

# Report

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## ATS Fan Coil Unit Link

Report 52496/1

April 2009

**Carried out for: Advanced Technical Solutions GmbH**

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**Total No. of pages:** 9

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## 1 INTRODUCTION

This report concerns tests carried out on a fan coil unit manifold (FCU link) to determine the flow coefficients of the assembly and hydrostatic leak tightness. The work was commissioned by ATS GmbH and carried out over the period 6 April to 12 April 2009.

## 2 OBJECTIVE

The objectives were:

1. To determine the signal flow coefficient (kvs) of the orifice within the FCU link.
2. To determine the flow coefficient (Kv) for the whole assembly.
3. To determine the ability of the assembly to withstand a 25 bar hydrostatic test without leaking.

## 3 ITEMS RECEIVED FOR TEST

The item received was a fan coil unit manifold assembly.

This consisted of isolating valves, bypass valve, regulating valve, orifice, strainer and motorised control valve all on a common manifold. Included with the package were two stainless steel corrugated flexible hoses.

Manufacturers literature is included in Appendix A of this report.

## 4 INSTRUMENTATION

Description	Identifier	Calibration expiry
Bourdon gauge	623	06-11-09
Differential manometer	930	04-11-09
Magflo meter DN20	124	23-04-10
Temperature indicator	2004	09-03-10

## 5 TEST METHOD

Tests consisted of three parts detailed below.

### 5.1 ORIFICE SIGNAL FLOW COEFFICIENT

The FCU link was installed on straight lengths of steel pipe in accordance with BS 7350 'Specification for double regulating globe valves and flow measurement devices for heating and chilled water systems'. Pressure tappings were installed at 2 diameters upstream and 8 diameters downstream of the orifice section, in addition to the integral tappings on the FCU link itself. The bypass valve was closed and the isolating valve was fully open. The steel pipe was fitted upstream and downstream of the orifice section.

Pressure difference was measured across the FCU link tappings and the pipe tappings. The latter included the pressure drop due to the strainer.

The water flow rate was increased in steps up to a maximum of 0.6 l/s, with the pressure difference being measured at each flowrate. Water temperature was also measured.

Graphs were then plotted of pressure difference (kPa) vs flowrate (l/s). Flow coefficient was then derived as shown below.

$$\text{Flow coefficient (Kvs)} = \frac{l/s}{\sqrt{Pa}} * 36$$

### 5.2 WHOLE ASSEMBLY FLOW COEFFICIENT

The FCU link was installed in a similar manner to the orifice coefficient test. In this case the steel pipe lengths were fitted to supply the orifice side and return from the control valve side. The flexible hoses were joined together to complete the circuit and the bypass valve shut.

The head of the motorised valve was removed for these tests and the control valve was fully open.

The joining piece used to connect the two flexible hoses together was tested separately to determine its resistance and this was deducted from the overall resistance to give the final result for the whole assembly.

### 5.3 HYDROSTATIC PRESSURE TEST

The FCU link, complete with flexible hoses, was plugged by means of BSP fittings. One of these was connected to a calibrated bourdon gauge of range 0-25 bar. A separate fitting connected the test unit to a hydraulic pump. The other two fittings had air vents installed.

Pressure was raised in 5 bar increments up to 25 bar and observations made of the unit. Test pressures were maintained for one minute at each increment.

## 6 RESULTS

The results for the flow resistance are shown graphically overleaf. The orifice signal flow coefficient (Kvs) reduced below signal pressures of approximately 3kPa.

The average flow coefficient (Kv) achieved, using the integral pressure tapings on the FCU link was 2.99.

The average flow coefficient (Kv) achieved, using the standard steel pipe pressure tapings and including the strainer was 2.55.

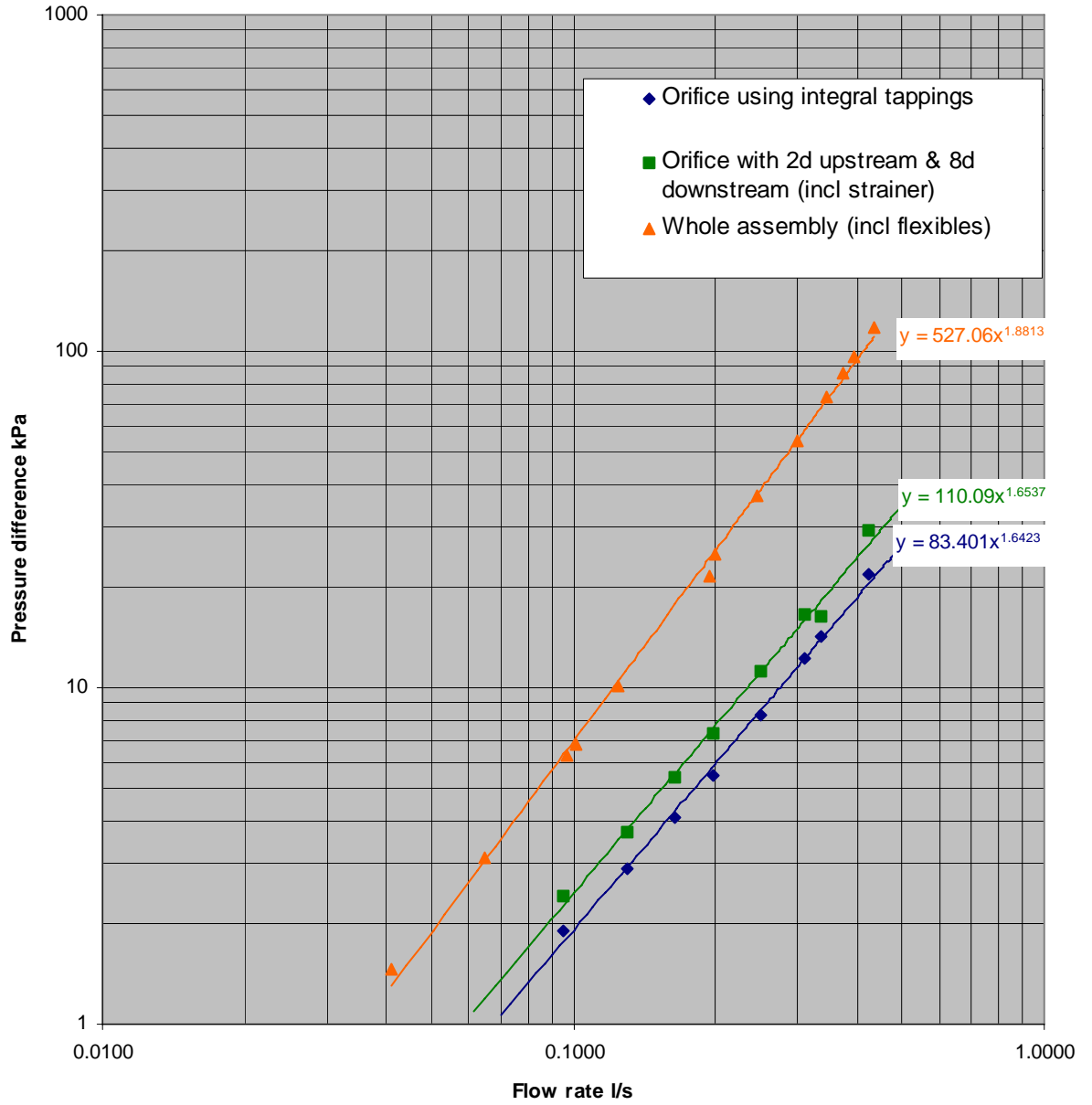
The average flow coefficient (Kv) for the whole assembly with flexible hoses was 1.42.

Water temperature range was 18°C - 25°C during the test.

The whole FCU link assembly withstood 25bar static pressure without leaking. The stainless steel flexible hoses expanded longitudinally during the hydrostatic pressure tests and contracted back on release of the test pressure. The permanent deformation of the hose assembly on release of the test pressure was a 3% increase in length (from 295mm to 304mm).

Figure 1 Flow resistance

Pressure difference vs flow rate for FCU link



## APPENDICES

Appendix: A Manufacturers Literature

FCU-Link

one solution...  
for many problems



FCU-Link

one solution...  
for many problems



small..  
BUT UNIQUE

If not innovative ..... It's not ATS



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Deutsches Patent-  
und Markenamt  
Nr. 307 63 721  
Az.: 307 63 721.2 / 11

**FCU-link** is factory assembled and factory pressure tested hookup valves that intelligently connect the FCU to the piping network.

The **FCU-link** is entirely new concept for connecting the fan coil unit into the chilled water/hot water piping network. Innovation, modern technology and effectiveness distinguish the new design.

If not Innovative ... It's not





# FCU=Link

one solution...  
for many problems

**For..**  
Air Conditioning Construction/Installation Contractors

**Who.**  
Need to achieve high quality and construct their projects in the fastest, most effective and cost-effective way in order to win their customers satisfaction and to catch more opportunities.

**FCU-Link**  
is leading-edge product and a new generation of ordinary valves set that promising superior quality and performance.

**That.**  
Enables, even unskilled labor, to hook-up the FCU to piping network without sophisticated tools or assistants in less than 15% the planned time with no leakage or improper installation possibility.

**Unlike all the others**  
Our Product is factory-assembled, factory-pressure tested, with flushing bypass, unions and flexible connections.

**To..**  
Quickly, properly and reliably hook-up the FCU to the piping network.

**FCU-Link is entirely new concept for connecting the fan coil unit into chilled, water / hot water piping network. It has the following benefits:**

- Factory Assembled set of valves and accessories leaves no chance for site installation mistakes.
  - Factory pressure tested unit leaves no chance for possible leakage.
  - Smooth internal surface makes it frictionless set of valves.
  - Valves' raised handles for insulation purposes.
  - Helical stainless steel flexible connection meets any FCU center to center pipe distance, and has null pressure drop at any twisting angle.
  - Fixed orifice single Kv value flow measuring station with high accuracy cut the time required for water balancing and provide solid state repeatable measurements.
  - PN 20 for heating application.
  - Unions with O-ring technology can be tightened by hands for easy assembling.
  - Very Compact 180 mm ONL.Y.
  - One set can cover wide range of flow rates for easy selection (0.03 – 0.8 l/s) (0.5 – 13 gpm).
  - Special DZR alloy.
  - Actuator is supplied in separate box packing to avoid damage during installation.
  - **Three Year Warranty.**
- and more...*

**Stainless Steel Flexible Connection**

Standard length 300 mm, other lengths are available upon request.



Can be twisted to any angle without affecting the circular cross-section.

**Control Valve Thermal Actuator**

Available in:  
- ON/OFF 2-WY - ON/OFF 2-WY - Proportional 0-10V



100% water protection No tools for installation

**Flow Way Control Valve**

Two way control valve with optimum valve authority.



**Regulating Flow Valve**

For independent regulation and water balancing.



**Isolating Valves**

Full port Isolating ball valves c/w raised handles for thermal insulation.



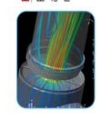
**Strainer**

Ht quality with stainless steel mesh water filter.



**Fixed Orifice Measuring Station**

Fixed orifice plate measuring station for accurate, solid state and repeatable flow measurements.



**Bypass**

Built-in Bypass c/w full port isolating valve for effective coil and drain flushing and cleaning.



Normal Operation Cooling/Heating

Bypass Flushing G/ent Cleaning

Back Flushing Coil Cleaning

Forward Flushing Strainer Cleaning

**Unions**

7 numbers unions for easy assembling and dismantling.



Center line connection to pipe with 45 degree angle

