



CONSUMPTION MEASUREMENT

AVL PLUREA™

CONSUMPTION MEASUREMENT SYSTEM

Function Summary

The AVL PLUrea™ Consumption Measurement System features dynamic urea flow measurement capability for the development and engine integration of a modern SCR system.

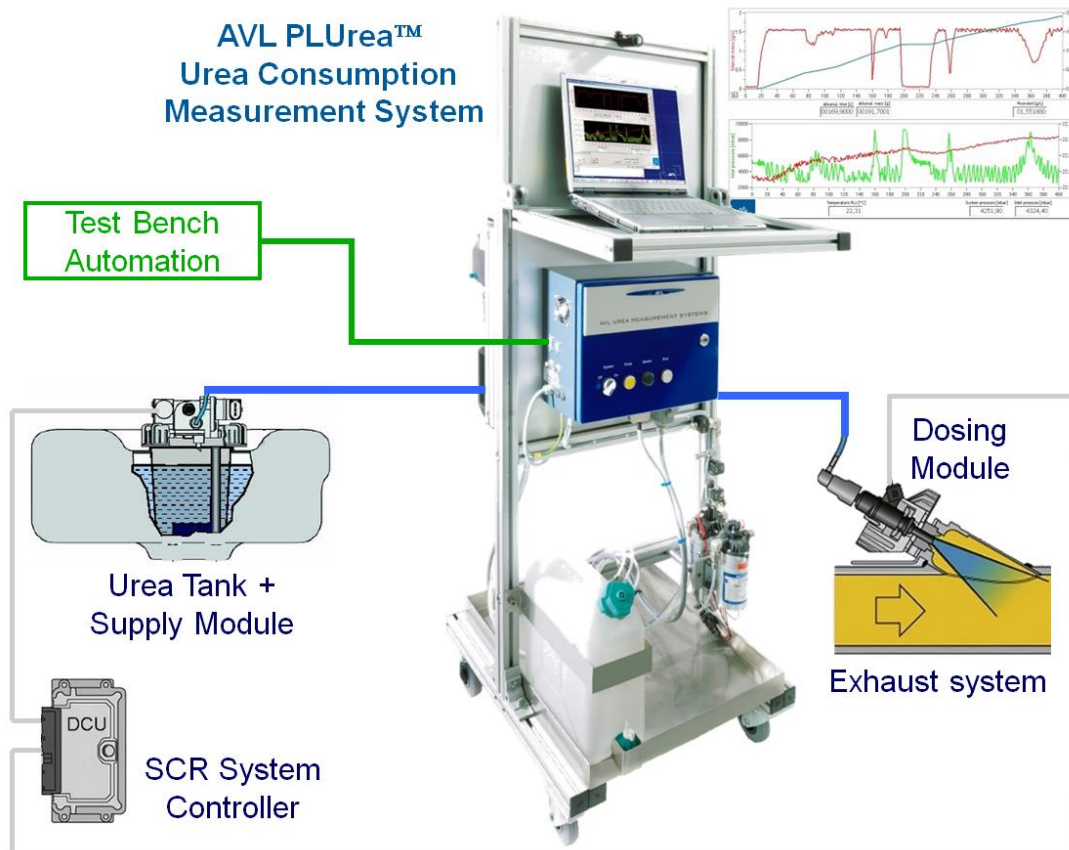
With fast, accurate transient flow rate measurement on engine test benches, AVL PLUrea™ enables:

- Efficient dosing strategy development due to dynamic dosing quantity correlation.
- Fast detection of dosing deviations or malfunction of the SCR system.
- Fast test bed integration, flexible use and comfortable stand-alone operation under SCR-specific operational conditions.

Functional Description

AVL PLUrea™ is available for all common PC/LD and for HD applications with dynamic flow sensors for different measuring ranges. A combined system controller and data acquisition unit manages all internal functions and external communication. An automated air purge system provides for reliable, bubble-free urea dosing and urea measurement. The system protects against venting in situations when the SCR-system automatically drains per ECU command. Proper measurement conditions can be monitored by an automated leakage test. Comfortable maintenance functions e.g. for media change provide for fast setup and easy handling. All system components are mounted on a mobile cart in order to allow for flexible use in various locations.

Along with accurate sensor technology, fast setup and simple operation are crucial factors for successful engine test bed operation. AVL has a long history and an outstanding record in providing appropriate system solutions to complex measurement tasks.



Application

Efficient NO_x reduction with an SCR system requires accurate urea dosing strategy development. An individual dosing calibration is required for each specific engine and catalyst combination. Successful emissions compliance testing requires the highest NO_x conversion ratios while avoiding ammonia slip.

The reducing agent AdBlue® must be dosed in exact amounts in all relevant operational engine states (load / speed engine map). Online urea flow is an important parameter to be measured on an engine test bed. Accurate results are required under stationary conditions as well as during highly dynamic test cycles with transient flow rates. Extremely low urea flow rates, about 10g/h, must be measured under pulsating pressure conditions. Minimizing temperature influence requires accurate urea consumption measurement in close vicinity to the injector. The unique PLU measuring principle is ideally applicable to this condition with pressure pulsation caused by the low frequency urea injection.

Benefits

- Efficient dosing strategy development due to dynamic correlation.
- Optimized system solution for SCR-specific operational conditions.
- Fast detection of dosing deviations or SCR system malfunction and exact identification of corresponding operational conditions.
- Fast test bed integration, flexible use and comfortable stand-alone functionality
- Modular design, expandable for future requirements

Component Description

Available models of AVL PLU 131U Flow Meter:

Description	Flow Range Specification	Part number
AVL PLU131U-010	0.05 ... 10 l/h	TN131U010.01
AVL PLU131U-020	0.05 ... 20 l/h	TN131U020.01
AVL PLU131U-040	0.1 ... 40 l/h	TN131U040.01

The AVL PLUrea™ system solution consists of one of the above flow meters plus the AVL PLUrea™ Measuring Cart:

Description	Specification	Part number
AVL PLUrea™ Measuring Cart	Mobile cart including data acquisition and control electronics with automated system filling and air purge functions, communication interface, PUMA driver, service software, etc.	TNPLUREAMC.01

Customized stationary solutions are offered on request.

Technical Insight

Technical Data:

Measurement parameters:	Momentary flow rate, total consumption, gravimetric data, statistical data, pressure, temperature, density optional
Measurement range:	
Volume	0.05 ... 10 l/h, 0.05 ... 20 l/h or 0.1 ... 40 l/h
Measuring uncertainty:	
Volume	0.2% for sensor calibration factors of mean flow rates*)
Mass	0.3% for total consumption of 3g to 3kg over dynamic cycle (ETC, FTP) in optimized SCR system setup**)
Max. measurement frequency:	20 Hz

Dynamic step response	< 250 ms ; acc. ISO 16183 (T ₁₀ ... T ₉₀)
Media:	Aqueous urea solution according ISO22241 2008/9 (AdBlue® ^{***}); water with min. 1% Prevox 7400 content
Media density range:	0.99 ... 1.19 g/cm ³ (further densities on request)
Operating temperature range:	
Media:	+10 ... +60 °C
Environment:	+10 ... +60 °C
Operating pressure range:	0.01 ... 10 bar (up to 20 bar on request)
Dynamic pressure drop:	ΔP=0 (PLU sensor measuring principle)
Back pressure:	No minimum back pressure required
Interfaces:	RS232 (AK compatible), Frequency output (differential pulse signal acc. RS485, max. 150 kHz)
	Liquid Media (Urea): 6x1 mm tube (stainless steel or plastic)
	Pressurized air: KD3/KS3 quick coupling or 6mm hose fitting
Media density range:	0.99 ... 1.19 g/cm ³ (further densities on request)
Supply voltage:	100-240 V AC 50/60 Hz
Power consumption	typ. 50 W, max. 150 W
Compressed air supply:	4 – 10 bar, oil-free, dry
Tank volume:	10 l
Dimensions:	600 x 600 x 1700 mm
	Outlet height position: 600 ... 1600mm Sensor height adjustment for tube length minimization to the injector
Weight (W x D x H):	65 kg
Safety:	CE

- *) Measurement uncertainty of flow meter calibration factors within a measuring range of 0.1-10l/h under repeatable conditions with medium HAKU at 20°C and 1 bar pressure.
- **) Total Measurement Uncertainty acc. GUM (Guide to the Expression of Uncertainty in Measurement) for an optimized injection system
- ***) AdBlue® is a trade mark of VDA (Verband der Automobilindustrie) for the official designation

Compatibility

The AVL PLUrea™ Consumption Measurement System can be connected to any automation system with AK-protocol communication via serial interface.

AVL PUMA OPEN drivers are available for the following versions:

Version	Installation
PUMA Open 1.1.2 PUMA Open 1.2.1	Manual installation
PUMA Open 1.3.1 PUMA Open 1.3.2 PUMA Open 1.4	MDDI (measurement device driver installer)
From PUMA Open 1.5 Suite 2010 on	included

Options/Extensions

Available options for AVL PLUrea™ Consumption Measurement System:

Description	Specification	Part number
AVL PLUrea™ Density Meter	Density sensor for gravimetric flow measurement data	TNPLUREADM.01
AVL PLUrea™ Back Flow System	Compact media conditioning module for single sensor urea consumption measurement on SCR systems with urea back flow	TNPLUREABF.01
PLUrea Analog Output	2 analog output signals (0...10V, selectable parameter)	TNPLURAO.01
	Adaptations:	
AVL PLUrea Adaptation NW1/4"-6mm; 0.5m	Flexible, inelastic adaptation hose for SCR systems with NW1/4" quick coupling; Length 0.5m	TNPLADPC05.01
AVL PLUrea Adaptation NW1/4"-6mm; 2m	Flexible, inelastic adaptation hose for SCR systems with NW1/4" quick coupling; Length 2m	TNPLADPC20.01
AVL PLUrea Adaptation NW5/16"-6mm; 0.5m	Flexible, inelastic adaptation hose for SCR systems with NW5/16" quick coupling; Length 0.5m	TNPLADH605.01
AVL PLUrea Adaptation NW5/16"-6mm; 2m	Flexible, inelastic adaptation hose for SCR systems with NW5/16" quick coupling; Length 2m	TNPLADH620.01
AVL PLUrea Adaption PC Ext. 4ID6-6mm; 4m	Flexible, inelastic hose extension PC with 6mm standard fitting; 4mm ID; Length 4m	TNPLADPE40.01
AVL PLUrea Adaptation NW3/8"-8mm; 0.5m	Flexible, inelastic adaptation hose for SCR systems with NW3/8" quick coupling; Length 0.5m	TNPLADH805.01
AVL PLUrea Adaptation NW3/8"-8mm; 2m	Flexible, inelastic adaptation hose for SCR systems with NW3/8" quick coupling; Length 2m	TNPLADH820.01
AVL PLUrea Adaption HD Ext. 6ID6-6mm; 4m	Flexible, inelastic hose extension HD with 6mm standard fitting; 6mm ID; Length 4m	TNPLADHE40.01

Available AVL system integration support:

<p>STARTUP & TRAINING AVL PLUREA SYSTEM</p>	<p>Commissioning and Training of AVL PLUrea™ Consumption Measurement System with a customer urea dosing systems (returnless type)</p>	<p>TT04PLUR01.01</p>
<p>STARTUP & TRAINING AVL PLUREA BACKFLOW</p>	<p>Commissioning and Training of AVL PLUrea™ Back Flow System with a customer urea dosing systems (return flow type)</p>	<p>TT04PLUR02.01</p>