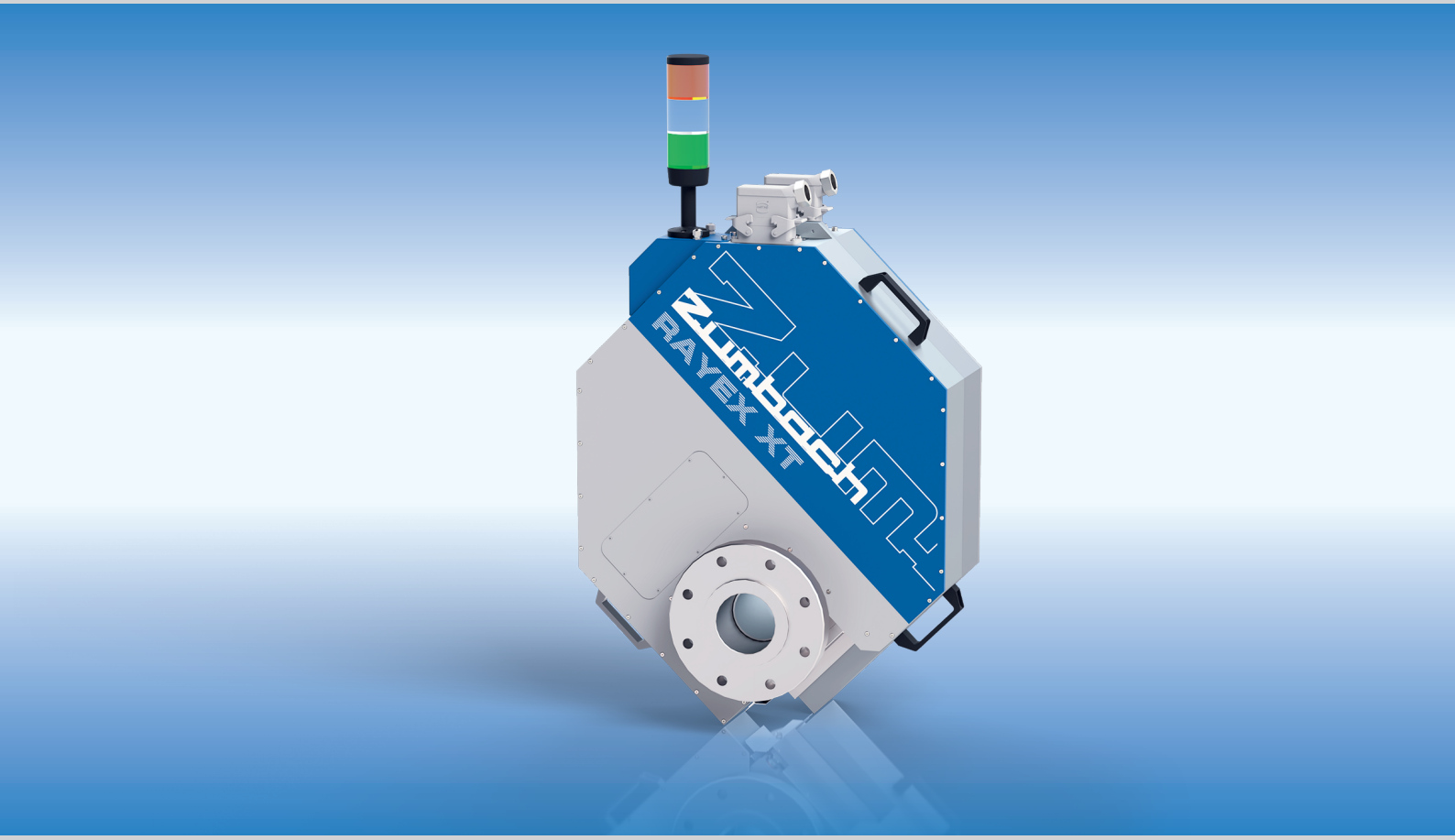
Zumbach

SWISS PRIME MEASURING SINCE 1957

RAYEX® D XT



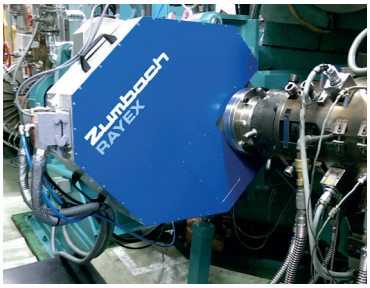
State-of-the-Art X-Ray Measuring and Control Systems for Wall Thickness (3 layers), Eccentricity, Diameter / Ovality

INTRODUCTION

RAYEX D XT is a low energy X-ray and high speed scanning system for the measurement of wall thickness, eccentricity, diameter and ovality of multilayer or single layer products in CV lines or others. RAYEX D XT is based on the worlds first system which was able to measure all relevant cable parameters from outside the tube looking through beryllium windows.
The RAYEX D XT is protected under international patents CH 685 336 A5, US 5 518 681, US 5 795 531 and other rights.

Safe, accurate and economic in any line and process:

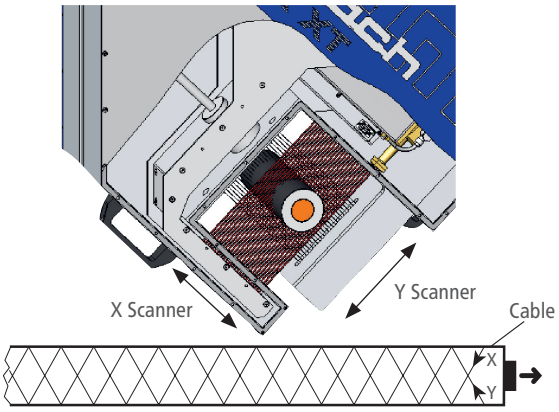
- CV lines
  - CCV, VCV
  - MDCV
  - Steam CV
  - Rubber CV
- Silane for LV and MV
- Subsea cables



MEASURING PRINCIPLE

In order to achieve an accurate measurement of the individual layers, a scanner with a ultra-stable X-ray source was developed. The source supplies a very narrow beam (pencil beam) which penetrates the cable very selectively at the points of interest.
The receiver has a very high resolution and is made so that no scattered radiation can falsify the readings. Source and receiver are mounted on a C-frame which is moved back and forth across the cable by a stepping motor driving a ball screw.
A special processor controls the scanner speed and positions. Two such units scan the cable in perpendicular planes oriented at 45° to the horizontal.

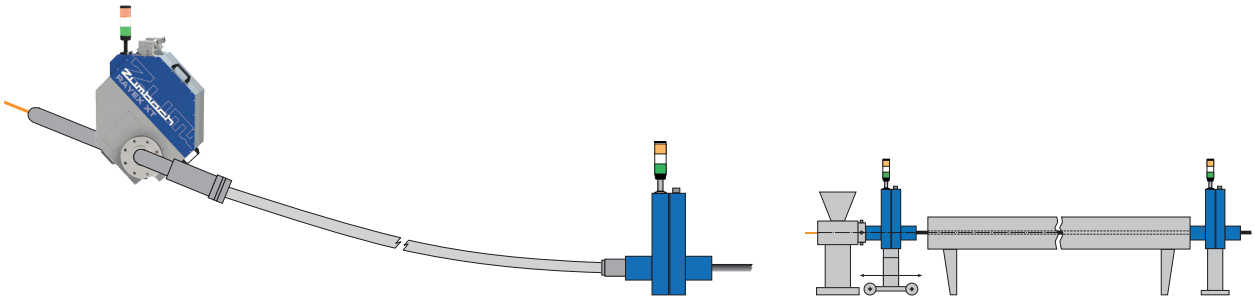
A pencil beam of radiation penetrates the product (e.g. high voltage cable etc.) in vertical and horizontal direction. Each X-ray scanner (X and Y) is accommodated in a separate scanner box. The intensity of the radiation after the penetration of the product cross-section is captured by a receiver (scintillator), located on the opposite side of the X-ray sources. The sensor signals are processed directly in the scanner box. The simultaneous processing of the X and Y axis allows a very high measuring rate.



Simultaneous, uninterrupted scanning in X and Y

APPLICATIONS AND TYPICAL LINE LAYOUTS

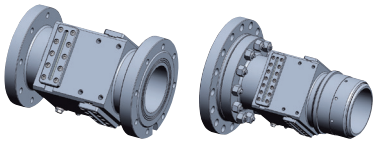
The measuring system RAYEX D XT is typically used on CCV, VCV or Silan extrusion lines. Individual implementation designs offers the best measuring results.



Customized measuring tube segments

Zumbach Electronic has wide experience and a high quality standard for the design and manufacture of customized tube segments for each particular applications.

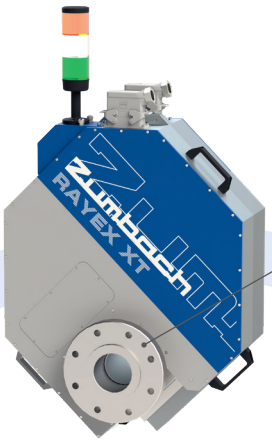
- For nitrogen and/or steam CV lines
- For all relevant safety standards (TÜV etc.)
- Made of highest quality stainless steel.


Typical designs of customized and delivered segments.

MODULAR AND PRACTICAL

The RAYEX D XT is engineered as a modular system. There are practically no limitations in cable lengths between the main components and the auxiliary displays etc. The measuring unit is composed of 2 identical, light-weight scanners. All this means flexibility and easy installation, maintenance and service.

Measuring unit
This unit comprises 2 identical scanners each with an X-ray source and a detector, as well as the corresponding driver system with control electronics.

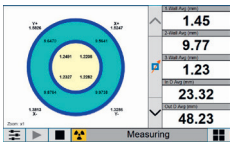


Measuring tube
This tube section, is manufactured to customer specifications. It usually replaces the head piece (sealing tube) of the telescopic tube and carries at the same time the measuring unit.

Air dryer/Cooler
Option for environments with high humidity and/or extreme temperatures.

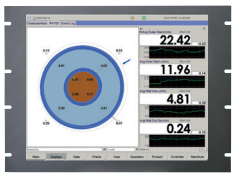
Cooling unit
This unit is equipped with a closed water system for the cooling of the measuring unit.

Distribution unit
Connection box for the system wiring. Power and signals are supplied through flexible conduits, and quick connectors.



Embedded communication – Web Server
The design with embedded communication interface allows the higher-level system to configure and capture measurement results. The measuring algorithm itself is controlled by the RAYEX D XT and only requires the number of layers and the nominal wall thickness to be specified. All measurement results can be read and processed by the higher-level system. Available interfaces are: Profinet IO, Ethernet TCP/IP, EtherNet/IP and OPC UA.

STANDALONE MEASURING SYSTEM SOLUTION WITH USYS RAYEXMASTER



USYS IPCe RAYEXMASTER

The USYS IPC 1e/2e processors allow complete process control and optimisation. All measured values can be monitored and logged in the software. The stored product recipes enable easy operation of the system. Additional sensors such as: ODAC laser diameter gauges or KW lump and neckdown detectors can be connected if required. The USYS processors also have inputs and outputs for alarming the line control and can also communicate with a higher-level system via the HOST interface.

Thanks to the USYS it is also possible to connect the system in combination with other Zumbach gauges.

ODAC®
Laser measuring heads

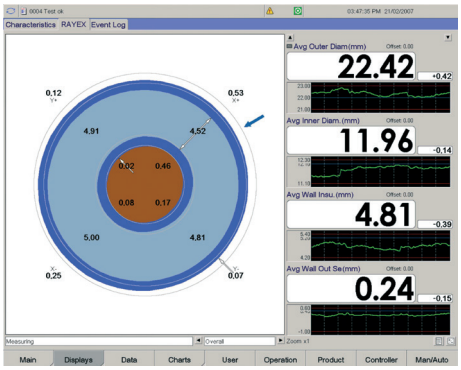
Spark Tester
Dielectric Testing/Spark Test

MSD
Linear sensor technology & multiple light sources

RAYEX®
X-Ray technology

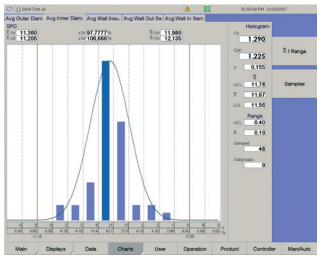
DATA DISPLAY ON TOUCH SCREEN

Great importance was attached to the simple operation and self-explanatory display of the measured data. This is achieved by using multi-colour graphics, supplemented by numerical values, bar graphs, trends etc. Out-of-tolerance situations will be immediately spotted, as respective areas turn red. Free moving arrows always point to the thinnest position of each layer.



Cross-section and characteristics view

Main screen showing, among others, line schematic, status and instrument view, as well as characteristics view.



Statistics

FEATURES

Highest accuracy and stability

- Ultra stable X-RAY source guarantees high local sensitivity and measuring accuracy thanks to highly focused beam and stable intensity.
- Even a 0.3 mm (.012 in.) inner semiconductor is measured accurately.
- The unique design of the X-RAY tube allows that 80% can be recycled!

Unique protection system for beryllium windows

- For efficient protection of the Beryllium windows (which is crucial regarding safety, lifetime and maintenance cost) a unique protection tube for quick exchange was conceived.
- Special version for steam CV lines

High measuring rates, simultaneously in X and Y axis

- Preprocessing already within scanner, guarantees high measuring rate and quality of measurements.

Modular light-weight scanners

- Superior design with 2 interchangeable scanners for X and Y axis.
- Operation with 1 single scanner is possible.
- Excellent X-ray protection; easy and simple integrated micro-focus X-ray source. No interference possibilities.
- Fully enclosed and protected scanners without external motors, cables etc.

Diagnose and function test

- Reference scan possibility to readjust dirt contamination.
- Fine tuning possibility to set against off-line comparison with overhead projector/shadow graph.

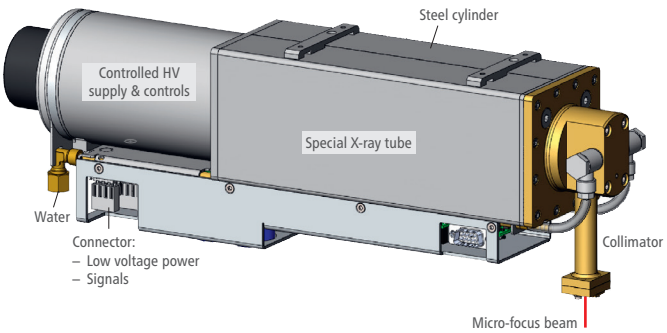
ULTRA STABLE X-RAY SOURCE

Since suitable X-ray sources were not available on the market, ZUMBACH decided to develop a special, integral source to solve the subject problems. The result is an Ultra-stable Micro-focus X-ray source, in short called UMX source. The UMX source is a self-contained module, containing the actual X-ray tube, the high voltage generator and auxiliary devices, all in an oil-filled and sealed steel cylinder.

Contrary to most other systems, there is no need for an external high voltage generator with long HV cables, which can cause instabilities and noise. Also, operating safety and reliability are improved.

Advantages of the Zumbach X-Ray source

- The stability of the UMX-source is better than standard X-ray tubes with external high voltage supply.
- Both voltage and current are accurately closed loop controlled.
- The X-ray beam is highly focussed and specially shaped by means of a beam "collimator" to ensure high local resolution.
- Thanks to precise mounting points the complete source can be changed quickly and without re-alignment by the user.



GENERAL TECHNICAL DATA

Measuring units (each unit comprises 2 measuring heads)

Power supply	115...230 VAC (- 10 % / + 6 %), 50 / 60 Hz (central connection to the DPU)
Max. power consumption	DPU: 620 W / Cooler unit: 1600 VA
Measuring range (max. cable ø)	Model 160D XT: 90 mm (3.5 in.) / Model 220D XT: 140 mm (5.5 in.)
Max. insulation thickness [1)]	XLPE: max. 40 mm (1.57 in.) / EPR: max. 10 mm (.4 in.)
Min. semicond. thickness	0.3 mm (12 mil)
Insulation / core material	XLPE or EPR / Cu or Alu (special materials on request)
Measuring accuracy	Typically ± 0.03 mm (.001 in.) repeatability for medium measuring range
Resolution	0.01 mm (.0005 in.)
Scanner system	2 X-ray scanners, at 90° to each other in the X and Y axis
Scan mode	Simultaneous, Hi-speed scanning in X and Y
Scan/updating time	1…3 seconds (automatic adaption to cable diameter)
Operating temperature	0…45° C (32…113° F)
Cooling [3)]	Heat exchanger for closed water circuit + optional air dryer/cooler
Weight	RAYEX 160D XT: 48 kg (105.8 lbs.) / measuring head RAYEX 220D XT: 52 kg (114.6 lbs.) / measuring head
Altitude	0...2000 m (0...6560 ft.)
Humidity (max.)	95 % non condensing (for higher humidity optional air dryer is requested)
Protection class	Measuring head: IP 60. DPU: protected against dust and splashing of water, corresponding to IP 54.
Radiation level	Max. 0.2 µS/hr above natural level [2)]

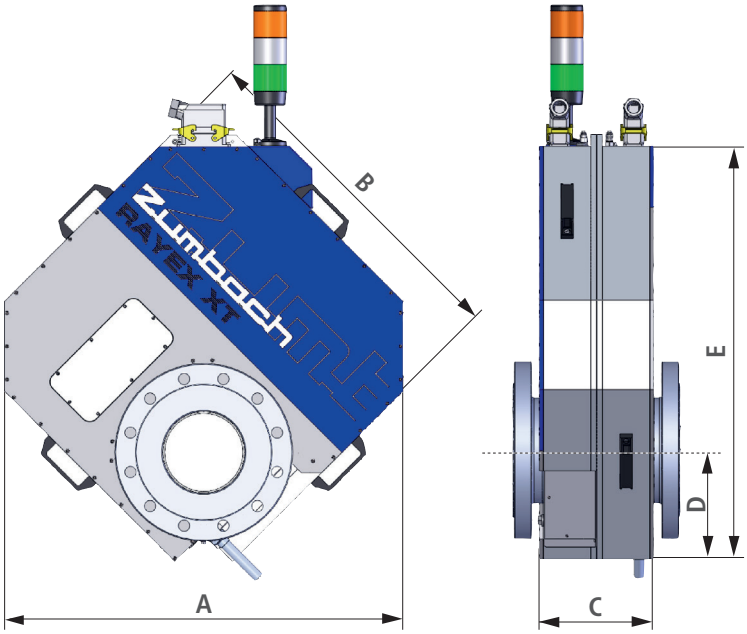
1) For higher values in XLPE or EPR special measuring units upon request.
2) Measured at a distance of 100 mm (4 in.) Note: This value is far below most national regulations
3) Due to the fact that the sensing part is outside of the pressure tube, the cooling of the system is not critical. A closed water circuit for the X-ray source and the measuring head ensures that permitted operating temperatures are not exceeded and guarantees long lifetime of the X-ray tube.

Processor and display unit (option)

Dimensions / Weight	510 x 600 x 2020 mm / approx. 120 kg (23.6 x 23.6 x 79.5 in. / approx. 264 lbs.)	
Power supply	115...230 VAC (- 10 % / + 6 %), 50 / 60 Hz	
Temperature	Operating: 0…45° C (32…113° F) / Transport: - 20...50° C (- 4...122° F)	
Display	SXGA colour TFT touch screen – Instant display after each measurement – Graphic display of the measured values – Bar graph, numerical or trend display – Measurement value display: – Diameter (min./max./average) – Wall thickness (outer semiconductor/ insulation/inner semiconductor) – Eccentricity – SPC/SQC data/charts: (configurable) – Average (X-bar) – Max./Min. value (range) – Standard deviation – Statistical distribution (histogram) – Output for remote readout	
Processors	USYS IPC 2e RAYEXMASTER – BUS System: PCIe/PCI – CPU: Intel i5-2400 – Memory: 128 MB – Interface: 3 x USB 1.1, Ethernet, Parallel – Serial Interface: 2 x RS-232 – Extension PCBs: Quad RS-422, IO.130	IO.130 PCB – Static controller: 1 (± 10 V, ± 5 mA) – Analogue inputs: 1 – Analogue outputs: 3 – Digital inputs: 8 – Digital outputs: 5 – Relay outputs: 3
Interface unit	– Easy and safe connection of RAYEX measuring units – Interface for additional user hardware – 24 V safety loop output – Spare output 24 V/1.25 A	– Length counter Namur A, Encoder AB

• All technical data are subject to change without notice

DIMENSIONS



	RAYEX 160D XT	RAYEX 220D XT
A	640 mm 25.20 in.	840 mm 33.87 in.
B	690 mm 27.17 in.	728 mm 28.66 in.
C	240 mm 9.45 in.	240 mm 9.45 in.
D	202 mm 7.95 in.	230 mm 9.05 in.
E	830 mm 32.68 in.	874 mm 34.41 in.

COMMUNICATION AND NETWORKING

Today, the ability of sensors or processors to communicate with other computers or networks is essential. ZUMBACH offers a variety of gauges, interface units and USYS software to satisfy almost any need and concept.

USYS Web Server – With this software integrated by default, a USYS processor can be addressed via an Ethernet TCP/IP network (LAN, Intranet, Internet), using a standard browser.

USYS Data Log – is a WINDOWS™ based software for easy data collection from one or several ZUMBACH processors and for saving the data in text or Excel™ files. USYS Data Log communicates to the ZUMBACH processors via a serial RS-232 port or an Ethernet TCP/IP connection.

USYS Report Manager – The USYS processor can store in a local or external memory the detailed statistical data calculated for the Piece, Lot and SPC periods. In this way it is possible to recover and visualize the data of previous productions and reproduce the quality control printed reports.

Embedded OPC UA Server – The OPC-UA protocol is integrated in the measurement system and can be activated as an option. The OPC Unified Architecture (UA) is a platform-independent machine-to-machine communication framework for industrial automation developed by the OPC Foundation. OPC-UA is the protocol of choice for industrial internet of things (IIoT) and is suitable for data collection and management and for control. The OPC-UA capabilities allow a seamless integration in the area of process control such as SCADA or MES.

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SAVINGS THANKS TO WALL THICKNESS REDUCTION

The worldwide fluctuations in raw material prices have an important influence on the cost structure. The rising production costs can hardly be passed on to the end customer in a competitive market. Thanks to the experience of over 60 years in the measuring, control and data processing technology, Zumbach offers solutions which guarantee most cost effective manufacturing, highest accuracy as well as continuous production and quality monitoring.

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