



Long-line flexible anode for impressed-current cathodic protection of on-grade and buried storage tanks.

### **ANODEFLEX-850 Cathodic Protection.**

**Construction:** Four basic elements:

**Central Copper Conductor :** #6 AWG serving as a low resistance busbar to deliver the required current over the entire tank bottom.

**Conductive polymer :** 13 mm (0.5 inch) in diameter special extrusion, sealing the copper conductor from chemical attack, yet allowing current to flow through it, from the conductor to the environment all along its length.

**Coke breeze:** Pre-packaged, high performance calcined petroleum coke breeze, serving as the active matrix in which the electrochemical reactions take place. Designed for min. 30 years service life at max. current output of 52 mA/m (16 mA/ft).

**Fabric jacket :** Integrated woven, acid resistant and porous jacket holding the coke breeze in place around the anode.

### *Product description*

Anodeflex 850 is a long-line, flexible, cable-like anode, which is placed in continuous close proximity to the tank bottom. Uniform distribution of cathodic protection current is therefore achieved on applications where secondary containment, or where traditional anode systems will not work. Key to the product's performance is the central, conductive-polymer coated copper conductor. This unique construction allows current to flow long distances down the center conductor, while allowing sufficient cathodic protection current to continuously pass through the conductive polymer all along the length of the anode.

In contrast to conventional CP systems, AnodeFlex is placed in the ground in close proximity to the steel surface to be protected and provides uniform distribution of protective current to the entire steel surface, thereby maintaining the steel-to-soil "instant-off" potential in the required window of  $-850\text{mv}$  ( $-950\text{mv}$  if SRB's present) and  $-1200\text{mv}$ .

The central anode cable is surrounded by factory prepackaged, high conductivity coke breeze, held in place by a porous and woven jacket. This arrangement avoids handling loose coke breeze and simplifies field installation. The improved current distribution increases anode efficiency and helps prevent over-voltage problems such as hydrogen generation. Above ground storage tank bottoms and buried tanks can be more effectively protected from corrosion using this continuous, close proximity anode system.

AnodeFlex 850 is delivered on long length spools and because no additional coke breeze is required, the installation is as simple as laying a low voltage power cable. Proven heat-shrinkable splice kits, Tee joints and end sealing caps are available to complete any installation design. A flexible rock shield protective covering is also available for tight applications.

### *Product features/benefits*

#### **Anode in close proximity to the tank bottom.**

- Distributes current uniformly over total area of the tank bottom.
- No over- or under-protected areas.
- Independent of soil or sand pad resistivity.

#### **No splices under the tank bottom.**

- Flexible design choices.
- Tight bend radius product.
- All maintenance is outside the tank.

#### **Easy installation.**

- Lower labor costs.
- Simple to bury in the sand pad.
- Will protect existing tanks.

#### **Low ground contact resistance.**

- Driving voltage is lower.
- Less expensive to operate.
- Pre-packaged coke breeze

### *Product selection guide*

	<b>AnodeFlex 850</b>
Recommended Maximum Design Current Output in Soil	52 mA/m (16 mA/ft)
Minimum installation and Storage Temperature	$-18^{\circ}\text{C}$ ( $0^{\circ}\text{F}$ )
Maximum installation and Storage Temperature	$50^{\circ}\text{C}$ ( $122^{\circ}\text{F}$ )
Minimum Bend Radius	500 mm (20 inches)

### *Product dimensions*

	<b>AnodeFlex 850</b>
Nominal diameter	38 mm (1.5 in.)
Weight	1.49 kg/m (1.0 lb/ft)
Length	494 +/- 6 m (1620 +/- 20 ft)
Coke breeze quantity	1.15 kg/m (0.072 lb/ft)

**Product properties**

Property	Test Method	AFLX 850 Typical Value
<b>Copper Conductor</b>		
Dimensions	ASTM B-263	6 AWG
Resistance	ASTM B-193	1.5 x10 <sup>-3</sup> Ohm/m
<b>Conductive Polymer</b>		
Dimensions	ASTM B-263	Pass
Volume resistivity	ASTM B-193	1.5 Ω cm
<b>Coke Breeze</b>		
Fixed carbon	ASTM D-172	99.7 %
Resistivity	G.L.C. – C – 12A @ 23°C (73°F), 10 bar (145 psi)	0.4 Ω cm
<b>Fabric Jacket</b>		
Weight	Min. 190 g/m <sup>2</sup>	208 g/m <sup>2</sup>
Bursting strength	ISO 3303	915 N
Abrasion resistance	ASTM D-4157	1200 cycles to failure
Fluid resistance	Internal immersion test 2 weeks	Pass
Chlorine resistance	Internal immersion test 2 weeks	Pass
UV resistance	ASTM G-53 @ 60°C (140°F), 8 hrs @ 50°C (122°F), 4 hrs condensation	55 % tear strength loss

**Ordering information**

AnodeFlex type products are available: as a spool with standard cut length = 494 meters +/- 6 m (1620 feet +/- 20 ft)

**AFLX-850**

AnodeFlex 850 type product, conductive polymer coated copper conductor, surrounded by pre-packaged high conductivity coke breeze

**Accessories**

- AFLX-850 - CAP
- AFLX-850 - TEE
- AFLX-850 - SPLICE

Local agent / Distributor:

DS-AFLX850-REV-01-04

*Important: Like any cathodic protection system, the Tyco Adhesives AnodeFlex system must be optimized for particular design conditions. Severe environments may limit the lifetime. AnodeFlex is a flexible cable anode system. When all the active anode material available around the polymeric cable is consumed, the anode will no longer function. Tyco Adhesives warrants that AnodeFlex meets the internal Tyco Adhesives specification, but the purchaser must rely on its own engineering experience judgment and skill to ascertain whether or not AnodeFlex is fit for the particular purpose proposed by the purchaser. All of the above information, including illustrations, is believed to be reliable. Users, however, should independently evaluate the suitability of each product for their application. Tyco Adhesives makes no warranties as to the accuracy or completeness of the information and disclaims any liability regarding its use. Tyco Adhesives' only obligations are those in the Standard Terms and Conditions of Sales for this product and in no case will Tyco Adhesives be liable for any incidental, indirect or consequential damages arising from the sale, resale, use or misuse of the product. Tyco Adhesives' specifications are subject to change without notice. In addition, Tyco Adhesives reserves the right to make changes in materials or processing, without notification to the Buyer, which do not affect compliance with any applicable specification.*



**Headquarters:**  
 Tyco Adhesives L.P.  
 1400 Providence Hwy  
 Norwood, MA, 02062 USA  
 Int'l Tel.: +1 718 440 6161  
 US Toll Free: +1 800 248 0149  
 Fax: +1 781 440 6271  
 Email: CPG@tycoadhesives.com

**In North America:**  
 Tyco Adhesives (Houston)  
 11010 Wallisville Road  
 Houston, TX 77013 USA  
 Tel.: +1 713 676 0085  
 US Toll Free: +1 888 676 7202  
 Fax: +1 713 676 0086  
 Email: CPGH@tycoadhesives.com

**In South America:**  
 Tyco Adhesives CPG  
 Riobamba 1234 7° C  
 C1116ABJ Buenos Aires  
 Argentina  
 Tel.: +54 11 4811-5000  
 Fax: +54 11 4814-5020  
 Email: CPG@tycoadhesives.com

**In Europe, Middle East, Africa, Asia & Pacific:**  
 Tyco Adhesive B.V.B.A.  
 Nieuwlandlaan B15  
 B-3200 Aarschot, Belgium  
 Tel.: +32 16 55 36 00  
 Fax: +32 16 55 36 74  
 Email: CPG@tycoadhesives.com



**Long-line flexible anode for impressed-current cathodic protection of buried pipelines and of on-grade and buried storage tanks.**

### Product description

**ANODEFLEX 1500 cathodic protection.**

**Construction:** Five basic elements:

**Central Copper Conductor:** #6 AWG, serving as a low resistance busbar to deliver the required current over considerable distance without incurring substantial longitudinal voltage drop.

**Conductive polymer:** 0.5 inch (13 mm) in diameter special extrusion, sealing the copper conductor from chemical attack, yet allowing current to flow through it, from the conductor to the environment all along its length.

**Coke breeze:** Pre-packaged, high performance calcined petroleum coke breeze, serving as the active matrix in which the electrochemical reactions take place. Designed for min. 20 years service life at max. current output of 16 mA/ft (52 mA/m).

**Fabric jacket:** Integrated woven, acid resistant and porous jacket holding the coke breeze in place around the anode.

**Protective braid:** Tough, porous, non-conductive protective braid enhancing the abrasion and damage resistance of the fabric jacket.

Anodeflex 1500-1 is a long-line, flexible, cable-like anode, which is placed in continuous close proximity to the target structure. Uniform distribution of cathodic protection current is therefore achieved on applications where many conventional anode ground beds do not work. Key to the product's performance is the central, conductive-polymer coated copper conductor. This unique construction allows current to flow long distances down the center conductor, while allowing sufficient cathodic protection current to continuously pass through the conductive polymer all along the length of the anode. In contrast to conventional CP systems, AnodeFlex is placed in the ground in close proximity to the steel surface to be protected and provides uniform distribution of protective current to the entire steel surface, thereby maintaining the steel-to-soil "instant-off" potential in the required window of -850mv (-950mv if SRB's present) and -1200mv. The central anode cable is surrounded by factory prepackaged, high conductivity coke breeze, held in place by a porous, woven acid-resistant jacket. This arrangement avoids handling loose coke breeze and simplifies field installation. The improved current distribution increases anode efficiency and helps prevent over-voltage problems such as hydrogen generation and associated rapid coating disbondment. In addition, interference from other structures and stray currents are virtually eliminated. On poorly coated pipelines where optimal polarization can no longer be achieved, Anodeflex 1500-1 can often be installed as an alternative to expensive recoating. Both on single and multi-parallel pipelines, safe levels of polarization will be restored at every point. The system avoids difficult and costly field recoating and greatly reduces environmental disturbance.

AnodeFlex 1500-1 is delivered on long length spools and because no additional coke breeze is required, the installation is as simple as laying a low voltage power cable. Proven heat-shrinkable splice kits, Tee joints and end sealing caps are available to complete any installation design.

### Product features/benefits

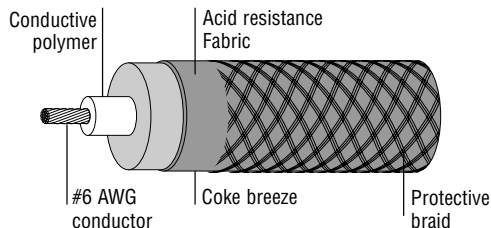
- Anode is always in close proximity to the pipeline**  
 Distributes current uniformly over total length of pipeline.  
 No over- or under-protected areas.  
 Prevents accelerated coating disbondment.  
 More effective & economical than a series of discrete anodes.  
 Independent of variations in soil resistivity.
- Pipeline Rehabilitation without Excavation**  
 A fraction of the cost of recoating.  
 Environmentally friendly.  
 No loss of revenue or supply interruptions.  
 No safety problems associated with working on live lines.  
 Far quicker, up to 1.25 miles(2 km) laying speed per day.
- Long continuous circuit lengths**  
 90% fewer joints compared to conventional anode systems.  
 Lower maintenance cost.
- Avoids interference and stray current problems**  
 Enhances long-term performance.  
 Focuses current on the target structure.  
 Improves protection and cost efficiency.
- Pre-packaging coke breeze (Anodeflex 1500-01)**  
 Ensures low resistance ground bed all the time.  
 Ensures the polymer coated cable is centred.  
 Simplifies field installation.
- Installation with standard cable laying equipment**  
 Fast, Easy & Cost Effective.

### Product selection guide

	AnodeFlex 1500-01
<b>Recommended Max Design Current Output in Soil</b>	52 mA/m (16 mA/ft)
<b>Min Installation and Storage Temperature</b>	-18°C (0°F)
<b>Min Bend Radius</b>	500 mm (20 inches)

### Product dimensions

	AnodeFlex 1500-01
<b>Nominal diameter</b>	38 mm (1.5 in)
<b>Weight</b>	1.49 Kg/m (1.0 lbs/ft)
<b>Length</b>	494 m ± 6 m (1620 ft ±20 ft)
<b>Coke breeze requirements</b>	1.15 kg/m (0.072 lbs/ft)



Property	Test method	Typical Value
<b>Copper Conductor</b>		
Dimensions	ASTM B-263	6 AWG
Resistance	ASTM B-193	1.5 x 10 <sup>-3</sup> Ohm/m
<b>Conductive Polymer</b>		
Dimensions	ASTM B-263	Pass
Volume resistivity	ASTM B-193	1.5 Ohm-cm
<b>Coke Breeze</b>		
Fixed carbon	ASTM D-172	99.7%
Resistivity	G.L.C. - C - 12A @ 23°C (73°F), 10 bar (145 psi)	0.4 Ohm-cm
<b>Fabric Jacket</b>		
Weight	Min. 200 g/m <sup>2</sup>	229 g/m <sup>2</sup>
Bursting strength	ISO 3303	575 N
Abrasion resistance	ASTM D-4157	219 cycles to failure
Fluid resistance	Internal immersion test 6 months	Pass
Chlorine resistance	Internal immersion test 6 months	Pass
UV resistance	ASTM G-53 @ 60°C (140°F), 8 hrs @ 50°C (122°F), 4 hrs condensation	55% tear strength loss

## Ordering information

### ANODEFLEX type products are available:

- as a spool

### Example: AFLX-1500-01

AFLX	AnodeFlex type product
1500-01	Conductive polymer coated copper conductor surrounded by pre-packaged high conductivity coke breeze Standard cutlength = 494 m ± 6 meters (1620 ft ± 20 ft)

### Accessories

AFLX-1500-01-CAP	End seal kit
AFLX-1500-01-TEE	Tee splice kit
AFLX-1500-01-SPLICE	In-line splice kit
Design software	Special computer program calculating the cathodic protection circuit lengths, anode to pipe distances, power supply voltages and current demands for each individual AnodeFlex section on pipeline and tank applications.

**Important:** Like any cathodic protection system, the Tyco Adhesives AnodeFlex system must be optimized for particular design conditions. Severe environments may limit the life-time. AnodeFlex is a flexible carbon cable anode system. When all the active anode material available around the polymeric cable is consumed, the anode will no longer function. Tyco Adhesives warrants that AnodeFlex meets the internal Tyco Adhesives specification, but the purchaser must rely on its own engineering experience judgement and skill to ascertain whether or not AnodeFlex is fit for the particular purpose proposed by the purchaser. All of the above information, including illustrations, is believed to be reliable. Users, however, should independently evaluate the suitability of each product for their application. Tyco Adhesives makes no warranties as to the accuracy or completeness of the information and disclaims any liability regarding its use. Tyco Adhesives' only obligations are those in the Standard Terms and Conditions of Sales for this product and in no case will Tyco Adhesives be liable for any incidental, indirect or consequential damages arising from the sale, resale, use or misuse of the product. Tyco Adhesives' specifications are subject to change without notice. In addition, Tyco Adhesives reserves the right to make changes in materials or processing, without notification to the Buyer, which do not affect compliance with any applicable specification.

**Tyco**  
**Adhesives**  
Corrosion Protection Group  
[www.tycoadhesives.com](http://www.tycoadhesives.com)

**Headquarters:**  
Tyco Adhesives L.P.  
1400 Providence Hwy  
Norwood, MA, 02062 USA  
Int'l Tel.: +1 718 440 6161  
US Toll Free: +1 800 248 0149  
Fax: +1 781 440 6271  
Email: CPG@tycoadhesives.com

**In North America:**  
Tyco Adhesives (Houston)  
11010 Wallisville Road  
Houston, TX 77013 USA  
Tel.: +1 713 676 0085  
US Toll Free: +1 888 676 7202  
Fax: +1 713 676 0086  
Email: CPGH@tycoadhesives.com

**In South America:**  
Tyco Adhesives CPG  
Riobamba 1234 7° C  
C1116ABJ Buenos Aires  
Argentina  
Tel.: +54 11 4811-5000  
Fax: +54 11 4814-5020  
Email: CPG@tycoadhesives.com

**In Europe, Middle East, Africa,  
Asia & Pacific:**  
Tyco Adhesive B.V.B.A.  
Nieuwlandlaan B15  
B-3200 Aarschot, Belgium  
Tel.: +32 16 55 36 00  
Fax: +32 16 55 36 74  
Email: CPGE@tycoadhesives.com

DS-AFLX-1500-REV-1-08/01



**Long-line flexible anode for high output impressed-current cathodic protection of buried pipelines and of on-grade and buried storage tanks.**

### Product description

#### ANODEFLEX 3000 Cathodic Protection

Construction: Five basic elements:

**Central Copper Bus Cable:** #8 AWG Halar Insulated, serving as a low resistance busbar to deliver the required current over considerable distance without incurring substantial longitudinal voltage drop. Halar insulation seals the conductor from chemical attack.

**Copper-Cored, Mixed Metal Oxide Anode (MMO):** Provides low attenuation for reduced splicing, in combination with prepackaged coke breeze, offers a low resistance grounded designed for a minimum life of 40 years.

**Coke Breeze:** Pre-packaged, high performance calcined petroleum coke breeze, serving as the active matrix in which the electro-chemical reactions take place. Designed for min. 20 years service life at max. current output of **656 mA/m (200 mA/ft)**.

**Fabric Jacket:** Integrated woven, acid resistant and porous jacket holding the coke breeze in place around the anode.

**Protective Braid:** Tough, porous, non-conductive protective braid enhancing the abrasion and damage resistance of the jacket.

AnodeFlex 3000 is a long-life, flexible, wire anode, which can be placed remote to the target structure. Greater current output can be achieved on applications where close proximity anode groundbeds do not work. Key to the product's performance is the central, copper-core mixed metal oxide anode. The anode is powered by a #8 AWG copper cable insulated with an inner layer of halar and outer layer of high molecular weight polyethylene. The unique construction of the anode and copper cable allow high current output with protection against low pH and chlorine attack. AnodeFlex 3000 can be placed remote to the steel surface to be protected, thereby maintaining the steel-to-soil "instant-off" potential in the required window of -850 mV (-950 mV if SRB's present) and -1200 mV. The central MMO wire and cable are surrounded by factory prepackaged, high conductivity coke breeze, held in place by a porous, woven acid-resistant jacket. This arrangement avoids handling loose coke breeze and simplifies field installation. The improved current distribution increases anode efficiency and maintains a low resistance groundbed. On poorly coated pipelines where optimal polarization can no longer be achieved, AnodeFlex 3000 can often be installed as an alternative to expensive recoating. Both on single and multi-parallel pipelines, safe levels of polarization will be restored at every point. The system avoids difficult and costly field recoating and greatly reduces environmental disturbance.

AnodeFlex 3000 is delivered on long length spools and because no additional coke breeze is required, the installation is as simple as laying a low voltage power cable. Proven heat-shrinkable splice kits, with tee splices and end sealing caps are available to complete any installation design.

### Product features/benefits

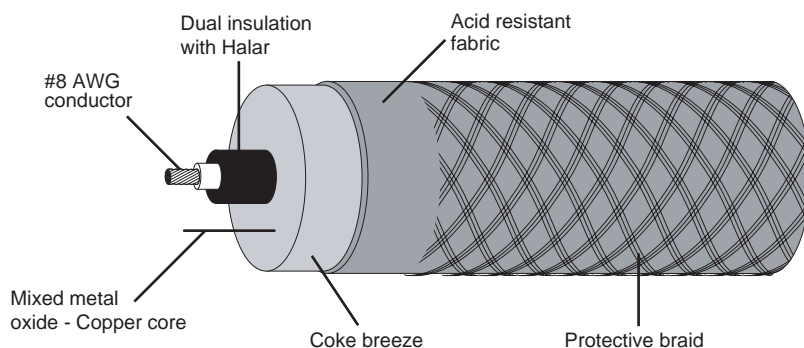
- Anode can be remote to the pipeline**  
 Distributes current uniformly over total length.  
 No over or under-protected areas.  
 Prevents accelerated coating disbondment.  
 More effective & economical than a series of discrete anodes.
- Pipeline Rehabilitation without Excavation**  
 A fraction of the cost of recoating.  
 Environmentally friendly.  
 No loss of revenue or supply interruptions.  
 No safety problems associated with working on live lines.  
 Far quicker, up to **1.25 miles (2 km)** laying speed per day.
- Long continuous circuit lengths**  
 67% fewer joints compared to conventional anode systems.  
 Lower maintenance cost.
- Flexible under tank bottom design**  
 Directional drill without PVC, no backfill.  
 Tight bend radius.  
 Driving voltage is lower than conventional MMO.
- Pre-packaged coke breeze**  
 Simplifies field installation.  
 Installation with standard cable laying equipment  
 Fast, easy & cost effective.

### Product selection guide

	Max Output
AnodeFlex 3100	<b>328 mA/m (100 mA/ft)</b>
AnodeFlex 3200	<b>656 mA/m (200 mA/ft)</b>

### Product dimensions

Nominal diameter	<b>37 mm (1.5 in)</b>
Weight	<b>1.5 Kg/m (1.0 lb/ft)</b>
Length	<b>494 m ± 6 m (1620 ft ± 20 ft)</b>



Property	Test method	Typical Value
<b>Copper Conductor</b>		
Dimensions	ASTM B-263	8 AWG
<b>Coke Breeze</b>		
Fixed carbon	ASTM D-172	99.7%
Resistivity	G.L.C. - C - 12A @ 23°C (73°F), 10 bar (145 psi)	0.4 Ohm-cm
<b>Fabric Jacket</b>		
Weight	Min. 200 g/m <sup>2</sup>	229 g/m <sup>2</sup>
Bursting strength	ISO 3303	575 N
Abrasion resistance	ASTM D-4157	219 cycles to failure
Fluid resistance	Internal immersion test 6 months	Pass
Chlorine resistance	Internal immersion test 6 months	Pass
UV resistance	ASTM G-53 @ 60°C (140°F), 8 hrs @ 50°C (122°F), 4 hrs condensation	55% tear strength loss

## Ordering information

ANODEFLEX type products are available on a spool.

Example: AFLX-3200

Copper-core MMO with copper conductor surrounded by pre-packaged high conductivity coke breeze  
Standard cutlength = 494 m ± 6 m (1620 ft ± 20 ft)

Accessories

AFLX-3000 - CAP	End seal kit
AFLX-3000 - TEE	Tee splice kit
AFLX-3000 - SPLICE	In-line splice kit

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Local Distributor / Representative:

For contact details of local Distributors / Representatives  
please visit [www.tycoadhesives.com](http://www.tycoadhesives.com).

Headquarters  
Tyco Adhesives  
Tel: +1 508 918 1714  
US Toll Free: +1 800 248 0149  
Fax: +1 508 918 1910  
Email: [CPG@tycoadhesives.com](mailto:CPG@tycoadhesives.com)

North America  
Tyco Adhesives L.P. (Houston)  
Tel: +1 713 676 0085  
US Toll Free: +1 888 676 7202  
Fax: +1 713 676 0086  
E-mail: [CPGH@tycoadhesives.com](mailto:CPGH@tycoadhesives.com)

Tyco Adhesives L.P. (South America)  
Tel US: +1 866 9 CORROSION  
Fax US: +1 619 424 4258  
Tel Mexico: +52 664 607 0926  
Fax Mexico: +52 664 623 6463  
Email: [CPGTJ@tycoadhesives.com](mailto:CPGTJ@tycoadhesives.com)

In Europe, Middle East, Africa,  
Asia & Pacific  
Tyco Adhesives B.V.B.A.  
Tel: +32 16 55 36 00  
Fax: +32 16 55 36 74  
E-mail: [CPGE@tycoadhesives.com](mailto:CPGE@tycoadhesives.com)