



KEMM
KAYNAK EĞİTİM VE MUAYENE MERKEZİ

NDT GÜNLERİ
“XII. Kaynak Kongresine Giderken”
9 Ekim 2021 Cumartesi / BAOB Yerleşkesi - BURSA

GELİSMİS ULTRASONİK MUAYENE TEKNİKLERİNİN GELECEĞİ VE GÜNCEL GELİSMELER

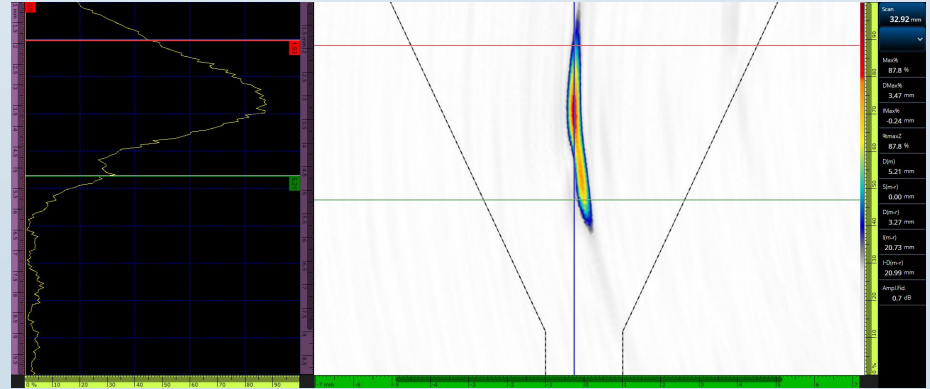
Sabri BABA

NDT Urun Muduru

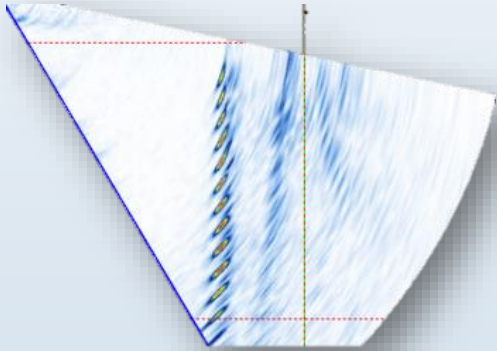
Olympus MEA

Metalurji ve Mzl. Muh. & Kaynak Muh.

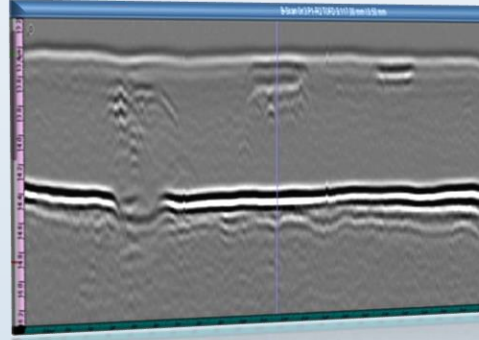
UT-Level 3 - MT,PT,RT Level2



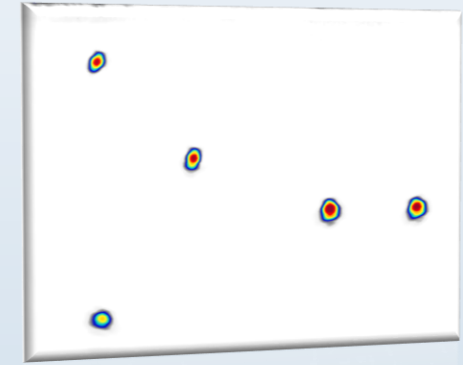
GELISMIS ULTRASONİK MUAYENE TEKNİKLERİ



Phased Array



TOFD



Full Matrix Capture
Total Focusing Method

STANDARTLAR

Organization	Code
ASME	ASME BPVC Sec. V, Article 4. 2019
ISO	ISO/DIS 23865 [IIW]: Non-destructive testing — Ultrasonic testing — General use of full matrix capture / total focusing technique (FMC/TFM) ISO 13588:2019 (PAUT) Non-destructive testing of welds Ultrasonic testing Use of automated phased array technology ISO 10863:2011 (TOFD) Non-destructive testing of welds Ultrasonic testing Use of time-of-flight diffraction technique
API	API 510 Refers to ASME Section V, Articles 4, 5 and 23 API 941 ADDENDUM1 AUGUST 2020 (TOFD,PAUT,TFM)
AWS	AWS D1.1/D1.1 M:2020 (Phased Array) Structural Welding Code Steel

STANDARTLAR

OLYMPUS

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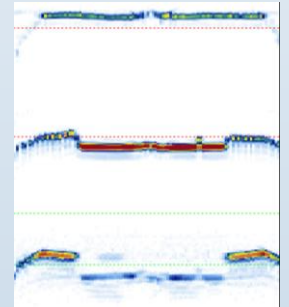
ISO 20601:2018

Non-destructive testing of welds — Ultrasonic testing — Use of automated phased array technology for thin-walled steel components



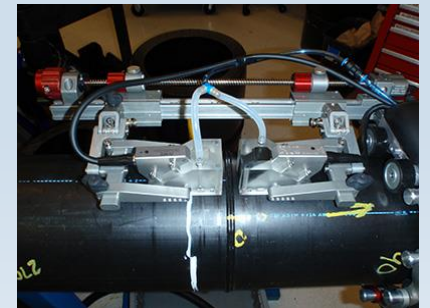
ISO/TS 16943:2019

Thermoplastic pipes for the conveyance of fluids — Inspection of polyethylene electrofusion socket joints using phased array ultrasonic testing



ISO/TS 22499:2019

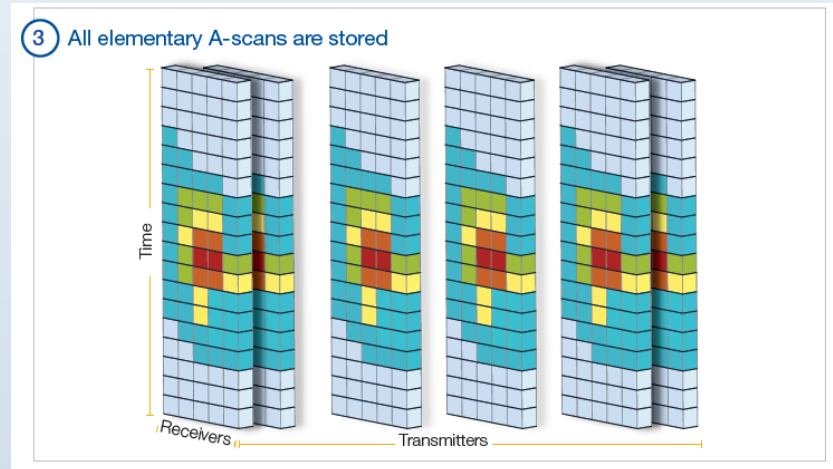
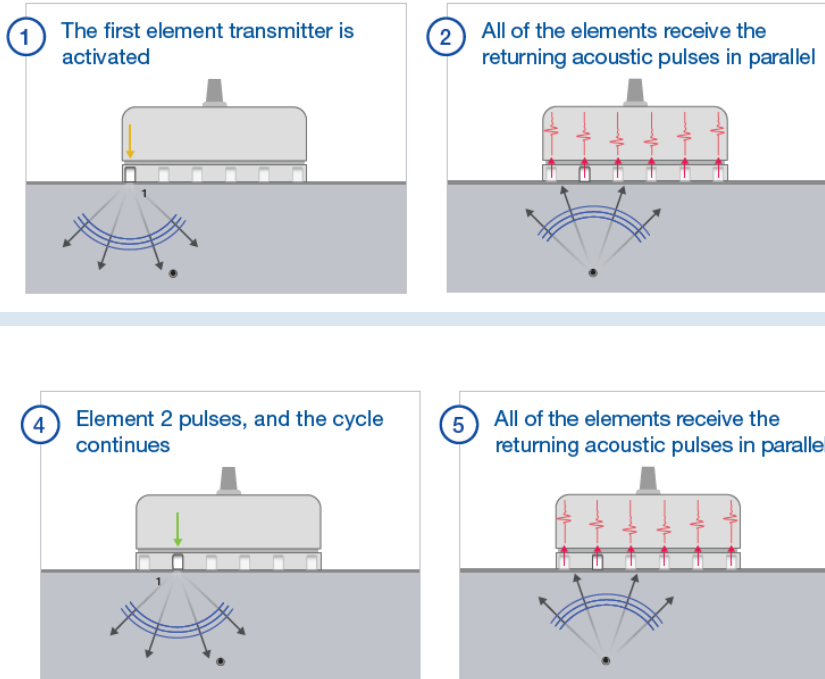
Thermoplastic pipes for the conveyance of fluids — Inspection of polyethylene butt fusion joints using phased array ultrasonic testing



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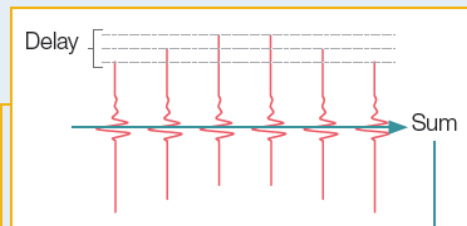
FMC – TFM

FMC—An Acquisition Strategy



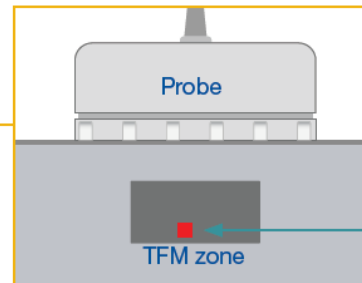
TFM – Image Reconstruction

6



Delay and sum processing is applied to all the A-scans, using the expected delay for a selected mode of propagation to a specific position in the TFM zone

7



8

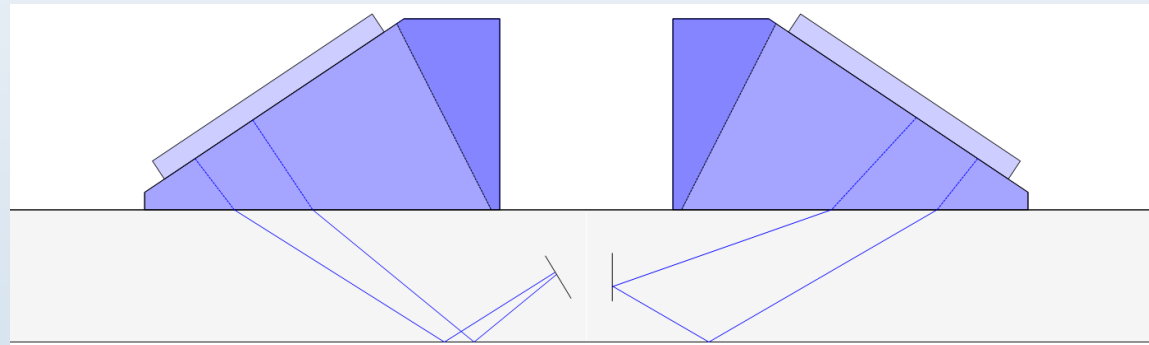
The same process is done for all pixels in the TFM zone

9

The completed cycle = 1 TFM image/frame

1 pixel is reconstructed from the amplitude of the summed A-scans

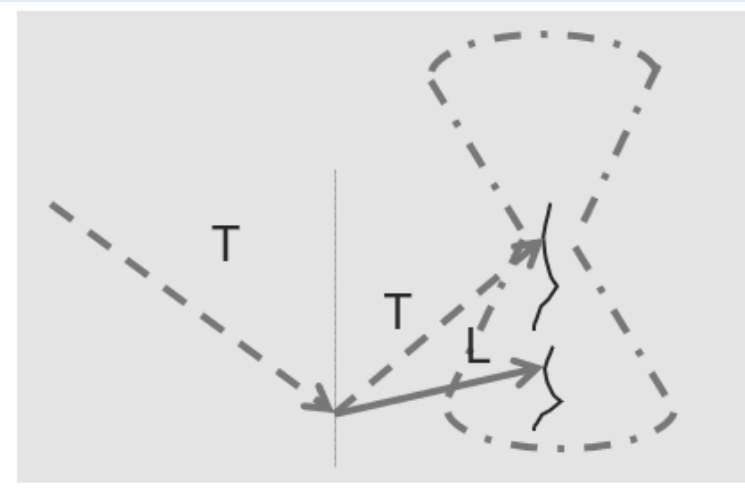
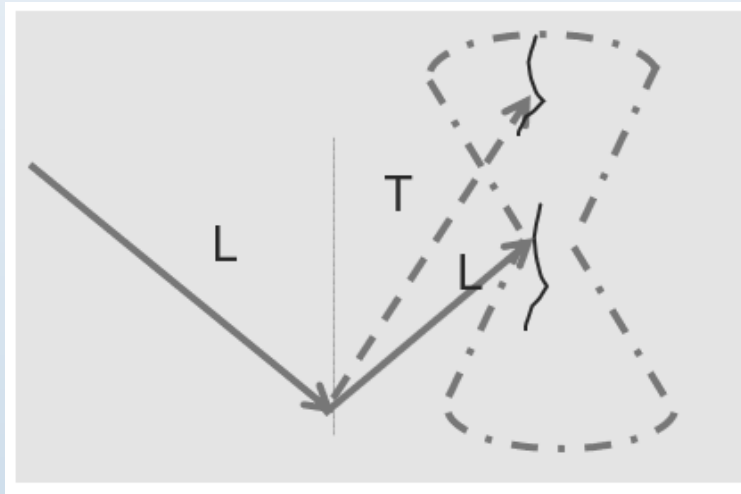
FMC – TFM



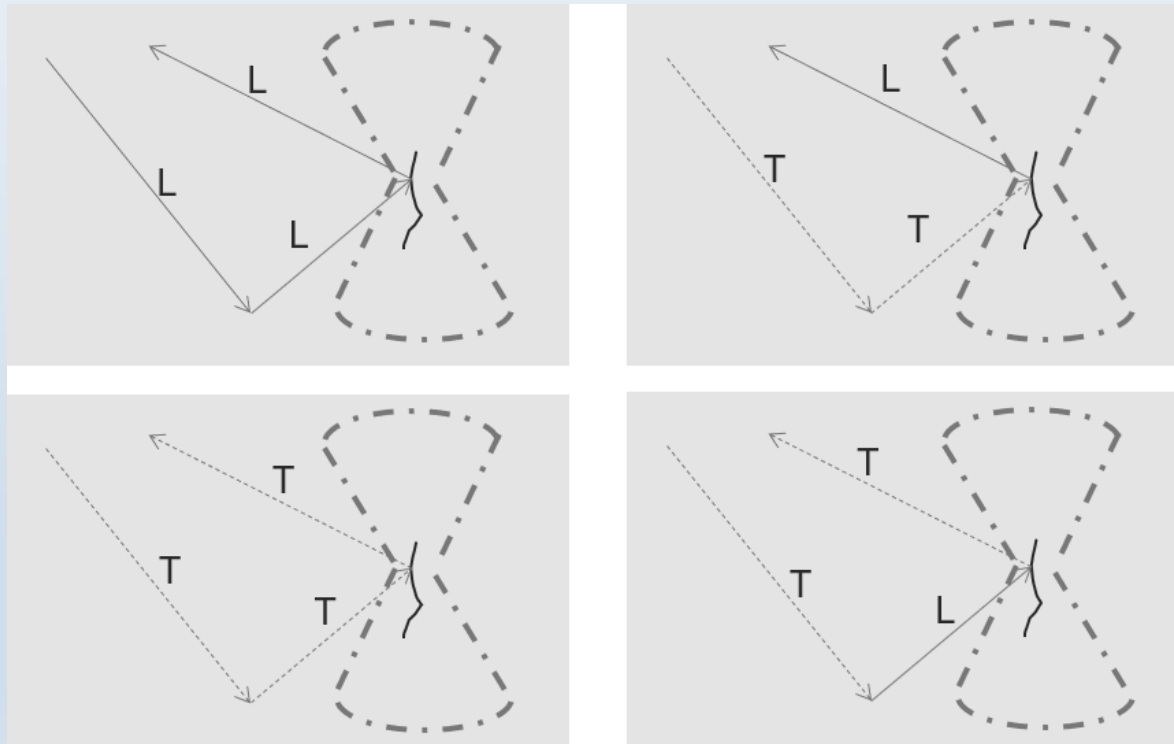
Pulse-echo mode
Like standard PAUT

Self-tandem mode
Like zonal discrimination

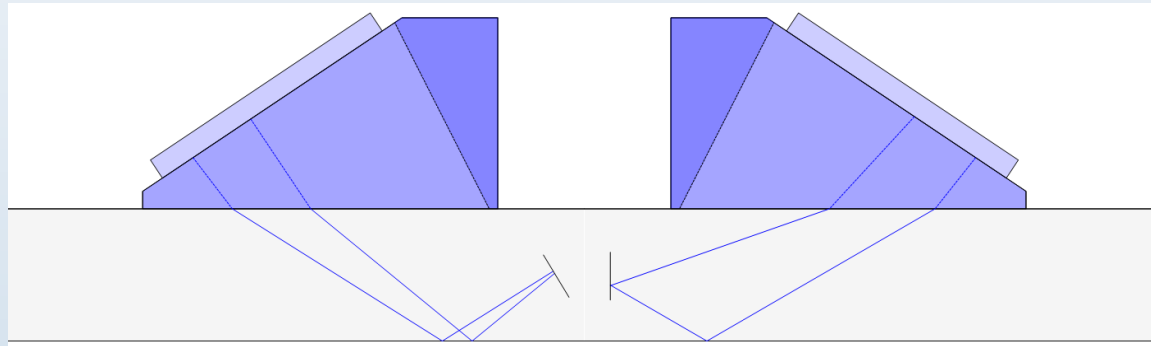
Mode conversions



Mode conversions

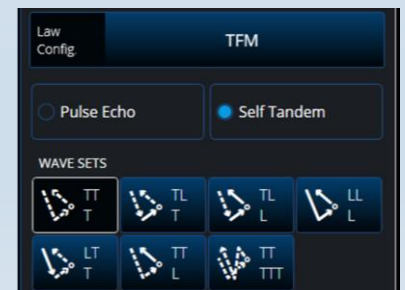
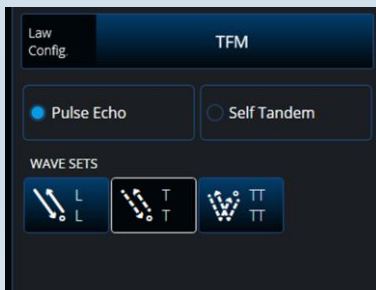


FMC – TFM



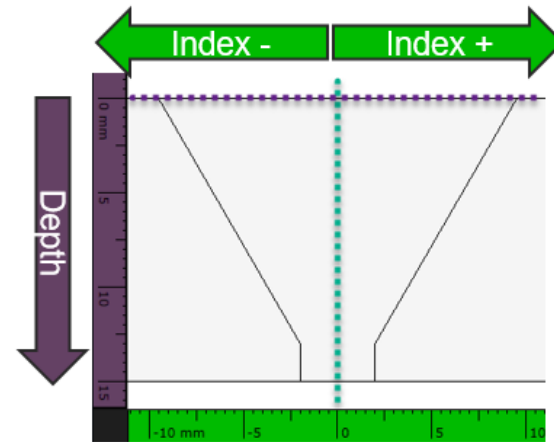
Pulse-echo mode
Like standard PAUT

Self-tandem mode
Like zonal discrimination

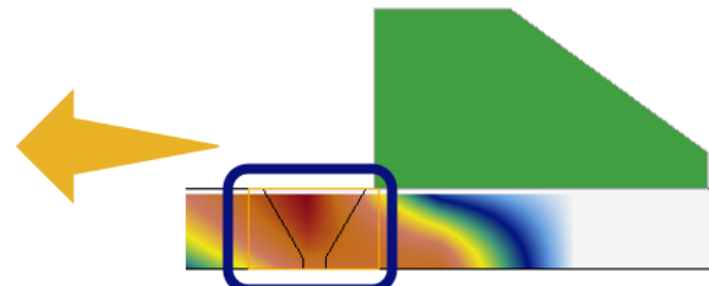
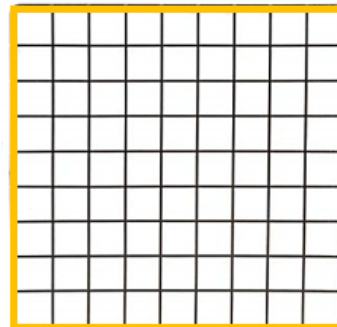


FMC – TFM

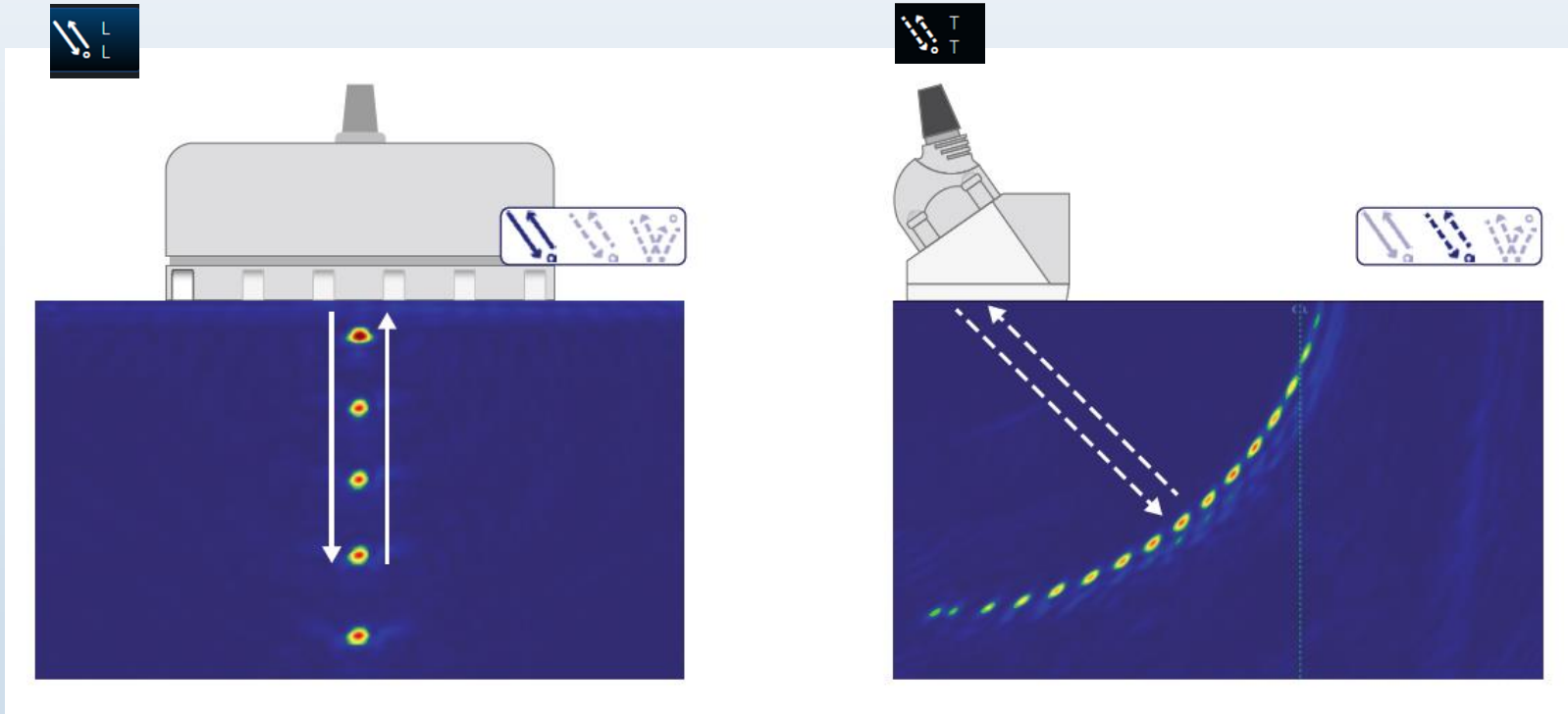
Set Zone			
Min index	-12.00 mm	Max. index	12.00 mm
Min. depth	0.01 mm	Max. depth	15.00 mm



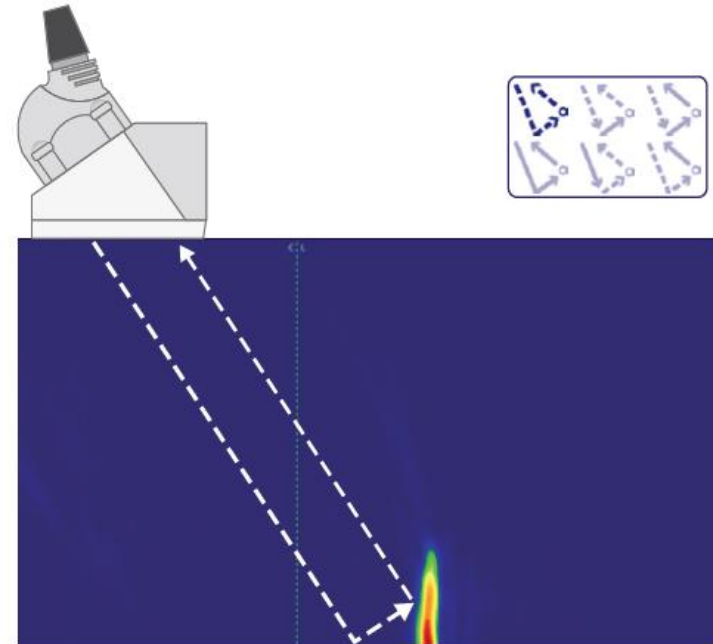
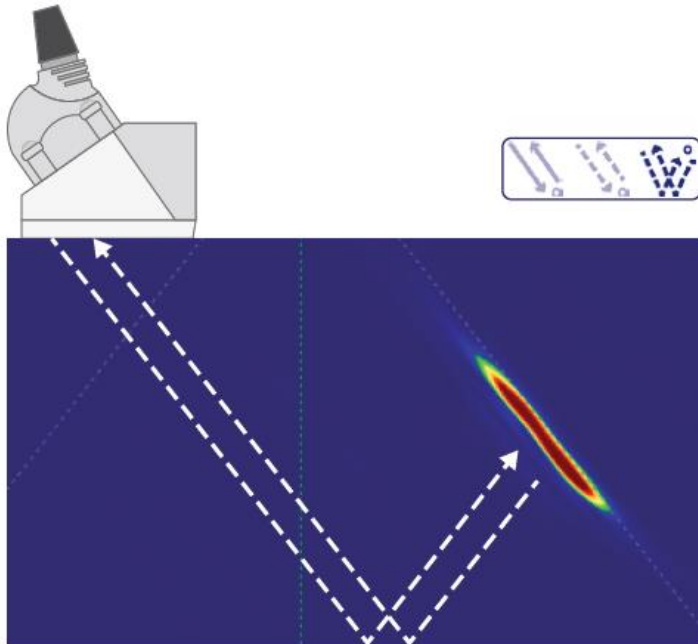
1024x1024 pixels



FMC – TFM



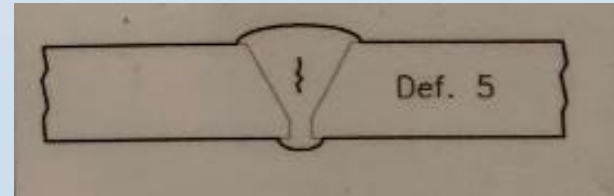
FMC – TFM



FMC – TFM

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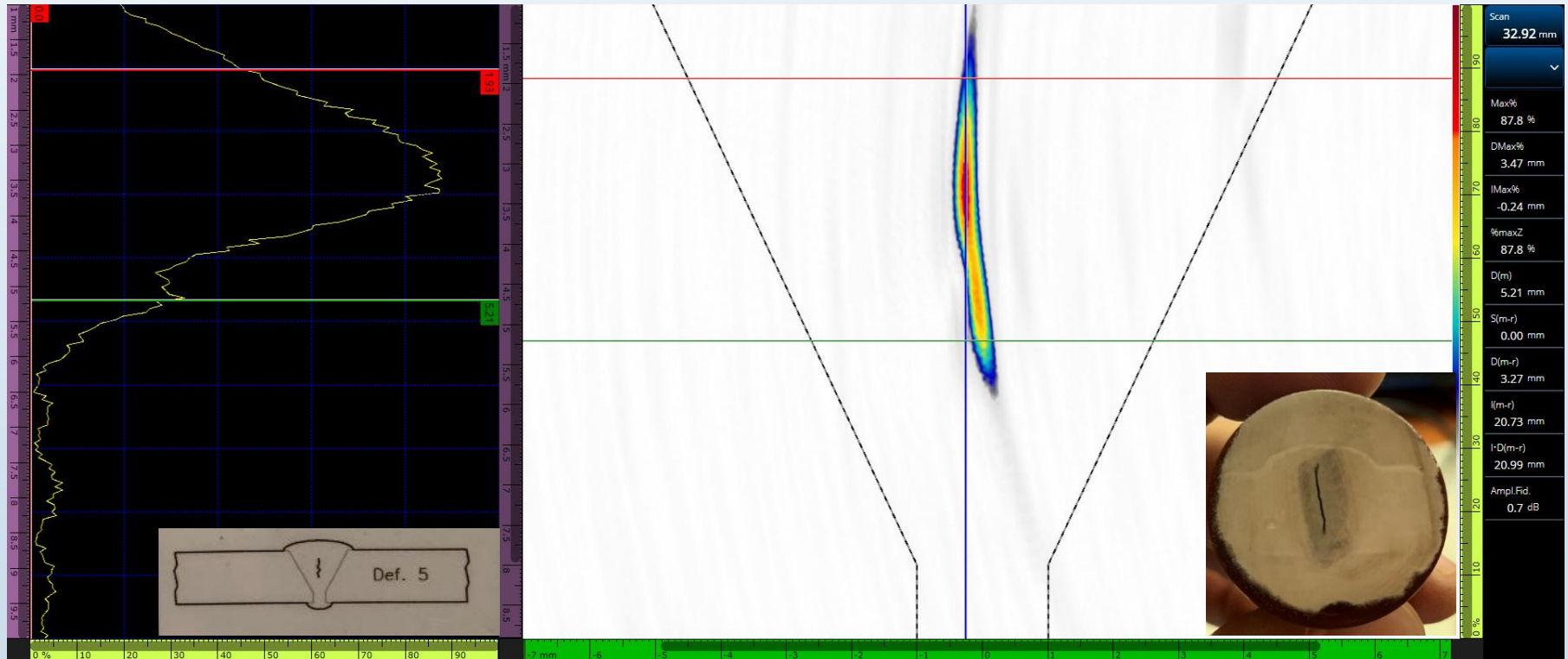
NDT GÜNLERİ

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200 mm



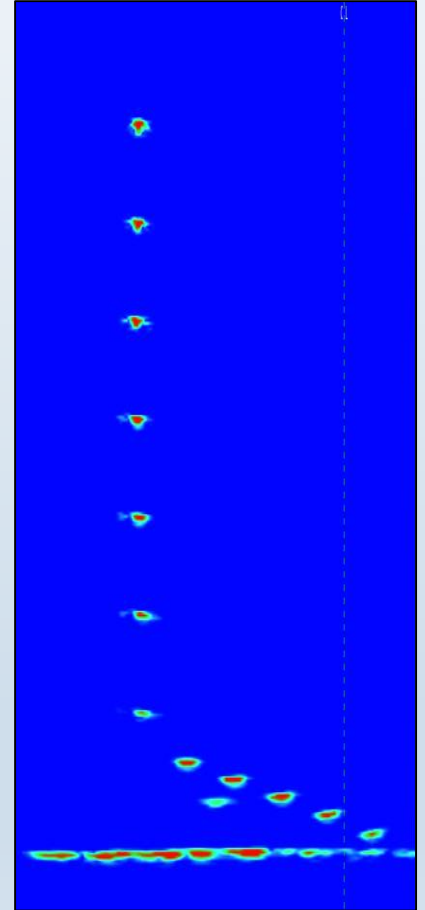
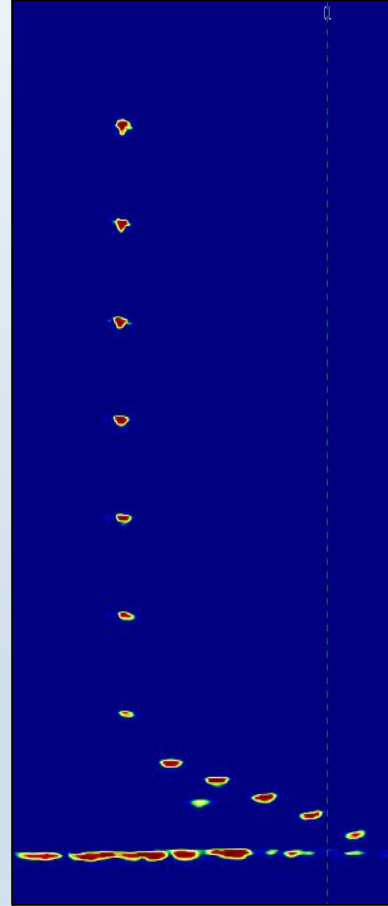
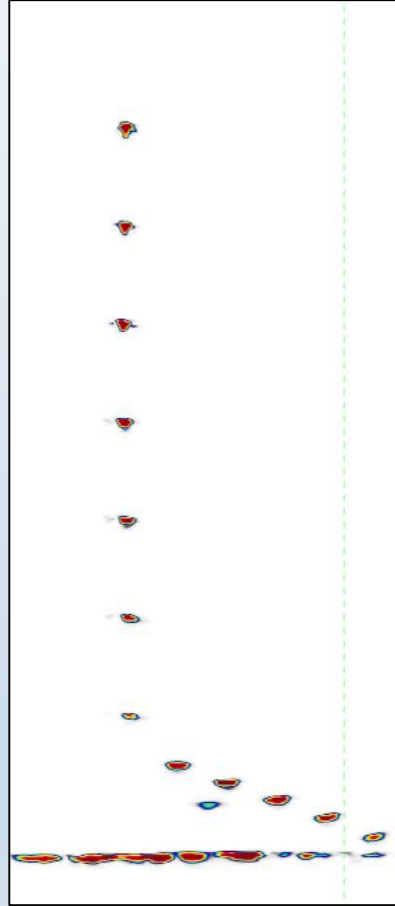
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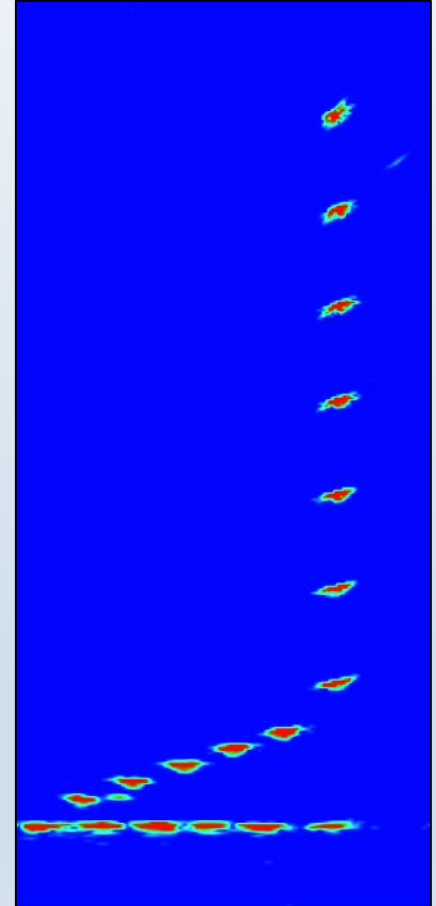
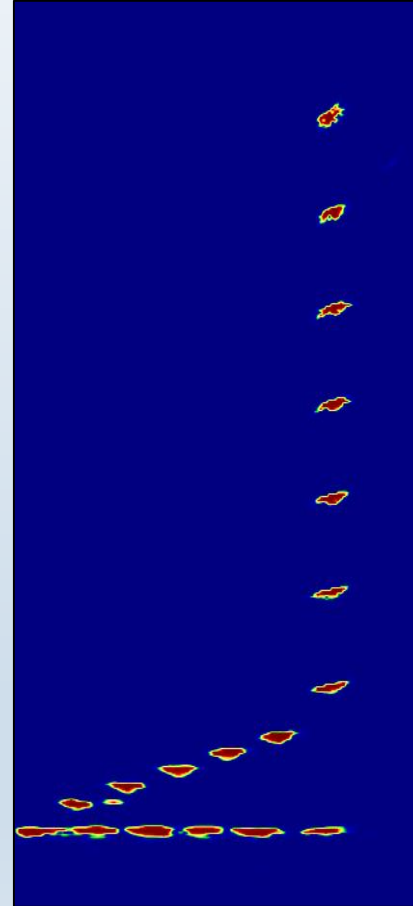
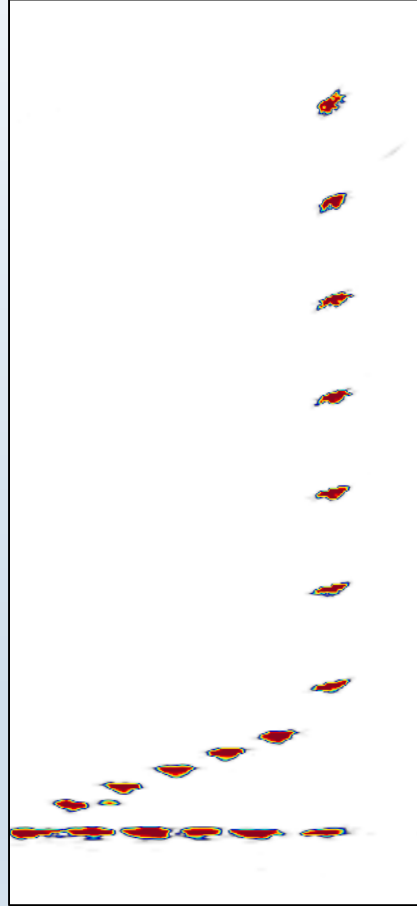
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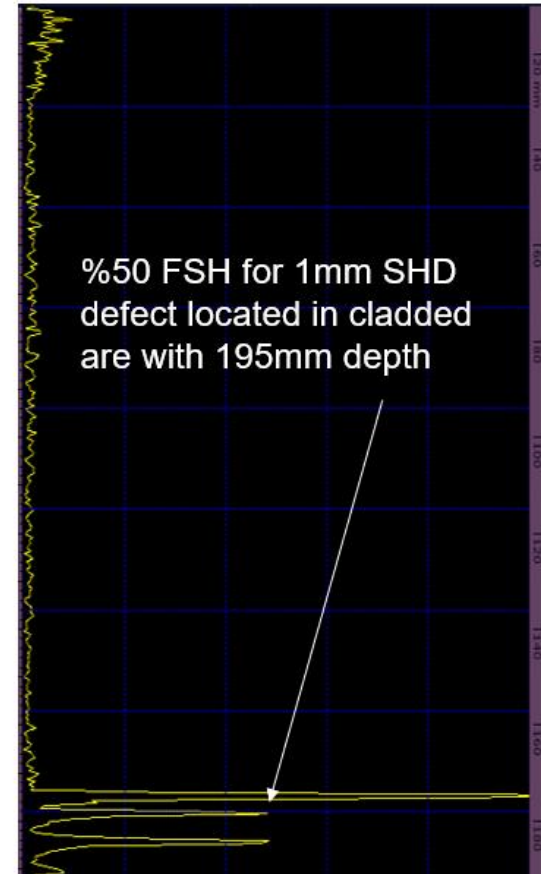
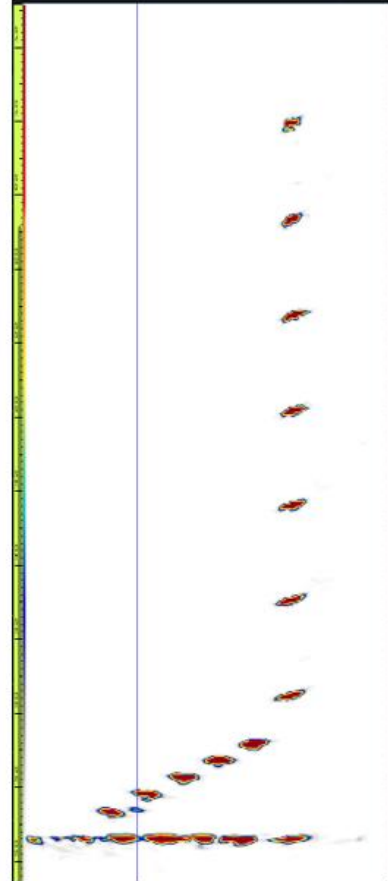
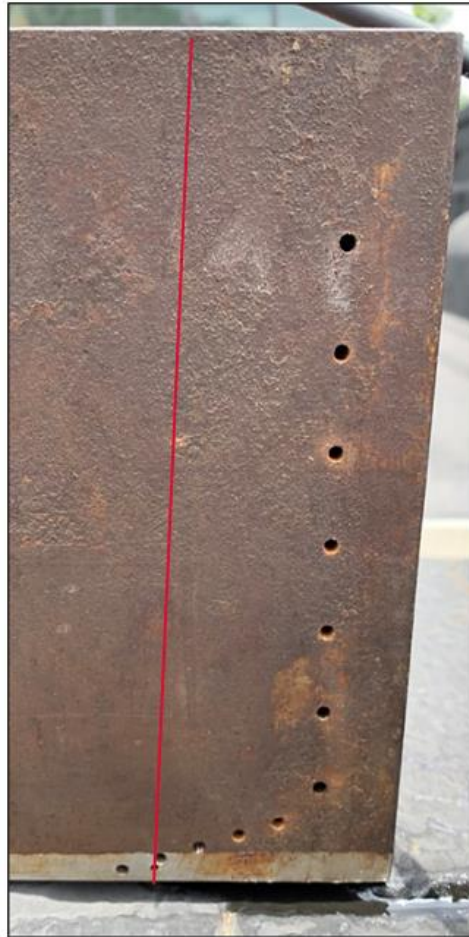


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Micrographic 1 : Cracks type 1 : Located near surface. Unetched

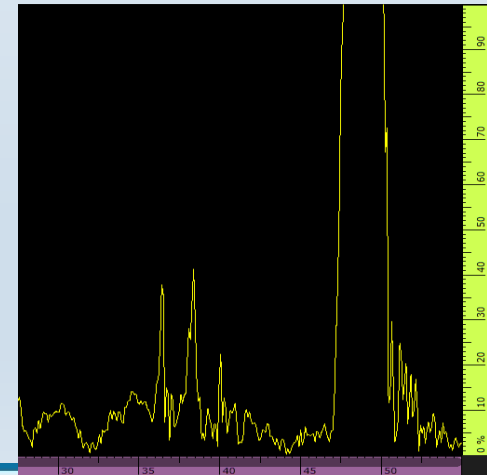
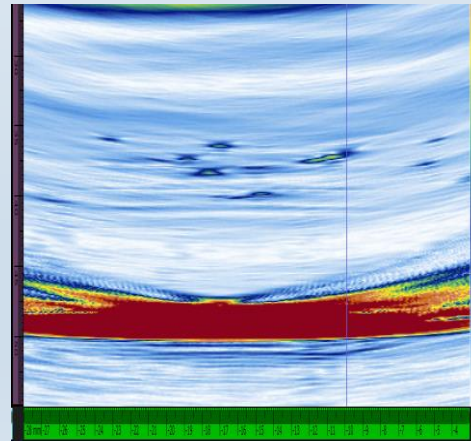
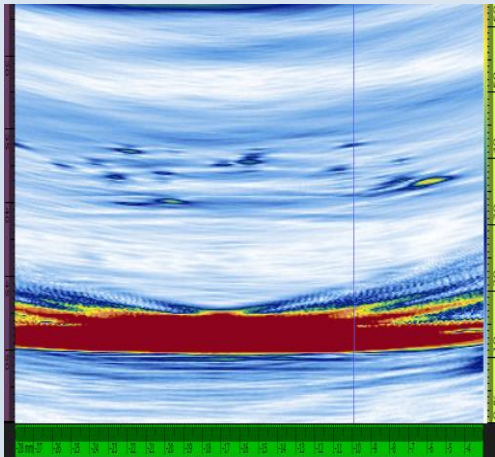
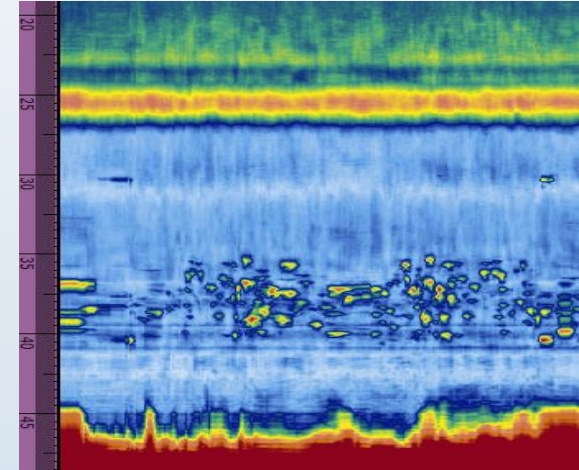


Figure 4. Micrographic sample 200x.

Micrographic 2 : Cracks type 1 : Located near surface. Etched



Figure 5. Micrographic sample 200x.



GELISMIS ULTRASONİK MUAYENE TEKNİKLERİ UYGULAMA ALANLARI

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Weld Inspection



Corrosion Inspection



Casting - Forging



HTHA Inspection



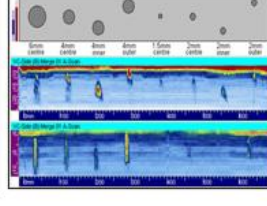
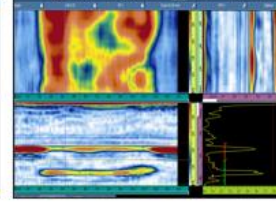
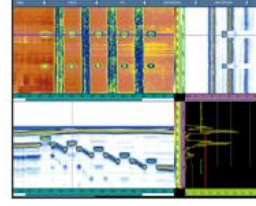
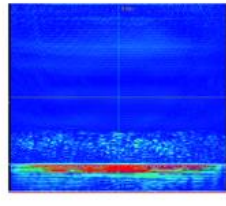
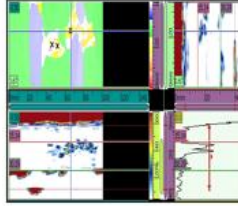
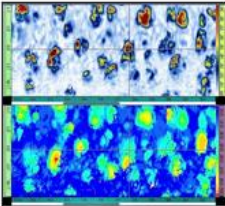
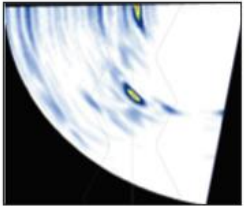
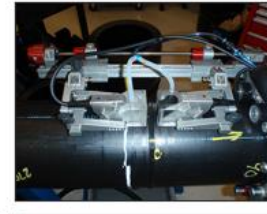
Composite Inspection



Wind Turbine Blade



HDPE Inspection



Solid Axle Inspection

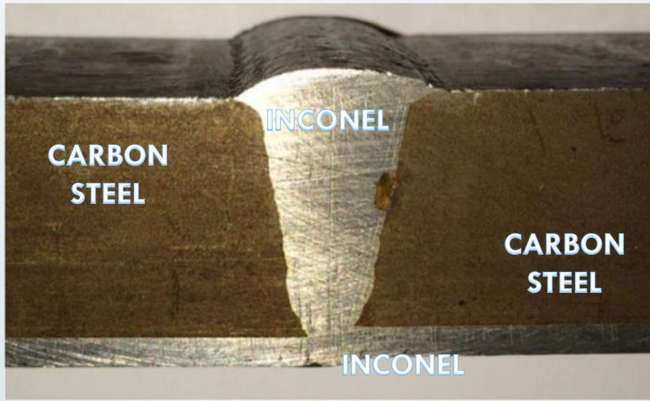


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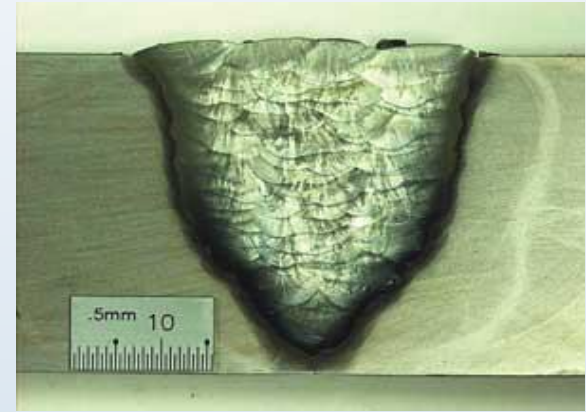
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GELISMIS ULTRASONİK MUAYENE TEKNİKLERİ UYGULAMA ALANLARI



Dissimilar material
(CRA = Corrosion Resistant Alloy)



Austenitic Stainless steel



Alloys

GELISMIS ULTRASONİK MUAYENE TEKNİKLERİ UYGULAMA ALANLARI

OLYMPUS

İNCEKARALAR

95mm



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KAYNAK EĞİTİM VE MUAYENE MERKEZİ

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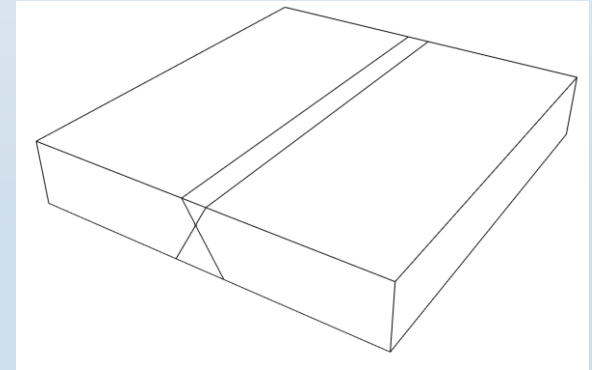
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GELISMIS ULTRASONİK MUAYENE TEKNİKLERİ UYGULAMA ALANLARI

OLYMPUS

İNCEKARALAR

110mm



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OLYMPUS

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GELISMIS TEKNIKLERDE ONEMLI ROL OYANAYAN PARAMETRELER

- MALZEME BILGISI
- STANDARTLAR
- GEOMETRI
- YAZILIM BILGISI
- EGITIM

“Bir insanın gelebileceği en büyük merteye güvenilir insan olmaktır.”

Doğan Cüceloğlu

