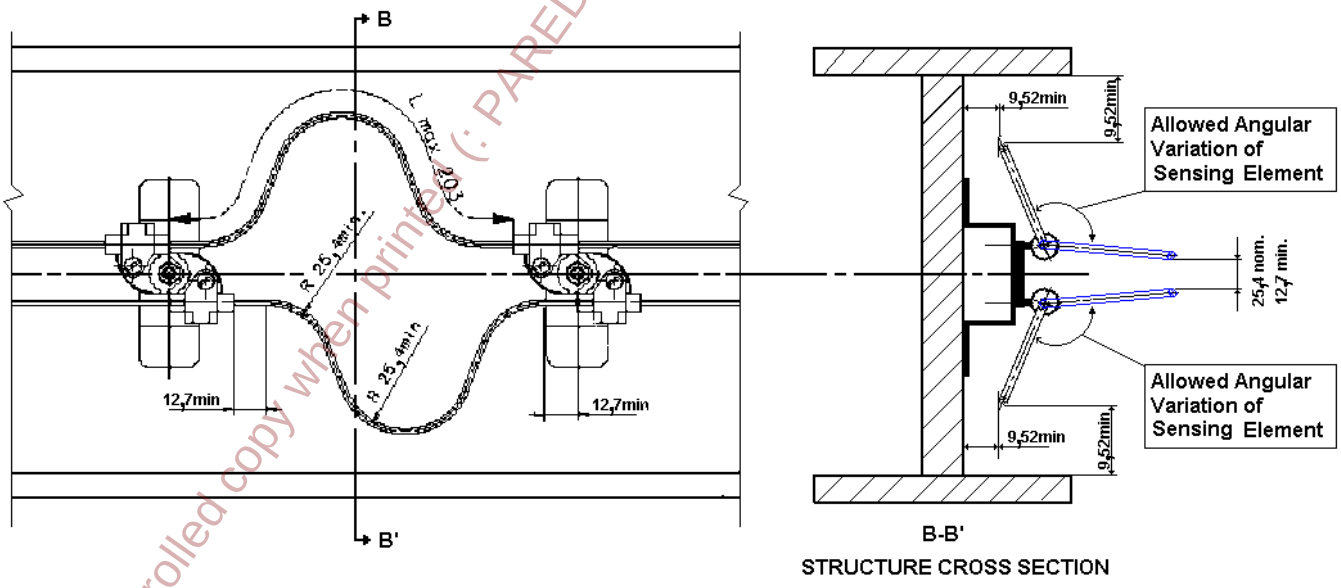


Figure 50: Sensing element installed on the structure

4.4.17.3.6.2 When the sensing elements are mounted on the ducts

It is only allowed the installation of the Omega shape in the plane defined on figure 51 and figure 52.

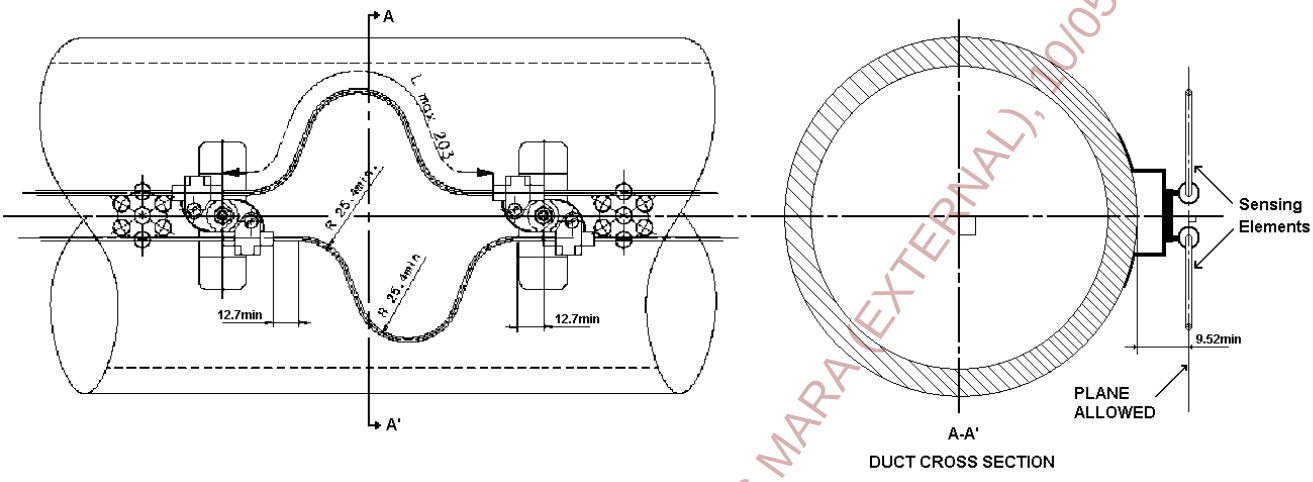


Figure 51: Sensing element installed on duct

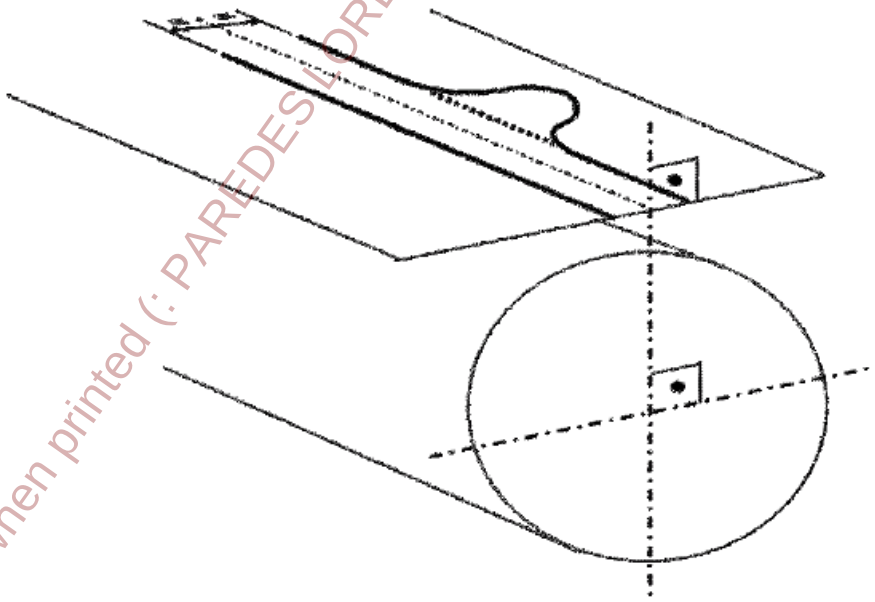


Figure 52: Definition of omega shape plane

Nevertheless, this type of over length compensation (Omega shape) shall only be used on an area free of venting holes/ grids (remember that the sensing element shall be positioned in front of the venting holes/grids), as shown in figure 47.
In case of need to proceed with compensation of length in the vicinity of venting holes/grids, refer to design authorities.

4.4.17.3.7 Sensing element routing around soft insulation sleeve

The soft insulation sleeve shall never be in contact with sensing elements.
Minimum distance specified in table 6 shall be kept between soft insulation sleeves and sensing elements.
OHDS to be routed outside thesoft insulation sleeve.

4.4.17.4 Clamping requirements

4.4.17.4.1 Axial positionning

Grommets shall be centered within the mounting clips to avoid any contact between any portion of the sensor surface and the routing clip (not to induce vibration and wear).

4.4.17.4.2 Grommet slit positionning

Grommets shall be rotated such that the slit position (opening of the grommet parallel to the SE) avoids any contact between the SE and the clamps (to avoid any metal to metal contact).
The grommet shall be installed so that the sensing elements cannot go out of it. The gap of the slit at the end of the grommet shall not be bigger than the half of the diameter of the sensing elements.

4.4.17.4.3 Bend routing

In a loop bend (see figure 53 the slit of the grommet shall be installed opposite to the bend direction, in a way that it does not open up (and not necessarily in line with the bracket hinge).

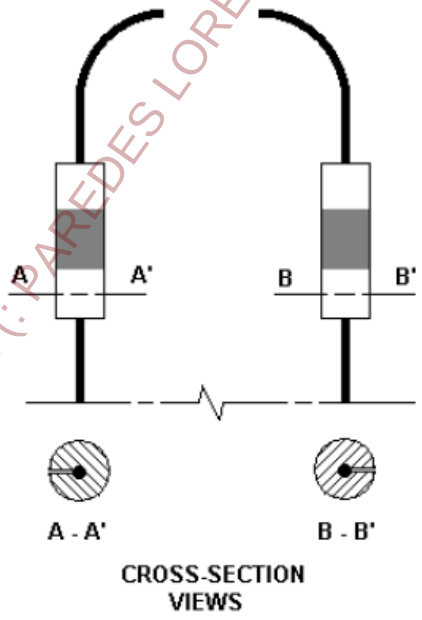


Figure 53: Slit face to a bend routing

4.4.17.4.4 Thermal path on clamp

The installation of the bracket assembly shall avoid thermal path between the hard insulation cover and the sensing element.

4.4.17.4.5 Screw split position

The split of the securing screw screwhead shall be parrallel to the sensing element direction.

4.4.17.5 Connectors

At the end of the sensing elements, connecting cables and interconnecting cables there are connectors (figure 54). These connectors shall be fitted accurately and firmly fixed (frequent error case: loose connectors). If the connectors are not well fixed, the contact of the inner conductors might be insufficient.

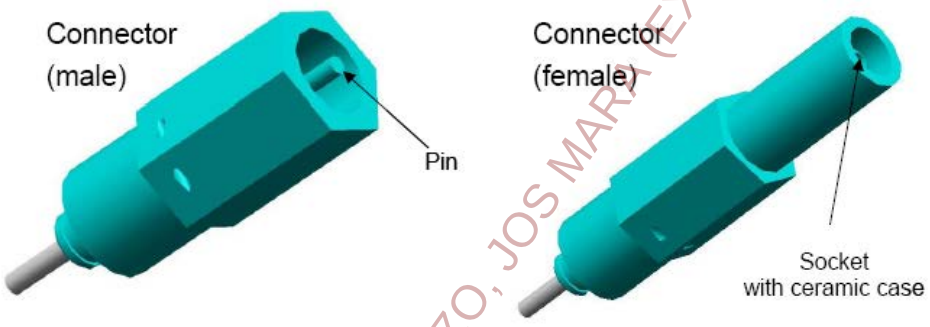


Figure 54: Examples of male and female connectors

A350 sensing element hex nuts shall be tightened to a torque of 5,7 to 6,8 Nm.
The attached connectors have to be additionally secured with a lock wire (figure 55 and 56). These principles shall be performed according to AIPS03-06-003.

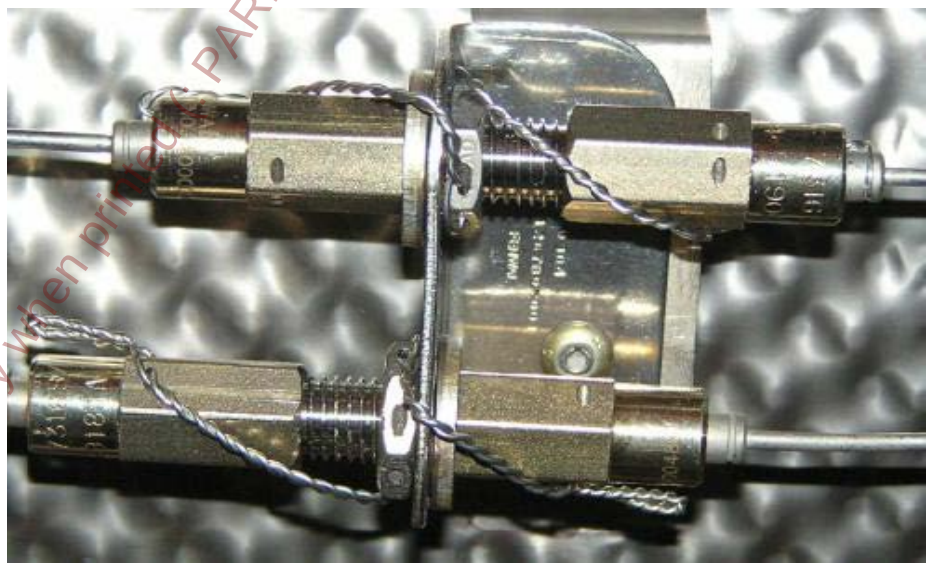


Figure 55: Lock-wire connection

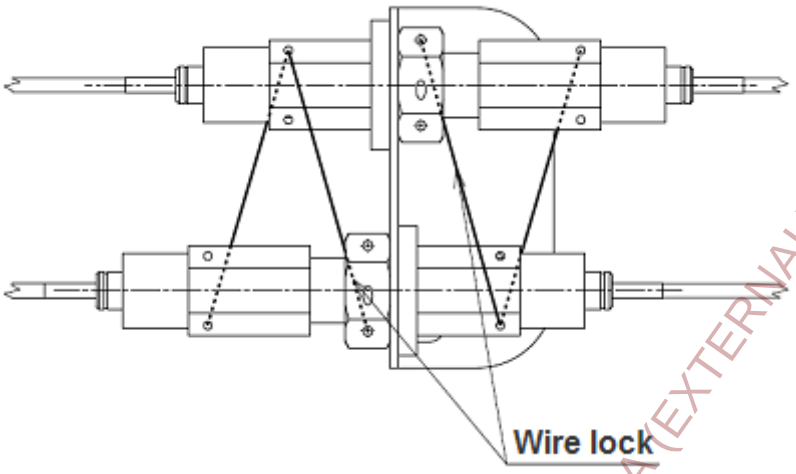


Figure 56: Lock-wire connection

4.4.18 Grommet installation on structure (for pipe routing)

Refer to AIPS03-06-008.

4.4.19 Electrical bonding

When necessary, piping shall be electrically bonded in accordance with relative installation documents and AIPS07-01-006.

4.4.20 Torque tightening

Unless otherwise specified on the drawing, the torque values range given in NSA2017 apply for duct connection and the torque values range given in AIPS01-02-008 apply for duct attachments.
Nominal torque values shall be applied at the first time in order to avoid any untorqued connection.
Special attention shall be taken to equally distribute the torquing load all around the the V-clamp connection (refer to AIPS03-01-003).
All torqued V-clamp shall be immediately red marked with TNA007-10050 (line 182 in the table). The red mark shall be applied as shown in figure 57. The red mark shall be a red line starting on the nut and going through the thread.

Figure 57: Red marking on torque tightened V-clamp

4.4.21 Removal

During removal of any component, a quality check shall be done on each part.
Any damage found on parts shall be reported the quality department.
Utmost care shall be taken in order to avoid any damage during the removal.

4.5 Test and quality requirements

4.5.1 Leakage tests on pneumatic pipes

Leakage testing of the installed hot air system shall be carried out according to the relevant installation documents and ground test requirements (GTR) in the presence of the responsible inspector.
Note that the tests shall be carried out without soft insulation sleeves installed on connection in order to ease the leak detection.
In case of leak detection, refer to GTR and the competent quality department.
After leakage test passed, a check of all clamps shall be made in order to check possible moved positions form their initial installation. In this case previous red marking shall be removed, clamp torque tightened per subclause 4.4.20 and red marked again according to subclause 4.4.20.

4.5.2 Quality control instructions

Quality checks shall be performed by the Quality department or by an operator approved by the Quality department to ensure that the requirements of this specification are met.

4.5.3 Damage tolerances (Damage acceptance)

4.5.3.1 Hard insulation cover

On Hard insulation covers, nine different types of imperfections could be identified:

- **A.** sharp edges, cracks or holes at the covers
- **B.** damaged welding seams
- **C.** imprints of stiffener rings
- **D.** different types of dents at the covers
- **E.** damage of the dimple pattern straight ducts
- **F.** damage of the dimple pattern bended ducts
- **G.** double patches with sharp edges
- **H.** varnish splashes on hot air cover
- **I.** nameplates with sharp distant edges

These different damage types are the result of inappropriate handling- or manufacturing reasons and have been classified as follows:

Damage class 1: acceptable for customer delivery no further actions necessary.

Damage class 2: Rework by Airbus or supplier. Rework shall be performed in situ. Acceptable for flight tests and ferry flights only.

Damage class 3: Rework by the supplier only. Acceptable for flight tests and ferry flights after consulting with design office.

4.5.3.2 Damage Classification

Table 7 shows the classification of the damages identified in the previous paragraph.

Table 7: Damage classification

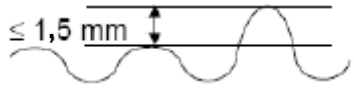
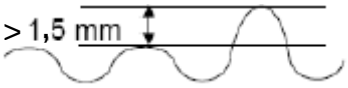
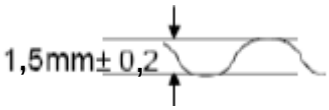
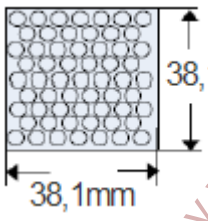
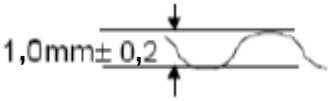
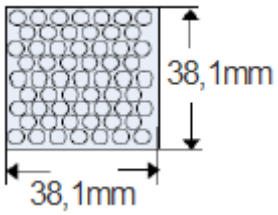
Damage class 1	Damage class 2	Damage class 3
A. Edges, Cracks, Holes: Not applicable.	**A. Edges, Cracks, Holes:** Not applicable.	**A. Edges, Cracks, Holes:** Sharp edges, cracks or holes.
B. Welding seamms: Not applicable.	**B. Welding seamms:** Not applicable.	**B. Welding seamms:** Sharp edges, cracks, holes or deformations on welding seams.
C. Imprints from stiffener rings: Imprints height less or equal than 1,5 mm from the highest surface of the dimple pattern. 	**C. Imprints from stiffener rings:** Not applicable.	**C. Imprints from stiffener rings:** Imprints height more than 1,5 mm from the highest surface of the dimple pattern. 
D. Dents: It shall be attempted to remove all dents. Max. dent depth 1,5 mm.	**D. Dents:** Dents with no plastic deformation and dent depth > 1,5mm.	**D. Dents:** Dents with plastic deformation.
E. Dimple pattern straight ducts: The dimple pattern shall have a depth of 1,5 mm ± 0,2.  At max. 2 points with a max. area of 38,1 mm x 38,1 mm, the dimple pattern may have a depth of 0 mm. 	**E. Dimple pattern straight ducts:** Not applicable.	**E. Dimple pattern straight ducts:** If any of the tolerances of damage class 1 will be exceeded.
(Continued)		

Table 7: Damage classification (concluded)

F. Dimple pattern bended ducts: The dimple pattern shall have a depth of 1,0 mm ± 0,2.  At max. 2 points with a max. area of 38,1 mm x 38,1 mm, the dimple pattern may have a depth of 0mm.  	**F. Dimple pattern bended ducts:** Not applicable	**F. Dimple pattern bended ducts:** If any of the tolerances of damage class 1 will be exceeded.
G. Patches: Maximum of 5 patches with no sharp edges cracks or holes.	**G. Patches:** Not applicable.	**G. Patches:** If any of the tolerances of damage class 1 will be exceeded: ≤ 38,1 mm ; > 38,1mm ; 38,1 mm x 38,1mm ; 1,5 mm ± 0,2 ; 1,0 mm ± 0,2.
H. Varnish splashes: No varnish splashes are allowed.	**H. Varnish splashes:** Removable varnish splashes. Allowed rework additives.	**H. Varnish splashes:** No varnish splashes are allowed.
I. Nameplates: Nameplates with no sharp distant edges.	**I. Nameplates:** Nameplates with sharp distant edges shall be reattached.	**I. Nameplates:** Not applicable.

4.5.3.3 Sensing element

Any damage found in the sensing elements installed is not acceptable. The sensing element shall be replaced.

4.5.3.4 Soft insulation sleeves

Any damage found on the soft insulation sleeves installed on the aircraft is not acceptable. The soft insulation sleeve shall be replaced.

4.5.3.5 Duct Joints (clamps, gimbal joints e.t.c.)

Any damage found on duct joints (clamps, gimbal joints…) installed in the aircraft is not acceptable. The affected element shall be replaced.

4.5.3.6 Hot air pipes

In case of any damage found on metallic pipe, the pipe shall be rejected and relevant quality departement informed.

4.6 Labelling

No specific requirement.

4.7 Other requirements

4.7.1 Qualification of operator

Personnel carrying out the work shall be adequately instructed and familiar not only with the materials and equipment but also with the contents of this process specification.

4.7.2 Manufacturing documentation

Reference shall be made to this specification. The manufacturing documents shall ensure that the specified minimum distance between pipes and adjacent components is achievable within the scope of the specified tolerances.
In some cases the torque values for tightening of fittings differ from those given in NSA2017 or AIPS01-02-008, they shall be specified in the manufacturing documents.

4.8 Process flow chart

The corresponding process instruction shall detail the process sequence and demonstrate its capability to meet the process requirements of this specification.

4.9 Key Characteristics

Key Characteristics acc. to EN9103 are defined by responsible engineering based on a risk analysis for parts installed by this process (see table 8).
They shall be subject to variation control by production organization according to EN9103.
Key Characteristics do not relieve the production organization from meeting all engineering requirements defined in this document.

Table 8: Key Characteristics

Product Key Characteristic			Process Key Characteristic		
No.	Designation	Requirement/ Limit	Sub.- No.	Designation	Requirement/ Limit
1	Leakage free installation	See subclause 4.4	Shall be defined in relevant AIPI		
2	Electrical continuity installation	See subclause 4.4.19			
3	Correct torque tightening	See subclause 4.4.20			
3	Stress free installation	See subclause 4.4.3			
4	Correct tooling used	See subclause 4.2.3			
5	Damage free installation	See subclause 4.3.2			
6	The pipes are installed according to drawings ensuring that the segregation distances are achieved	See subclause 4.4.2			

5 Technical qualification

The Technical Qualification shall be performed, according to the relevant Airbus procedure.

6 First part qualification

Not applicable.

7 Series production inspection

The shop shall perform the following series production inspections under serial conditions.

7.1 General inspection

The checks and their frequencies may be modulated according to the level of confidence acquired and the information supplied by the indicators installed (see table 9).

Table 9: Inspection points

Check to be conducted	Requirement
Visual / touch test to be conducted on all parts (100%)	Clearances, alignment, routing, tightening torques observed

Unless otherwise specified in process or component-specific design, manufacturing or QA documents, the competent organization unit shall ensure that the following measures are taken:
All pipes/hoses/equipment shall be subjected to a visual inspection after installation.
Pipe attachments shall be checked for correct installation. A check that junctions are free from tension and that the pipes are correctly aligned shall be done.
It shall be checked that the specified minimum distances have been observed in accordance with subclause 4.4.2.
Torque-tightening shall be in accordance with subclause 4.4.20.
Electrical bonding connections for components and equipment shall be in accordance with subclause 4.4.19.
Cleaning shall be in accordance with subclause 4.2.
Leakage testing has to be carried out according to subclause 4.5.1 including relevant GTR.

7.2 Assembly of air ducts

After installation, specific inspection shall be provided on Air duct installation and connection. These checks shall demonstrate that the installation fulfill requirement specified in this instruction.
In case of deviation, the relevant quality authorities shall be informed.

8 Rework

Not applicable.

9 Environment, health and safety

The installation process shall be in line with Airbus Health and Safety and ecoefficiency policies.
Compliance with A1091 shall be ensured for all materials, substances and/or articles implemented during process.
In particular, targeted substances according to A1091 shall not be used, if a safer alternative is available.

Uses made of all substances involved in the process shall be documented in Safety Data Sheet as required by REACh regulation (Registration Evaluation and Authorization of Chemicals).

Banned Substances, as per AP2091.0 and listed in AP2091.1, shall not be applied.

Targeted substances according to AP2091 shall be avoided wherever alternative products are available. The golden rules listed in AP2091.0 shall be satisfied.

RECORD OF REVISIONS

Issue	Clause modified	**Description of modification**
1 06/11		New standard
2 06/14	3.1.2 4.4.16.2 4.4.16.2.2 4.4.16.2.4 4.4.17.2 4.4.17.2 4.4.17.3.1 4.4.17.4.5	Addition of new abbreviations in Table 1, ABD, AP, CRES, M, PADS, WIP. Split into 4.4.16.2.1, 4.4.16.2.2, 4.4.16.2.3 and 4.4.16.2.4. Figure added 23. Figure added 25. Modify table 4 Split “A380 Soft” column into (muffler outer cover, venting grid). Added Figure 28. Table 5: A380 nominal distance Z change 25,4 to 23,0 Added Figure 43. Removal of Figures.
3 10/14	Table 4 4.4.16.2 4.4.17.4.2	Dimensions changes/corrected. Installation requirements added. Grommet slit positioning better defined.
4 08/16	2 4.5.3.2	AIPI03-06-022 deleted. No reference in the text. Table 7: Text of damage C, class 3: “less or equal” changed into “more”. In the figure for damage C, class 3: "≤ 1,5 mm" changed into "> 1,5 mm".