

Indicative proposal regarding conducted market consultation No. 45842 with subject "Supply of Ultrasonic Inspection Scanner"

from

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No.	Contracting Authority ID	Description and technical features of the offered product	Unit	Quantity	Unit price VAT excl.	Price VAT excl.
		Supply of Ultrasonic Inspection Scanner		1	183.000,00	183.000,00
Total value VAT excl.						183.000,00

Delivery time: 10 months after signing the contract

Terms of delivery: DDP Kozloduy

Warranty period: 12 months

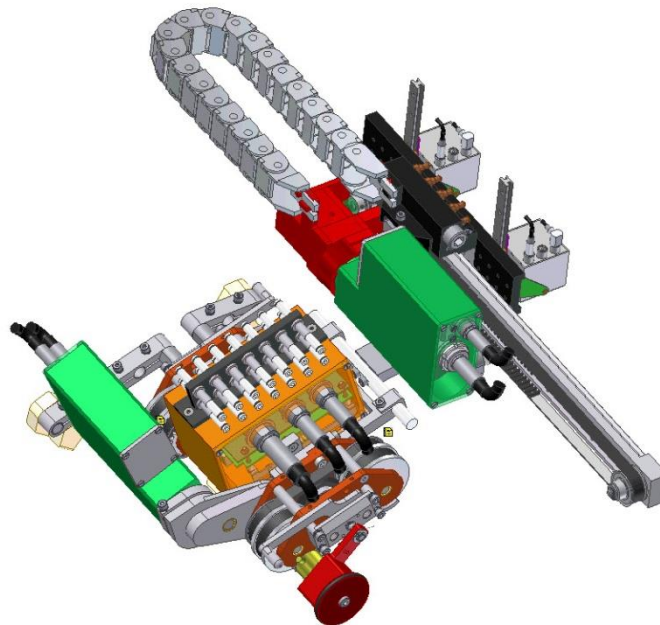
Accompanying documentation on delivery: Instructions for use, certificate of origin

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Заличено на
основание
ЗЗЛД

Technical Description

For Piping Circumferential Welds Inspection System



December, 2020

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1 Introduction

This document describes the design of the HRID SPH Piping Welds Ultrasonic Inspection System Scanner (hereinafter HRID SPH scanner).

2 Technical description of the inspection scanner

2.1 This document contains basic technical data which establish the main parameters, characteristics and conditions of functioning of the automated inspection system scanner of the pipeline welded joints, as well as the data about the completeness of supply.

2.2 The HRID SPH inspection scanner (Figure 2.1) is used for the automated remote ultrasonic pre-service and in-service inspection of the piping welded joints with outside diameter of 200 mm to flat surface. Basically HRID SPH inspection scanner is intended for:

- Inspection of primary circulating pipeline :
 - 1) Welded joints of pipes and elbows;
 - 2) Welded joints of pipes with pipes, reactor and steam generator nozzles;
 - 3) Welded joints of pipes and reactor coolant pump set;
- Inspection of ECCS pipeline:
 - 1) welded joints of pipes and ECCS nozzles;
 - 2) welded joints of ECCS nozzles and shells of reactor pressure vessel nozzles area;
 - 3) welded joints of pipes with pipes and with elbows (as far as the check valves from the reactor side);

The scanner system is capable of flaw detecting and sizing with recording of flaw coordinates.

2.3 Inspection of welded joints is performed in order to:

- Determination of the initial data about condition of the welded joints of primary pipelines before the reactor plant commissioning;
- In-service inspection of the welded joints of primary pipelines during nuclear power plant (NPP) operation.

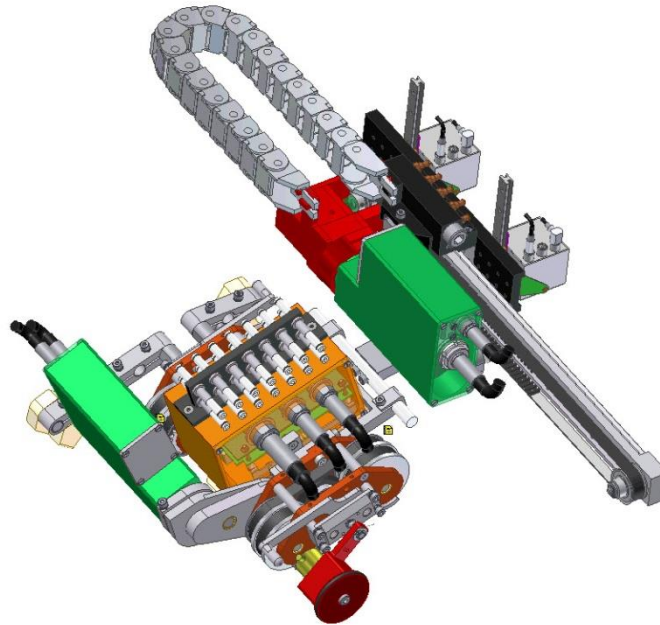


Figure 2.1: HRID SPH Piping Circumferential Welds inspection scanner

3 Fulfillment of technical requirements

The design of the scanner for inspection of the main coolant piping welds provides the following characteristics:

- failure-free operation;
- long lasting durability;
- easy serviceability;
- easy maintenance.

The scanner is designed with all precautions in regard to safe operation, user friendly utilization and environment.

4 General Technical Characteristics of HRID SPH Inspection Scanner

4.1 The inspection system use common source of electric power and compressed air source which is available at Site:

- Power network voltage, V 220^{+11}_{-22}
- Frequency of current, Hz 50^{+1}_{-1}

4.2 Any component to be transported manually will have weight of not more than 30 kg.

5 Scanner Design

The SPH (Scanner for Piping HRID) is a general-purpose magnetic wheel X-Y scanner primarily designed for pipe inspection. It is designed with special attention to:

- Use of standard modular scanner components;
- Performance;
- Geometrical flexibility;
- Stability;
- Possible upgrade / options for inspection of special geometries.

These features make the scanner ideal for areas where a robust and stable scanner is required for inspection with high speed, large strokes, several probes etc.

The use of modular scanner components makes it possible to configure the size (height contra width) according to the actual requirements by rotating the motor and electronics modules. The scanner can also be equipped with optional long Y-module rail; Y-module mounted chain guide, wheel space extension kit etc. for fulfilling special requirements.

5.1 SPH - Scanner System Main Components

SPH scanner module presents Figure 5.1-1 and Figure 5.1-2. SPH system consists of mechanical, electrical and water supply components:

- SPH scanner with X-axis motor and Y-axis motor, free wheel X encoder, emergency stop ESR-1, control module, SPH platform, water Coupland crossbar and ultrasonic probes connector interface;
- Y-axis guide rail with possibility of installation simple and sophisticated probe holder;
- Sophisticated probe holder with preassembled vertical compensators for ultrasonic probes;

- Scanner guide chain;
- Water supply system (Figure 5.1-3);

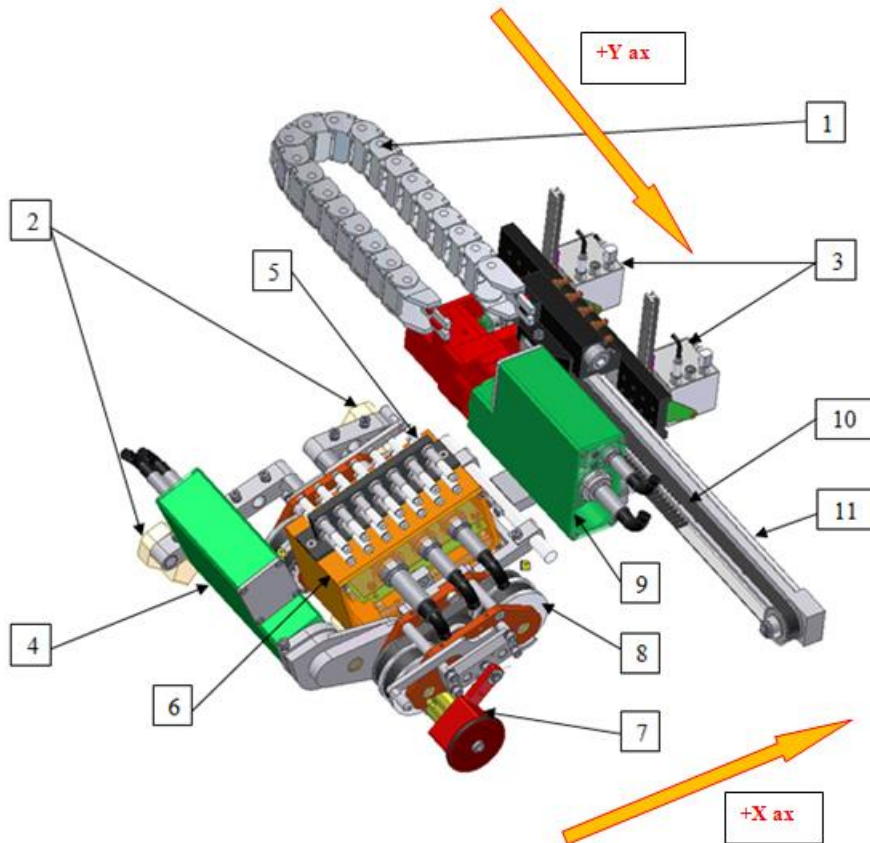


Figure 5.1-1 Main parts of SPH scanner

Description :

- 1 wire and hose protection plastic envelop
- 2 peripheral chain guide (the another chain guide located in the middle of manipulator is not visible on this picture)
- 3 UT probes on special holders
- 4 motor of X-ax (drive on all 4 wheels)
- 5 UT probe cable splitter
- 6 integrated controller
- 7 encoder of X ax
- 8 module of magnetic wheels
- 9 motor of X ax
- 10 belt transmission of Y ax
- 11 assembly of Y ax with UT probe holder

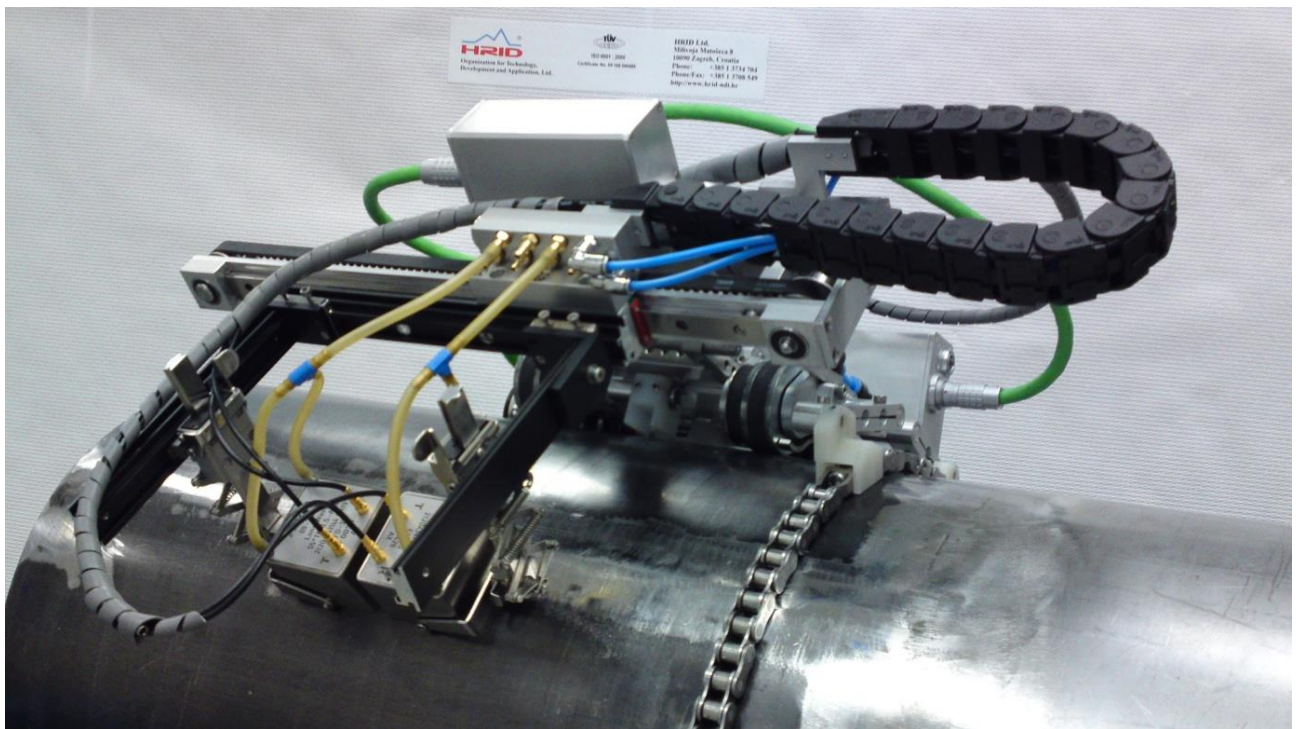


Figure 5.1-2: SPH photographs on stand in laboratory with simple probe holder



Figure 5.1-3: Water supply system

5.2 Scanner Performance:

The SPH is a general-purpose magnetic wheel X-Y scanner primarily designed for pipe inspection. It is designed with special attention to:

- Use of standard modular scanner components;
- Performance;
- Geometrical flexibility;
- Stability;
- Possible upgrade / options for inspection of special geometry's like bends, small radius pipes, flat surfaces, tanks, etc.

These features make the scanner ideal for areas where a robust and stable scanner is required for inspection with high speed, large strokes, several probes etc.

Its general characteristics are the following:

5.3 Scanner Main Components – Characteristics

- Two axes of motion: X-axis perpendicular to tube axis, Y-axis parallel to tube axis
- X-axis, maximum velocity 75 mm/s
- Y-axis, maximum velocity 150 mm/s
- Scan length in Y-axis direction till 240 mm or till 600 mm (depending on used rail, both rails are an integral part of delivery)
- Positioning Accuracy ± 0.1 mm on the path of 100 mm
- Scanner is equipped with encoders to monitor the position of ultrasonic probes in the X and Y direction
- Regarding to the geometry, possibility of testing tubes with diameters from 70 mm to infinity (plain surface)
- Regarding to test material, possibility of testing ferrite steel tubes, as well as stainless austenitic steel tubes
- Testing on straight tube parts
- Protection against dust and water: according to IP54 standard
- Mass of the scanner: approx. 10 kg
- Scanner dimensions (Figure 5.3-1):

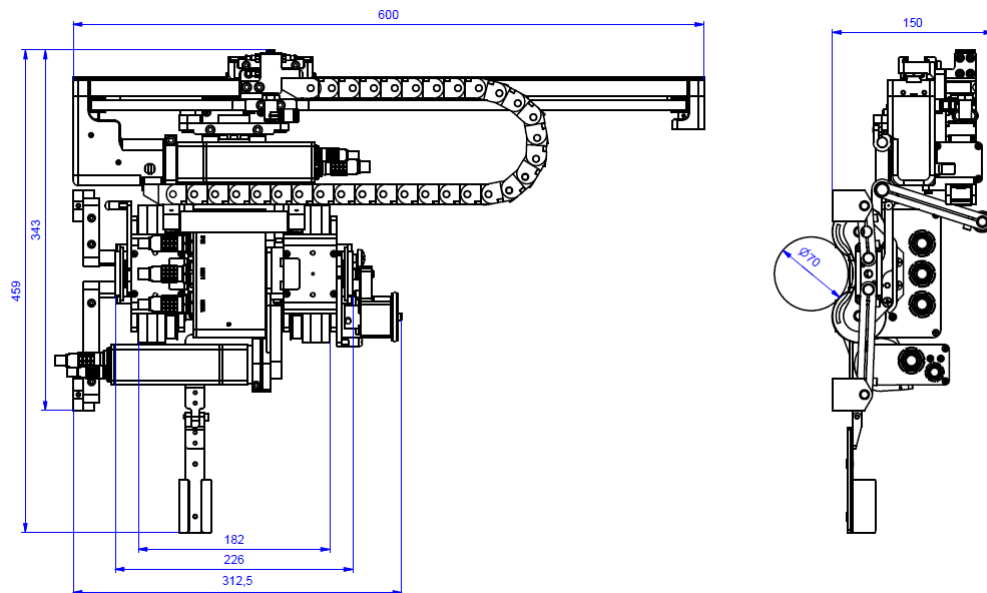


Figure 5.3-1: SPH scanner – main dimensions

5.4 Control System

Control system layout is shown on Figure 5.4-1. Main part of the control system is scanner controller which purpose is to provide power and position control of 2-axis SPH scanner.

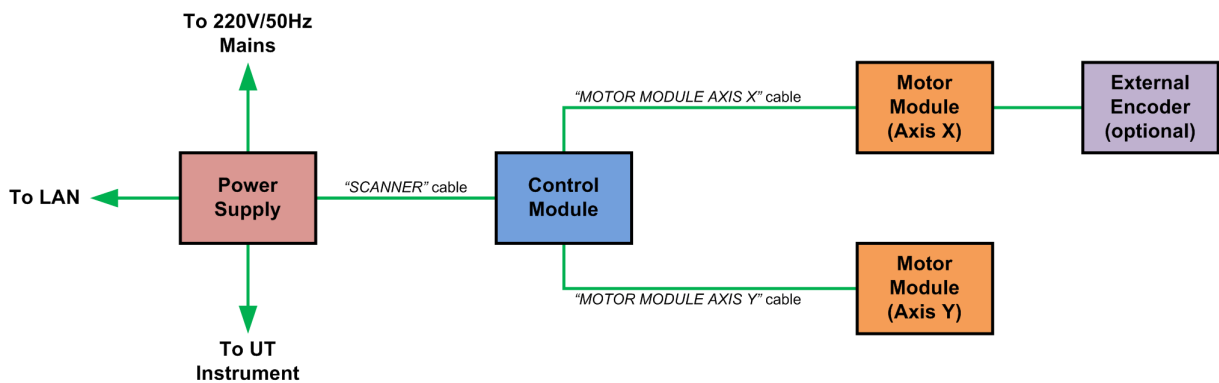


Figure 5.4-1: SPH control system block diagram

Scanner controller receives commands from remote PC through UTP LAN cable. From received commands and actual scanner speed and position, the controller calculates control signal which is then passed to scanner motors. Each scanner axis has independent control loop which means that the scanner axes can be moved independently.

The second important part of control system is *HRID Scout* control software. This software runs on remote PC and its purpose is to provide user interface to scanner operator and to, from operator commands, create position and speed set values for scanner controller. Each movable scanner axis has a position relative to its zero position. In scanner control software, all movable modules' positions can be controlled, and all axes are controlled using their position.

The axes used for scanning will combine their positions through a coordinate model to give a set of scanner coordinates in the X-Y coordinate system. This enables execution of various scan trajectories which are needed during the inspection of piping welds.

HRID Scout software is an advanced 3D software where all manipulator movement can be monitored by external camera and in virtual reality. External camera can be mounted on the inspection platform or can be mounted on the scanner body.