

# Welding Consumables in Industry

## Pipe Mill & Process Piping



**TIENTAI**

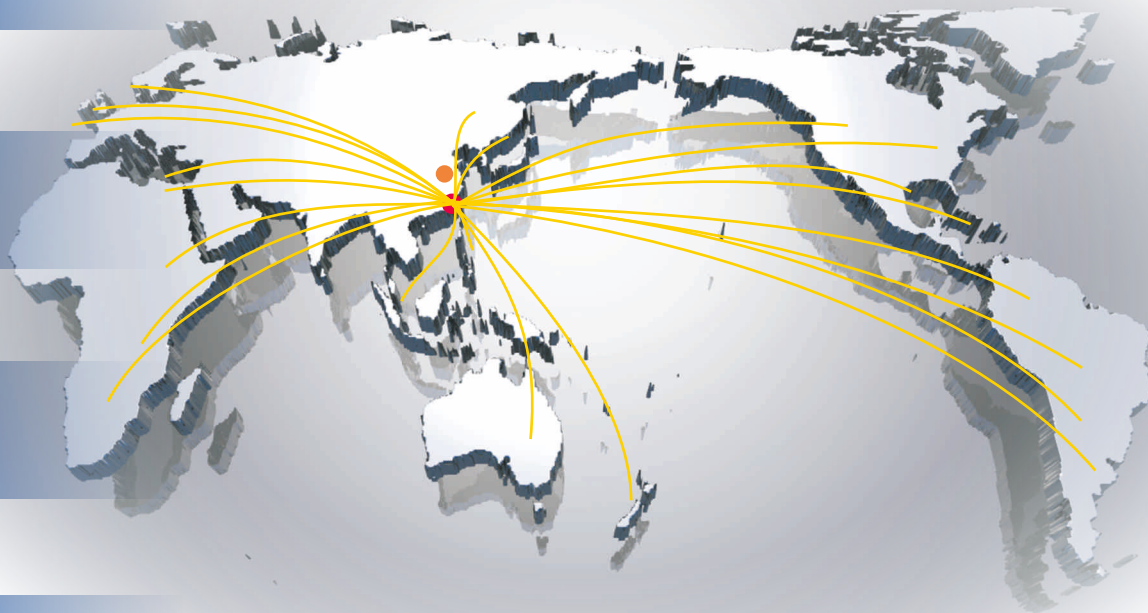
AN ILLINOIS TOOL WORKS COMPANY

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



TIENTAI ELECTRODE CO., LTD.

# ITW- Tradition of Excellence



Illinois Tool Works Inc. (NYSE:ITW) designs and produces an array of highly engineered fasteners and components, equipment and consumable systems, and specialty products and equipment for customers around the world. A Fortune 200 diversified manufacturing company with more than 100 years of history. ITW's 650 decentralized business units in 45 countries employ nearly 49,000 men and women who are focused on creating value-added products and innovative customer solutions.

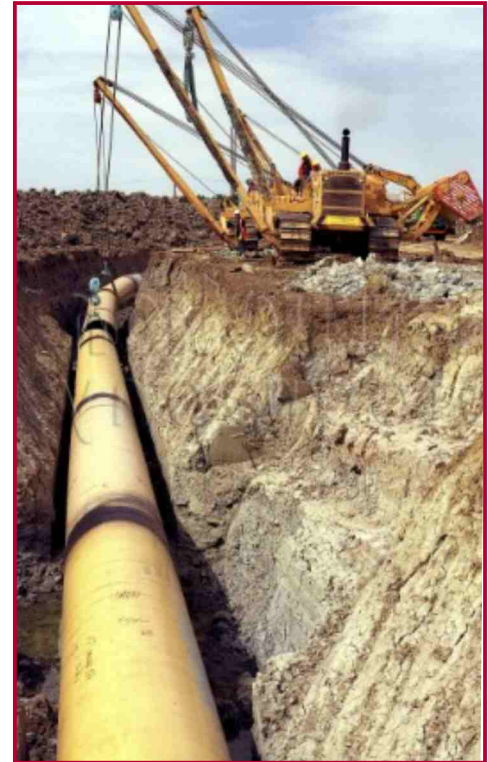
"During its more than 100 years of existence, ITW's recipe for success has been focused on creating "value-added products for key customers around the world. We do this by growing our business and making acquisitions which provide additional product solutions to our customers.

Many of our best product innovations come from simple observation coupled with a keen understanding of our customers' needs. Most companies design products specifically to increase sales volume. ITW's main goal is not to create a best seller, but to enhance customers. To attain that goal, our product design engineers develop value-added, proprietary products. Our unique approach begins at our customers' plants or worksites. By working closely with our customers. We determine how an ITW product or process could provide a better solution. Proof of our highly innovative culture is seen in our patent activities. In 2004, we had more than 16,000 unexpired patents and pending patent applications worldwide, including 2,900 U.S. Patents and 1,116 pending U.S. Applications. We typically rank in the top 100 of patent issuers in the U.S.

# Pipe Mill & Process Piping



For global Pipe equipments and construction, TienTai provide consumables with top quality and specialized welding services.



## Spiral pipe

The base material is classified in acc. API-5L or in acc. ISO standards.

The wall thickness is mostly maximized up to 25mm. Typical wall thickness are 9 - 12 - 17 - 22 mm, most diameters used are 960 -1016 and 1220. Length can vary , much used is 12 and-or 18m.

## Longitudinal pipe

The base material is classified in acc. API-5L or in acc. ISO standards.

The wall thickness is mostly maximized up to 50.8mm.

## Your Perfect Welding Solutions

The limited page cannot afford whole specific contents of products and techniques. Please contact us if further information required.



## Welding Consumables for longitudinal pipe

Kind of pipe	Typical mechanical properties of weld metal			(GMAW)	Filler Pass and cover pass
	Tensile Strength (N/mm <sup>2</sup> )	Yield Stress (N/mm <sup>2</sup> )	CVN J(kgf-m)		
API-5L, A25 A,B X42, X46 X52 ASTM-A53Gr.A,B TypeF -A106Gr.A,B	415 415 435 460 415 330 415	240 290 315 359 240 205 240	-	TM-56 (ER70S-6)	TF-565/TSW-12KM (F7A2-EM12K)
ASTM A106 Gr C API-5L X56	485 490	275 386	0°C 42/31J	TM-56 (ER70S-6)	TF-565/TSW-12KM (F7A2-EM12K)
API-5L X60	517	414	0°C 42/31J	TM-56 (ER70S-6)	TF-650/TSW-12KH (F7A6-EH12K)
X65	531	448	0°C 55/42J	TM-56 (ER70S-6)	TF-650/TSW-E12 (F8A5-EA2-A2)
X70	565	483	-20°C 90/60J	TM-56 (ER70S-6)	TF-650/TSW-E12 (F8A5-EA2-A2)
X80	621	552	-20°C 120J	TM-60 (ER80S-G)	TF-650/TSW-E13 (F9A4-EG-G) TF-650/TSW-E41 (F9A6-EF3-F3)

## Products for longitudinal pipe

Kind of pipe	Typical mechanical properties of weld metal			Filler Pass and cover pass
	Tensile Strength (N/mm <sup>2</sup> )	Yield Stress (N/mm <sup>2</sup> )	CVN J(kgf-m)	
A53 Gr A,B A139 Gr A B C A252 Gr 1 2 3	415 331 414 414 345 414 455	240 207 241 290 205 240 310	-	TF-385/TSW-12KM (F7A0-EM12K)

# :t≤19mm to water pipes

**Your Perfect Welding Solutions**

**TIENTAI ELECTRODE CO., LTD.**

# Pipe Mill & Process Piping



## Introduction for Pipe-Mill welding

- ☆ For transport of water, oil and gas.
- ☆ Piling pipe for bridges.
- ☆ Piling pipe for foundations.
- ☆ Offshore (Jackets).
- ☆ Pipe for heavy constructions.

## Pipe-Mill Characteristics

- ☆ Standard line pipe is still commonly designated by its "X" grade. This designation
- ☆ comes from the API 5L specification for line pipe, which is still the most commonly used.
- ☆ Specification worldwide. "7" grade refers to the specified minimum yield strength (SMYS) of the line pipe steel measured in kilo pounds per square inch (ksi).

API 5L grade	EN 10208	YS ksi/Mpa min	UTS ksi/Mpa min
A	-	30/207	48/331
B	L245	35/241	60/413
X42	L290	42/289	60/413
X52	L360	52/360	66/460
X56	-	56/386	71/489
X60	L415	60/413	75/520
X65	L450	65/450	77/535
X70	L485	70/485	82/570
X80	L555	80/555	90/625
X90	-	No Specified	No Specified
X100	-	No Specified	No Specified

## Welding consumables for pipe welding

Kind of pipe	Applicable pass	Vertical up	Vertical down or vertical down + vertical up
API-5L, A25 A, B X42, X46 X52  ASTM-A53Gr.A, B & Type F -A106Gr.A, B	Root pass	TC-10 E6010(DC) TC-11 E6011(AC)	TL-50 E7016 (Vertical up) PipeMark 610 E6010 PipeMark 718 E7018
	Hot pass		
	Filler Pass and cover pass	TC-10 E6010(DC) TC-11 E6011(AC) TL-50 E7016 TL-508 E7018	
API-5L, X56 ASTM -A106Gr.C	Root pass	TC-10 E6010(DC) TC-11 E6011(AC)	PipeMark 610 E6010
	Hot pass		
	Filler Pass and cover pass	TC-70A1 E7010-A1 TL-50 E7016 TL-508 E7018	TC-70A1 E7010A1 or TL-50 E7016, TL-508 E7018 for vertical up PipeMark 710 E7010-P1 PipeMark 718 E7018
API-5L, X60	Root pass	TC-10 E6010(DC) TC-11 E6011(AC)	PipeMark 610 E6010
	Hot pass	TL-50 E7016 TL-508 E7018	TL-50 E7016, TL-508 E7018 for vertical up PipeMark 710 E7010 PipeMark 718 E7018
	Filler Pass and cover pass	TL-60 E8016-G	TL-60 E8016-G for vertical up PipeMark 845 E8018-G~E8045-P2

# PipeMark for vertical down.

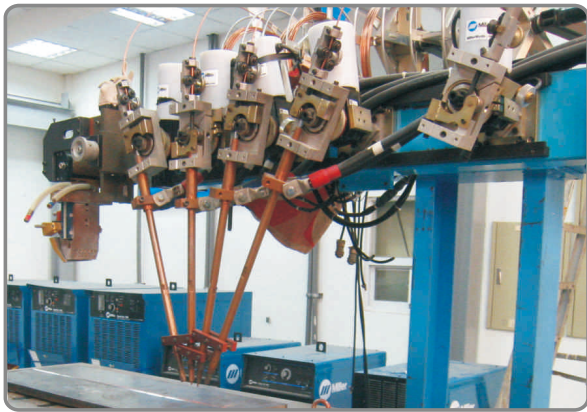
Your Perfect Welding Solutions

**TIENTAI ELECTRODE CO., LTD.**

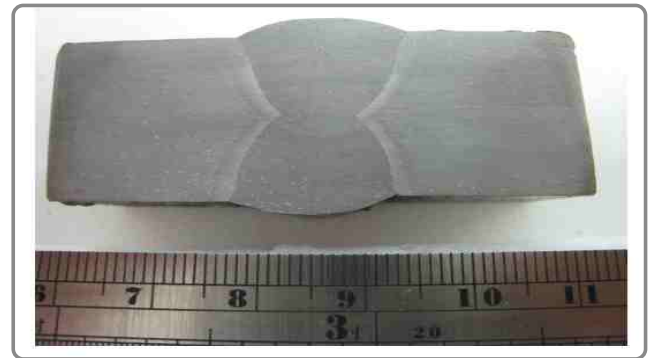


## Introduction for TIENTAI Products

No .	Specimen	CVN -10 °C (J)				R.A (%)			
		1	2	3	Ave	1	2	3	Ave
TF-650 x TSW-E41	Weld-Bead	175	145	185	168	75	55	80	70
	H.A.Z	185	180	200	188	80	60	85	75



AWS Spec. :F9A6-EF3-F3  
 Parent plate : X80  
 Flux : TF-650  
 Wire : TSW-E41  
 Heat Input : 45KJ/cm  
 Travel Speed : 170cpm



Macro Structure (TF-650\*TSW-E41)



Bead Appearance (TF-650\*TSW-E41)

Your Perfect Welding Solutions

**TIENTAI ELECTRODE CO., LTD.**

# Pipe Mill & Process Piping



## Typical chemical composition of weld metal (wt%)

Product Name		C	Si	Mn	Cr	Mo	P	S	Other
TS-308LB		0.038	0.65	1.1	18.3	0.07	0.025	0.01	Ni:10,Cu:0.07
TS-309LB		0.04	0.30	1.30	22.5	0.10	0.025	0.015	Ni:12.8,Cu:0.10
TS-316LB		0.038	0.60	1.10	17.5	2.2	0.027	0.01	Ni:11.5,Cu:0.20
TFW-308LP		0.028	0.57	1.71	19.10	0.05	0.022	0.009	Ni:10.10
TFW-309LP		0.025	0.58	1.58	24.02	0.05	0.022	0.008	Ni:12.48
TFW-316LP		0.026	0.68	1.70	18.95	2.70	0.023	0.010	Ni:12.52
TM-56		0.07	0.85	1.53	0.027	0.023	0.015	0.005	Ni:0.024,Cu:0.02 V:0.003
Product Name	Wire	C	Si	Mn	Ni	Mo	P	S	Other
TF-385	TSW-12KM	0.06	0.60	1.40	-	-	<0.035	<0.02	-
	TSW-12KH	0.06	0.70	1.80	-	-	<0.03	<0.02	-
	TSW-E12	0.05	0.70	1.50	-	0.43	<0.03	<0.02	-
TF-565	TSW-12KM	0.06	0.40	1.70	-	-	0.03	<0.02	-
	TSW-12KH	0.05	0.40	2.00	-	-	<0.03	<0.02	-
	TSW-E12	0.06	0.29	1.60	-	0.45	<0.03	<0.02	-
TF-650	TSW-12KM	0.06	0.23	1.30	-	-	-	-	-
	TSW-12KH	0.06	0.32	1.84	-	-	-	-	-
	TSW-E12	0.05	0.16	1.34	-	0.45	-	-	-
	TSW-E13	0.06	0.35	1.71	-	0.45	-	-	-
	TSW-E41	0.07	0.25	1.70	0.90	0.48	-	-	-
	SubCor H12KN	0.05	0.23	1.98	2.16	-	0.029	0.002	-
TGFA	TGFA-308H	0.059	0.61	1.42	10.52	-	0.022	0.009	Cr:20.51
	TGFA-308L	0.02	0.40	1.40	10.30	-	0.022	0.008	Cr:20.20
	TGFA-316L	0.027	0.52	1.35	12.50	2.30	0.023	0.007	Cr:18.56
	TGFA-309L	0.022	0.35	1.45	13.50	-	0.024	0.009	Cr:23.26
	TGFA-317L	0.024	0.50	1.20	12.70	3.36	0.023	0.007	Cr:18.50
	TGFA-347	0.024	0.50	1.53	10.22	-	0.024	0.006	Cr:20.0, Nb:0.63

Your Perfect Welding Solutions

**TIENTAI ELECTRODE CO., LTD.**



## Typical mechanical properties of weld metal:

Product Name		Yield Stress (N/mm <sup>2</sup> )	Tensile Strength (N/mm <sup>2</sup> )	Elongation (%)	Charpy V-Nothch (J)	Temperature (°C)	PWHT
TS-308LB		380	590	53	35	-196	-
TS-309LB		440	570	40	72	-46	-
TS-316LB		392	539	50	41	-196	-
TFW-308LP		390	555	42	-	-	-
TFW-309LP		420	565	37	-	-	-
TFW-316LP		370	552	41	-	-	-
TM-56		450	550	30	74	-30	-
Product Name	Wire	Yield Stress (N/mm <sup>2</sup> )	Tensile Strength (N/mm <sup>2</sup> )	Elongation (%)	Charpy V-Nothch (J)	Temperature (°C)	PWHT
TF-385	TSW-12KM	480	550	33	33	-20	-
	TSW-12KH	529	589	30	43	-29	-
	TSW-E12	617	656	29	-	-	-
TF-565	TSW-12KM	460	530	30	40	-40	-
					65	-30	
	TSW-12KH	508	600	31	32	-50	AW
	TSW-E12	546	614	26	60	-30	AW
TF-650	TSW-12KM	443	496	37	40	-30	AW
	TSW-12KH	459	546	38	93	-50	AW
		413	521	34	102	-50	620°Cx1hr
	TSW-E12	516	570	27	94	-46	AW
	TSW-E13	614	672	27	97	-40	AW
	TSW-E41	617	706	27	50	-50	AW
	SubCor H12KN	579	652	28	76	-46	AW

Your Perfect Welding Solutions

**TIENTAI ELECTRODE CO., LTD.**



The Portfolio of Brands





## Head Office

TienTai Electrode Co., Ltd.  
No.6, Kaifa 4th Rd., Rende Township,  
Tainan County 717, Taiwan.  
Tel: 886-6-2663721 / Fax: 886-6-2664301  
<http://www.tientai.com>  
E Mail: [ttrad@mail.tientai.com.tw](mailto:ttrad@mail.tientai.com.tw)

Business Contact 

TIENTAI ELECTRODE CO., LTD.

*All data of our products in this brochure are upon careful investigation and intensive research. However, we do not assume any liability for their correctness, please contact our staff before adoption.*

PRINTED: 08.2012