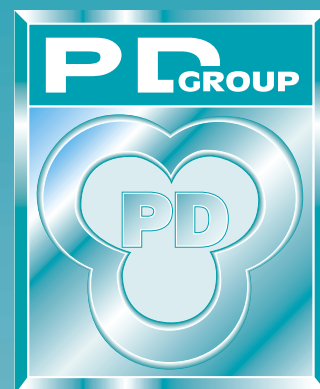
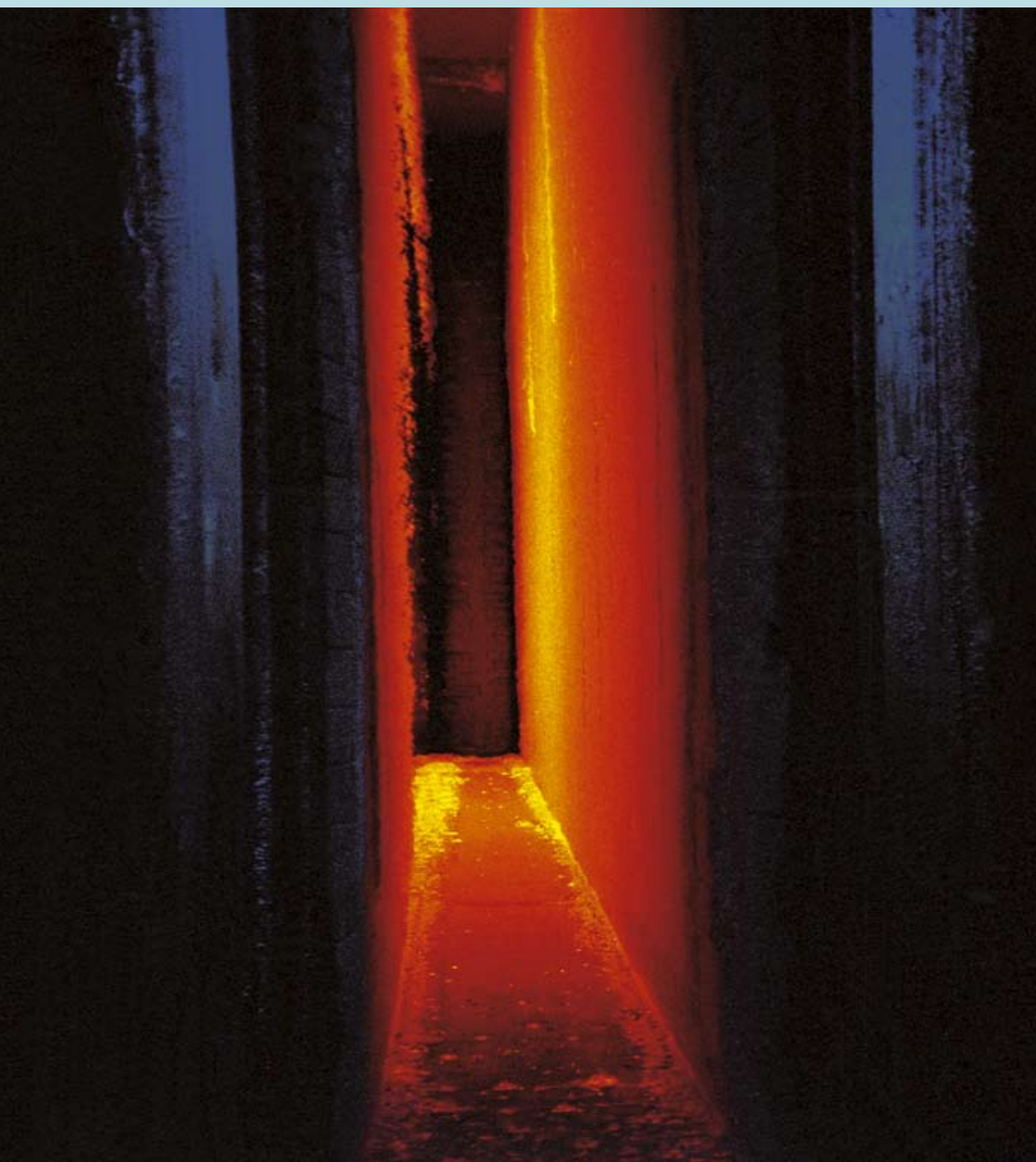


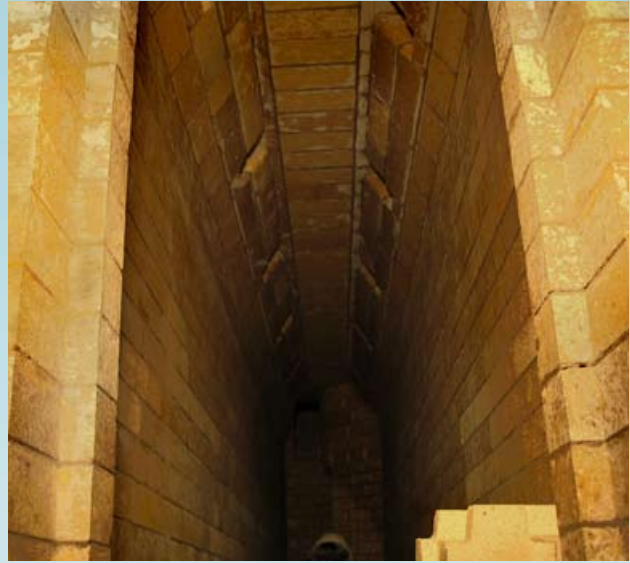
# P-D REFRACTORIES



P-D Refractories CZ

*Refractories  
for Coke Ovens*

## P-D REFRACTORIES







## P-D Refractories CZ a. s.

is an important manufacturer and supplier of refractory products and raw materials for an extensive range of users with operations on a worldwide scale. The firm was established in 1892. From 1950 it was well-known as MŠLZ Velké Opatovice and in 2000 became part of the P-D REFRATORIES Group.

The firm's traditional products are fireclay bricks and silica bricks for coke oven plants. Our business activities involve not only the production and delivery of refractory materials, but also encompass the recognition of customer problems and the selection and recommendation of the most appropriate product in terms of shape and material.

With over a century of experience in the production of refractories we offer comprehensive solutions that assure a longer service life for refractory linings under even the toughest and most varied operating conditions.

P-D Refractories CZ a. s. is holder of quality certificate according to ISO 9001 standard.



## P-D REFRACTORIES

### Silica Bricks

Brand		Chemical Analysis					Residual Quartz [%]	Bulk Density [kg/m <sup>3</sup> ]	Apparent Solid Density [kg/m <sup>3</sup> ]
		SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub> [%]	CaO	Na <sub>2</sub> O + K <sub>2</sub> O			
<b>DISIL DKN</b>	$\bar{X}$	95,5	0,5	0,8	2,8	0,20	0,5	1820	2318
	S	0,2	0,1	0,1	0,2	0,02	0,3	25,0	6,0
<b>DISIL DKD</b>	$\bar{X}$	95,5	0,5	0,8	2,8	0,20	0,4	1825	2310
	S	0,2	0,1	0,1	0,2	0,02	0,2	20,0	5,0
<b>DISIL DKS</b>	$\bar{X}$	95,6	0,5	0,8	2,7	0,20	0,3	1855	2304
	S	0,2	0,1	0,1	0,2	0,02	0,2	10,0	4,0

### Fireclay Bricks

Brand		Chemical Analysis			Pyrometric Cone Equivalent (ISO)	Acid Resistance [%]	Bulk Density [kg/m <sup>3</sup> ]	Thermal Shock Resistance cycle
		SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub> [%]	Fe <sub>2</sub> O <sub>3</sub>				
<b>OPATSI E65</b>	$\bar{X}$	70,2	26,4	1,7	158	99,8	2045	15
	S	1,1	0,8	0,08	0,7	0,05	38	7
<b>OPATSI E70</b>	$\bar{X}$	71,5	23,6	1,7	158/160	99,8	2035	14
	S	1,1	1,0	0,16	0,6	0,05	40	7
<b>OPTIM KA35</b>	$\bar{X}$	58,1	37,0	1,6	166/168	99,5	2175	25
	S	1,3	1,5	0,17	10	0,2	34	10
<b>OPTIM KA40</b>	$\bar{X}$	52,0	42,6	1,9	174	99,5	2195	25
	S	0,6	0,7	0,18	0,8	0,1	40	10
<b>OPATAL A60S</b>	$\bar{X}$	37,9	60,2	0,9	>178	-	2515	>30
	S	1,2	1,3	0,08	-	-	47	-

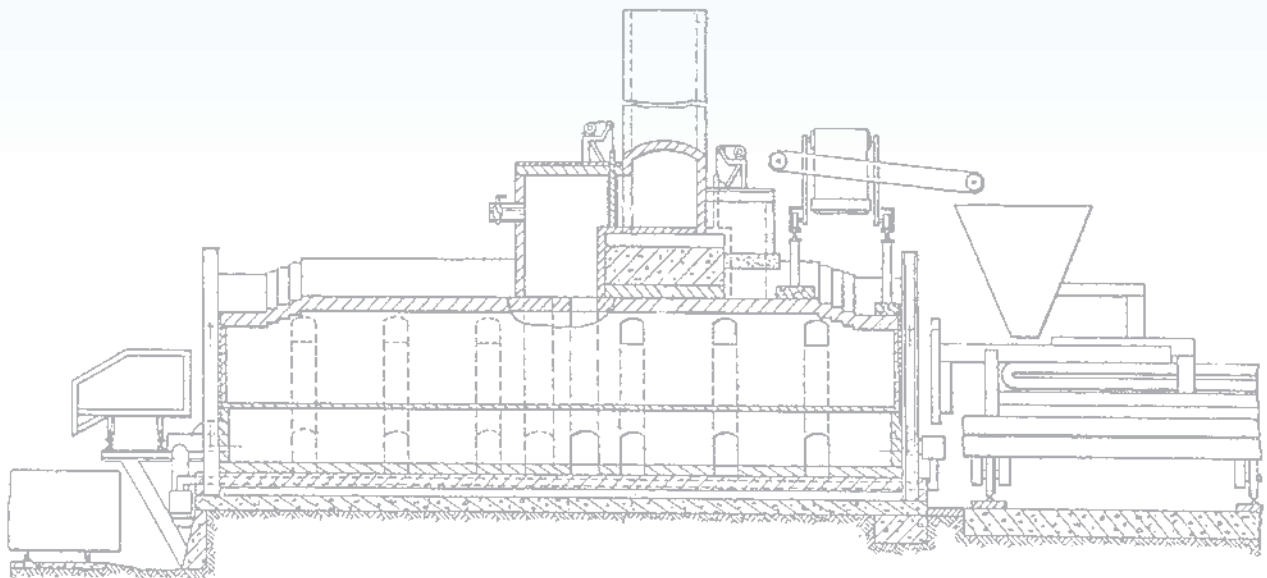
Note:  $\bar{X}$  = Arithmetic Mean  
S = Sample Standard Deviation

\* Creep at 1350°C/0,2 MPa



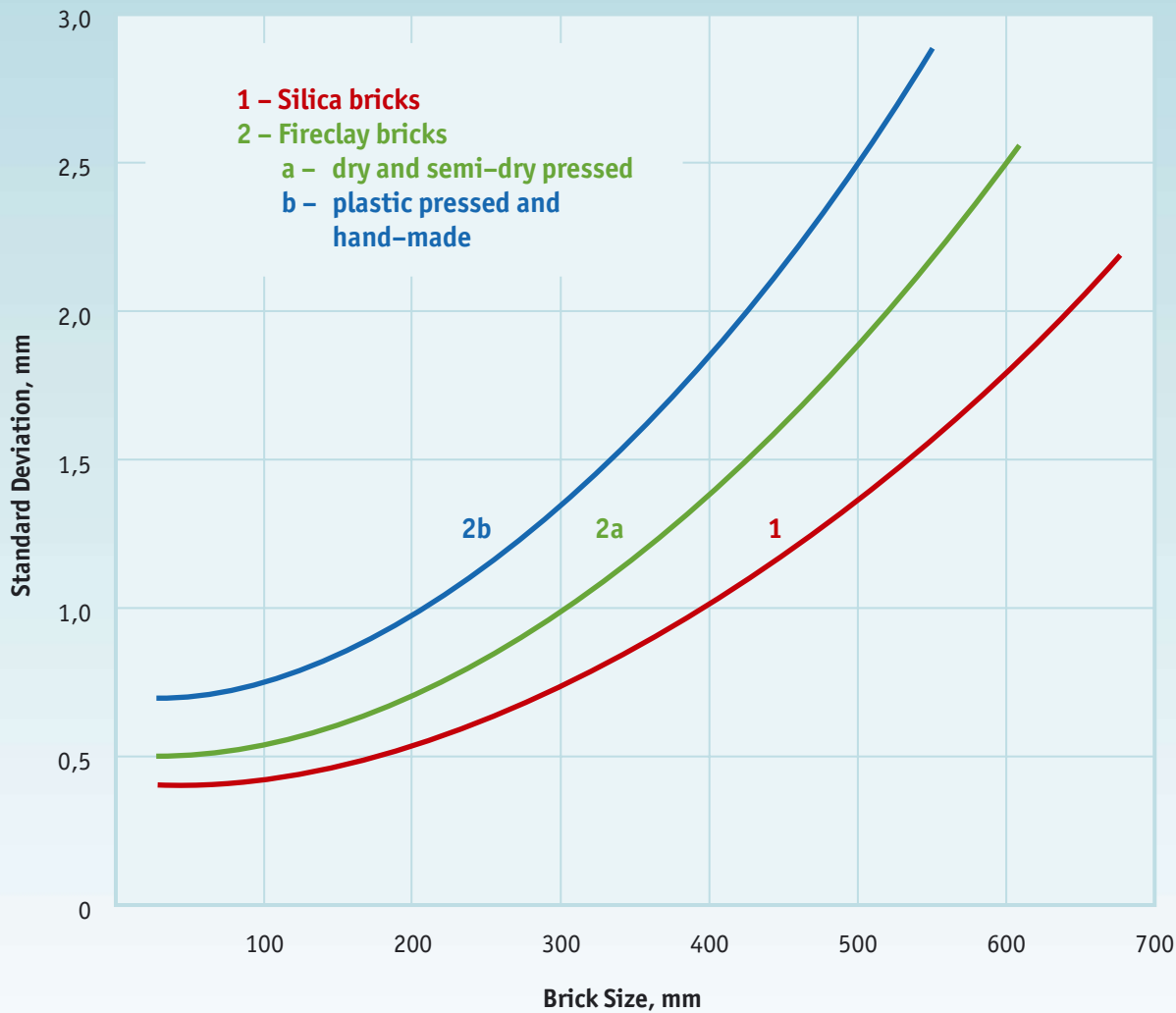
Apparent Porosity	Cold Crushing Strength	Refractoriness under load	Creep at 1450°C/0,4 MPa		Reference Standard	Typical application
[%]	[MPa]	[T <sub>05</sub> °C]	Z <sub>5-25</sub>	Z <sub>25</sub>		
21,5	40,0	1660	0,06	0,1	DIN 1089-1: 1995-02	Regenerators, walls and roofs of by-product ovens and for all parts of non-recovery ovens
1,1	9,0	7,0	0,03	0,05		
21,0	45,0	1660	0,06	0,1		Heating walls
0,9	8,0	7,0	0,02	0,05		
19,5	60,0	1660	0,07	0,1		
0,6	7,0	7,0	0,03	0,05		

Apparent Porosity	Cold Crushing Strength	Refractoriness under load	Creep at 1050°C/0,2 MPa		Reference Standard	Typical application
[%]	[MPa]	[T <sub>05</sub> °C]	Z <sub>5-25</sub>	Z <sub>25</sub>		
20,4	35,0	1350	0,05	0,16	DIN 1089-2: 1995-02	Sole channels, regenerator structure, checker brickwork, roofs, buttresses side brickwork, etc.
1,2	8,0	20	0,03	0,05		
20,5	40,0	1390	0,04	0,13		Roofs, ascension pipes, bends, etc.
1,2	9,0	25	0,02	0,04		
19,0	30,0	1400	0,03	0,10		
1,2	7,0	21	0,02	0,04		
20,0	35,0	1450	0,02	0,07	S-E-W 912 (S55)	Most prone areas of thermal shock, such as oven jambs and door linings
1,2	8,0	21	0,01	0,03		
14,6	65,0	1650	0,10*	0,25*		
1,2	15,0	20	0,03*	0,10*		



# Accuracy of Real Dimensions of Refractory Products

## Standard Deviation in Dependence on Size



The tables show the quality level of the products convenient for DIN 1089 standards. The manufacturer is prepared to modify quality supplies in accordance with individual customer's wishes. The products are suitable and have been proven in use for coke oven refractory structures of By-Product Ovens as well as Non-Recovery Ovens.

In addition to the mentioned products, P-D Refractories CZ a. s. is a supplier of comprehensive ranges of unshaped refractory materials (mortars, mastics, castables) and the wide range of insulating bricks and high alumina bricks.



# Reference List

## Refractory Supplies to Coke Ovens

Company	Battery No.	Buyer	Year	(t)	Product
<b>VSŽ Košice, Slovakia</b>	1 block A	Termostav Košice	1987	7350 1490	silica fireclay
<b>OKK Ostrava, Czech Republic</b>	4; 9	Teplotechna Ostrava	1989	8510 992	silica fireclay
<b>NH Ostrava, Czech Republic</b>	1	Teplotechna Ostrava	1990	6260 994	silica fireclay
<b>TŽ Třinec, Czech Republic</b>	11	Teplotechna Ostrava	1991	6400 788	silica fireclay
<b>TŽ Třinec, Czech Republic</b>	12	Teplotechna Ostrava	1994	1442	fireclay
<b>TŽ Třinec, Czech Republic</b>	12	Teplotechna Ostrava	1995	1003	fireclay
<b>NH Ostrava, Czech Republic</b>	2	Teplotechna Ostrava	1995	1225	fireclay
<b>Inland Steel Comp., East Chicago, USA</b>	non-recovery	Harbison-Walker Refract.	1997	15260	silica
<b>ILVA, Taranto, Italy</b>	9; 10	Thyssen Krupp EnCoke	2000	2994 1040	silica fireclay
<b>ILVA, Taranto, Italy</b>	7; 8	Thyssen Krupp EnCoke	2001	2840	silica
<b>ILVA, Taranto, Italy</b>	7; 8	Sanac	2001	300	fireclay
<b>China Steel Comp., Kaohsiungm Taiwan</b>	1	Danieli Corus	2001	200	silica
<b>Lucchini Group, Piombino, Italy</b>	1	Sanac	2001	1300	fireclay
<b>Sidex SA, Galati, Romania</b>	2	Sidex Trading	2001	5758	silica
<b>Dunaferr-DBK, Dunaúsváros, Hungary</b>	1; 3	Dunaferr Trading	2002	166	fireclay
<b>ILVA, Taranto, Italy</b>	7; 8	Sanac	2002	182	fireclay
<b>ILVA, Taranto, Italy</b>	7; 8	Thyssen Krupp EnCoke	2002	1116	silica
<b>ILVA, Taranto, Italy</b>	7; 8	Thyssen Krupp EnCoke	2003	525 45	silica fireclay
<b>ILVA, Taranto, Italy</b>	7; 8	Sanac	2003	44	fireclay
<b>ISPAT Sidex. Galati, Romania</b>	3; 4	ISPAT Sidex	2003	1617	silica
<b>ISPAT Sidex. Galati, Romania</b>	4	ISPAT Sidex	2004	5737	silica
<b>ISPAT Sidex. Galati, Romania</b>	3	ISPAT Sidex	2004	714	silica
<b>US STEEL Košice, Slovakia</b>	3	US STEEL Košice	2004	18	fireclay
<b>ILVA, Taranto, Italy</b>	11	Thyssen Krupp EnCoke	2004	838	silica
<b>ILVA, Taranto, Italy</b>	7; 8	Thyssen Krupp EnCoke	2004	162	silica
<b>ILVA, Taranto, Italy</b>	11	Uhde GmbH	2005	144	silica
<b>MITTAL STEEL Galati, Romania</b>	3	MITTAL STEEL Galati	2005	600	silica
<b>MITTAL STEEL Ostrava, Czech Republic</b>	1	MITTAL STEEL Ostrava	2006-7	6918 2651	silica fireclay
<b>MITTAL STEEL Ostrava, Czech Republic</b>	11	MITTAL STEEL Ostrava	2006	137	silica
<b>US STEEL Košice, Slovakia</b>	3	US STEEL Košice	2006	35	fireclay
<b>ILVA, Taranto, Italy</b>	7-10	ILVA, Taranto	2006	100	fireclay
<b>ZKS, Dillingen, Germany</b>	3	Paul Wurth	2007-8	5142 6810	silica fireclay
<b>OKK Ostrava, Czech Republic</b>	8	OKK	2008	1 085 730	silica fireclay





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