INTRODUZIONE ALLA ISO 4309

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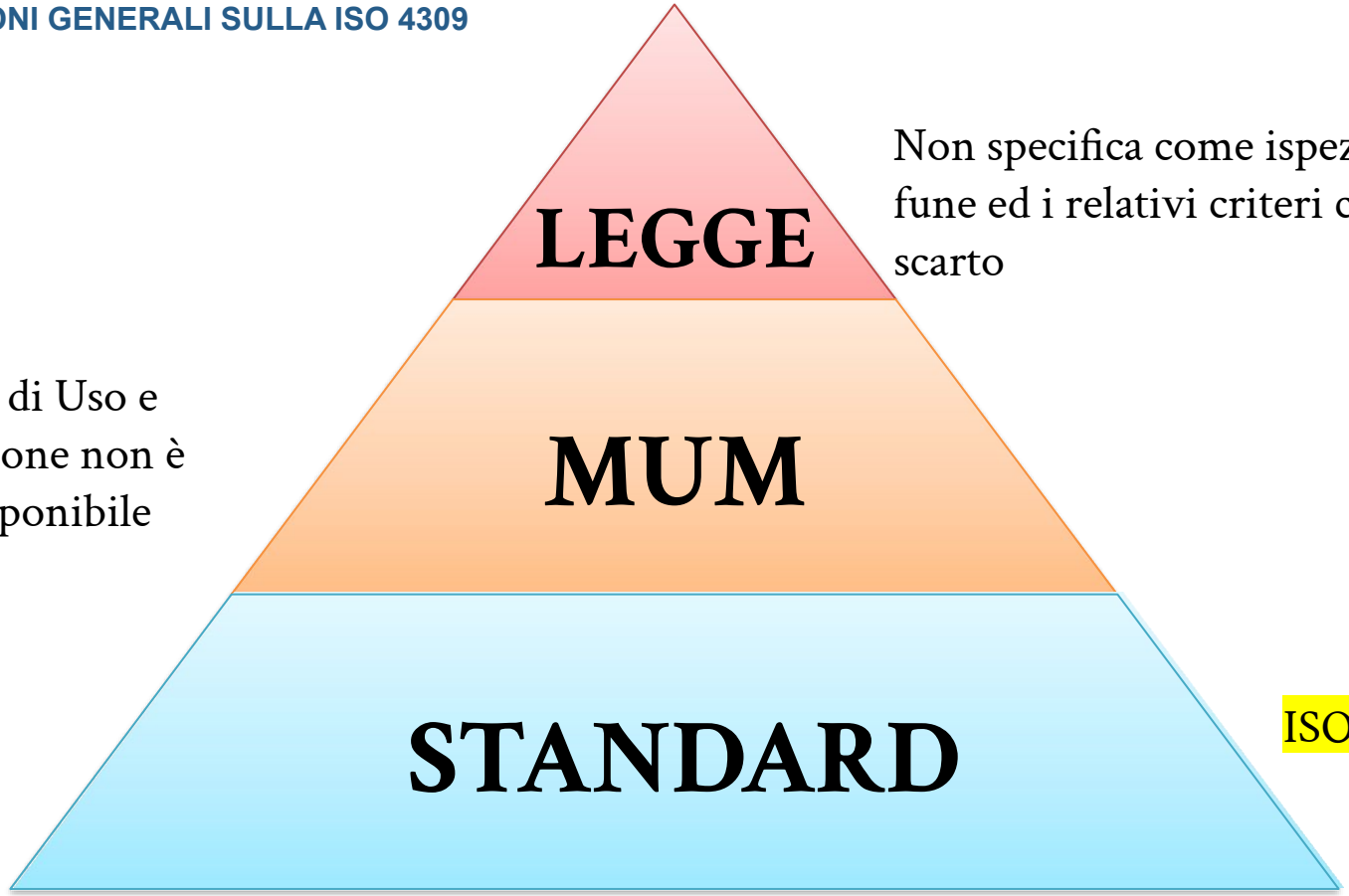
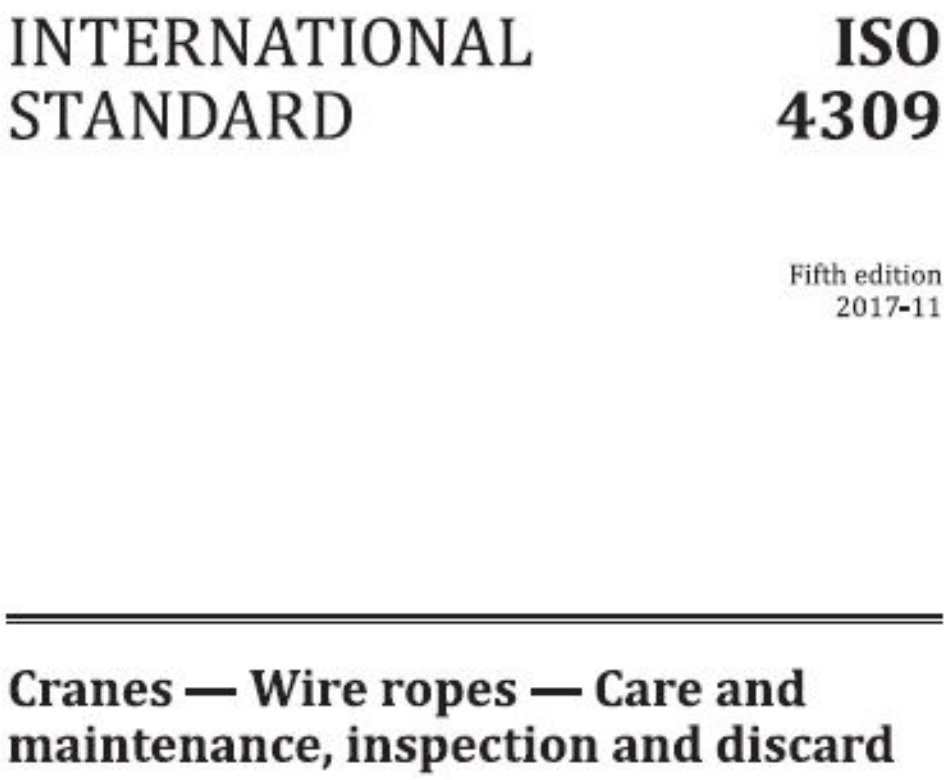


Non specifica come ispezionare una fune ed i relativi criteri criteri di scarto

Il Manuale di Uso e Manutenzione non è sempre disponibile

ISO4309



La normativa stabilisce principi generali per la cura e la manutenzione, nonché per l'ispezione e lo scarto delle funi metalliche utilizzate su gru e paranchi.

Fornisce criteri di scarto realistici che coprono le diminuzioni del diametro della fune e la corrosione e fornisce un metodo per valutare l'effetto combinato del deterioramento in qualsiasi posizione della fune.

- Estremamente Completa
- Semplice da applicare
- Spiegazione altamente dettagliata dei fenomeni di usura e del modalità di ispezione
- Riconosciuta su scala globale
- Tabelle chiare e semplici per i criteri di scarto delle diverse tipologie di funi metalliche

1. INFORMAZIONI GENERALI SULLA ISO 4309

- La norma ISO 4309 è generalmente richiamata dal "Manuale di uso e manutenzione" (Questo manuale deve essere fornito dal produttore / distributore della fune)

- Per essere conforme alla "Direttiva macchine 2006/42 / CE", il manuale deve fare riferimento alla norma ISO 4309 per l'ispezione e la manutenzione delle funi metalliche

- Il manutentore per essere legalmente protetto deve seguire la norma ISO 4309 per l'ispezione della fune, la manutenzione e la segnalazione di problemi

DEMAG
Cranes & Components

Operating instructions
for wire ropes used in Demag P, DH, DR and MPW hoist units
and for their application in hoist units of other manufacturers
Only valid together with the relevant hoist unit operating instructions.

2.9 Inspection regulations

Notes on inspections in accordance with:

- DIN EN 12385 Part 3, Wire ropes
- ISO 4308-1 Cranes and lifting appliances; Selection of wire ropes, General
- DIN 15061
  - Part 1, Lifting appliances; groove profiles for wire rope sheaves
  - Part 2, Cranes; groove profiles for wire rope sheaves
- ISO 4309, Cranes, wire ropes – Care, maintenance, installation, examination and discard

The EC machinery directive 2006/42/EC requirements are therefore also fulfilled.

TABLE 1: MODES OF DETERIORATION AND ASSESSMENT METHODS

MODE OF DETERIORATION	ASSESSMENT METHODS
Number of visible broken wires (including those which are randomly distributed, localized groupings, valley wire breaks and those that are at, or in the vicinity of, the termination)	By counting
Loss of metallic area caused by broken wires	Visual, MRT
Decrease in rope diameter (resulting from external wear/abrasion, internal wear and core deterioration)	By measurement
Loss of metallic area caused by mechanism other than broken wires e.g. corrosion, wear, etc.	Visual, MRT
Fracture of strand(s)	Visual
Corrosion (external, internal and fretting)	Visual, MRT
Deformation	Visual and by measurement (wave only)
Mechanical damage	Visual
Heat damage (including electric arcing)	Visual

Il controllo MRT è il metodo migliore per il rilevamento di difetti interni ed esterni

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1. GENERAL INFO ON THE ISO 4309

Fili rotti

Rope category number (RCN) (see Annex H)	Total number of load-bearing wires in the outer layer of strands in the rope[a] n	Number of visible broken outer wires[b]					
		Sections of rope working in steel sheaves and/or spooling on a single-layer drum (wire breaks randomly distributed) Classes M1 to M4 (ISO 4301-1:1986) or class unknown[d]				Sections of rope spooling on a multi-layer drum[c] All classes	
		Ordinary lay		Lang lay		Ordinary and Lang lay	
		Over a length of $6d$ [e]	Over a length of $30d$ [e]	Over a length of $6d$ [e]	Over a length of $30d$ [e]	Over a length of $6d$ [e]	Over a length of $30d$ [e]
05	$121 \le n \le 140$						
06	$141 \le n \le 160$						
07	$161 \le n \le 180$						
08	$181 \le n \le 200$						
09	$201 \le n \le 220$						
10	$221 \le n \le 240$						
11	$241 \le n \le 260$						
12	$261 \le n \le 280$						
13	$281 \le n \le 300$						
	$n > 300$	$0{,}04 \times n$	$0{,}08 \times n$	$0{,}02 \times n$	$0{,}04 \times n$	$0{,}08 \times n$	$0{,}16 \times n$

NOTE Ropes having outer strands of Seale construction where the number of wires in each strand is 19 or less (e.g. 6 × 19 Seale) are placed in this table two rows above that row in which the construction would normally be placed based on the number of load bearing wires in the outer layer of strands.

[a] For the purposes of this document, filler wires are not regarded as load-bearing wires and are not included in the values of n.

[b] A broken wire has two ends (counted as one wire).

[c] The values apply to deterioration that occurs at the cross-over zones and interference between wraps due to fleet angle effects (and not to those sections of rope which only work in sheaves and do not spool on the drum).

[d] Twice the number of broken wires listed may be applied to ropes on mechanisms whose classification is known to be M5 to M8 [ISO 4301-1:1986].

[e] d is the nominal diameter of rope.

Decremento del diametro $[(d_{\mathrm{ref}} - d_{\mathrm{m}})/d] \times 100\ (\%)$

Rope type	Uniform decrease in diameter (expressed as % of nominal diameter)	Severity rating	
		Description	%
Single-layer rope with fibre core	Less than 6 % 6 % and over but less than 7 % 7 % and over but less than 8 % 8 % and over but less than 9 % 9 % and over but less than 10 % **10 % and over**		
Single-layer rope with steel core or parallel-closed rope	Less than 3,5 % 3,5 % and over but less than 4,5 % 4,5 % and over but less than 5,5 % 5,5 % and over but less than 6,5 % 6,5 % and over but less than 7,5 % **7,5 % and over**		
Rotation-resistant rope	Less than 1 % 1 % and over but less than 2 % 2 % and over but less than 3 % 3 % and over but less than 4 % 4 % and over but less than 5 % **5 % and over**		

Usura e corrosione

Type of corrosion	Condition	Severity rating
External corrosion[a]	Signs of surface oxidation but can be wiped clean Wire surface rough to touch **Wire surface heavily pitted and slack wires**[b]	Superficial – 0 % High – 60 %[c] **Discard – 100 %**
Internal corrosion[d]	**Obvious visible signs of internal corrosion – i.e. corrosion debris exuding from the valleys between the outer strands**[e]	**Discard – 100 %** or if deemed practicable by the competent person, internal examination in accordance with the procedure described in 6.3 or Annex C
Fretting corrosion	The process of fretting involves the removal of fine particles of steel from the wires due to dry wires and strands constantly rubbing together and then oxidizing and creating internal corrosion debris, which manifests itself as a dry powder, similar to a red rouge.	Evidence of such a characteristic should be further investigated and if there is any doubt about its severity, the rope should be discarded (100 %).

[a] For examples, see Figures B.11 and B.12. For an example of the progression of external corrosion in a rope, see Annex I.

[b] For any other intermediate condition, an assessment should be made as to its severity rating (i.e. contribution towards the combined effect).

[c] The oxidation of zinc-coated wires can result in a wire surface which is also rough to the touch, but the overall condition might not be as serious as wires which are not coated. In such cases, the inspector may consider applying a lower contribution towards the combined effect to that given above in this table.

[d] For an example, see Figure B.19.

[e] Assessment of internal corrosion is subjective without MRT. However, if there is any doubt about the seriousness of any internal corrosion, the rope should be discarded.


KINKING


DOGLEGS


BROKEN WIRES


CORROSION

Caratteristiche:

È il primo controllo non distruttivo

Non richiede strumenti speciali

Deve essere sempre eseguito


BIRDCAGING


SEVERE WEAR


DAMAGED FITTINGS

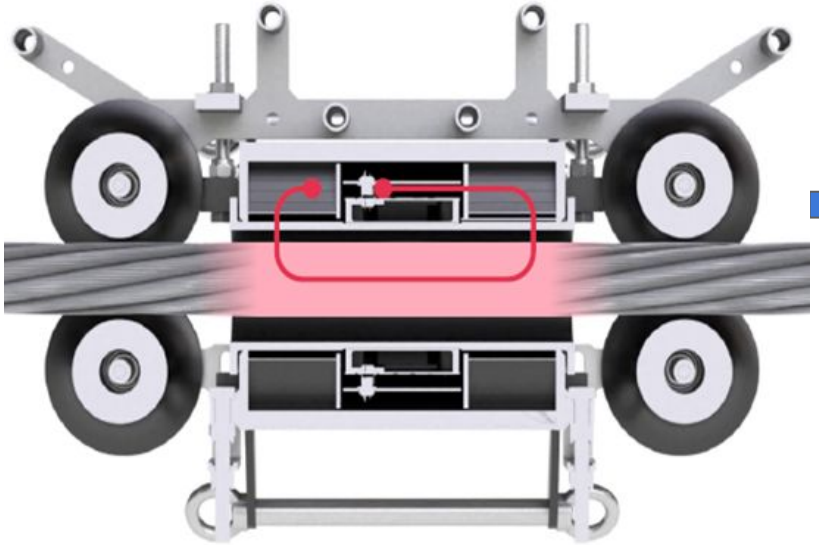

ILLEGIBLE TAG / ID

Limitazioni:

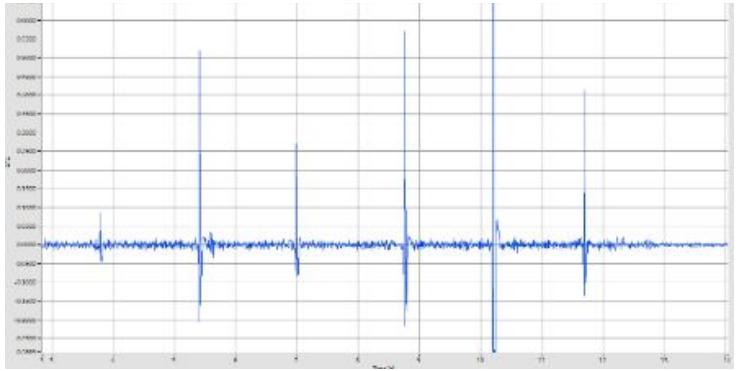
In molte situazioni i difetti non sono visibili

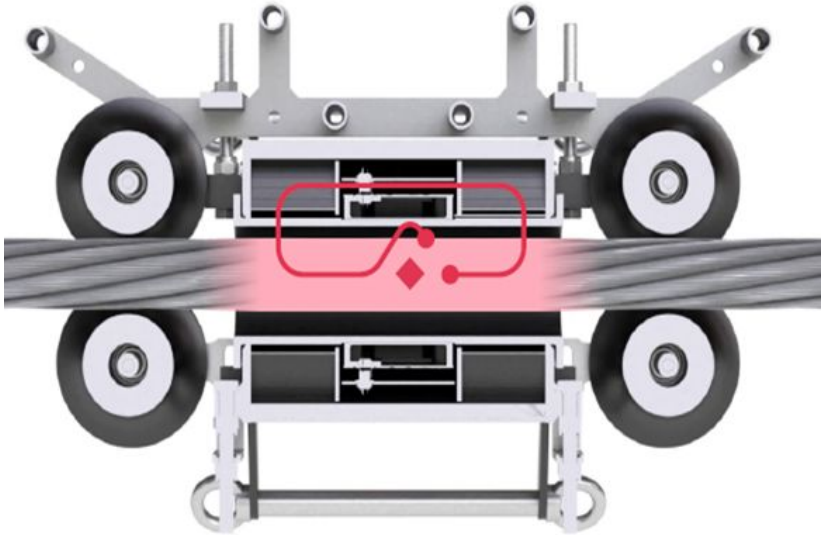
- Lo strato di grasso rende spesso impossibile identificare i difetti
- Spesso i difetti iniziano dal nucleo (funi anti-giro). In questo caso, i difetti esterni sono solo la parte finale di un forte processo di degrado

3. INTRODUZIONE SUL METODO MRT

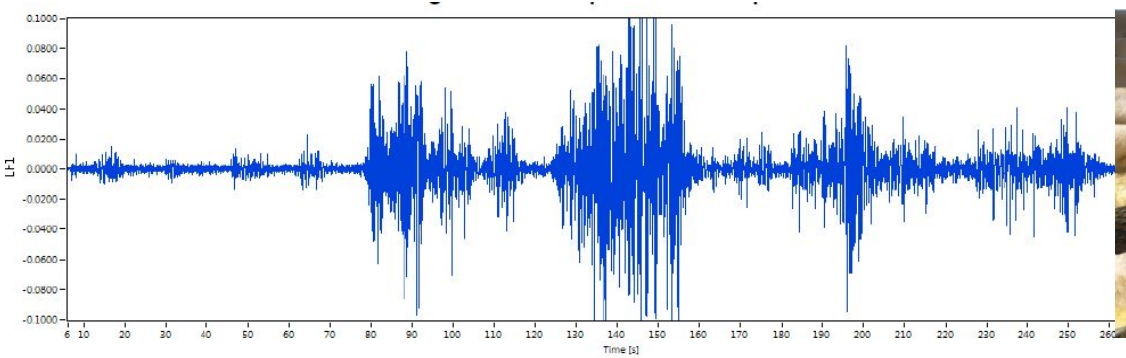


Quando si verificano fili rotti o difetti, appare una modifica delle linee del flusso magnetico.
Questo cambiamento, in valore e direzione, viene rilevato da sensori che trasformano i fenomeni fisici in un segnale leggibile

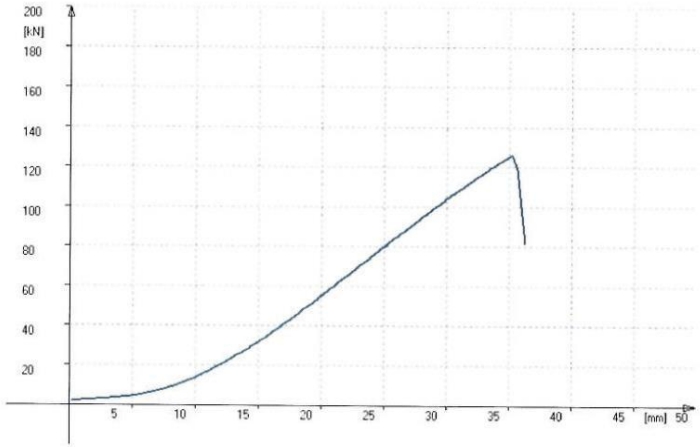




4. ESEMPI

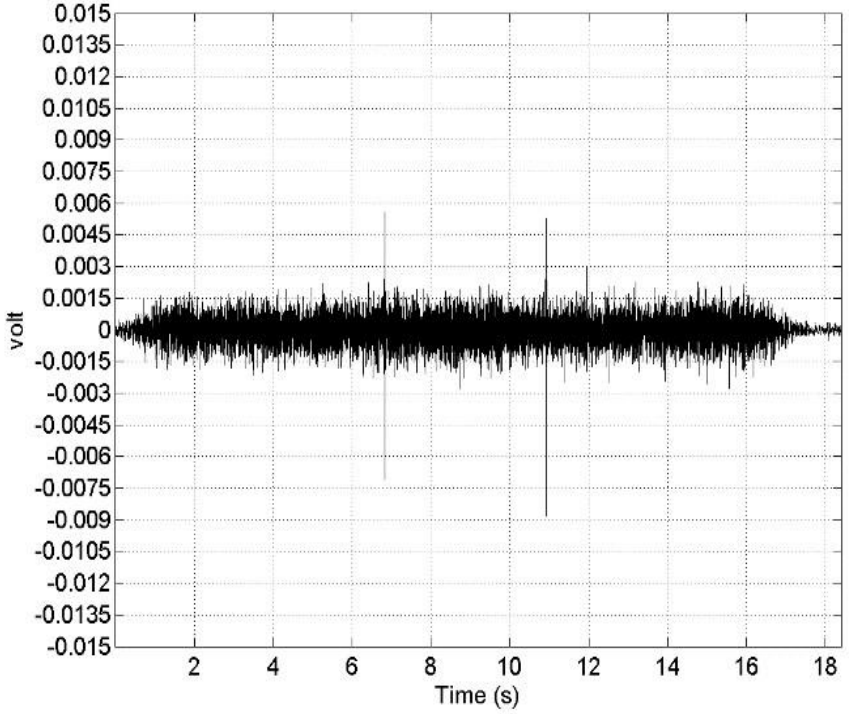


Nessun filo rotto esterno
Usura interna profonda

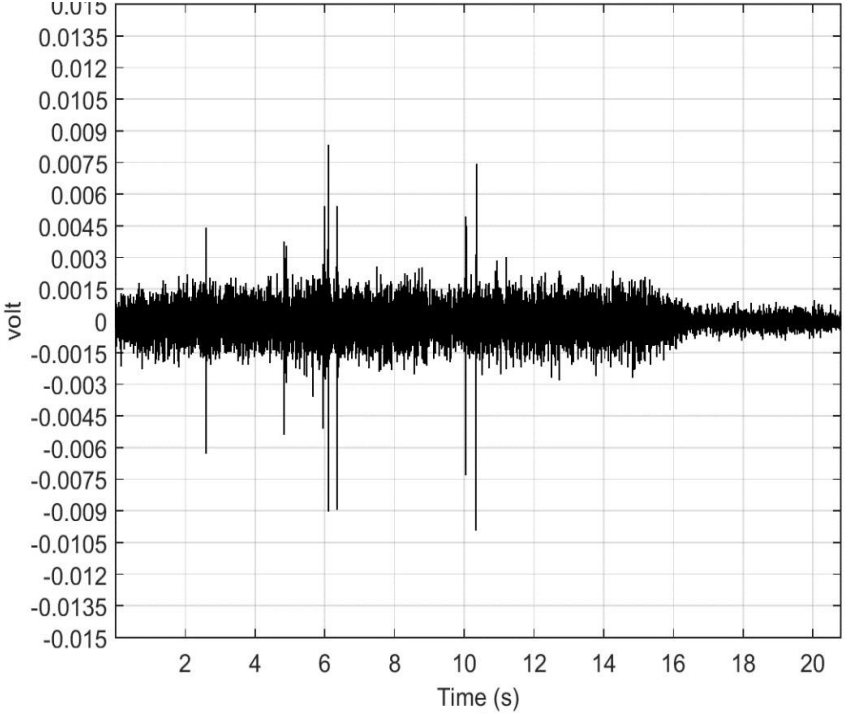


<u>Carico di rottura nominale: 400 kN</u>
<u>Carico di rottura reale (testato): 125 kN</u>

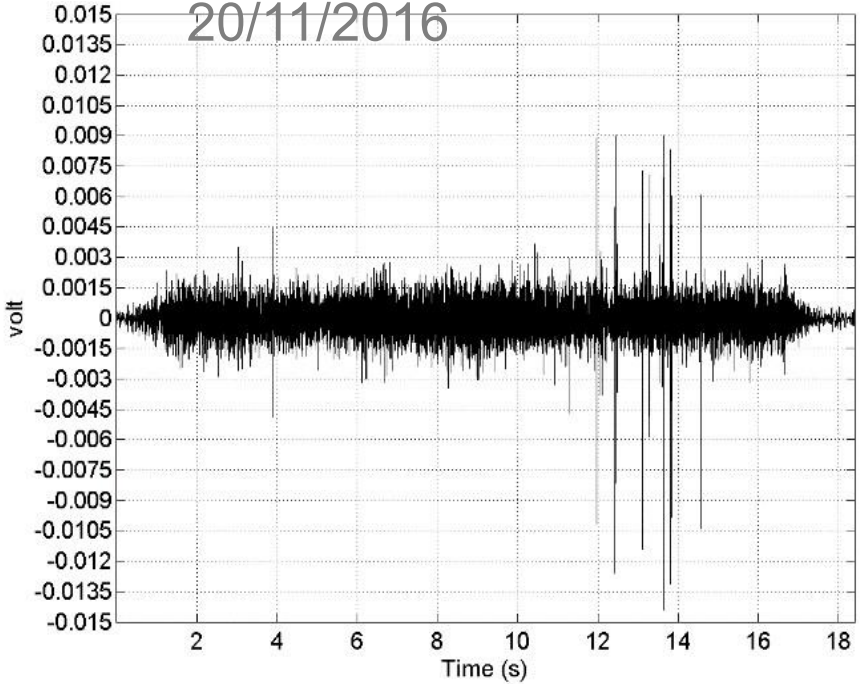
TEST 1 – 13/05/2016



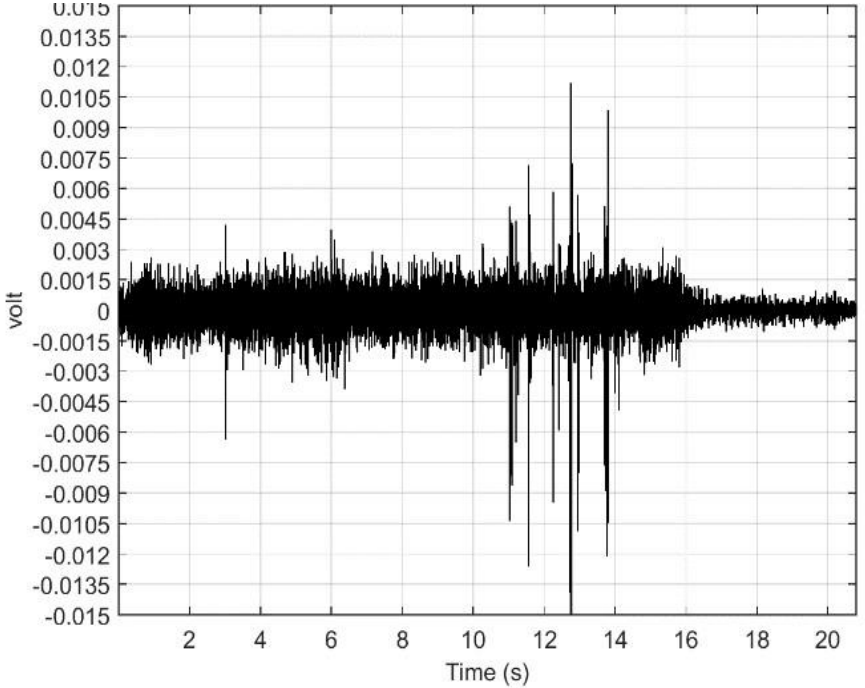
TEST 2 – 22/09/2016



TEST 1 – 20/11/2016



TEST 2 – 22/01/2017



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