

Technical Data Sheet

HelCor® and HelCor PA®



VIACON

Constructing connections.
Consciously.

HELCOR® & HELCOR PA®

This technical data sheet is valid for the ViaCon Polska Sp. z o.o. production plant in Rydzyna, Poland.

CE Certificate of Factory Production Control No. 1023-CPR-0640 F.

Steel structures and aluminium structures according to EN 1090-1. Issued by notified body no. 1023

DESCRIPTION

Flexible, cold formed, helically corrugated steel HelCor® pipes and HelCor PA® pipe arches with couplings, used mainly in civil engineering as a steel-soil composite structures for rail and road traffic loads.

INTENDED USE

- road and railway culverts
- underpasses
- ecological crossings
- relining of deteriorated structures
- hydrotechnical structures
- detention systems

PRODUCT FEATURES

- high structural strength
- wide range of shapes and sizes
- relatively low weight
- high corrosion protection
- short installation time

DESIGN LIVE LOADS

HelCor® and HelCor PA® pipes are used for every common class of road and rail loads (according to the European Standard EN 1991-2 or others).

TECHNICAL PROPERTIES

STEEL

The steel used for production of HelCor® pipes, HelCor PA® pipe arches and all types of coupling bands conform to the European Standard: EN 10346 "Continuously hot-dip coated strip and sheet of structural steels - Technical delivery conditions"

Table 1

HELCOR® AND HELCOR PA® PIPES STEEL MECHANICAL PROPERTIES

Steel grade	Standard	Yield point R _e [MPa]	Tensile strength R _m [MPa]	Elongation A _{80min} [%]
DX51D*	PN-EN 10346	–	270–500	22
S250GD	PN-EN 10346	250	330	19

* the steels DX51D and S250GD are used alternately

The steel is delivered with the certificate 3.1 acc. to EN 10204

CORRUGATION

HelCor® & HelCor PA® pipes are produced in two types of corrugation depending on the dimensions of the profile:

- D1+ 71 x 16 mm
- D3 125 x 26 mm

HELCOR D1+

Plate thickness t [mm]	Yield stress [MPa]	Area [mm ² /mm]	Moment of inertia [mm ⁴ /mm]	Section modulus [mm ³ /mm]	Plastic section modulus [mm ³ /mm]
1,5	250	1,663	46,4	5,303	7,695
2,0	250	2,218	62,6	6,951	10,312
2,5	250	2,774	79,2	8,562	12,964
3,0	250	3,329	96,4	10,148	15,654

HELCOR D3

Plate thickness t [mm]	Yield stress [MPa]	Area [mm ² /mm]	Moment of inertia [mm ⁴ /mm]	Section modulus [mm ³ /mm]	Plastic section modulus [mm ³ /mm]
1,5	250	1,660	143,1	10,411	13,880
2,0	250	2,213	191,8	13,697	18,557
2,5	250	2,768	241,0	16,909	23,263
3,0	250	3,322	290,8	20,057	28,000
3,5	250	3,877	341,4	23,149	32,772

SHAPES & SIZES

HelCor® pipes are produced with diameters from Ø300mm to Ø3600mm.

HelCor PA® pipe-arches are produced with dimensions (span x rise) from 0.80 x 0.58 m to 3.67 x 2.61 m.

The standard lengths of HelCor® pipe segments are 6, 7 and 8 m. The manufacturer can produce and deliver longer segments, but the length must be accepted by the production department at the order preparation stage.

HelCor PA® pipe arch types from HCPA-S1 to HCPA-20 are produced only in 6 m segment lengths.

The pipe arch types from HCPA-21 to HCPA-50 are produced in standard segment lengths of 6 m, but segments of 7 m and 8 m long are also available upon customer request.

HelCor® and HelCor PA® can be produced with re-corrugated ends.

All standard HelCor® pipe diameters and HelCor PA® profile shapes are presented in TDS Appendix no.1. Additionally, you can find their basic geometrical data there.

COUPLING BANDS

The designed length of the whole culvert is obtained by joining several segments using the coupling bands, which are made from flat or corrugated steel. Different types and widths of coupling bands are used to join the segments of pipes of different dimensions and purposes. All coupling bands meet the following conditions::

$$300 \leq W \leq 0,4 D$$

W – width of the coupling band,
D – nominal pipe diameter in [mm]

Five types of couplings are used to connect culvert sections together::

- **Type 1 – flat steel coupling band**
- **Type 2 – helically corrugated coupling band – standard solution with 2xL steel beams**
- **Type 3 - helically corrugated coupling band – for relining with steel sleeves**
- **Type 4 – corrugated coupling band for the re-corrugated pipe ends**
- **Type 5 - flat steel coupling band with edges adjusted to the re-corrugated pipe ends**

All details of coupling bands are presented in the "Catalogue of Production Standard Solutions and Details". Steel thickness and corrosion protection of coupling bands and pipe may differ.





TOLERANCES OF PIPE'S GEOMETRY

The values of the geometric parameters of the pipe after the assembly should not differ from the designed values more than:

HelCor® pipe:

- span ± 1.5%
- rise ± 1.5%

HelCor PA® pipe:

- span ± 2% for profiles HCPA-S1 to HCPA-20 and ± 5% for profiles HCPA-21 to HCPA-50
- rise ± 2% for profiles HCPA-S1 to HCPA-20 and ± 5% for profiles HCPA-21 to HCPA-50
- length + 0.5%

The vertical displacement of the pipe's crown point during the backfilling process should not exceed 2% of its span measured before backfilling.

FLANGE CONNECTIONS

Each HelCor®/HelCor® PA section can also be also connected to an adjacent section with a flange connection.

The standard solution is a 100x10mm flange, connected by M20 bolts and nuts.

This solution is also used for connecting additional elements, such as inlets, connectors, and manholes.

All details of flange connections are presented in the "Catalogue of Production Standard Solutions and Details".

BOLTS, NUTS, ANCHOR BOLTS

Depending on the application, the following standard fasteners are used in the production of the pipes.

BOLTS, NUTS, ANCHOR BOLTS

Type	Dimension	Length	Standard
Bolts	M8	Different lengths depending on the project / order	EN ISO 4070
	M12		EN ISO 4070
	M16		EN ISO 4070
	M20 (CLASS 8.8)	50mm, 70mm	EN ISO 898-1
Nuts	M8, M12, M16	-	EN ISO 4032
	M20	-	EN ISO 898-2
Anchor bolts	M20	135mm, 225mm	EN ISO 10025-2

CORROSION PROTECTION

The steel is delivered with ready-made corrosion protection:

- 600g/m² of zinc coating on both sides, which corresponds to 42 µm on each side (Z600)
- 1000g/m² of zinc coating on both sides, which corresponds to 70 µm on each side (Z1000)
- 600g/m² of galvanized zinc coating on both sides, which corresponds to 42 µm on each side with an extra 300 µm-thick layer of polymer film (such as Trenchcoat™, W-Protect®, Isofilm or similar) on one or both sides (1TC, 2TC).



Table 3

	Non-aggressive environment	Aggressive environment
Air aggressiveness category according to EN ISO 12944-2*	<ul style="list-style-type: none"> ■ C1 ■ C2 	<ul style="list-style-type: none"> ■ C3 ■ C4 ■ C5-I, C5-M
Water parameters	<ul style="list-style-type: none"> ■ pH from 6.5 to 8.0 ■ hardness of water ≥ 20 mg Ca/l ■ speed of water ≤ 1.5 m/s 	<ul style="list-style-type: none"> ■ pH from 3.0 to 6.5 & from 8.0 to 12.0 ■ hardness of water < 20 mg Ca/l ■ speed of water > 1.5 m/s
Soil parameters	<ul style="list-style-type: none"> ■ pH from 6.5 to 8.0 ■ soil permeability $k_{10} \geq 8.0$ m /24h ■ no organic parts ■ ununiformity $C_u \geq 5$ ■ humidity $\leq 17\%$ 	<ul style="list-style-type: none"> ■ pH from 3.0 to 6.0 & from 8.0 to 12.0 ■ soil permeability $K < 8.0$ m.24h ■ contains oranic parts ■ ununiformaty index $C_u < 5$ ■ Humidity $> 17\%$

Anti corrosive protection endurance	Zinc coating 42 μ m (600 g/m ²)	min. 40 years	Not recommended
	Zinc coating 70 μ m (1000 g/m ²)	50–70 years	20–50 years
	Zinc coating 42 μ m (600 g/m ²) + polumer coating 300 μ m	over 100 years	80–100 years

ABRASION

The pipes, during their service, can be subjected to an abrasion process. In accordance with the recommendations of the Local Board of Roads, the abrasion resistance of HC/ HCPA pipes due to the applied anti-corrosion layer, can be classified as shown in the table below.

Table 4

	Low abrasion	Medium – High abrasion	
	≤ 1.5 m/s	≤ 3.5 m/s	> 3.5 m/s
Aggregate	Sand & gravel	Sand & gravel	Fine Sand
Zinc coating 42–70 μ m	Suitable	Not suitable	
μ m Zinc coating + polymer coating	Suitable	Suitable	

OTHER INFORMATION

Each application of the HelCor® and HelCor PA® requires a technical design, including estimated loads, hydrological conditions and other limiting factors. Appropriate rise and span of the cross section should be chosen. The lifetime analysis should specify the anti-corrosion system to be applied. The design should follow the guidelines issued by ViaCon as well as respective country-specific requirements.

Pipes can also be produced and delivered with additional elements, upon special request. A wide range of such elements is available in the catalogue: "HelCor & HelCor PA - Catalogue of Production Standard Solutions and Details. Any other individual designs are also possible, but they should be discussed and accepted by ViaCon at the inquiry or order stage.

More details about this product can be found in product catalogues, i.e.: "HelCor & HelCor PA - Catalogue of Production Standard Solutions and Details", "HC & MP & SC - Catalogue of Design Details". With other questions, please contact the manufacturer directly.

LIST OF STANDARDS:

EN ISO 1090-1 – Execution of steel structures and aluminum structures. Requirements for conformity assessment of structural components

EN ISO 1991-2 – Eurocode – Traffic loads on bridges

EN ISO 10204 – Metallic Products: Types of Inspection Documents

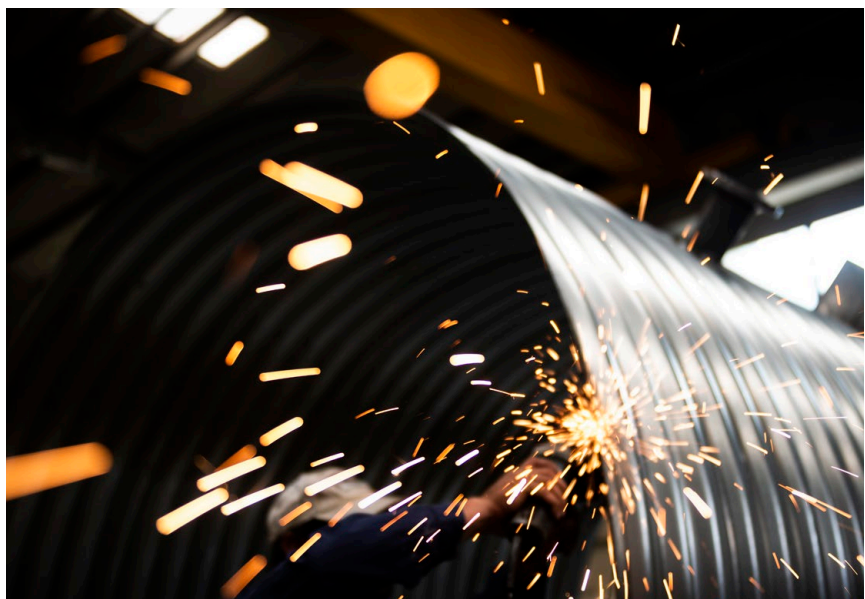
EN ISO 10346 – “Continuously hot-dip coated steel flat products – Technical - delivery conditions”

EN ISO 12944-2 – Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Classification of environments

TRANSPORT AND STORAGE

The pipes are delivered to the jobsite by trucks. The unloading and placing of the pipes should be performed using light mechanical crane devices using textile belts. The pipes must not be dropped from the truck. The pipes can be stored in stacks using wooden spacers.

Any damages to the anti-corrosion protection of the pipe caused during transport, unloading or assembly must be repaired in accordance to the manufacturer instruction.



APPENDIX

VIACON HELCOR PIPES - STANDARD DIAMETERS

Name	Diameter - inner [m]	Area [m ²]	Corrugation type	Plate thickness for D1+ corrugation [mm]	Plate thickness for D3 corrugation [mm]
300	0,30	0,07	D1+	1,5 / 2,0	-
400	0,40	0,13	D1+	1,5 / 2,0	-
500	0,50	0,20	D1+	1,5 / 2,0	-
600	0,60	0,28	D1+	1,5 / 2,0	-
700	0,70	0,38	D1+	1,5 / 2,0	-
800	0,80	0,50	D1+	1,5 / 2,0	-
900	0,90	0,64	D1+	1,5 / 2,0	-
1000	1,00	0,79	D1+, D3	1,5 / 2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1100	1,10	0,95	D1+, D3	1,5 / 2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1200	1,20	1,13	D1+, D3	1,5 / 2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1300	1,30	1,33	D1+, D3	2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1400	1,40	1,54	D1+, D3	2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1500	1,50	1,77	D1+, D3	2,0 / 2,5	1,6 (TC) / 2,00 / 2,50
1600	1,60	2,01	D1+, D3	2,0 / 2,5	1,6 (TC) / 2,00 / 2,50 / 3,00
1700	1,70	2,27	D1+, D3	2,0 / 2,5	1,6 (TC) / 2,00 / 2,50 / 3,00
1800	1,80	2,54	D1+, D3	2,0 / 2,5	2,00 / 2,50 / 3,00 / 3,50
1900	1,90	2,84	D1+, D3	-	2,00 / 2,50 / 3,00 / 3,50
2000	2,00	3,14	D1+, D3	-	2,00 / 2,50 / 3,00 / 3,50
2100	2,10	3,46	D3	-	2,00 / 2,50 / 3,00 / 3,50
2200	2,20	3,80	D3	-	2,00 / 2,50 / 3,00 / 3,50
2300	2,30	4,15	D3	-	2,00 / 2,50 / 3,00 / 3,50
2400	2,40	4,52	D3	-	2,50 / 3,00 / 3,50
2500	2,50	4,91	D3	-	2,50 / 3,00 / 3,50
2600	2,60	5,31	D3	-	2,50 / 3,00 / 3,50
2700	2,70	5,73	D3	-	2,50 / 3,00 / 3,50
2800	2,80	6,16	D3	-	2,50 / 3,00 / 3,50
2900	2,90	6,61	D3	-	2,50 / 3,00 / 3,50
3000	3,00	7,07	D3	-	2,50 / 3,00 / 3,50
3100	3,10	7,55	D3	-	3,00 / 3,50
3200	3,20	8,04	D3	-	3,00 / 3,50
3300	3,30	8,55	D3	-	3,00 / 3,50
3400	3,40	9,08	D3	-	3,00 / 3,50
3500	3,50	9,62	D3	-	3,00 / 3,50
3600	3,60	10,18	D3	-	3,00 / 3,50



VIACON HELCOR PA PIPES - STANDARD PROFILES

Name	Span - inner [m]	Rise -inner [m]	Area [m ²]	Corrugation type	Plate thickness for D1+ corrugation [mm]	Plate thickness for D3 corrugation [mm]
HCPA-S1	0,80	0,58	0,37	D1+	1,6 (TC) / 2,0	-
HCPA-S2	0,91	0,66	0,47	D1+	1,6 (TC) / 2,0	-
HCPA-S3	1,03	0,74	0,60	D1+	1,6 (TC) / 2,0	-
HCPA-S4	1,15	0,82	0,74	D1+	1,6 (TC) / 2,0 / 2,5	-
HCPA-01	1,34	1,05	1,13	D1+	2,0 / 2,5	-
HCPA-02	1,44	0,97	1,10	D1+	2,0 / 2,5	-
HCPA-03	1,49	1,24	1,46	D1+	2,0 / 2,5 / 3,0	-
HCPA-04	1,62	1,10	1,42	D1+	2,0 / 2,5 / 3,0	-
HCPA-05	1,65	1,38	1,82	D1+	2,0 / 2,5 / 3,0	-
HCPA-06	1,80	1,20	1,70	D1+	2,0 / 2,5 / 3,0	-
HCPA-07	1,80	1,50	2,15	D1+	2,0 / 2,5 / 3,0	-
HCPA-08	1,84	1,39	2,04	D1+	2,0 / 2,5 / 3,0	-
HCPA-09	1,84	1,48	2,16	D1+	2,0 / 2,5 / 3,0	-
HCPA-10	1,89	1,55	2,32	D1+	2,0 / 2,5 / 3,0	-
HCPA-11	1,91	1,46	2,23	D1+	2,0 / 2,5 / 3,0	-
HCPA-12	1,95	1,32	2,04	D1+	2,0 / 2,5 / 3,0	-
HCPA-13	2,01	1,59	2,55	D1+	2,5 / 3,0	-
HCPA-14	2,04	1,49	2,41	D1+	2,5 / 3,0	-
HCPA-15	2,10	1,45	2,42	D1+	2,5 / 3,0	-
HCPA-16	2,10	1,55	2,59	D1+	2,5 / 3,0	-
HCPA-17	2,14	1,64	2,74	D1+	2,5 / 3,0	-
HCPA-18	2,16	1,62	2,80	D1+	2,5 / 3,0	-
HCPA-19	2,20	1,71	2,99	D1+/D3	2,5 / 3,0	2,5 / 3,0
HCPA-20	2,23	1,68	2,93	D1+/D3	2,5 / 3,0	2,5 / 3,0
HCPA-21	2,28	1,70	3,03	D3	-	2,5 / 3,0 / 3,5
HCPA-22	2,35	1,77	3,28	D3	-	2,5 / 3,0 / 3,5
HCPA-23	2,35	1,73	3,16	D3	-	2,5 / 3,0 / 3,5
HCPA-24	2,37	1,83	3,45	D3	-	2,5 / 3,0 / 3,5
HCPA-25	2,48	1,79	3,47	D3	-	2,5 / 3,0 / 3,5
HCPA-26	2,49	1,83	3,61	D3	-	2,5 / 3,0 / 3,5
HCPA-27	2,55	1,86	3,73	D3	-	2,5 / 3,0 / 3,5
HCPA-28	2,58	1,94	3,97	D3	-	2,5 / 3,0 / 3,5
HCPA-29	2,60	1,93	3,97	D3	-	2,5 / 3,0 / 3,5
HCPA-30	2,75	1,95	4,20	D3	-	2,5 / 3,0 / 3,5
HCPA-31	2,76	2,05	4,48	D3	-	2,5 / 3,0 / 3,5
HCPA-32	2,80	2,01	4,43	D3	-	2,5 / 3,0 / 3,5
HCPA-33	2,84	2,02	4,58	D3	-	2,5 / 3,0 / 3,5
HCPA-34	2,95	2,04	4,69	D3	-	2,5 (TC) / 3,0 / 3,5
HCPA-35	2,96	2,16	5,06	D3	-	2,5 (TC) / 3,0 / 3,5
HCPA-36	2,97	2,00	4,57	D3	-	2,5 (TC) / 3,0 / 3,5
HCPA-37	3,08	2,08	4,94	D3	-	3,0 / 3,5
HCPA-38	3,14	2,27	5,63	D3	-	3,0 / 3,5
HCPA-39	3,17	2,06	5,12	D3	-	3,0 / 3,5
HCPA-40	3,23	2,12	5,41	D3	-	3,0 / 3,5
HCPA-41	3,23	2,15	5,39	D3	-	3,0 / 3,5
HCPA-42	3,28	2,17	5,67	D3	-	3,0 / 3,5

VIACON HELCOR PA PIPES - STANDARD PROFILES

Name	Span - inner [m]	Rise -inner [m]	Area [m ²]	Corrugation type	Plate thickness for D1+ corrugation [mm]	Plate thickness for D3 corrugation [mm]
HCPA-43	3,33	2,23	5,97	D3	-	3,0 / 3,5
HCPA-44	3,33	2,39	6,29	D3	-	3,0 / 3,5
HCPA-45	3,35	2,19	5,65	D3	-	3,0 / 3,5
HCPA-46	3,38	2,25	5,60	D3	-	3,0 / 3,5
HCPA-47	3,49	2,27	6,28	D3	-	3,0 / 3,5
HCPA-48	3,52	2,49	6,91	D3	-	3,0 / 3,5
HCPA-49	3,65	2,39	6,85	D3	-	3,0 / 3,5
HCPA-50	3,67	2,61	7,52	D3	-	3,0 / 3,5

VIACON HELCOR PA PIPES - HAMCO SPECIAL PROFILES

Name	Span - inner [m]	Rise -inner [m]	Area [m ²]	Corrugation type	Plate thickness for D1+ corrugation [mm]	Plate thickness for D3 corrugation [mm]
HCPA-H1	1,00	0,82	0,65	D1+	2,0	-
HCPA-H2	1,20	0,92	0,87	D1+	2,0 / 2,5	-
HCPA-H3	1,41	0,94	1,06	D1+	2,0 / 2,5	-
HCPA-H4	1,56	1,32	1,62	D1+	2,0 / 2,5 / 3,0	-
HCPA-H5	1,73	1,17	1,60	D1+	2,0 / 2,5 / 3,0	-
HCPA-H6	1,82	1,21	1,74	D1+	2,0 / 2,5 / 3,0	-
HCPA-H7	1,95	1,25	1,91	D1+	2,0 / 2,5 / 3,0	-
HCPA-H8	2,04	1,32	2,10	D1+	2,0 / 2,5 / 3,0	-
HCPA-H9	1,95	1,52	2,36	D1+	2,0 / 2,5 / 3,0	-
HCPA-H10	2,12	1,34	2,22	D1+	2,0 / 2,5 / 3,0	-
HCPA-H13	2,57	1,80	3,63	D3	-	2,5 / 3,0 / 3,5
HCPA-H14	2,64	1,86	3,85	D3	-	2,5 / 3,0 / 3,5
HCPA-H15	2,78	1,90	4,13	D3	-	2,5 / 3,0 / 3,5
HCPA-H16	2,85	1,96	4,37	D3	-	2,5 / 3,0 / 3,5
HCPA-H17	3,06	2,06	4,88	D3	-	2,5 (TC) / 3,0 / 3,5



The background features a dark blue-grey color with large, light grey, stylized letters 'C' and 'A' partially visible on the right side. A vertical grey bar is on the left side.

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