

# TECHNICAL Appendix

- Purpose of Tube Clamp in Piping System
- Clamp selection criteria
- Material characteristics
- Recommended distance between clamps
- Clamps installation in case of bend pipe
- Thread chart
- Property classes for bolts and screws
- Tightening torques and maximum loads in pipe direction

## Purpose of Tube Clamps in the Piping Systems

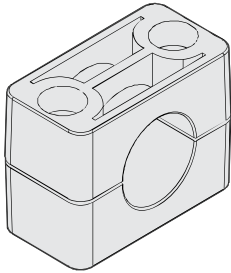
- Clamps are use to give easy & quick installation on the pipes in the Hydraulic, Instrumentation, gas lines, Electric Application, Civil Lines, Oil lines, Water Lines, Fluid Lines and Air Piping Systems.
- Clamps are use to prevent noise & vibration due to working pressure in the piping systems.
- Clamps are use to absorb shocks and to avoid any loosening of fittings joints in the piping systems & take care of any leakages happened due to vibration in the working systems.
- Clamps are use to prevent loosening of tubes to the fittings parts due to pressure lines.

## Selection of " Ve-Lock" Tube clamps over Other clamping Systems

- In the past years, Many Industries have been using wooden clamps, Rubber clamps, Plastic clips, Metal clips, U clips, U bolts, Wire clamps, Plastic clamps.
- But Now "Ve-Lock" Brand Clamps have Replaced all other Clamping Techniques due to Better Performance, Easy installation, Flexibility in piping systems, hanging of tubes & fittings components, Better costs, Excellent quality output in the systems.
- "Ve-Lock" Brand Clamps has strong Product design as per DIN 3015 Standards worldwide, which gives Guarentee for users to prevent any loosening of tubes in the piping systems.
- "Ve-Lock" clamps are made from Combination of Metals and Platics as per DIN 3015 Standards design & diamensions.
- "Ve-Lock" Brand will never use Low quality Plates , Bolts and Plastic Jaws which gives Lower output & less shelf life of the piping systems.
- "Ve-Lock" Brand clamps are suitable for civil pipe lines / gas pipe lines / chemical pipe lines / aeronautics piping systems / hydraulic piping systems / water piping systems / pneumatic piping systems / lubrication piping systems / Electrical Piping /Platic Piping Food application piping systems / Heating storage piping systems ( for High temp. Application)
- " Ve-Lock" Brand clamps are available in smaller sizes like 2 mm od to 60.3 mm od & for Larger sizes like 60.3 mm od to 300 mm od of pipes.
- " Ve-Lock" Brand clamps are available in Light Series / Heavy Series / Twin Series (horizontal) / Double Series (Vertical) / Rail Mounted Flexible piping/ for Piping which has Higher Temp. up to 400 °C / Multi numbers of Piping in one clamps / with Rubber insert types.
- "Ve-Lock " brand Clamp Sizes are available in Millimeter ( MM) / Inch od ( Inch) / Nominal Bore Dia of Pipe ( NB) Series for Pipes.
- " Ve-Lock " brand clamps are Approved By various Third Party Inspection Like - GL Iloyds, BVQI, IRS, TUV, due to its dimensional stability, Quality, better Performance, High Shelf Life, As per DIN 3015 standards, Good Surface Finish & 100 % in house Testing.

## CLAMPS SELECTION CRITERIA

LIGHT SERIES CLAMPS	HEAVY SERIES CLAMPS	ALUMINIUM SERIES	RUBBER INSERT CLAMPS
<p>W.P. UP TO 1500 PSI (100 BAR) IN THE PIPING SYSTEMS</p> <p>MAINLY USE FOR LOW TEMP. FROM - 30 ° C + 90 ° CRECOMMANDED</p> <p>MAINLY AVAILABLE IN PLASTIC JAWS FROM PP (POLYPROPYLENE) AND PA-6 ( POLYAMIDE -6)</p> <p>CLAMPS ARE AVAILABLE IN CARBON STEEL (C.S.) ANDSTAINLESS STEEL (S.S.) MATERIALS</p>	<p>W.P. UP TO 6000 PSI ( 400 BAR) IN THE PIPING SYSTEMS</p> <p>MAINLY USE FOR LOW TEMP. FROM - 40 ° C + 120 ° CRECOMMANDED</p> <p>MAINLY AVAILABLE IN PLASTIC JAWS FROM PP (POLYPROPYLENE) AND PA-6 (POLYAMIDE-6)</p> <p>CLAMPS ARE AVAILABLE IN CARBON STEEL (C.S.) ANDSTAINLESS STEEL (S.S.)</p>	<p>W.P. UP TO 6000 PSI (400 BAR) IN THE PIPING SYSTEMS</p> <p>MAINLY USE FOR HIGH TEMP. UP TO 300 ° C RECOMMANDED</p> <p>MAINLY AVAIALBLE IN HEAVYSERIES WITH ALUMINIUM JAWSCASTING OR SOLID BAR STOCK</p> <p>CLAMPS ARE AVAILABLE IN CARBON STEEL (C.S.) ANDSTAINLESS STEEL (S.S.)</p>	<p>W.P. UP TO 6000 PSI ( 400 BAR) IN THE PIPING SYSTEMS</p> <p>MAINLY USE FOR LOW TEMP. FROM - 40 ° C + 125 ° CRECOMMANDED</p> <p>MAINLY AVAILABLE IN LIGHTSERIES / HEAVY SERIES PLASTICS AND ALUMINIUM</p> <p>CLAMPS ARE AVAILABLE IN C.S. AND S.S. ALONG WITH RUBBER INSERT - NBR</p>
<b>COLOR GREEN</b>	<b>COLOR GREEN</b>	<b>NATURAL</b>	<b>BLACK</b>
<p>AVAILABLE SIZES FROM 6 MM OD UP TO 76.1 MM OD UP TO 2.5" NB</p> <p>LOW COST THEN HEAVY SERIES</p>	<p>AVAILABLE SIZES FROM 6 MM OD UP TO 324 MM OD UP TO 12" NB</p> <p>HIGH COST THEN LIGHT SERIES</p>	<p>AVAILABLE SIZES FROM 6 MM OD UP TO 324 MM OD UP TO 12" NB</p> <p>VERY HIGH COST</p>	<p>AVAILABLE SIZES FROM 6 MM OD UP TO 168 MM OD UP TO 6" NB</p> <p>VERY HIGH COST</p>
<b>AVAILABLE IN TO</b>	<b>AVAILABLE IN TO</b>	<b>AVAILABLE IN TO</b>	<b>AVAILABLE IN TO</b>
<p>MOUNTAIN RAIL TYPES</p> <p>MULTILAYER TYPES</p> <p>MULTIPLE OF 2 TO 10 TYPES</p> <p>METAL CLAMPS TYPES</p> <p>U BOLTS TYPES</p> <p>LIGHT IN WEIGHT</p>	<p>MOUNTAIN RAIL TYPES</p> <p>MULTILAYER TYPES</p> <p>MULTIPLE OF 2 TO 10 TYPES</p> <p>METAL CLAMPS TYPES</p> <p>U BOLTS TYPES</p> <p>LIGHT IN WEIGHT</p>	<p>MOUNTAIN RAIL TYPES</p> <p>MULTILAYER TYPES</p> <p>MULTIPLE OF 2 TO 10 TYPES</p> <p>METAL CLAMPS TYPES</p> <p>U BOLTS TYPES</p> <p>LIGHT IN WEIGHT</p>	<p>MOUNTAIN RAIL TYPES</p> <p>MULTILAYER TYPES</p> <p>MULTIPLE OF 2 TO 10 TYPES</p> <p>METAL CLAMPS TYPES</p> <p>U BOLTS TYPES</p> <p>LIGHT IN WEIGHT</p>

CLAMP BODY		MATERIAL			
		PP	PA	RI	AL
		POLYPROPYLENE Green Homopolymer	POLYAMIDE FA 6	RUBBER Elastomer NBR	ALUMINIUM EN AB AISi11
COLOURE		BLUE	BLACK	BLACK	NATURAL
MECHANICAL CHARACTERISTICS	TEST METHOD				
Modulus of elasticity	ISO 178	Mpa 1.200	Mpa 7.200	--	--
Load in bending at break	ISO 178	--	Mpa 190	--	--
Elongation at break	ISO 527	<10%	3%	600%	1%
Tensile load at break	ISO 527	Mpa 27	Mpa 130	Mpa 9	Mpa 150
Tear strenght	--	--	--	29 N/mm	--
Izod notched	ISO 180/4	KJ/m211	J/m 100	--	--
Charpy notched	ISO 179	KJ/m212	KJ/m2 9	--	--
THERMAL CHARACTERISTICS	TEST METHOD				
Flammability	UL 94	HB	V0	--	--
Vicat (50°C/h 9.8 N)	ISO 306	°C150	°C254	--	--
HDT (0,45 N/ mm2)	ISO 75	°C82	°C248	--	--
HDT (1,82 N/ mm2)	ISO 75	--	°C242	--	--
Recommended Min/Max temperature	IEC 216	-30°C + 90°C	-40°C +120° C	-40°C + 90°C	up to 300° C
ELECTRICAL CHARACTERISTICS	TEST METHOD				
Dielectric strenght	ASTM D 149	--	KV/mm 21	--	--
Comparative Tracking Index	IEC 112	--	V 600/600M	--	--
Resistiviy	DIN 53482	Ohm.m >1018	--	--	--
CHEMICAL CHARACTERISTICS	TEST METHOD				
Weak acids - Alkaline solution	--	Limited resistance	Good resistance	--	--
Benzine - Mineral oils	--	Good resistance	Good resistance	--	--
Alcohol - Other oils - Sea water	--	Good resistance	Good resistance	--	--

## MATERIAL COMPONENTS AND ACCESSORIES

## STEELS

**Plates:** in steel St37.4

**Accessories:** in steel lead (11SMnPb37), ENIA (nut for fixing clamps to the rail) and St 37.4 (standard series rail)

## STAINLESS STEEL

**Metal parts:** in stainless steel 316L (X2CrNiMo17-12-2) 1.4404.

**U-Bolts** in stainless steel 304L with good corrosion resistance and stainless steel 316L (stainless marine) with excellent resistance to corrosion.

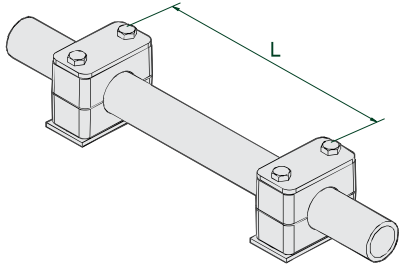
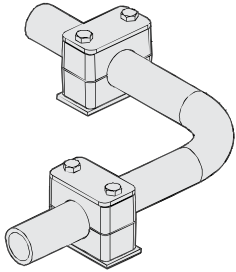

## SURFACE FINISHINGS

**Components and accessories:** they are treated with white zinc c8 Fe Zn II for standard series rail surface treatment Sendzimir.

For U-Bolts electrolytic zinc coating thickness 8 micron Fe/Zn8/A.

All finishing surfaces are according to the RoHS directive.

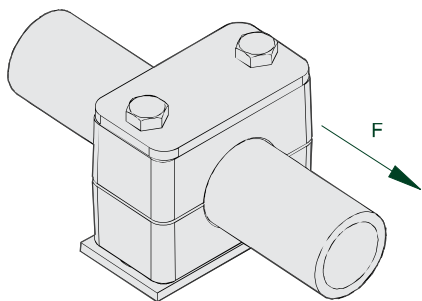
**Crapal:** Zinc / Aluminium coating gray opaque with excellent corrosion resistance (only for U-Bolts).

RECOMMENDED DISTANCE BETWEEN CLAMPS				CLAMP INSTALLATION IN CASE OF BEND PIPE	
 <p>The values of the distances of the clamps shown in the table are indicative values, reported to static loads.</p>					
Pipe outside diameter (mm)	Distance L (m)	Pipe outside diameter (mm)	Distance L (m)		
6,0 - 13,5	1,0	114,0 - 168,0	5,0	Bend pipes should be fixed by clamps immediately before and after the bend. Moreover it is recommended to do these clamps as fixed point clamps.  Joints is recommended for applications with the use of clamps before and after the junction.	
13,5 - 18	1,2	168,0 - 219,0	6,0		
18 - 32	1,5	219,0 - 324,0	6,7		
32 - 38	2,0	324,0 - 356,0	7,0		
38 - 57,2	2,7	356,0 - 406,0	7,5		
57,2 - 75	3,0	406,0 - 480,0	8,0		
75 - 76,1	3,5	481,0 550,0	8,5		
76,1 - 88,9	3,7	551,0 - 630,0	9,0		
88,9 - 102,0	4,0	631,0 - 716,0	10,0		
102,0 - 114,0	4,5	716,0 - 800,0	12,0		

THREAD CHART								
Conversion table and Metric thread / UNC thread								
STANDARD SERIES			HEAVY SERIES			TWIN SERIES		
Code Ve-lock	Metric thread	UNC thread	Code Ve-lock	Metric thread	UNC thread	Code Ve-lock	Metric thread	UNC thread
PCL 1A	M6	1/4 - 20 UNC	PCH 1	M10	3/8 - 16 UNC	PCT 1	M6	1/4 - 20 UNC
PCL 1			PCH 2			PCT 2		
PCL 2			PCH 3			PCT 3		
PCL 3			PCH 4	M12	7/16 - 14 UNC	PCT 4	M8	5/16 - 18 UNC
PCL 4			PCH 5	M16	5/8 - 11 UNC	PCT 5		
PCL 5			PCH 6	M20	3/4 - 10 UNC			
PCL 6			PCH 7	M24	7/8 - 9 UNC			
PCL 7			PCH 8	M30	11/8 - 7 UNC			
PCL 8			PCH 9	M30	11/4 - 7 UNC			
	PCH 10							

PROPERTY CLASSES FOR BOLTS AND SCREWS			
ACCESSORIES	MATERIAL	FINISHING	CLASS
Socket cap screw	Steel	Zinc plated/Untreated	4.6 / 8.8
	Stainless Steel	---	A4-70
Hexagon head bolt	Steel	Zinc plated/Untreated	4.6 / 8.8
	Stainless Steel	---	A4-70
Safety washer	Steel	Zinc plated/Untreated	8
	Stainless Steel	---	A4-70
U-bolt nut	Steel	Zinc plated	8
	Stainless Steel	---	A4-70 A2-70
Flanged nut for U-bolts	Steel	Zinc plated	8
	Stainless Steel	---	---
Washer for U-bolts	Steel	Zinc plated	100 HV
	Stainless Steel	---	A4-70 A2-70
Nut bolt	Steel	Zinc plated	8

## TIGHTENING TORQUES AND MAXIMUM LOADS IN PIPE DIRECTION



All tightening torques and maximum loads in pipe direction regard clamps with upper plates and hexagon head bolts according to EN ISO 4014/4017.

The value of the load F is an average value of tests performed with steel tube Fe360.  
If the stress of the clamp in an axial direction of the pipe, the pipe slides into the clamp.

Sliding starts when F value is reached.

## STANDARD SERIES

Code Ve-lock	Hexagon head bolt (EN ISO 4014/4017)	Polypropylene		Polyamide		Aluminium	
		Tightening torque (Nm)	Max load in pipe direction F (KN)	Tightening torque (Nm)	Max load in pipe direction F (KN)	Tightening torque (Nm)	Max load in pipe direction F (KN)
PCL 1A	M6	8	0,7	10	0,7	12	3,6
PCL 1		8	1,2	10	0,9	12	4,3
PCL 2		8	1,5	10	1	12	4,4
PCL 3		8	1,7	10	1,8	12	4,8
PCL 4		8	1,8	10	1,9	12	5,2
PCL 5		8	2	10	2,1	12	7,5
PCL 6		8	2,2	10	2,8	12	9
PCL 7		8	2,3	10	2,5	---	---
PCL 8		8	2,4	10	2,5	---	---

## HEAVY SERIES

Code Ve-lock	Hexagon head bolt (EN ISO 4014/4017)	Polypropylene		Polyamide		Aluminium	
		Tightening torque (Nm)	Max load in pipe direction F (KN)	Tightening torque (Nm)	Max load in pipe direction F (KN)	Tightening torque (Nm)	Max load in pipe direction F (KN)
PCH 1	M10	13	1,8	21	4,5	32	13
PCH 2		13	3	21	4,7	32	16
PCH 3		15	3,5	25	5,2	37	16,5
PCH 4	M12	30	8,5	40	9,5	55	30,5
PCH 5	M16	46	11,5	56	27	125	36,5
PCH 6	M20	80	15	155	25	225	62,5
PCH 7	M24	110	30	200	34	250	71,7
PCH 8	M30	190	41	360	50	500	86,5
PCH 9		210	125	380	130	500	190,5
PCH 10		270	168	450	180	600	244,5

## TWIN SERIES

Code Ve-lock	Hexagon head bolt (EN ISO 4014/4017)	Polypropylene		Polyamide	
		Tightening torque (Nm)	Max load in pipe direction F (KN)	Tightening torque (Nm)	Max load in pipe direction F (KN)
PCT 1	M6	6	1,1	6	1,1
PCT 2	M8	13	2,5	13	2,5
PCT 3		13	2,1	13	2,1
PCT 4		13	2,9	13	3,1
PCT 5		9	2,2	9	2,7