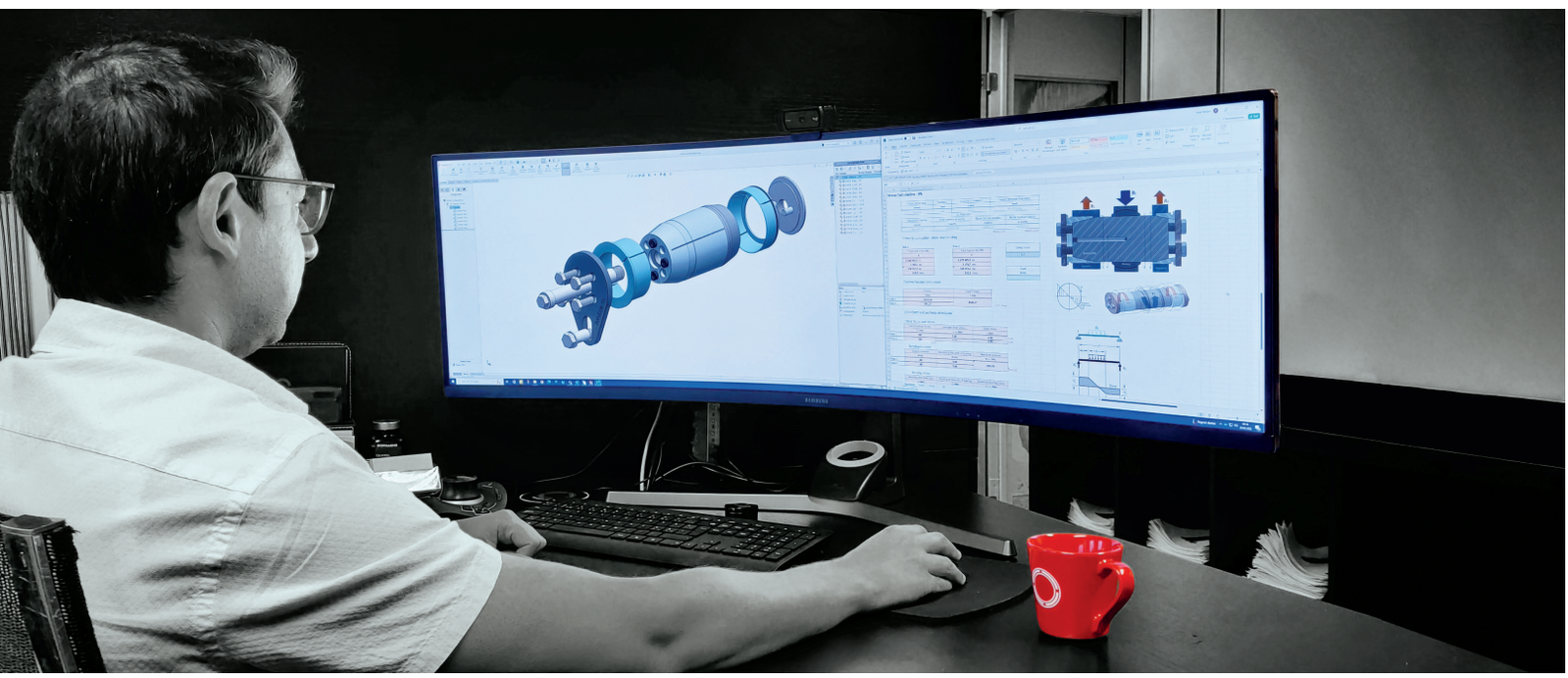
bondura®
technology

TECHNICAL HANDBOOK

www.bondura.no
post@bondura.no

BONDURA® ENGINEERING



Bondura Technology AS design and manufacture customer-specific pin solutions for your applications and needs based on the patented and certified bondura® pin technology.

With more than 35 years of experience our products operate in high demanding applications worldwide.

Our Engineers in the office and in the field work together with you to define the right solution for your project.

Bondura Technology's engineering department will provide assistance in each phase of your project, ensuring the best possible solution for your application.

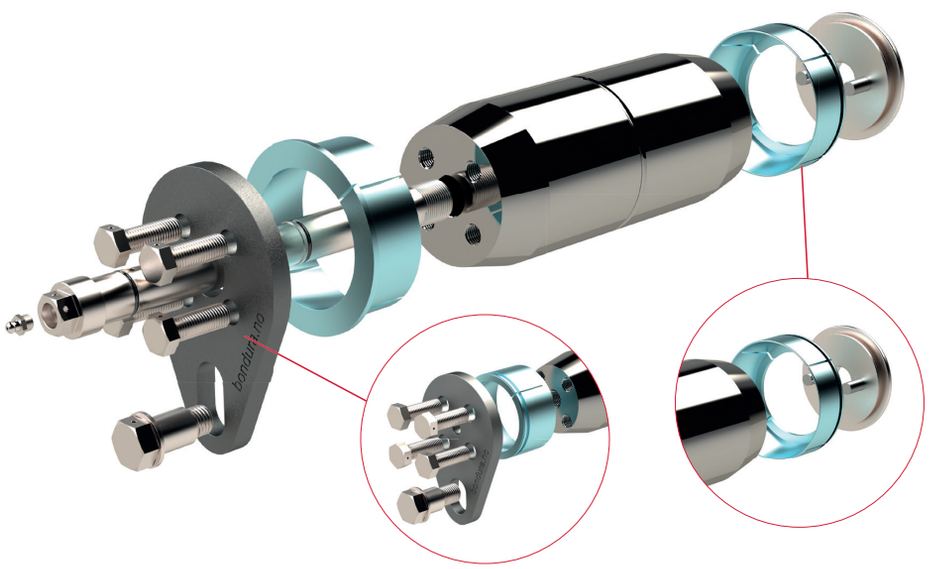
This engineering brochure is created to provide more in-depth knowledge about the functionality and benefits of using the bondura® technology.

MODULAR SYSTEM

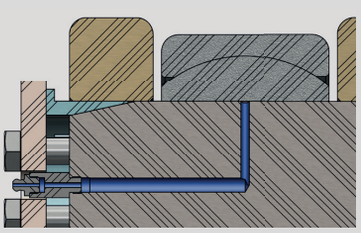
The bondura® pin design utilizes a modular system

The bondura® pin design utilizes a modular system by combining the most suited components for the application. The customized pin is adapted to fulfil all customer needs in terms of design features, material properties, coatings, and price.

The description of the bondura® pins are derived from the modular design used.

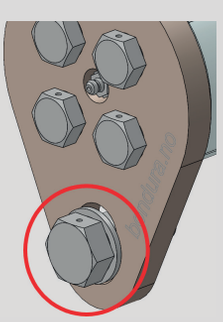


Example; a combination of design 6 on the near side and design 1 on the far side. Together they make up the bondura® 6.1



Lubrication

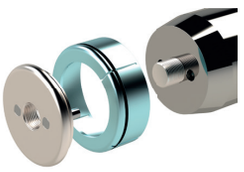
bondura® pivot pins can be delivered with customized lubrication channels.



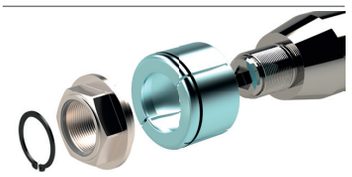
Positioning details

Positioning details are optional and used to control the rotary position of the pin more easily during installation.

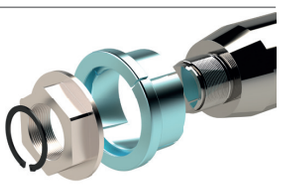
AVAILABLE CONFIGURATIONS



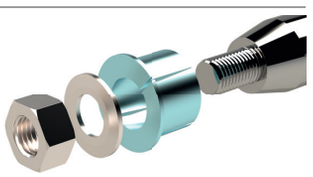
CONFIGURATION 1



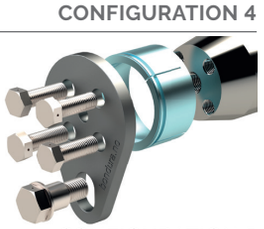
CONFIGURATION 2



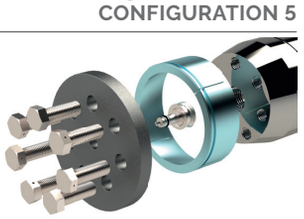
CONFIGURATION 3



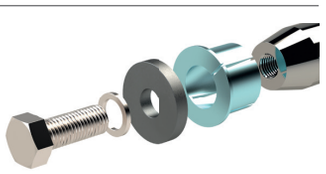
CONFIGURATION 4



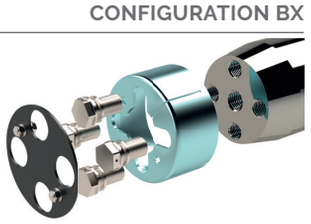
CONFIGURATION 5



CONFIGURATION 6



CONFIGURATION BX



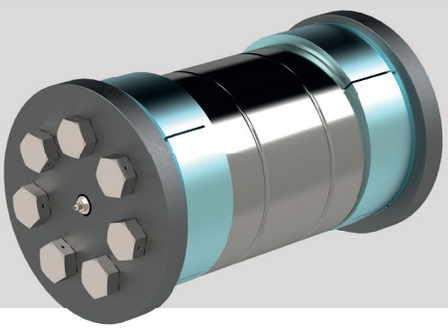
CONFIGURATION BXC

SPECIAL PINS

bondura® non-standard solutions

Our Engineering Dept. can provide assistance to your project in an early phase to optimize the design and to ensure best possible functionality.

Engineering Dept. is responsible for all design, modeling and drawing of standard and special solutions, including maintaining third part certifications and patent related issues.



The bondura® special designs include all non-standard pin solutions required by our customers, such as

- Asymmetric designs
- Non-circular pins
- Eccentric solutions
- Special requirements for operating in wide temperature ranges
- Special materials or corrosion protection
- Special sub-sea, shipping, aeronautic and space technology requirements

BONDURA® LMP

bondura® LMP is a unique design for load monitoring. Available for 3 different types of bondura® pins.

The bondura® Load Monitoring Pin contains a combination of a specially designed bondura® expanding pin solution with high quality load monitoring electronics.

With this combination, we have created one of the best load monitoring pin solutions available on the market. Our load tests confirm that the accuracy of our pins are among the most accurate available with up to 0,3% accuracy of full scale expectancy.

bondura® 6.6, bondura® 6.2 and bondura® 3.3 are available with load monitoring technology.

MATERIAL TABLE

Material	Yield $R_{p0,2}$ UTS R_m [MPa]	Corrosion resistant	Typically in stock	Typical use
S355J2	275-355 450-630		X	Low strength requirements. Typically onshore in industrial equipment and structures. Also used for Sleeve and Plate.
34CrNiMo6+QT	600-900 900-1300		X	High strength requirements. Typically onshore industrial equipment and structures.
42CrMo4+QT IHCr	500-750 750-1200	Partly on bearing surface	X	High strength and surface hardness requirements in high wear applications. Excellent for use where sliding occurs directly on pin bearing surface.
38MnVS6 IHCr	Min. 520 850-1000	Partly on bearing surface	X	Medium strength and high surface hardness requirements in high wear applications. Excellent for use where sliding occurs directly on pin bearing surface.
S165M QT900	Min. 700 900-1100	X	X	High strength and corrosion/salt water resistance requirements. Also used for Sleeve.
17/4PH DH1150	Min. 725 Min. 860	X		High strength and corrosion/salt water resistance requirements.
30CrNiMo8+QT	800-1050 1000-1450			Very high strength requirements. Typically onshore in industrial equipment and structures.
42CrMo4+QT	500-750 750-1200			Medium to high strength requirements. Typically onshore in industrial equipment and structures.
C45E+QT	370-490 630-800			Medium strength requirements. Typically onshore in industrial equipment and structures.
AISI 304L	Min. 210 515-680	X		Low strength and high corrosion resistance requirements. Also used for Sleeve and Plate
AISI 316L	Min. 220 515-690	X		Low strength and very high corrosion resistance requirements.Also used for Sleeve and Plate.

- IHCr = Induction hardened and Chrome plated bearing surface
- Materials in the table are typically used but many others are available on request.
- Through-hardening to increase strength is possible on many materials.

COATINGS

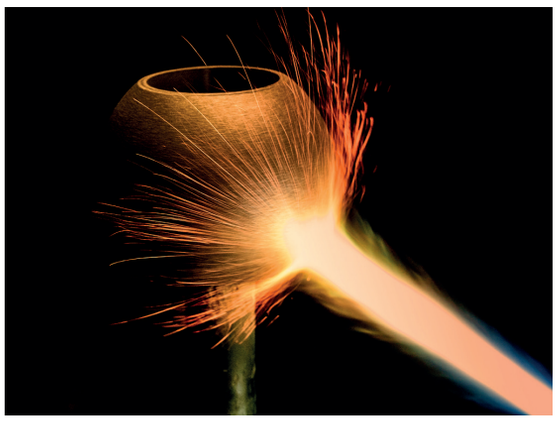
Coating	Abbreviation	Typical salt mist hours to red rust	Applicable to	Typical use
El Zinc with passivation	ZnP	72-200	Pin, Sleeve, Plate, Fastener	General use in most applications.
El Zinc + Nickel with passivation	ZnNi	500-1000	Pin, Sleeve, Plate, Fastener	High corrosion resistance requirements.
Hot-dip galvanizing	HDG / tZn	-	Plate, Fastener	General use in most applications.
PTFE Xylan	Xylan	3000	Pin, Sleeve, Plate, Fastener	Extreme corrosion resistance requirements with electrical insulation properties.
Zinc Flake	ZnFl	1000+	Pin, Sleeve, Plate, Fastener	Very high corrosion resistance requirements.
Zinc Phosphate with oil	Znph	48-120	Pin, Sleeve, Plate, Fastener	General use in most applications.

- Thermal spray also available for coating of base material to increase surface hardness, wear resistance or corrosion resistance.
- Coatings in the table are typically used but many others are available on request.

THERMAL SPRAYING

Used methods to protect components and assemblies against wear, corrosion, heat or combinations. Available coating technologies are:

- Spray-and-fuse method
- High-velocity oxygen fuel spraying (HVOF)
- Laser deposition welding method

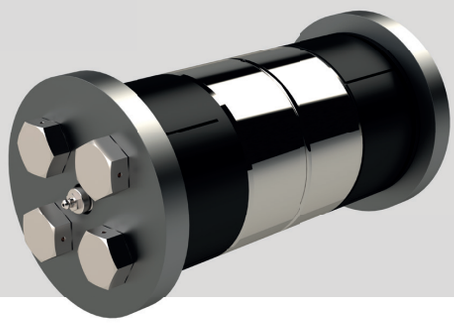


Coating type – examples

	Laser depsotion welding	**Flame spraying**
Description	Inconel 625 nickel alloy	Nickel brazing alloy with tungsten carbide
Thickness	0,5 - 3,0 mm	0,5 - 0,8 mm
Hardness	240 - 280 HV0,3	850 - 950 HV0,3
Heat resistance	1000°C	450°C
Porosity	Non-porous	Non-porous
Abrasion resistance	Low	Very good to excellent
Chem. resistance to acids & caustic solutions	Very good to excellent	Good
Sub-surface corrosion resistance	Very good	Very good
Flaking resistance	Very good	Excellent due to metallurgical bonding
Adhesion to base material	Very good	Very good
Dry running properties	Unsuitable	Good
Fiction coefficient	0,2 - 0,4	0,2 - 0,4

PTFE COATING FOR BONDURA® APPLICATIONS

PTFE coatings based on synthetic fluoropolymer are used in several industrial applications to improve durability, prevent corrosion, achieve predictable friction and provide non-stick properties for surfaces. Several PTFE options are available depending on requirements and provided under brand names such as Xylan® and Teflon®.



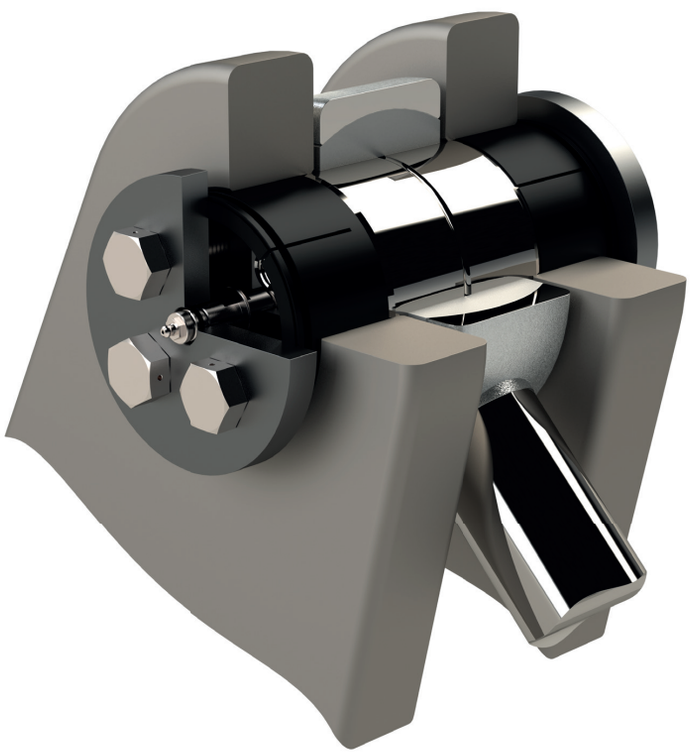
Suitable for use on

- Conical Sleeves
- End Plates
- Fasteners
- Pin (certain cases)

Typical range

Property	Range
Operating temperature	-250 to +260°C
Coating thickness	20 to 70 µm
Corrosion resistance to salt spray	1500 to 3000 hours
Coefficient of friction	0,02 to 0,14

Note: Properties may vary for different coating types!



Benefits

- Extreme corrosion resistance
- Provides electrical insulation to reduce galvanic corrosion
- Prevents galling/cold welding between surfaces
- Defined friction on conical sleeve during installation & removal
- High and low temperature options available
- UV resistant options available
- Wide range of colours available
- VOC compliant

GUIDELINES & HINTS

bondura® pins can easily be used without any complex alterations. It can easily be adapted to any position in new or old equipment.

SUPPORT TOLERANCES:

Since bondura® pivot pin has expanding conical sleeves,
there is no need to manufacture equipment with tight tolerances.
A bore hole tolerance of +0,2/+0,3 mm is sufficient.

PIN TOLERANCES

bondura® pivot pins are typically machined with a surface finish of Ra 0.8 µm and a pin diameter tolerance of ISO h7, but other finishes and tolerances are readily available.

SUPPORT WIDTH

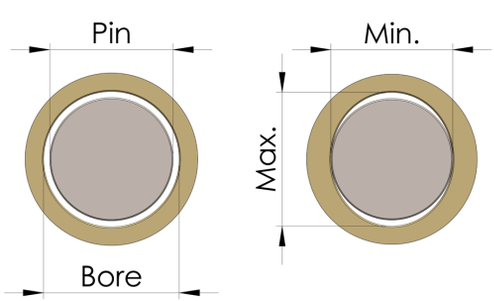
There are no special differences in the support width when using either bondura® or a cylindrical pin.
This width is determined by the forces that act on the support, and the bondura® pins are designed to replace standard cylindrical pins in all applications.

Note: In order to ease the installation, the pin-bore in the support/ clevis can be designed substantially larger if this is preferred. The additional clearance will then be taken up by the expanding sleeves which are also available in oversize dimensions.

OVALITY

The difference of min. and max. diameter in the bore should not exceed 1,0 mm. If exceeded, grinding the bore more circular is recommended.

Note: Re-tightening of fasteners after some time in operation is recommended, especially for worn equipment.

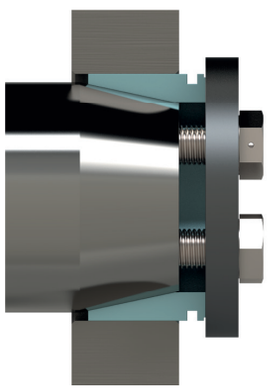


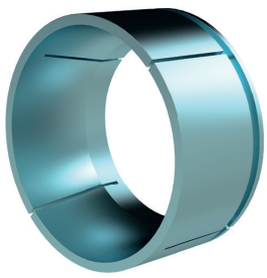
PLAY

Sleeves expand and will absorb wear in the lug bore up to 2,0 mm from nominal pin diameter. For larger play „oversize sleeves“ should be ordered/used.

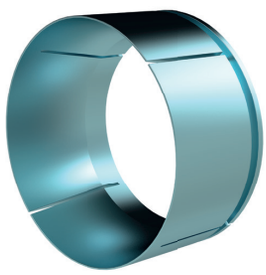
OVERSIZE SLEEVE:

For larger clearances, oversize sleeves should be ordered and used. Full expansion normally results in the sleeve moving 5,0 mm inwards in the bore.





oversize sleeve



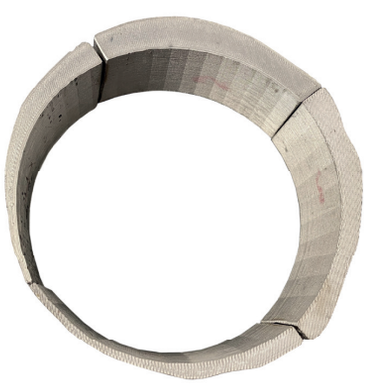
standard sleeve

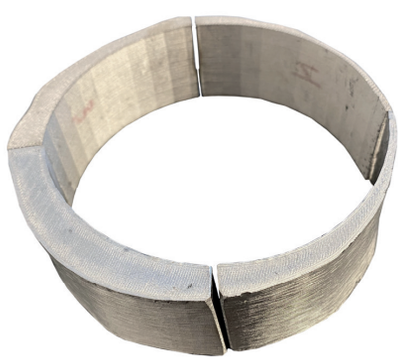
CUSTOMIZE SLEEVES

In cases where downtime due to repair of joints must be minimized or eliminated, Bondura can supply a 100% customized repair sleeve which fits perfectly to the damaged bore, by using 3D scanning and additive manufacturing/3D printing.

A longer service stop in production can be substituted by two short stops, to scan the damaged area, and later to install the customized sleeve, together with a bondura® expanding pin.

Operations can then continue in a safe manner as long as required.





CERTIFICATION & DOCUMENTATION

Certifications and Approvals

bondura® pivot pins are classified as “proven Technology”.
Standard products can be delivered with:

- DNV Type Approval
- ABS Product Design Assessment
- Other certification on request

Documentation Packages available

Depending on individual requirments different types of documents / doc.-packages can be we offered.

Package Type C represents the standard and is always included, other types are availbale on request.

Documentation Package	Type A	Type B	Type C
Front Page	Yes	Yes	Yes
Material Traceability List	Yes	Yes	Yes
Certificate of Conformity	Yes	Yes	Yes
Technical Drawing	Yes	Yes	Yes
Material Certificate EN 10204	Yes	Yes	Yes
NDT Report – If applicable	Yes	Yes	Yes
Third Party Certificate	Yes	DNV TA or ABS PDA	NA
GA Drawing for Certificate	Yes	Yes	NA
Assembly & Maintenance Procedure	Yes	Yes	Yes

Bondura Services at a glance:

Technical support:

- Design
- Calculation
- 3D-Models
- Special coating for individual requirements
- Advanced testing (security-critical application)

On-Site:

- Installation support
- Inspection
- Product training

Installation Instruction:

- General (multilingual)
- Customized instructions for specific designs

Removal Tools:

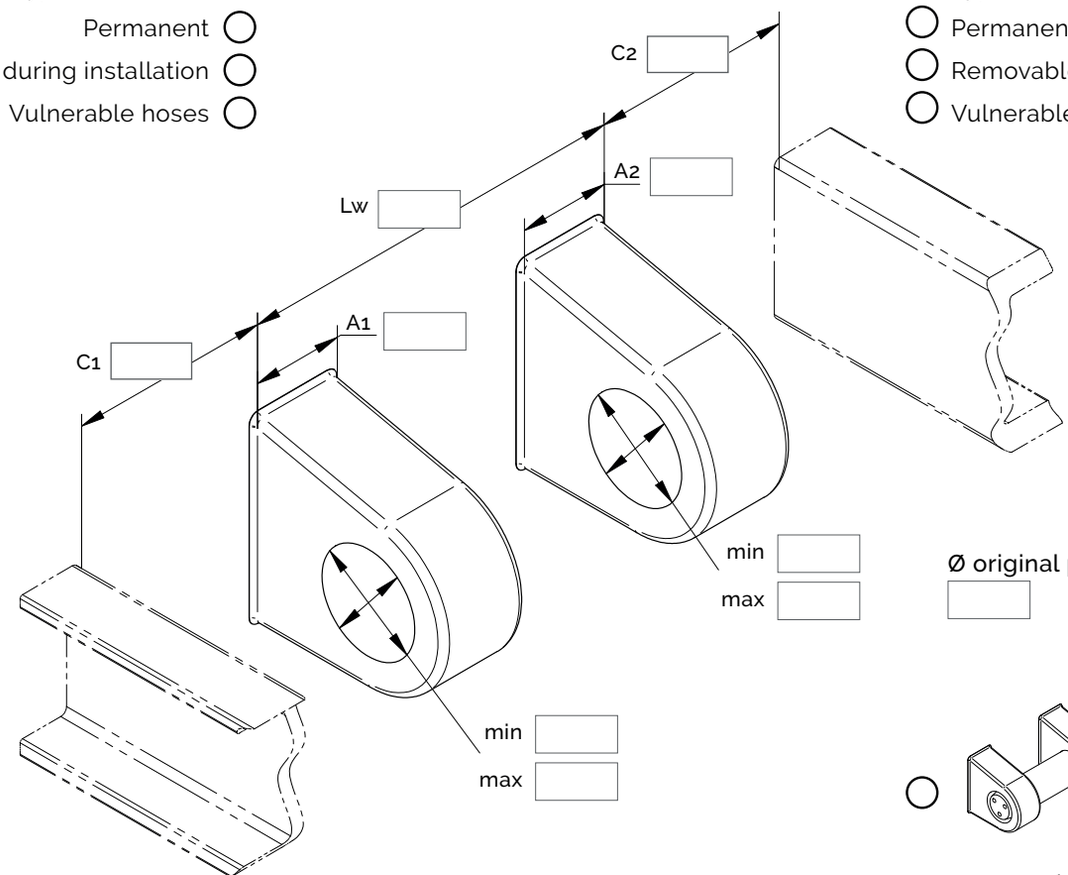
- Multi Tools (rent or purchase)
- Customized tools for specific dimensions
- Bondura® Multi Tool (BMT)

bondura®
DESIGN SHEET

The customer is responsible for the accuracy of all measurements and data written in the design sheet submitted

Type of obstacle:

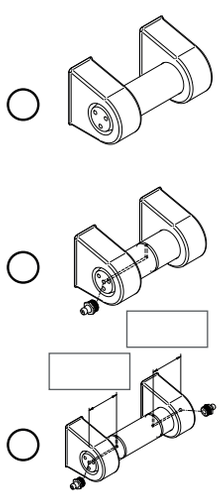
- ◯ Permanent
- ◯ Removable during installation
- ◯ Vulnerable hoses



Type of obstacle:

- ◯ Permanent
- ◯ Removable during installation
- ◯ Vulnerable hoses

Ø original pin



quantity	
material	
equipment	
position	

company	
contact person	
telephone	
e-mail	
delivery address	

Additional requirements:

- ◯ Documentation incl. 3.1 cert.
- ◯ NDT of pin
- ◯ Certification (DNV, ABS, etc.)
- ◯ Wedgelock washers
- ◯ Safety wire holes
- ◯ Positioning details

bondura® technology

(tel) +47 51 77 20 20 (mail) post@bondura.no

REDUCE INSTALLATION TIME AND MAINTENANCE COST BY USING DURABLE AND STRONG BONDURA® PIN CONNECTIONS

PLEASE CONTACT US!

bondura®
technology

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