STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s. p.
(ENGINEERING TEST INSTITUTE, Public Enterprise)
Hudcova 56b, 621 00 Brno, Czech Republic

TEST REPORT
No. 39-8910/4

Product:	Hot-water boiler burning wood with manual fuel supply
Type designation:	ORLIGNO 200
Versions:	ORLIGNO 200 80 kW

Customer:	EKO-VIMAR ORLAŃSKI Sp. Z o.o. ul. Nyska 17 B 48-385 Otmuchów Poland
Manufacturer:	EKO-VIMAR ORLAŃSKI Sp. Z o.o. ul. Nyska 17 B 48-385 Otmuchów Poland
Responsible employee:	Ing. Stanislav Buchta
Report issue date:	2011-02-02
Distribution list:	1 copy to the Engineering Test Institute 1 copy to the Customer

This Report was drafted on the basis of Order B-38376 of 2010-09-01, Contract B-38376/39 of 2010-09-15 and Contract Supplement No. 1. The above mentioned Report reproduces the test results of Report No. 39-8358/T of 2008-12-11 and No. 39-8210 of 2008-05-27.

I. Product description

The steel hot-water boiler with manual fuel supply, type ORLIGNO 200, is designed for the burning of wood on the principle of upward burning with pyrolisis combustion.
The boiler is designed for the central heating of family homes, residential premises, flats, offices, small community premises, business premises and stores, etc.
The boiler body is made of welded steel components, with a combined wall thickness of 6 and 4 mm. The charging chamber is situated in the upper part of the boiler body, and the combustion chamber with ceramic lining is situated in the bottom part. The charging chamber is separated from the combustion chamber with a wall in which a ceramic nozzle is mounted with integrated openings for the secondary combustion air supply. Combustion products are discharged from the combustion chamber through a tubular heat exchanger to the boiler exhaust branch. The primary and secondary combustion air is supplied to the boiler via a pair of forced draft blowers situated in the front wall. The quantity of air can be regulated in combination of an electronic setup (30 ÷ 100)% and mechanical throttles. The boiler shell consists of coated steel plates lined with mineral wool.
Water connection branches in the rear part of the boiler have the dimension of G2 for heating water inlet and outlet, and G3/4 for the drainage and filling. The exhaust branch with a horizontal axis is situated on the rear side of the boiler.
There is a control panel in the upper part of the boiler with an electronic regulation (EKOSTER 2) guaranteeing the control and safety functions, including the indication of the water temperature in the boiler.

Basic technical specifications:

Size	Rated capacity wood [kW]	Water volume [l]	Max. operating temperature [°C]	Max. operating pressure [bar]	Weight [kg]
ORLIGNO 200 80 kW	77	205	95	3,0	1165

The evaluation was conducted at the Boiler and Industrial Heating Equipment Test Station of the Engineering Test Institute in Brno, in December 2010, by Milan Holomek (technician).

II. Test results

No.	Name and specification	Technical standard and regulation applied		Source materials	Evaluation	
					testing	evaluation
1.	Heat capacity, calorific efficiency, temperature of combustion products, draught after the boiler	ČSN EN 303-5:2000 Art. 4.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 5.8.2		page 4÷7	+	
		ČSN EN 303-5:2000 Annex A, deviation A.1.1		page 8	+	
2.	Combustion efficiency, emissions	ČSN EN 303-5:2000 Art. 4.2.6		page 9	+	
		ČSN EN 303-5:2000 Annex A (deviations A.1.2, A.2, A.5)	A.1.2	page 10	-	
			A. 2	page 11	+	
			A. 5	page 12	+	
3.**	Control, regulation and safety elements	ČSN EN 303-5:2000 Art. 4.1.5.11, 4.1.5.11.1 ÷ 4.1.5.11.2		page 13÷14		+

Note:
No. 3
(**) Not a test

Evaluation:
+ Requirement fulfilled
- Requirement not fulfilled
x Not evaluated
0 Not applicable

Accredited test number:	**1004.1** **1004.2**	Test title:	**Test of heat capacity, input and efficiency** **Test of combustion product temperature**

Testing method: ČSN EN 303-5:2000 Art. 5.7 to 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐	*other:*

Test results:

Requirement	Requirement specification	Test evaluation	Note
Requirements regarding boiler capacity The fulfilment of the requirements specified below regarding the boiler capacity must be checked with the use of test fuels. The rated heat capacity and the heat output range may fluctuate depending on the fuel. The requirements regarding the boiler efficiency and emissions are divided into three categories. So that the requirements for the given category can be deemed fulfilled, all efficiency and emission limit values for the category concerned must be fulfilled.	ČSN EN 303-5 Art. 4.2	+	
Boiler efficiency During tests according to 5.7, 5.8 and 5.10, the boiler efficiency for the rated heat output must not be lower than the values specified in the formulas shown in figure 1.	ČSN EN 303-5 Art. 4.2.1	+	
Combustion product temperature In boilers operated under the rated heating output and at temperatures lower than 160 K above the ambient temperature, the manufacturer must provide recommendations regarding the mounting of the flue duct for adequate draught and to prevent condensation and soot depositing in the entire chimney.	ČSN EN 303-5 Art. 4.2.2	+	
Draught The determined values of draught, as specified in Fig. 2, are the maximum values. They also serve as the recommended values for the chimney. If the maximum draught values are exceeded, there must be a special reference to technical instruction manuals.	ČSN EN 303-5 Art. 4.2.3	+	
Period of burning In boilers with manual fuel charging and under the rated heating output, the period of burning must be declared by the manufacturer and must be at least: - 2 hours as regards biological fuels - 4 hours as regards fossil fuels In boilers with automatic fuel charging, the period of burning must be at least 6 hours.	ČSN EN 303-5 Art. 4.2.4	+	

Minimum heat capacity The minimum heating output must not be higher than 30% of the rated heating output. In boilers with manual fuel charging, the minimum heating output may be higher. In such a case, the manufacturer must state in the technical documentation how the generated heat will be dissipated.	ČSN EN 303-5 Art. 4.2.5	+	
Determination of rated heating output The heating output declared by the manufacturer must be verified by testing, with tolerance of ± 8%. The rated heating output declared by the manufacturer must be achieved at least during one burning period. Otherwise, the rated heating output must be modified.	ČSN EN 303-5 Art. 5.8.2	+	

Measurement results: **boiler: ORLIGNO 200 80 kW, fuel: wood**

Average measured and calculated values (solid fuels):

Period of burning: Type of boiler: Date of testing: Test conditions:		I. ORLIGNO 200 80 kW 2005-10-04 Rated capacity	II. ORLIGNO 200 80 kW 2005-10-04 Rated capacity
Type of fuel:		wood/birch/50cm	wood/birch/50cm
Rated heat capacity (specified by manufacturer)	[kW]	77	77
Combustion product temperature	[°C]	129.4	110.4
Fuel consumption	[kg/hour]	19.05	19.50
Output water temperature	[°C]	58.0	50.3
Output water temperature	[°C]	68.3	57.5
Cooling water temperature	[°C]	-	-
Cooling water flow rate	[m^3 / hour]	6.355	9.275
Draught behind the boiler	[Pa]	24	27
Ambient temperature	[°C]	25.1	25.4
Relative air humidity	[%]	65.3	62.7
Barometric pressure	[kPa]	98.125	98.125

Analysis of combustion products:

Period of burning: Type of boiler: Date of testing: Test conditions:		I. ORLIGNO 200 80 kW 2005-10-04 Rated capacity	II. ORLIGNO 200 80 kW 2005-10-04 Rated capacity
Type of fuel:		wood/birch/50cm	wood/birch/50cm
Oxygen O_2	[%]	8.6	6.8
Carbon dioxide CO_2	[%]	10.8	13.0
Carbon monoxide CO	[ppm]	360	580
Higher hydrocarbons OGC	[ppm]	336	56
Nitrogen oxides NO_x	[ppm]	80	109

Auxiliary combustion values (solid fuels):

Period of burning: Type of boiler: Date of testing: Test conditions:		I. ORLIGNO 200 80 kW 2005-10-04 Rated capacity	II. ORLIGNO 200 80 kW 2005-10-04 Rated capacity
Type of fuel:		wood/birch/50cm	wood/birch/50cm
Stoichiometric oxygen volume	[m^3/kg]	0.919	0.919
Stoichiometric air volume	[m^3/kg]	4.375	4.375
Stoich. vol. of dry comb. products	[m^3/kg]	4.267	4.267
Maximum volume of CO_2	[%]	18.93	18.93
Stoichiometric air multiple	[-]	1.67	1.46
Vol. of dry comb. products, actual	[m^3/kg]	7.454	6.168
Volume of H_2O in the combustion air	[m^3/kg]	0.103	0.084
Volume of H_2O in the combustion products	[m^3/kg]	0.966	0.947

Calculated values - thermal summary:

Period of burning: Type of boiler: Date of testing: Test conditions:		I. ORLIGNO 200 80 kW 2005-10-04 Rated capacity	II. ORLIGNO 200 80 kW 2005-10-04 Rated capacity
Type of fuel:		wood/birch/50cm	wood/birch/50cm
Loss of sensible heat of combustion products (chimney)	[%]	9.82	6.77
Loss of gas underburning	[%]	0.22	0.29
Loss of mechanical underburning	[%]	0.34	0.34
Loss of heat transfer into the environment	[%]	1.11	0.96
Total loss	[%]	11.5	8.4
Calorific efficiency - indirect method	[%]	88.5	91.6
Heat input	[kW]	83.80	85.77
Heat capacity	**[kW]**	**76.63**	**77.98**
Uncertainty of determining heat capacity	[kW]	1.53	1.56
Calorific efficiency – direct method	**[%]**	**91.4**	**90.9**
Capacity / rated capacity	[%]	99.5	101.3

Under the rated output, the boiler efficiency regarding wood burning meets the requirements applicable to category 3 according to ČSN EN 303-5:2000, figure 1.

Fuel analysis

Fuel type	wood			
Analytical indicator	Symbol	Unit	Value	Uncertainty
Heat of combustion	Q_s	[MJ/kg]	17.35	0.14
Caloric value	Q_j	[MJ/kg]	15.65	0.14
All water in original condition	W^r_t	[% by weight]	15.18 ± 0.01	
Ash	A	[% by weight]	1.01 ± 0.02	
Carbon	C	[% by weight]	43.83	0.25
Hydrogen	H	[% by weight]	6.08	0.10
Nitrogen	N	[% by weight]	0.45	0.10
Sulphur	S	[% by weight]	0.00	
Chlorine	Cl	[% by weight]	0.00	
Oxygen – calculation for 100%	O	[% by weight]	33.44	

Note: Sample in the original condition

Measurement uncertainty: specified in the table of measurement results

The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, k=2, corresponding to the coverage certainty of 95% as regards standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4/02."

Test evaluation:

The heating output measured is within the tolerance of ±8%;
Boiler class 3;
The temperature of combustion products is lower than 160°C above the ambient temperature, see the respective data in the technical documentation;
The measured draught values do not exceed the maximum values according to figure 2;
The period of burning is more than 2 hours during wood burning;
The minimum heating capacity equals the rated heating capacity - see the follow-up data in the technical documentation.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Accredited test number: **1004.1** Test title: **Test of heat capacity, input and efficiency Deviation of type A.1.1**

Testing method: ČSN EN 303-5:2000 Art. 5.7, 5.8 and 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Date of test and ambient conditions - see the "Heating output and calorific efficiency" test							
Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐	*other:*

Test results:

Requirement	**Requirement specification**	**Test evaluation**	**Note**
Type A deviations			
A.1 Deviation for Austria			
Boiler efficiency for rated heating output and minimum heating output: *a) Manual fuel supply* ≤ 10 kW 73 % > 10 kW ≤ 200 kW $(65.3 + 7.7 \log Q_N)$ % > 200 kW 83 % *b) Automatic fuel supply* ≤ 10 kW 73 % > 10 kW ≤ 200 kW $(65.3 + 7.7 \log Q_N)$ % > 200 kW 83 %	ČSN EN 303-5 Annex A Art. A 1.1	+	

Measurement results: **boiler: ORLIGNO 200 80 kW, rated output, fuel: wood**

Boiler capacity	**Calorific efficiency required**	**Calorific efficiency measured**
Rated – 1st burning period	79.8	91.4
Rated - 2nd period of burning	79.8	90.9

Test evaluation: The measured efficiency is higher than the required minimum.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Accredited test number: **1005.1** Test title: **Combustion efficiency test - emissions**

Testing method: ČSN EN 303-5:2000 Art. 5.7, 5.9 and 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Date of test and ambient conditions - see the "Heating output and calorific efficiency" test							
Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐	*other:*

Test results:

Requirement	Requirement specification	Test evaluation	Note
Limit values of emissions The emission values must be low during burning. This requirement is considered fulfilled if the emission values specified in table 7 are not exceeded, provided that the boiler is operated under rated heating output, or as regards boilers with a range of heating outputs operated under the rated heating output and the minimum heating output in accordance with 5.7, 5.9 and 5.10. The requirement regarding the limit values of dust emissions under the minimum heating output is fulfilled if the requirements concerned are fulfilled under the rated heating output.	ČSN EN 303-5 Art. 4.2.6	+	class 3

Measurement results: **boiler: ORLIGNO 200 80 kW, rated output, fuel: wood**

Average values of gas emissions of O_2, CO_2, CO, OGC, NO_x and dust:

Boiler capacity	O_2 [%]	CO_2 [%]	CO [ppm]	OGC [ppm]	NO_x [ppm]	Dust [mg/m^3]	CO [mg/m^3] O_2 = 10%	OGC [mg/m^3] O_2 = 10%	NO_x [mg/m^3] O_2 = 10%	Dust [mg/m^3] O_2 = 10%
Rated	7.7	11.9	473	196	94	17	483	92	-	14

Test evaluation: Emissions – category 3.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Accredited test number: **1005.1** Test title: **Combustion efficiency test – emissions Deviation of type A.1.2**

Testing method: ČSN EN 303-5:2000 Art. 5.7, 5.9 and 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Date of test and ambient conditions - see the "Heating output and calorific efficiency" test						
Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐ *other:*

Test results:

Requirement						Requirement specification	Test evaluation	Note
A.1 Deviation for Austria								
Limit values of emissions						ČSN EN 303-5 Annex A Art. A 1.2	-	
	mg/MJ[1)]	**CO**	**NO_x**	**OGC**	**Dust**			
Manual fuel charging	**Biological fuels**	**1100**	**150[2)]**	**80**	**60**			
	Fossil fuels	**1100**	**100**	**80**	**60**			
Automatic fuel charging	**Biological fuels**	**500[3)]**	**150[2)]**	**40**	**60**			
	Fossil fuels	**500**	**100**	**40**	**40**			
[1)]With respect to the caloric value of the fuel used **[2)] Limit values of NO_x apply for boilers burning wood only** **[3)]At 30% of the rated heating output, the limit value may be exceeded by 50%**								

Measurement results: **boiler: ORLIGNO 200 80 kW, rated output, fuel: wood**

Boiler capacity	Average emission values								
	Measured values					Converted values			
	O_2 [%]	CO [ppm]	NO_x [ppm]	OGC [ppm]	Dust [mg/m³]	CO [mg/MJ]	NO_x [mg/MJ]	OGC [mg/MJ]	Dust [mg/MJ]
Rated	7.7	473	94	196	17	396	131	109	10

Test evaluation: The emission OGC exceeds the allowed limit value.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Accredited test number: **1005.1** Test title: **Combustion efficiency test – emissions Deviation of type A.2**

Testing method: ČSN EN 303-5:2000 Art. 5.7, 5.9 and 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Date of test and ambient conditions - see the "Heating output and calorific efficiency" test						
Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐ *other:*

Test results:

Requirement	Requirement specification	Test evaluation	Note
A.2 Deviation for Germany			
For Germany, only category 3 in accordance with table 7 is acceptable. Central heating boilers burning solid fuels with the rated heat capacity exceeding 15 kW must be constructed and operated so that the emissions meet the following requirements, depending on the fuel used:	ČSN EN 303-5 Annex A Art. A.2	+	

Fuel	Emission values [g/m³]	CO	Dust
Black and brown coal (lignite)	reference content of O_2 = 8%	-	0.15
Wood in natural condition	reference content of O_2 = 13%	4 [1] 2 [2] 1 [3] 0.5 [4]	0.15

[1] 15 kW < O_N ≤ 50 kW
[2] 50 kW < O_N ≤ 150 kW
[3] 150 kW < O_N ≤ 500 kW
[4] O_N > 500 kW

Measurement results: **boiler: ORLIGNO 200 80 kW, rated output, fuel: wood**

Boiler capacity	Average emission values								
	Measured values				Converted values				
	O_2 [%]	CO [ppm]	OGC [ppm]	Dust [mg/m³]	CO O_2 = 10% [mg/m³]	OGC O_2 = 10% [mg/m³]	Dust O_2 = 10% [mg/m³]	CO O_2 = 13 % [g/m³]	Dust O_2 = 13% [g/m³]
Rated	7.7	473	196	17	483	92	14	0.352	0.011

Test evaluation: The measured emission values do not exceed the limit values.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Accredited test number: **1005.1** Test title: **Combustion efficiency test – emissions**
Deviation of type A.5

Testing method: ČSN EN 303-5:2000 Art. 5.7, 5.9 and 5.10

Sample tested: ORLIGNO 200 80 kW

Measuring equipment used: see Report 39-8358/T

Date of test and ambient conditions - see the "Heating output and calorific efficiency" test							
Place of testing:	at the Engineering Test Institute	x	at the manufacturer	☐	at the customer	☐	*other:*

Test results:

Requirement					**Requirement specification**	**Test evaluation**	**Note**
A.5 Deviation for Switzerland							
For boilers burning wood in natural condition, only category 3 of Table 7 is acceptable. The use of coal, coal briquettes and coke with the specific content of sulphur > 1% is not permitted.					ČSN EN 303-5 Annex A Art. A.5	+	
Fuel	**Q_N [kW]**	**Emissions [mg/m^3#]**	**CO**	**Dust**			
Fossil	**$O_N \leq 70$** **$70 < O_N \leq 1000$**	**reference content of O_2 = 7%**	**4000** **1000**	**-** **150**			
Wood in natural condition	**$O_N \leq 70$** **$70 < O_N \leq 200$** **$200 < O_N \leq 500$** **$500 < O_N \leq 1000$**	**reference content of O_2 = 13%**	**4000** **2000** **1000** **500**	**-** **150** **150** **150**			

Measurement results: **boiler: ORLIGNO 200 80 kW, rated output, fuel: wood**

Boiler capacity	**Average emission values**								
	Measured values				**Converted values**				
	O_2 [%]	**CO [ppm]**	**OGC [ppm]**	**Dust [mg/m^3]**	**CO O_2 = 10% [mg/m^3]**	**OGC O_2 = 10% [mg/m^3]**	**Dust O_2 = 10% [mg/m^3]**	**CO O_2 = 13 % [mg/m^3]**	**Dust O_2 = 13% [mg/m^3]**
Rated	7.7	473	196	17	483	92	14	352	11

Test evaluation: The measured emission values do not exceed the limit values.

Tested by: Milan Holomek Date: 2010-12-10 Signed:

Reviewed by: Ing. Stanislav Buchta Date: 2010-12-10 Signed:

Evaluated requirement: **Control, regulation and safety elements**

Requirement specification: ČSN EN 303-5:2000 Art. 4.1.5.11, 4.1.5.11.1 – 4.1.5.11.2

Evaluated sample: ORLIGNO 200 80 kW

Results of evaluation: see the table below

Requirement	Requirement specification	Test evaluation	Note
Temperature control regulator and limit temperature regulators The control and safety devices described and further specified in the articles below and the choice thereof, depending on the manner of installation, must secure each boiler depending on the type of the heating system and the security of the determined installation within which the boiler is to be installed. The manufacturer shall supply the devices required for individual cases together with the boiler; otherwise, an exact specification must be specified in the instructions for installation, especially as regards limit values and time constants for temperature limiters.	ČSN EN 303-5 Art. 4.1.5.11	+	Embedded EKOSTER 2 electronic regulator with a temperature regulator and limiter, with automatic recovery.
Temperature control regulator and limit temperature regulators for open heating systems If the boiler's operation within a heating system is secured physically (temperature limited by the system pressure), the boiler must be equipped with the following devices: - temperature control regulator; - temperature limiter with automatic recovery. The temperature limiter is not necessary provided that the heating system cannot be quickly or partly disconnected; in these cases (e.g. in boiler without forced exhaust with automatic control), excess heat is released by the opening of the discharge pipeline, in the form of steam released to the environment.	ČSN EN 303-5 Art. 4.1.5.11.1	+	
Temperature control regulator and limit temperature regulators for closed heating systems If the boiler's operation within a heating system is secured thermally, it must be possible to quickly or partly disconnect the heating system, and/or the heat or excess heating output not utilized by the heating system must be reliably transmitted to the backup heat accumulator or an equivalent device. For these reasons, the following devices are required: a) quickly disconnecting heating system; the required devices include: - temperature control regulator; - temperature limiter with automatic recovery; b) partly disconnecting heating system; the required devices include: - temperature control regulator; - temperature limiter with automatic recovery;	ČSN EN 303-5 Art. 4.1.5.11.2	0 +	

Requirement	Requirement specification	Test evaluation	Note
reliable equipment for the release of the residual heating output in accordance with 4.1.5.11.3; c) non-disconnecting system with a rated heating output < 100kW; the required devices include: - temperature control regulator; a reliable device (in accordance with 4.1.5.11.3) for the discharge of the maximum possible heating output in the event of a failure.		0	

Note:
+ Compliant
- Non-compliant
0 Not applicable
x Not evaluated

Selected functions of the EKOSTER 2 electronic regulation:

- Temperature regulator function, adjustable range (60 ÷ 80)°C, adjustable hysteresis (2 ÷ 9)°C
- Temperature limiter with automatic recovery, adjustable temperature 90°C;
- Adjustable range (30 ÷ 100)% of the output of the blowers for the combustion air supply;
- Activation of the circulating pump;
- Possibility of connecting a room thermostat.

Evaluation drafted by: Milan Holomek Date: 2010-12-10 Signed:

Person responsible for evaluation:
Ing. Stanislav Buchta Date: 2010-12-10 Signed:

The test methods in this Report were applied without deviations, additions, or exceptions.

III. List of referenced documents

- Order B-38376 of 2010-09-01
- Contract B-38376/39 of 2010-09-15
- Contract Supplement No. 1 of 2011-02-02
- ČSN EN 303-5:2000 – Central heating boilers – Part 5: Central heating boilers burning solid fuels, with manual or automatic fuel supply and max. rated heat capacity of 300 kW. Terminology, requirements, testing, and marking.
- Instruction & Service Manual ORLIGNO 200
- Customer's declaration of 2010-12-27
- Source materials for Task No. 39-8358/T and 39-8210

The persons stated below are accountable for the accuracy of the above-specified data:

STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. CZ

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