A. T. M. S. Proven Advanced Technology Solutions

Duct*Runner*
Gyrometric System for Pipeline Mapping
by REDUCT

Duct*Runner* DR-4 with centralising wheels

- Quickly traces the lay of all types of pipe in three dimensions
- No excavation
- No measurements from the surface
- All sizes of pipe from **80 mm**. internal diameter.
- All types and shapes of duct
- Long distances and any depth
- Good accuracy in three dimensions
- Between two ends or manholes, or from only one entry
- No traffic disturbance
- Measures under Buildings, Rivers, Motorways, Railways, etc.
- Good working conditions and safety
- Maps available immediately in CAD or GIS format
- **NEW - Google Earth** image available immediately

Advanced Technology Marketing Services—
26, High Street, HASLEMERE, GU27 2HW.
Tel -+447717763510 E-mail—**sales@advantechms.com**
www.advantechms.com

The **Duct*Runner*** by **REDUCT** is a practical and cost effective solution to the problem of tracing all types of pipes, sewers and ducts by using a patented technique for position-finding, employing rate-gyros and accelerometers developed for inertial navigation. The device is inserted into the pipe at a manhole or any access, and pulled along the pipe to be measured by hand or winch at between 1 & 2 meters/sec. The result obtained is not only the horizontal track of the pipe, but also the depth and curvature. Very simple to use, the device has no need to communicate with the surface during measurement, and thus there is no electric cable. The data acquired are stored on-board and recovered once the device is removed from the tube. The specific software packages X-Traction and X-View are used for the transfer, analysis and display of the data.

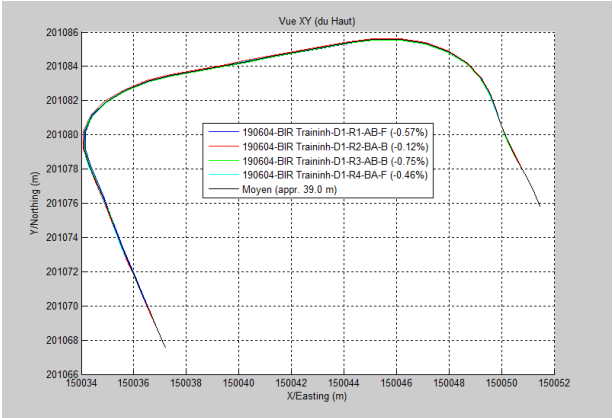
The position of the access points is established with precision, normally by GPS. Typically this is done before commencing the measurements with the **Duct*Runner***, but, should there be any delay these positions can be obtained subsequently and entered into the software after having made the measurements.

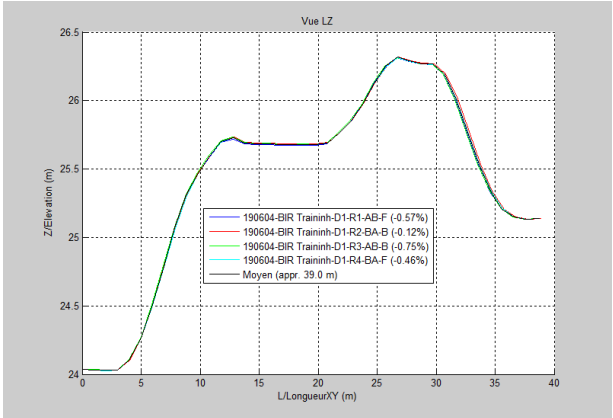
The incertitude of the pipe's position measurement is small, and is a function of the pipe length. The optimum precision is normally obtained by making four passes through the pipe, and in normal circumstances, the accuracy will be within the French « Classe A» norm of +/- 40cm. for pipes up to 650 meters in length. The pipe course measured is normally that of the top of the pipe, but, thanks to the centralising wheel sets specific to this system, the results can be determined for the centre or the bottom (invert) of the pipe, as required.

The **Duct*Runner*** is unaffected by magnetic and electric fields. Being completely waterproof, it can be immersed and is not affected by variations of flow. It can measure ducts of all diameters from 77 mm. and greater, and can pass through bends in proportion with the diameters.

Normally used between two pipe ends or manholes, the system can be run from only one entry after establishing an accurate azimuth of the start, the position of a point along the run, or by an extension of the pipe before the entry. A camera can be mounted on the device for a film of the passage through the pipe.

The software packages help the operator to optimise the result obtained, and to present it in an easily interpreted form. X-view can display the shape of the trace in any sense, including an orientable view in three dimensions, and also give the position and radius of the bends in the trace so as to locate any undesired deformations.





Plan View (Left) and Graph of Depth versus Length (Right) as displayed in the X-View software.

A. T. M. S. Proven Advanced Technology Solutions

Duct*Runner*
by REDUCT
Specification and Use

TECHNOLOGY

The heart of the **Duct*Runner* DR-4** is an OMU (Orientation Measurement Unit) which employs rate-gyros and accelerometers to detect all movement of the system, and the software packages which treat the collected data to calculate the trajectory followed from the summation of these movements. The OMU is seconded by odometers on two of the wheels to improve the precision of the lengths. The untreated data gathered by these transducers is held in memory in the **Duct*Runner*** during the measurement phase.

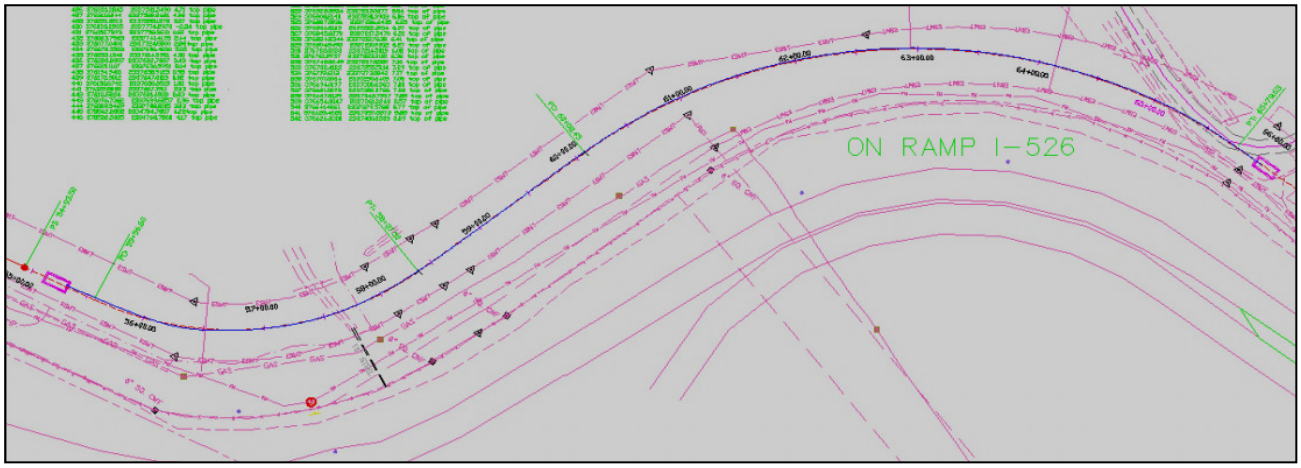
After being started, the device is inserted in the duct entry and held stationary during at least 30 seconds for initialisation and the establishment of a start point. Then the **Duct*Runner*** is pulled along the duct and the measurements are recorded on board. Once pulled to the exit point, it is once again immobilised for 30 seconds to confirm this point, and, normally, after this it is pulled back in the opposite direction to the entry pont, paused, turned around, and the passages repeated, giving a total of four passages. The number of passes can be increased to further improve the accuracy, or to optimise the accuracy over long lengths. Once withdrawn from the duct, the device is connected to the computer to transfer the recorded data using the X-Traction software. This data is immediately processed and checked for repeatability, and then the trace can be displayed in X-view.

To obtain the best results, the **Duct*Runner*** is pulled at a speed of about 1.5 meters per second, but it can function at speeds up to 4 meters per second in a smooth, clean tube, which allows the production of a map of a pipe up to 500 meters long in less than one hour, including the set up and re-packing time (except the pre-insertion of the pulling cord). This possibility ensures a minimum interruption of service, and a reduced cost per meter mapped.

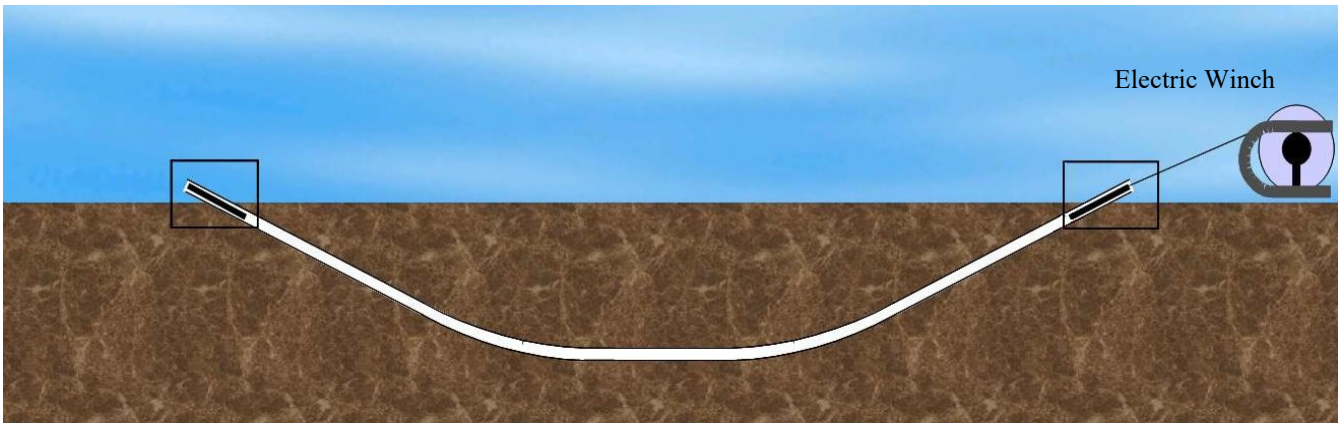
The analysis of the data by the PC takes about 5 min., and two output formats are possible: either Comma Separated Value .csv, which can be loaded directly into Excel, ArcView etc., or Script Format .scr, the defaut format for **AutoCAD**.

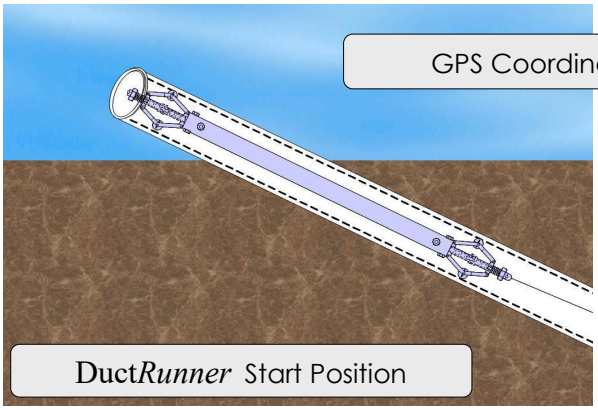
A descriptive **VIDEO** is accessible at https://www.reduct.net/technology/video.php

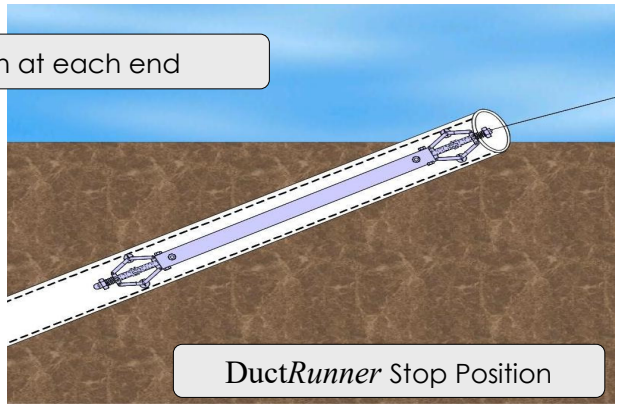
Example of a plan prepared with the results supplied



Typical Operation







Technical Specification

Orientation Measurement Unit

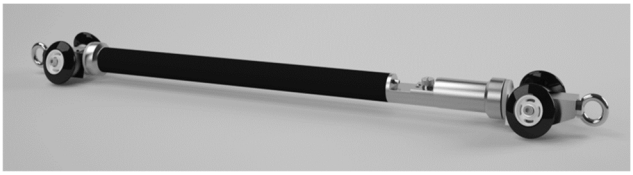
Rate-Gyro Range	+/- 600°/sec.
Frequency Response	1 kHz.
Acceleration Range	5 g.
Sampling Rate	100 Hz
Output Format	TCP/IP Ethernet 4Mbit/sec
Supply	5 v. 1,5 A
Autonomy	2 heures
Temperature Range	- 10 à 50 °C
Sensitivity to noise	negligible

Physical Specification

Diameter	40 mm.
Length	90 cm.
Weight	1,1 kg. (OMU)
Bend Radius	4,5 m. at 90 mm.
	0,9m. at 300 mm.

Operational Limits

Depth	No limit
Resistance in tension	< 150 kg.



Examples of different configurations of the **Duct*Runner***

Advanced Technology Marketing Services—
Tel -+447717763510 E-mail—**sales@advantechms.com**
www.advantechms.com

4/12/19