

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept	Date	Reg.
	GPMA	2004-02-24	M DB 101
Prepared		YAMAMA CEMENT	
Markus Pernerros			

## TABLE OF CONTENTS

<b>Purpose of the system</b>	<b>2</b>
<b>General description of the system</b>	<b>2</b>
Function	4
Start up	4
Continuous operation	4
Turbine stop	4
Stand still	4
Gas turbine trip	4
Gas turbine start abort	4
Generator breaker trip	4
Loss of power supply	4
System faults	4
Other faults	5
<b>Technical specification</b>	<b>5</b>
Design criterias and standards	5
Dimensioning data	5
Engineering data	5
Emergency power supply	5
Installation	5
Materials	5
Component data	5
<b>Testing and service</b>	<b>6</b>
Testing during normal operation	6
Accessibility during normal operation	6
Testing during no operation	6
<b>INDEX OF COMPONENTS</b>	<b>7</b>

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept GPMA	Date 2004-02-24	Reg. M DB 101
	Prepared Markus Pernerros		YAMAMA CEMENT

## Purpose of the system

The dosage unit supplies magnesium additive into gas turbine fuels which are contaminated by lead, sodium and vanadium. In order to increase the ash melting point. A temperature above 950°C for GT10B2 will make sure that the ashes passes through hot parts of the gas turbine as dry powder.

The dosage rate of is stated by SIEMENS after analysing the ash sticking point of the fuel. The dosage rate should be 21 ppm(vol) (21 ml/m<sup>3</sup>).

## General description of the system

Please also see P&ID 2046 025

The dosage pump is installed together with the fuel additive tank. The dosage unit is installed on the same skid as the liquid fuel unit. The dosage unit is connected to the pipe upstreams of the minute tank in the liquid fuel unit.

The dosage unit is load controlled. The solenoid valves is controlled by open and close pulses. The length of the pulses varies depending on gas turbine load i.e. liquid fuel flow.

## Main components

- Strainer  
MBU10AT401  
Suction strainer for fill pipe.
- Shutoff valve  
MBU10AA405  
Hand manoeuvred shutoff valve.
- Pump  
MBU10AP403  
Hand driven pump transports dosage media from the barrel when need for refill.
- Fuel additive tank  
MBU10BB405  
The tank is containing 250 litres of dosage media. The tanks purpose is to decrease handling time and to avoid media from getting in contact with ambient air. The tank is ventilated by a dehydrating breather.
- Dehydrating breather  
MBU10AT405  
Dehydrates air flowing through when filling and emptying tank.

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM		Respons. dept GPMA	Date 2004-02-24	Reg. M DB 101
		Prepared Markus Pernerros		YAMAMA CEMENT
<ul style="list-style-type: none"> <li>• Combined shutoff valve and level indicator.  <b>MBU10CF405</b>                      The function and dosage rate can be checked by a combined shut off valve and level indicator. The shut off valves MBU10CF405-KA03 and MBU10CF405-KA01 are opened, shut off valves MBU10CF405-KA02 and MBU10AA410 are closed. Read level difference on the indicator markings during 60 sec. The flow rate shall, correctly adjusted be 1,2 cm/ 60 sec (full turbine load).</li>   <li>• Shutoff valve  <b>MBU10AA415</b>                      Hand manoeuvred shutoff valve for drain of Fuel Additive Tank.</li>   <li>• Shutoff valve  <b>MBU10AA410</b>                      Hand manoeuvred shutoff valve.</li>   <li>• Strainer  <b>MBU10AT410</b></li>   <li>• Pressure reducing valve  <b>MBU10AA425</b>                      The pressure regulator valve reduces the instrument air pressure supplied to dosage pump. Pressure read on gauge shall be set to 2 bar(g). Pressure is adjusted with reduce screw.</li>   <li>• Shutoff valve  <b>MBU10AA420</b>                      The shutoff valve shuts off instrument air to dosage pump when service is carried out. Valve is located upstreams instrument air inlet on the dosage pump.</li>   <li>• Dosage pump  <b>MBU10AP405</b>                      The dosage pump, a piston type of displacement pump, is driven by instrument air. The pump is started by activating solenoid and the frequency of air impulses is adjusted with a control knob on the controller. The stroke length can be adjusted by a stroke adjuster.</li>   <li>• Safety valve  <b>MBU10AA430</b>                      Safety valve pressure side dosage pump.</li>   <li>• Shutoff valve  <b>MBU10AA435</b>                      The shutoff valve is located near the dosage media outlet. Purpose is to keep dosage media in pipe upstreams valve when service is carried out.                      markings during 60 sec. The flow rate shall, correctly adjusted be 1,2 cm/ 60 sec (full turbine load).</li> </ul>				
Approved 2004-03-02 Henrik Orn		Latest revision -		Archive HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848		

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept GPMA	Date 2004-02-24	Reg. M DB 101
	Prepared Markus Pernerros		YAMAMA CEMENT

## Function

A controlled amount of fuel additive is fed from the fuel additive tank to the liquid fuel pipe ahead of the minute tank by a set variable speed dosage pump. The dosage pump is installed in the liquid fuel unit. The dosage rate is checked by the combined shut off valve and level indicator. The dosage rate for turbine protection additive should be 21 ppm(vol) (21 ml/m<sup>3</sup>). The shut off valves MBU10CF405-KA03 and MBU10CF405-KA01 are opened, shut off valves MBU10CF405-KA02 and MBU10AA410 are closed. Level difference is read on the indicator markings during 60 sec. The dosage pump is containing non return valves.

## Start up

The dosage pump MBU10AP405 starts when the turbine is in operation. Additive is supplied to the liquid fuel system.

## Continuous operation

During continuous operation the fuel additive is supplied to the liquid fuel system at a constant dosage/flow rate of 21 ppm(vol) (21 ml/m<sup>3</sup>).

## Turbine stop

During gas turbine shut down the dosage pump is stopped and the dosage system is shut down.

## Stand still

After shut down the system is not in operation.

## Disturbances

### Gas turbine trip

Initiates dosage system shut down.

### Gas turbine start abort

The dosage system is not running until turbine in operation.

### Generator breaker trip

Does not affect the system.

### Loss of power supply

Initiates dosage system shut down.

## System faults

Consequenses with main component faults

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept	Date	Reg.
	GPMA	2004-02-24	M DB 101
Prepared		YAMAMA CEMENT	
Markus Pernerros			

This document is issued in Pulse.

Pump AP405: Too much or not enough additive is supplied to the fuel.

### Other faults

Fault in connecting systems:

Instrument air system QFA: The dosage system can not operate in case of air failure to dosage pump AP405

### Technical specification

#### Design criterias and standards

Liquid fuel specifications according to document: GTI J242002E edition K.

Liquid fuel additive specifications according to document: GTI J243006E edition 1.

#### Dimensioning data

Constant dosage rate of 21 ppm(vol) (21 ml/m<sup>3</sup>).

#### Engineering data

Design pressure: 5 Bar(e)

Design temperature 100°C

#### Emergency power supply

The solenoid operates the dosage pump which is powered from the 24 VDC system. The 24 VDC system is powered from the 230 VAC UPS system.

#### Installation

The dosage pump is installed together with the fuel additive tank which is separated from the liquid fuel unit. The dosage unit is connected to the pipe upstreams of the minute tank in the liquid fuel unit.

#### Materials

The dosage pump, tank and piping are made of stainless steel.

#### Component data

Tank volume: 250 l standard.

Weight: 350 kg (filled).

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept	Date	Reg.
	GPMA	2004-02-24	M DB 101
Prepared		YAMAMA CEMENT	
Markus Pernerros			

## Testing and service

### Testing during normal operation

No function test during normal operation.

### Accessibility during normal operation

No objects in the system are available for maintenance during normal operation.

### Testing during no operation

No function test during operation.

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	

SYSTEM DESCRIPTION MBU10 LIQUID FUEL DOSAGE SYSTEM	Respons. dept GPMA	Date 2004-02-24	Reg. M DB 101
	Prepared Markus Pernerros		YAMAMA CEMENT

## INDEX OF COMPONENTS

### M

MBU10 AA405		Shutoff valve	3
Shutoff valve	2	MBU10 AP403	
MBU10 AA410		Pump	2
Shutoff valve	3	MBU10 AP405	
MBU10 AA415		Dosage Pump	3
Shutoff valve	3	MBU10 AT401	
MBU10 AA420		Strainer	2
Shutoff valve	3	MBU10 AT405	
MBU10 AA425		Dehydrating breather	2
Pressure reducing valve	3	MBU10 AT410	
MBU10 AA430		Strainer	3
Safety valve	3	MBU10 BB405	
MBU10 AA435		Additive tank	2
		MBU10 CF405	
		Level indicator	3

This document is issued in Pulse.

we reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure to third Parties without express authority is strictly forbidden.  
© Demag Delaval Industrial Turbomachinery AB

A 087 0474-B 00-03 MS Word 97

Approved 2004-03-02 Henrik Orn	Latest revision -	Archive	HG 5255
Checked 2004-03-02 Roger Jonsson		No. 1CS39848	