

# HEXWELD

## CATHODIC PROTECTION





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**HEX - BCA factory at Vapi, Gujarat**



**HEX - HCA factory at Jamnagar, Gujarat**

## INTRODUCTION

**Cathodic protection (CP) is an electro-chemical process that slows or stops corrosion currents by applying DC current to a metal.**

**Used to control the corrosion of metal surfaces of machines by making the electrochemical cell negative electrode in the metal to be protected binds to the positive pole of a nearby metal more corrosive, corroding the metal nearby rather than the metal protected in cutting structures such as long pipelines.**

**In the event of inadequate Cathodic or descending protection, a continuous external electrical power source is used to provide an adequate Cathodic protection current.**

**There are two basic types of cathodic protection systems use different types of anodes: galvanic (frequently referred to as galvanic) and impressed current.**

## 1) Galvanic Cathodic Protection

A galvanic system utilizes anodes connected to a protected structure in a circuit. Furthermore, galvanic anodes use the natural voltage differential, or potential, between the anode (more negative) and the structure (less negative) to drive current off the anode and to the structure.

## 2) Impressed Current Cathodic Protection

When galvanic cathodic protection is insufficient, the solution calls for an external power supply, or cathodic protection rectifier. Impressed current systems utilize a rectifier to generate larger potential differences that drive current off of the anode so it flows to the protected structure.

## How does Cathodic Protection work?

Cathodic Connections are the preferred method of exothermically welding cathodic protection anode leads to pipes (steel or cast iron), tanks, and other structures.

Cathodic protection systems are designed to prevent galvanic corrosion along a pipeline or in various structures.

## Benefits of Cathodic Protection

Cathodic Protection or electrochemical protection is a way to protect metal structures. It is used to control the corrosion of metal surfaces of machines by making the electrochemical cell negative electrode in the metal to be protected binds to the positive pole of a nearby metal more corrosive, corroding the metal nearby rather than the metal protected in cutting structures such as long pipelines.

In the event of inadequate Cathodic or descending protection, a continuous external electrical power source is used to provide an adequate Cathodic protection current.



# Types of corrosion in the oil and gas industry requiring Cathodic Protection :

- **Co<sub>2</sub> corrosion :**

Carbon dioxide erosion has been a challenge in the oil and gas industry. For many years because it has become a corrosive substance when dissolved in a water environment, enhancing the electrochemistry between the steel tube and the aquatic environment, which erodes the tube, and carbon dioxide erosion is the most widespread corrosion in the oil and gas industry.

- **Acid corrosion (H<sub>2</sub>S Corrosion) :**

H<sub>2</sub>S is not an eating substance, but it becomes so when it comes into contact with water, eroding the pipeline. Depending on this, metal damage when in contact with hydrogen sulphide (H<sub>2</sub>S) and moisture is called acid corrosion, which is most harmful to oil extraction pipes.

- **Oxygen corrosion O<sub>2</sub> :**

Oxygen is known for its ability to interact with metals quickly, especially dissolved oxygen within drilling fluids, which is a significant cause of pipe erosion.

- **Microbiome corrosion :**

Microbial corrosion (MIC) is a type of bacterial activity. Bacteria produce waste mostly involving carbon dioxide and organic acids that directly affect pipe erosion by increasing the toxicity of the fluid flowing within the pipeline.



# How does Cathodic Protection mitigate the effects of corrosion?

Applying an electric current to the tube structure to be protected from one of the causes of corrosion is how the protection process is achieved.

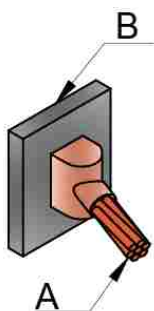
There are two basic ways to apply for cathodic protection in the oil and gas industry:

- The method of cathodic protection of forced current (ICCP) where electricity is isolated or applied by one of the available energy sources.
- The melt anode method (SACP) uses different metals' electromagnetic potential to protect against corrosion forces.



## HEXWELD CATHODIC CONNECTIONS

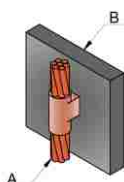
### Angular Cable to Vertical Steel Surface Connections (HWCS-3)



A		B	Product Code	
mm2	AWG		Welding Material	Standard Mould
10	#8	STEEL SURFACE	#045	HWCS-3-10
16	#6	STEEL SURFACE	#045	HWCS-3-16
25	#4	STEEL SURFACE	#065	HWCS-3-25
35	#2	STEEL SURFACE	#065	HWCS-3-35
50	1/0	STEEL SURFACE	#090	HWCS-3-50
70	2/0	STEEL SURFACE	#090	HWCS-3-70
95	3/0	STEEL SURFACE	#115	HWCS-3-95
100	3/0	STEEL SURFACE	#115	HWCS-3-100
120	4/0	STEEL SURFACE	#150	HWCS-3-120
150	300MCM	STEEL SURFACE	#150	HWCS-3-150
185	350MCM	STEEL SURFACE	#200	HWCS-3-185
240	500MCM	STEEL SURFACE	#250	HWCS-3-240
300	600MCM	STEEL SURFACE	#250	HWCS-3-300

**PS :** Other types of connections, configuration or size of conductors are available on request.

### Vertical Cable Through Steel Surface Connections (HWCS-4)

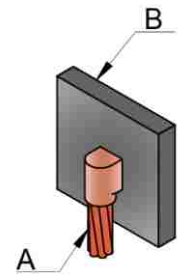


A		B	Product Code	
mm2	AWG		Welding Material	Standard Mould
10	#8	STEEL SURFACE	#045	HWCS-4-10
16	#6	STEEL SURFACE	#065	HWCS-4-16
25	#4	STEEL SURFACE	#090	HWCS-4-25
35	#2	STEEL SURFACE	#115	HWCS-4-35
50	1/0	STEEL SURFACE	#150	HWCS-4-50
70	2/0	STEEL SURFACE	#150	HWCS-4-70
95	3/0	STEEL SURFACE	#150	HWCS-4-95
100	3/0	STEEL SURFACE	#200	HWCS-4-100
120	4/0	STEEL SURFACE	#200	HWCS-4-120
150	300MCM	STEEL SURFACE	#250	HWCS-4-150
185	350MCM	STEEL SURFACE	#250	HWCS-4-185
240	500MCM	STEEL SURFACE	#150X2	HWCS-4-240

**PS :** Other types of connections, configuration or size of conductors are available on request.

## Vertical Cable to Steel Surface Connections (HWCS-25)

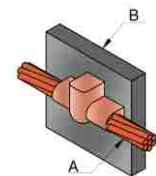
A		B	Product Code	
mm2	AWG		Welding Material	Standard Mould
10	#8	STEEL SURFACE	#045	HWCS-25-10
16	#6	STEEL SURFACE	#065	HWCS-25-16
25	#4	STEEL SURFACE	#065	HWCS-25-25
35	#2	STEEL SURFACE	#090	HWCS-25-35
50	1/0	STEEL SURFACE	#115	HWCS-25-50
70	2/0	STEEL SURFACE	#115	HWCS-25-70
95	3/0	STEEL SURFACE	#150	HWCS-25-95
100	3/0	STEEL SURFACE	#150	HWCS-25-100
120	4/0	STEEL SURFACE	#200	HWCS-25-120
150	300MCM	STEEL SURFACE	#200	HWCS-25-150
185	350MCM	STEEL SURFACE	#250	HWCS-25-185
240	500MCM	STEEL SURFACE	#150X2	HWCS-25-240
300	600MCM	STEEL SURFACE	#150X2	HWCS-25-300



**PS :** Other types of connections, configuration or size of conductors are available on request.

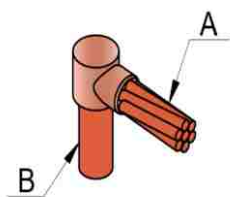
## Horizontal Cable Through Vertical Steel Surface Connections (HWCS-27)

A		B	Product Code	
mm2	AWG		Welding Material	Standard Mould
10	#8	STEEL SURFACE	#045	HWCS-27-10
16	#6	STEEL SURFACE	#065	HWCS-27-16
25	#4	STEEL SURFACE	#090	HWCS-27-25
35	#2	STEEL SURFACE	#115	HWCS-27-35
50	1/0	STEEL SURFACE	#150	HWCS-27-50
70	2/0	STEEL SURFACE	#150	HWCS-27-70
95	3/0	STEEL SURFACE	#150	HWCS-27-95
100	3/0	STEEL SURFACE	#200	HWCS-27-100
120	4/0	STEEL SURFACE	#200	HWCS-27-120
150	300MCM	STEEL SURFACE	#250	HWCS-27-150
185	350MCM	STEEL SURFACE	#250	HWCS-27-185
240	500MCM	STEEL SURFACE	#150X2	HWCS-27-240
300	600MCM	STEEL SURFACE	#200X2	HWCS-27-300



**PS :** Other types of connections, configuration or size of conductors are available on request.

## Vertical L Cable to Rod Connections (HWCR-1)



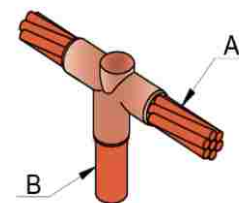
A		B-Ø	Product Code	
mm2	AWG		Welding Material	Standard Mould
10	#8	12.7	#065	HWCR-1-10-127
16	#6	12.7	#065	HWCR-1-16-127
25	#4	12.7	#065	HWCR-1-25-127
35	#2	12.7	#065	HWCR-1-35-127
50	1/0	12.7	#065	HWCR-1-50-127
70	2/0	12.7	#090	HWCR-1-70-127
95	3/0	12.7	#090	HWCR-1-95-127
100	3/0	12.7	#090	HWCR-1-100-127
120	4/0	12.7	#090	HWCR-1-120-127
16	#6	14.2	#065	HWCR-1-16-142
25	#4	14.2	#065	HWCR-1-25-142
35	#2	14.2	#065	HWCR-1-35-142
50	1/0	14.2	#090	HWCR-1-50-142
70	2/0	14.2	#090	HWCR-1-70-142
95	3/0	14.2	#090	HWCR-1-95-142
100	3/0	14.2	#090	HWCR-1-100-142
120	4/0	14.2	#090	HWCR-1-120-142
150	300 MCM	14.2	#115	HWCR-1-150-142
185	350 MCM	14.2	#115	HWCR-1-185-142
240	500 MCM	14.2	#150	HWCR-1-240-142
16	#6	17.2	#065	HWCR-1-16-172
25	#4	17.2	#090	HWCR-1-25-172
35	#2	17.2	#090	HWCR-1-35-172
50	1/0	17.2	#090	HWCR-1-50-172
70	2/0	17.2	#090	HWCR-1-70-172
95	3/0	17.2	#090	HWCR-1-95-172
100	3/0	17.2	#090	HWCR-1-100-172
120	4/0	17.2	#090	HWCR-1-120-172
150	300 MCM	17.2	#115	HWCR-1-150-172
185	350 MCM	17.2	#115	HWCR-1-185-172
240	500 MCM	17.2	#150	HWCR-1-240-172
300	600 MCM	17.2	#200	HWCR-1-300-172

**PS :** Other types of connections, configuration or size of conductors are available on request.



## Vertical Tee Cable to Rod Connections (HWCR-2)

A		B-Ø	Product Code	
mm2	AWG		Welding Material	Standard Mould
16	#6	14.2	#065	HWCR-2-16-142
25	#4	14.2	#090	HWCR-2-25-142
35	#2	14.2	#090	HWCR-2-35-142
50	1/0	14.2	#090	HWCR-2-50-142
70	2/0	14.2	#115	HWCR-2-70-142
95	3/0	14.2	#115	HWCR-2-95-142
120	4/0	14.2	#115	HWCR-2-120-142
125	250 MCM	14.2	#150	HWCR-2-125-142
150	300 MCM	14.2	#200	HWCR-2-150-142
185	350 MCM	14.2	#200	HWCR-2-185-142
240	500 MCM	14.2	#250	HWCR-2-240-142
16	#6	17.2	#065	HWCR-2-16-172
25	#4	17.2	#090	HWCR-2-25-172
35	#2	17.2	#090	HWCR-2-35-172
50	1/0	17.2	#115	HWCR-2-50-172
70	2/0	17.2	#115	HWCR-2-70-172
95	3/0	17.2	#115	HWCR-2-95-172
120	4/0	17.2	#115	HWCR-2-120-172
125	250 MCM	17.2	#150	HWCR-2-125-172
150	300 MCM	17.2	#200	HWCR-2-150-172
185	350 MCM	17.2	#200	HWCR-2-185-172
240	500 MCM	17.2	#250	HWCR-2-240-172
400	750 MCM	17.2	#200X2	HWCR-2-400-172



**PS :** Other types of connections, configuration or size of conductors are available on request.

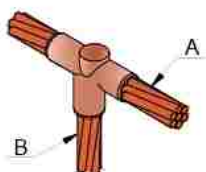
## Horizontal Straight Cable to Cable Connections (HWCC-1)



A	B	Product Code	
		Welding Material	Standard Mould
10	10	#032	HWCC-1-10-10
16	16	#032	HWCC-1-16-16
25	25	#032	HWCC-1-25-25
35	35	#032	HWCC-1-35-35
50	50	#045	HWCC-1-50-50
70	70	#065	HWCC-1-70-70
95	95	#090	HWCC-1-95-95
100	100	#090	HWCC-1-100-100
120	120	#115	HWCC-1-120-120
150	150	#115	HWCC-1-150-150
185	185	#150	HWCC-1-185-185
240	240	#200	HWCC-1-240-240
300	300	#250	HWCC-1-300-300
400	400	#150 X 2	HWCC-1-400-400
500	500	#200 X 2	HWCC-1-500-500

**PS :** Other types of connections, configuration or size of conductors are available on request.

## Vertical Tee Cable to Cable Connections (HWCC-3)

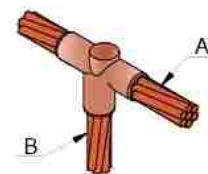


A	B	Product Code	
		Welding Material	Standard Mould
10	10	#045	HWCC-3-10-10
16	16	#045	HWCC-3-16-16
25	16	#045	HWCC-3-25-16
25	25	#045	HWCC-3-25-25
35	16	#045	HWCC-3-35-16
35	25	#045	HWCC-3-35-25
35	35	#045	HWCC-3-35-35
50	16	#065	HWCC-3-50-16
50	25	#065	HWCC-3-50-25
50	35	#065	HWCC-3-50-35
50	50	#090	HWCC-3-50-50
70	25	#065	HWCC-3-70-25
70	35	#065	HWCC-3-70-35
70	50	#090	HWCC-3-70-50
70	70	#090	HWCC-3-70-70

*...continued*

## Vertical Tee Cable to Cable Connections (HWCC-3)

A	B	Product Code	
mm <sup>2</sup>		Welding Material	Standard Mould
95	25	#090	HWCC-3-95-25
95	35	#090	HWCC-3-95-35
95	50	#090	HWCC-3-95-50
95	70	#090	HWCC-3-95-70
95	95	#115	HWCC-3-95-95
100	35	#090	HWCC-3-100-35
100	50	#090	HWCC-3-100-50
100	70	#090	HWCC-3-100-70
100	95	#115	HWCC-3-100-95
100	100	#115	HWCC-3-100-100
120	25	#090	HWCC-3-120-25
120	35	#090	HWCC-3-120-35
120	50	#090	HWCC-3-120-50
120	70	#090	HWCC-3-120-70
120	95	#115	HWCC-3-120-95
120	100	#115	HWCC-3-120-100
120	120	#150	HWCC-3-120-120
150	70	#090	HWCC-3-150-70
150	95	#150	HWCC-3-150-95
150	100	#150	HWCC-3-150-100
150	120	#150	HWCC-3-150-120
150	150	#200	HWCC-3-150-150
185	95	#150	HWCC-3-185-95
185	100	#150	HWCC-3-185-100
185	120	#200	HWCC-3-185-120
185	150	#200	HWCC-3-185-150
185	185	#200	HWCC-3-185-185
240	100	#200	HWCC-3-240-100
240	120	#200	HWCC-3-240-120
240	150	#200	HWCC-3-240-150
240	185	#200	HWCC-3-240-185
240	240	#150 X 2	HWCC-3-240-240
300	150	#250	HWCC-3-300-150
300	185	#250	HWCC-3-300-185
300	240	#200 X 2	HWCC-3-300-240
300	300	#200 X 2	HWCC-3-300-300



**PS :** Other types of connections, configuration or size of conductors are available on request.



**BRASS COPPER & ALLOY (I) LTD.**

# 15, Mehta Mahal, 2nd Floor, Mathew Road, Charni Road (E), Mumbai - 400 004.

Tel. : +91 22 4960 8008 • E-mail : [hexweld@hexworldwide.com](mailto:hexweld@hexworldwide.com)

[www.hexworldwide.com](http://www.hexworldwide.com)