Universidad Zaragoza

1542

ANEXOS

Definición, caracterización e implementación de un gemelo digital aplicado a procesos de fabricación.

Definition, characterization and implementation of a digital twin applied to manufacturing processes.

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ANEXOS

ANEXO I Programas de simulación TECNALIA

En este anexo se adjunta el listado de los programas que dispone el centro de investigación TECNALIA y sobre los que se ha realizado el estudio para poder identificar cuáles de los diferentes programas que están bajo su posesión son capaces de poder modelar un gemelo digital.

2. LISTADO DE LOS SOFTWARES DISPONIBLES.
2.1 MODELIZACIÓN Y SIMULACIÓN, CAD-CAM-CAE.
· ABAQUS.
· ALTAIR.
· ANSYS.
o Ansys Mechanical.
o Ansys Fluent CFD.
o Ansys Speos.
· CadnaA / Computer Aided Noise Abatement.
· CATIA.
o DYMOLA.
o CATIA.
· CREO Essential / CREO Simulation.
· CUBUS Engineering Software.
· FORGE ENGINSOFT.
· JMatPro, materials properties for alloys.
· MATHWORKS.
o Matlab.
o Simulink.
· MAXSURF, Naval Architecture.
· MSC Software HEXAGON.
· NASGRO.
· NX SIEMENS.
o CAD Diseño.
o CAE Cálculo.
· ODEON Room Acoustics Software.
· OROS noise and vibration software platform.
· PROFIS Engineering Suite, Software de Diseño Estructural.
· PowerMILL Additive Autodesk.
· PowerSHAPE Autodesk.
· Simcenter SIEMENS.
· SOLIDEDGE SIEMENS.
· OrcaFlex ORCINA.
· Rhinoceros.

· SOLIDWORKS Dassault Systemes.

· VEDA - Vibrational Energy Distribution Analysis.

2.2 GIS SISTEMAS DE INFORMACIÓN GEORREFERENCIADA.

· ArcGIS ESRI.

2.3 CAD – BIM - RV.

· Adobe Creative Cloud.

· AutoCAD AUTODESK.

· ICS Design – Driven Develpment.

· Unity Pro.

2.4 Sistemas de Inspección, Monitorización, HMI y SCADAS.

· BeamTool.

· TeamViewer.

· Wonderware AVEVA.

2.5 Software de Ingeniería Electrónica.

· ALTIUM Designer.

· ELCAD AUCOTEC.

· winIDEA iSYSTEM.

· Programmable Automation Control Systems (PLC/PAC) EMERSON.

2.6 Ecodiseño, Ciclo de Vida – PLM – LCA.

· DOORS IBM® Engineering Requirements Management.

· ENVI_MET.

· TeamCenter SIEMENS.

· Windchill PLM.

2.7 Desarrollo Software y Programación.

· JIRA Software, tableros de scrum para ayuda a equipos ágiles.

· LabVIEW.

· PyCharm.

· TIAPortal SIEMENS.

· Visual Studio Professional.

2.8 Ofimática, procesamiento de texto.

· DocuSign.

· ZOTERO.

ANEXO II Programas de PYTHON

Se adjunta el programa creado en PYTHON que se ha utilizado para la obtención de datos en tiempo real de la fresadora HAAS y del torno PINACHO. Estas dos máquinas forman parte del laboratorio 4.0 de la universidad de zaragoza que tiene en colaboración con la cátedra TECNALIA, tanto la fresadora HAAS como el torno PINACHO están sensorizados lo que conlleva que estén tomando datos en tiempo real sobre el funcionamiento de ambas máquinas. Estos datos se envían a un PC industrial y se almacenan en la nube para su posterior procesado. Para la obtención de estos datos se crea este programa. Por temas de confidencialidad se ha tenido que tapar algunas partes del código

Programa adquisición de datos **fresadora HAAS**:

```python
# Necesario para evitar toda una serie de feos warnings cuando se
# lanzan curls contra SSL sin verificar
import time

import requests
from requests.packages.urllib3.exceptions import
InsecureRequestWarning
requests.packages.urllib3.disable_warnings(InsecureRequestWarning)
import influxdb
import pandas as pd
from datetime import datetime
from time import sleep
import numpy as np

def influxDBtoDF_continuo(t_inicio, t_fin, l_nombres): # los valores
deben ser str '1648634044800000000' '1648634304000000000'
    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb
    ##Este DF SÍ tiene valores temporales continuos (cada s)
    # accedo a la base de datos
    client = influxdb.InfluxDBClient(host=             , port=     ,
username=          , password=                , database='      ')
    dic_df = {}
    res = client.query("SELECT * FROM haas WHERE time>="+t_inicio+"
AND time<="+t_fin+" AND variable='PARTS' ORDER BY time;",
database='vixion')
    if len(res) == 0:
        exit(print('No hay datos'))
    t_fin_df = list(map(lambda x: x["time"], res.get_points()))[-1]
#guardamos el ultimo tiempo en el que se guardan datos para recortar a
ese valor el dataframe
    try:
```

```python
        offset = int((str(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%S.%fZ").astimezone())).split('+')[1].split(':')[0])
        t_fin_df =
str((int(datetime.timestamp(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%S.%fZ"))) + offset*3600)*1000000000)
    except:
        offset = int((str(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%SZ").astimezone())).split('+')[1].split(':')[0])
        t_fin_df =
str((int(datetime.timestamp(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%SZ"))) + offset * 3600)*1000000000)
    i = 0
    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir
    for valor in l_nombres:
        #guardo los datos de una variable para cada segundo
        res1 = client.query("SELECT mean(*) FROM haas WHERE
time>="+t_inicio+" AND time<="+t_fin_df+" AND variable='"+valor+"'
group by time(1s) fill(previous);", database='vixion')
        values = list(map(lambda x: x["mean_value"],
res1.get_points()))
        dic_df[l_nombres[i]] = values
        i += 1
    dic_df['tiempo'] = list(map(lambda x: x["time"],
res1.get_points()))#l_tiempo_max #
    df = pd.DataFrame(dic_df)
    df = df.set_index('tiempo')
    return df

def influxDBtoDF_discontinuo(t_inicio, t_fin, l_nombres): # los
valores deben ser str '1648634044800000000' '1648634304000000000'
    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb
    #Este DF NO tiene valores temporales continuos (cada s)
    # accedo a la base de datos
    client = influxdb.InfluxDBClient(host='172.26.40.77', port=8086,
username="tecnalia", password="PWDTecnalia#01", database='vixion')
    dic_df = {}
    i = 0
    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir
    for valor in l_nombres:
        #guardo los datos de una variable para cada segundo
        res1 = client.query("SELECT * FROM haas WHERE
time>="+t_inicio+" AND time<="+t_fin+" AND variable='"+valor+"';",
database='vixion')
        values = list(map(lambda x: x["value"], res1.get_points()))
        if values == []:
            values = list(map(lambda x: x["valueStr"],
res1.get_points()))
        dic_df[l_nombres[i]] = values
        i += 1
    dic_df['tiempo'] = pd.to_datetime(list(map(lambda x: x["time"],
res1.get_points())))
    dic_df['tiempo'] = [valor.replace(microsecond=0) for valor in
dic_df['tiempo']]  # elimino microsegundos
    #Creo un df
    df = pd.DataFrame(dic_df)
    df = df.set_index('tiempo')
    return df
```

```python
def influxDBtoDF_discontinuoStr(t_inicio, t_fin, l_nombres): # los
valores deben ser str '1648634044800000000' '1648634304000000000'
    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb
    #Este DF NO tiene valores temporales continuos (cada s)
    # accedo a la base de datos
    client = influxdb.InfluxDBClient(host='172.26.40.77', port=8086,
username="tecnalia", password="PWDTecnalia#01", database='vixion')
    dic_df = {}
    i = 0
    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir
    for valor in l_nombres:
        #guardo los datos de una variable para cada segundo
        res1 = client.query("SELECT * FROM haas WHERE
time>="+t_inicio+" AND time<="+t_fin+" AND variable='"+valor+"';",
database='vixion')
        values = list(map(lambda x: x["valueStr"], res1.get_points()))
        dic_df[l_nombres[i]] = values
        i += 1
    dic_df['tiempo'] = pd.to_datetime(list(map(lambda x: x["time"],
res1.get_points())))
    dic_df['tiempo'] = [valor.replace(microsecond=0) for valor in
dic_df['tiempo']] #elimino microsegundos
    #Creo un df
    df = pd.DataFrame(dic_df)
    df = df.set_index('tiempo')
    return df
```

Programa para la adquisición de datos del **torno PINACHO.**

```python
# Necesario para evitar toda una serie de feos warnings cuando se

# lanzan curls contra SSL sin verificar

import time



import requests

from requests.packages.urllib3.exceptions import
InsecureRequestWarning

requests.packages.urllib3.disable_warnings(InsecureRequestWarning)

import influxdb

import pandas as pd

from datetime import datetime

from time import sleep

import numpy as np
```

```python
def influxDBtoDF_continuo(t_inicio, t_fin, l_nombres): # los valores
deben ser str '1648634044800000000' '1648634304000000000'

    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb

    ##Este DF SÍ tiene valores temporales continuos (cada s)

    # accedo a la base de datos

    client = influxdb.InfluxDBClient(host='172.26.40.77', port=8086,
username="tecnalia", password="PWDTecnalia#01", database='vixion')

    dic_df = {}

    res = client.query("SELECT * FROM pinacho WHERE time>="+t_inicio+"
AND time<="+t_fin+" AND variable='PART_COUNTER' ORDER BY time;",
database='vixion')

    if len(res) == 0:

        exit(print('No hay datos'))

    t_fin_df = list(map(lambda x: x["time"], res.get_points()))[-1]
#guardamos el ultimo tiempo en el que se guardan datos para recortar a
ese valor el dataframe

    try:

        offset = int((str(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%S.%fZ").astimezone()).split('+')[1]).split(':')[0])

        t_fin_df =
str((int(datetime.timestamp(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%S.%fZ"))) + offset*3600)*1000000000)

    except:

        offset = int((str(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%SZ").astimezone()).split('+')[1]).split(':')[0])

        t_fin_df =
str((int(datetime.timestamp(datetime.strptime(t_fin_df, "%Y-%m-
%dT%H:%M:%SZ"))) + offset * 3600)*1000000000)

    i = 0

    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir

    for valor in l_nombres:

        #guardo los datos de una variable para cada segundo

        res1 = client.query("SELECT mean(*) FROM pinacho WHERE
time>="+t_inicio+" AND time<="+t_fin_df+" AND variable='"+valor+"'
group by time(1s) fill(previous);", database='vixion')
```

```python
        values = list(map(lambda x: x["mean_value"],
res1.get_points()))

        dic_df[l_nombres[i]] = values

        i += 1

    dic_df['tiempo'] = list(map(lambda x: x["time"],
res1.get_points()))#l_tiempo_max #

    df = pd.DataFrame(dic_df)

    df = df.set_index('tiempo')

    return df


def influxDBtoDF_discontinuo(t_inicio, t_fin, l_nombres): # los
valores deben ser str '1648634044800000000' '1648634304000000000'

    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb

    #Este DF NO tiene valores temporales continuos (cada s)

    # accedo a la base de datos

    client = influxdb.InfluxDBClient(host="172.26.40.77", port=8086,
username="tachalla", password="EWDTachalla#01", database='vixion')

    dic_df = {}

    i = 0

    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir

    for valor in l_nombres:

        #guardo los datos de una variable para cada segundo

        res1 = client.query("SELECT * FROM pinacho WHERE
time>="+t_inicio+" AND time<="+t_fin+" AND variable='"+valor+"';",
database='vixion')

        values = list(map(lambda x: x["value"], res1.get_points()))

        if values == []:

            values = list(map(lambda x: x["valueStr"],
res1.get_points()))

        dic_df[l_nombres[i]] = values

        i += 1

    dic_df['tiempo'] = pd.to_datetime(list(map(lambda x: x["time"],
res1.get_points())))
```

```python
    dic_df['tiempo'] = [valor.replace(microsecond=0) for valor in
dic_df['tiempo']]  # elimino microsegundos

    #Creo un df

    df = pd.DataFrame(dic_df)

    df = df.set_index('tiempo')

    return df


def influxDBtoDF_discontinuoStr(t_inicio, t_fin, l_nombres): # los
valores deben ser str '1648634044800000000' '1648634304000000000'

    #Creamos un dataframe a partir de los valores que se recogen en
Influxdb

    #Este DF NO tiene valores temporales continuos (cada s)

    # accedo a la base de datos

    client = influxdb.InfluxDBClient(host='172.26.40.77', port=8086,
username="tecnalia", password="PWDTecnalia#01", database='vixion')

    dic_df = {}

    i = 0

    #guardo una lista de tiempo y una lista por cada una de las
variables a adquirir

    for valor in l_nombres:

        #guardo los datos de una variable para cada segundo

        res1 = client.query("SELECT * FROM pinacho WHERE
time>="+t_inicio+" AND time<="+t_fin+" AND variable='"+valor+"';",
database='vixion')

        values = list(map(lambda x: x["valueStr"], res1.get_points()))

        dic_df[l_nombres[i]] = values

        i += 1

    dic_df['tiempo'] = pd.to_datetime(list(map(lambda x: x["time"],
res1.get_points())))

    dic_df['tiempo'] = [valor.replace(microsecond=0) for valor in
dic_df['tiempo']] #elimino microsegundos

    #Creo un df

    df = pd.DataFrame(dic_df)

    df = df.set_index('tiempo')

    return df
```

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ANEXO III Características de las máquinas

Datos de la fresadora HAAS

Datos de la fresadora HAAS obtenidos por los sensores en tiempo real con los que se permite modelar el funcionamiento de este con una distribución normal 236 con una desviación 16.31.

Tiempo (s)	Tiempo (m)	Rpm	Nº Pza	Energía Consumida (KWh)	Nº Cambios Utillajes
209	3,48333333	2066504883	1	50	4
236	3,93333333	2135319560	2	5	5
242	4,03333333	1874659109	3	0	4
239	3,98333333	2066504883	4	0	5
236	3,93333333	2135319560	5	0	4

Tabla 1. Características del funcionamiento de la fresadora HAAS.

Media	236
Desviación	13,3154046

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
1563519600	19/07/2019 9:00	90051	0	261	146262	3839
1563519601	19/07/2019 9:00	90051	0	261	146262	3839
1563519602	19/07/2019 9:00	90051	0	261	146263	3839
1563519603	19/07/2019 9:00	90054	0	0	146263	3839
1563519604	19/07/2019 9:00	90054	0	0	146263	3839
1563519605	19/07/2019 9:00	90054	0	0	146263	3839
1563519606	19/07/2019 9:00	90057	0	0	146263	3839
1563519607	19/07/2019 9:00	90057	0	0	146263	3839
1563519608	19/07/2019 9:00	90057	0	0	146263	3839
1563519609	19/07/2019 9:00	90100	2458447266	0	146263	3839

1563519610	19/07/2019 9:00	90100	2458447266	0	146264	3839
1563519611	19/07/2019 9:00	90100	2458447266	0	146264	3839
1563519612	19/07/2019 9:00	90103	2497558594	0	146264	3839
1563519613	19/07/2019 9:00	90103	2497558594	0	146264	3839
1563519614	19/07/2019 9:00	90103	2497558594	0	146264	3839
1563519615	19/07/2019 9:00	90105	2497998047	0	146264	3839
1563519616	19/07/2019 9:00	90105	2497998047	0	146264	3839
1563519617	19/07/2019 9:00	90105	2497998047	0	146264	3839
1563519618	19/07/2019 9:00	90108	2497558594	0	146266	3839
1563519619	19/07/2019 9:00	90108	2497558594	0	146266	3839
1563519620	19/07/2019 9:00	90111	2497558594	0	146266	3839
1563519621	19/07/2019 9:00	90111	2497558594	0	146267	3839
1563519622	19/07/2019 9:00	90111	2497558594	0	146267	3839
1563519623	19/07/2019 9:00	90114	2497558594	0	146267	3839
1563519624	19/07/2019 9:00	90114	2497998047	0	146267	3839
1563519625	19/07/2019 9:00	90114	2497998047	0	146267	3839
1563519626	19/07/2019 9:00	90117	2497998047	0	146268	3839
1563519627	19/07/2019 9:00	90117	2497998047	0	146268	3839
1563519628	19/07/2019 9:00	90117	2497998047	0	146268	3839
1563519629	19/07/2019 9:00	90120	2496679688	0	146268	3839
1563519630	19/07/2019 9:00	90120	2496679688	0	146269	3839
1563519631	19/07/2019 9:00	90120	2496679688	0	146269	3839
1563519632	19/07/2019 9:00	90123	2496679688	0	146269	3839
1563519633	19/07/2019 9:00	90123	2497558594	0	146269	3839
1563519634	19/07/2019 9:00	90123	2497558594	0	146269	3839
1563519635	19/07/2019 9:00	90126	2497851563	0	146270	3839
1563519636	19/07/2019 9:00	90126	2497851563	0	146270	3839
1563519637	19/07/2019 9:00	90126	2497851563	0	146270	3839
1563519638	19/07/2019 9:00	90129	2497998047	0	146270	3839
1563519639	19/07/2019 9:00	90129	2497998047	0	146270	3839
1563519640	19/07/2019 9:00	90129	2497998047	0	146271	3839
1563519641	19/07/2019 9:00	90132	2497412109	0	146271	3839
1563519642	19/07/2019 9:00	90132	2497412109	0	146271	3839
1563519643	19/07/2019 9:00	90132	2497412109	0	146271	3839
1563519644	19/07/2019 9:00	90135	2497558594	0	146272	3839
1563519645	19/07/2019 9:00	90135	2497558594	0	146272	3839
1563519646	19/07/2019 9:00	90135	2497558594	0	146272	3839
1563519647	19/07/2019 9:00	90138	0	0	146272	3839
1563519648	19/07/2019 9:00	90138	0	0	146272	3839
1563519649	19/07/2019 9:00	90140	0	0	146273	3839
1563519650	19/07/2019 9:00	90140	0	0	146273	3839
1563519651	19/07/2019 9:00	90140	0	0	146273	3839
1563519652	19/07/2019 9:00	90143	0	0	146273	3839
1563519653	19/07/2019 9:00	90143	2497412109	0	146274	3839

1563519654	19/07/2019 9:00	90143	2497412109	0	146274	3839
1563519655	19/07/2019 9:00	90146	2497412109	0	146274	3839
1563519656	19/07/2019 9:00	90146	2497119141	0	146275	3839
1563519657	19/07/2019 9:00	90146	2497119141	0	146275	3839
1563519658	19/07/2019 9:00	90149	2497119141	0	146275	3839
1563519659	19/07/2019 9:00	90149	2497558594	0	146275	3839
1563519660	19/07/2019 9:01	90149	2497558594	0	146277	3839
1563519661	19/07/2019 9:01	90152	2497558594	0	146277	3839
1563519662	19/07/2019 9:01	90152	2497412109	0	146277	3839
1563519663	19/07/2019 9:01	90152	2497412109	0	146277	3839
1563519664	19/07/2019 9:01	90155	2497705078	0	146278	3839
1563519665	19/07/2019 9:01	90155	2497851563	0	146278	3839
1563519666	19/07/2019 9:01	90155	2497851563	0	146278	3839
1563519667	19/07/2019 9:01	90158	2497851563	0	146278	3839
1563519668	19/07/2019 9:01	90158	2496972656	0	146278	3839
1563519669	19/07/2019 9:01	90158	2496972656	0	146279	3839
1563519670	19/07/2019 9:01	90201	0	0	146279	3839
1563519671	19/07/2019 9:01	90201	0	0	146279	3839
1563519672	19/07/2019 9:01	90201	0	0	146279	3839
1563519673	19/07/2019 9:01	90204	0	0	146279	3839
1563519674	19/07/2019 9:01	90204	0	0	146280	3839
1563519675	19/07/2019 9:01	90204	0	0	146280	3839
1563519676	19/07/2019 9:01	90207	3001171875	0	146280	3839
1563519677	19/07/2019 9:01	90207	3001171875	0	146281	3839
1563519678	19/07/2019 9:01	90207	3001171875	0	146281	3839
1563519679	19/07/2019 9:01	90209	2999707031	0	146281	3839
1563519680	19/07/2019 9:01	90209	2999707031	0	146281	3840
1563519681	19/07/2019 9:01	90209	2999707031	0	146282	3840
1563519682	19/07/2019 9:01	90212	2999121094	0	146282	3840
1563519683	19/07/2019 9:01	90212	2999121094	0	146282	3840
1563519684	19/07/2019 9:01	90215	2999121094	0	146283	3840
1563519685	19/07/2019 9:01	90215	2999267578	0	146284	3840
1563519686	19/07/2019 9:01	90215	2999267578	0	146284	3840
1563519687	19/07/2019 9:01	90218	2999267578	0	146284	3840
1563519688	19/07/2019 9:01	90218	2998681641	0	146284	3840
1563519689	19/07/2019 9:01	90218	2998681641	0	146285	3840
1563519690	19/07/2019 9:01	90221	2998681641	0	146285	3840
1563519691	19/07/2019 9:01	90221	2998974609	0	146285	3840
1563519692	19/07/2019 9:01	90221	2998974609	0	146285	3840
1563519693	19/07/2019 9:01	90224	2998974609	0	146285	3840
1563519694	19/07/2019 9:01	90224	0,146484375	0	146285	3840
1563519695	19/07/2019 9:01	90224	0,146484375	0	146286	3840
1563519696	19/07/2019 9:01	90227	0,146484375	0	146286	3840
1563519697	19/07/2019 9:01	90227	0	0	146286	3840

1563519698	19/07/2019 9:01	90227	0	0	146286	3840
1563519699	19/07/2019 9:01	90230	1524755859	0	146287	3840
1563519700	19/07/2019 9:01	90230	1524755859	0	146288	3840
1563519701	19/07/2019 9:01	90230	1524755859	0	146288	3840
1563519702	19/07/2019 9:01	90233	1600488281	0	146288	3840
1563519703	19/07/2019 9:01	90233	1600488281	0	146288	3840
1563519704	19/07/2019 9:01	90233	1600488281	0	146288	3841
1563519705	19/07/2019 9:01	90236	1600488281	0	146289	3841
1563519706	19/07/2019 9:01	90236	1600488281	0	146289	3841
1563519707	19/07/2019 9:01	90236	1600488281	0	146289	3841
1563519708	19/07/2019 9:01	90238	1599902344	0	146290	3841
1563519709	19/07/2019 9:01	90238	1599902344	0	146291	3841
1563519710	19/07/2019 9:01	90238	1599902344	0	146291	3841
1563519711	19/07/2019 9:01	90241	1600634766	0	146291	3841
1563519712	19/07/2019 9:01	90241	1600634766	0	146291	3841
1563519713	19/07/2019 9:01	90244	1600634766	0	146291	3841
1563519714	19/07/2019 9:01	90244	1600634766	0	146292	3841
1563519715	19/07/2019 9:01	90244	1600634766	0	146292	3841
1563519716	19/07/2019 9:01	90247	1600634766	0	146292	3841
1563519717	19/07/2019 9:01	90247	1601074219	0	146292	3841
1563519718	19/07/2019 9:01	90247	1601074219	0	146292	3841
1563519719	19/07/2019 9:01	90250	1601074219	0	146293	3841
1563519720	19/07/2019 9:02	90250	1601513672	0	146293	3841
1563519721	19/07/2019 9:02	90250	1601513672	0	146293	3841
1563519722	19/07/2019 9:02	90253	1601513672	0	146293	3841
1563519723	19/07/2019 9:02	90253	1599169922	0	146293	3841
1563519724	19/07/2019 9:02	90253	1599169922	0	146294	3841
1563519725	19/07/2019 9:02	90256	1599169922	0	146294	3841
1563519726	19/07/2019 9:02	90256	1599023438	0	146294	3841
1563519727	19/07/2019 9:02	90256	1599023438	0	146294	3841
1563519728	19/07/2019 9:02	90259	1599023438	0	146294	3841
1563519729	19/07/2019 9:02	90259	1600488281	0	146294	3841
1563519730	19/07/2019 9:02	90259	1600488281	0	146295	3841
1563519731	19/07/2019 9:02	90302	1600488281	0	146295	3841
1563519732	19/07/2019 9:02	90302	1599023438	0	146295	3842
1563519733	19/07/2019 9:02	90302	1599023438	0	146295	3842
1563519734	19/07/2019 9:02	90305	0,146484375	0	146296	3842
1563519735	19/07/2019 9:02	90305	0	0	146296	3842
1563519736	19/07/2019 9:02	90305	0	0	146296	3842
1563519737	19/07/2019 9:02	90307	0	0	146296	3842
1563519738	19/07/2019 9:02	90307	0	0	146296	3842
1563519739	19/07/2019 9:02	90307	0	0	146297	3842
1563519740	19/07/2019 9:02	90311	1799707031	0	146297	3842
1563519741	19/07/2019 9:02	90311	1799707031	0	146298	3842

1563519742	19/07/2019 9:02	90313	1799707031	0	146298	3842
1563519743	19/07/2019 9:02	90313	1798388672	0	146298	3842
1563519744	19/07/2019 9:02	90313	1798388672	0	146299	3842
1563519745	19/07/2019 9:02	90316	1798388672	0	146299	3842
1563519746	19/07/2019 9:02	90316	1797949219	0	146299	3842
1563519747	19/07/2019 9:02	90316	1797949219	0	146300	3842
1563519748	19/07/2019 9:02	90319	1797949219	0	146300	3842
1563519749	19/07/2019 9:02	90319	1798388672	0	146301	3842
1563519750	19/07/2019 9:02	90319	1798388672	0	146301	3842
1563519751	19/07/2019 9:02	90322	1798388672	0	146301	3842
1563519752	19/07/2019 9:02	90322	1798242188	0	146301	3842
1563519753	19/07/2019 9:02	90322	1798242188	0	146301	3842
1563519754	19/07/2019 9:02	90325	1798242188	0	146301	3842
1563519755	19/07/2019 9:02	90325	1798095703	0	146302	3842
1563519756	19/07/2019 9:02	90325	1798095703	0	146302	3842
1563519757	19/07/2019 9:02	90328	1798095703	0	146302	3842
1563519758	19/07/2019 9:02	90328	1798242188	0	146302	3842
1563519759	19/07/2019 9:02	90328	1798242188	0	146302	3842
1563519760	19/07/2019 9:02	90331	1798242188	0	146302	3842
1563519761	19/07/2019 9:02	90331	1798388672	0	146303	3842
1563519762	19/07/2019 9:02	90331	1798388672	0	146303	3842
1563519763	19/07/2019 9:02	90334	1798388672	0	146303	3842
1563519764	19/07/2019 9:02	90334	1798681641	0	146303	3842
1563519765	19/07/2019 9:02	90334	1798681641	0	146304	3842
1563519766	19/07/2019 9:02	90337	1798681641	0	146304	3842
1563519767	19/07/2019 9:02	90337	1798535156	0	146304	3842
1563519768	19/07/2019 9:02	90337	1798535156	0	146304	3842
1563519769	19/07/2019 9:02	90340	1797509766	0	146304	3842
1563519770	19/07/2019 9:02	90340	1797509766	0	146305	3842
1563519771	19/07/2019 9:02	90342	1797509766	0	146305	3842
1563519772	19/07/2019 9:02	90342	1798681641	0	146305	3842
1563519773	19/07/2019 9:02	90342	1798681641	0	146305	3842
1563519774	19/07/2019 9:02	90342	1798681641	0	146305	3843
1563519775	19/07/2019 9:02	90345	3515625	0	146306	3843
1563519776	19/07/2019 9:02	90345	3515625	0	146306	3843
1563519777	19/07/2019 9:02	90348	3515625	0	146306	3843
1563519778	19/07/2019 9:02	90348	0	0	146306	3843
1563519779	19/07/2019 9:02	90348	0	0	146306	3843
1563519780	19/07/2019 9:03	90351	0	0	146307	3843
1563519781	19/07/2019 9:03	90351	0	0	146307	3843
1563519782	19/07/2019 9:03	90351	0	0	146307	3843
1563519783	19/07/2019 9:03	90354	0	0	146308	3843
1563519784	19/07/2019 9:03	90354	0	0	146308	3843
1563519785	19/07/2019 9:03	90354	0	0	146308	3843

timestamp	datetime	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
1563519786	19/07/2019 9:03	90357	0	0	146308	3843
1563519787	19/07/2019 9:03	90357	0	0	146309	3843
1563519788	19/07/2019 9:03	90357	0	0	146309	3843
1563519789	19/07/2019 9:03	90400	0	0	146309	3843
1563519790	19/07/2019 9:03	90400	0	0	146309	3843
1563519791	19/07/2019 9:03	90400	0	0	146309	3843
1563519792	19/07/2019 9:03	90403	0	0	146309	3843
1563519793	19/07/2019 9:03	90403	0	0	146309	3843
1563519794	19/07/2019 9:03	90403	0	0	146310	3843
1563519795	19/07/2019 9:03	90406	0	0	146310	3843
1563519796	19/07/2019 9:03	90406	0	0	146310	3843
1563519797	19/07/2019 9:03	90406	0	0	146310	3843
1563519798	19/07/2019 9:03	90409	0	0	146310	3843
1563519799	19/07/2019 9:03	90409	0	0	146310	3843
1563519800	19/07/2019 9:03	90409	0	0	146311	3843
1563519801	19/07/2019 9:03	90411	0	0	146311	3843
1563519802	19/07/2019 9:03	90411	0	0	146311	3843
1563519803	19/07/2019 9:03	90411	0	0	146311	3843
1563519804	19/07/2019 9:03	90414	0	0	146311	3843
1563519805	19/07/2019 9:03	90414	0	0	146311	3843
1563519806	19/07/2019 9:03	90417	0	0	146311	3843
1563519807	19/07/2019 9:03	90417	0	0	146312	3843
1563519808	19/07/2019 9:03	90417	0	0	146312	3843
1563519809	19/07/2019 9:03	90420	0	0	146312	3843

Tabla 2. Datos en tiempo real de la fresadora HAAS.

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
1563519810	19/07/2019 9:03	90420	0	262	146312	3843
1563519811	19/07/2019 9:03	90420	0	262	146312	3843
1563519812	19/07/2019 9:03	90423	0	262	146312	3843
1563519813	19/07/2019 9:03	90423	0	262	146312	3843
1563519814	19/07/2019 9:03	90423	0	262	146313	3843
1563519815	19/07/2019 9:03	90426	0	262	146313	3843
1563519816	19/07/2019 9:03	90426	0	262	146313	3843
1563519817	19/07/2019 9:03	90426	0	262	146313	3843
1563519818	19/07/2019 9:03	90429	0	262	146313	3843
1563519819	19/07/2019 9:03	90429	0	262	146314	3843
1563519820	19/07/2019 9:03	90429	0	262	146314	3843
1563519821	19/07/2019 9:03	90432	0	262	146314	3843
1563519822	19/07/2019 9:03	90432	0	262	146314	3843
1563519823	19/07/2019 9:03	90432	0	262	146314	3843

1563519824	19/07/2019 9:03	90435	0	262	146314	3843
1563519825	19/07/2019 9:03	90435	0	262	146314	3843
1563519826	19/07/2019 9:03	90435	0	262	146315	3843
1563519827	19/07/2019 9:03	90438	0	262	146315	3843
1563519828	19/07/2019 9:03	90438	0	262	146315	3843
1563519829	19/07/2019 9:03	90438	0	262	146315	3843
1563519830	19/07/2019 9:03	90440	0	262	146315	3843
1563519831	19/07/2019 9:03	90440	0	262	146315	3843
1563519832	19/07/2019 9:03	90440	0	262	146315	3843
1563519833	19/07/2019 9:03	90444	0	262	146315	3843
1563519834	19/07/2019 9:03	90444	0	262	146316	3843
1563519835	19/07/2019 9:03	90446	0	262	146316	3843
1563519836	19/07/2019 9:03	90446	0	262	146316	3843
1563519837	19/07/2019 9:03	90446	0	262	146316	3843
1563519838	19/07/2019 9:03	90449	0	262	146316	3843
1563519839	19/07/2019 9:03	90449	0	262	146316	3843
1563519840	19/07/2019 9:04	90449	0	262	146317	3843
1563519841	19/07/2019 9:04	90452	0	262	146317	3843
1563519842	19/07/2019 9:04	90452	0	262	146317	3843
1563519843	19/07/2019 9:04	90452	0	0	146317	3843
1563519844	19/07/2019 9:04	90455	0	0	146317	3843
1563519845	19/07/2019 9:04	90455	0	0	146317	3843
1563519846	19/07/2019 9:04	90455	0	0	146317	3843
1563519847	19/07/2019 9:04	90458	0	0	146317	3843
1563519848	19/07/2019 9:04	90458	0	0	146317	3843
1563519849	19/07/2019 9:04	90458	0	0	146317	3843
1563519850	19/07/2019 9:04	90501	2497412109	0	146317	3843
1563519851	19/07/2019 9:04	90501	2497412109	0	146317	3843
1563519852	19/07/2019 9:04	90501	2497412109	0	146317	3843
1563519853	19/07/2019 9:04	90504	2497265625	0	146317	3843
1563519854	19/07/2019 9:04	90504	2497265625	0	146317	3843
1563519855	19/07/2019 9:04	90504	2497265625	0	146317	3843
1563519856	19/07/2019 9:04	90507	2496826172	0	146317	3843
1563519857	19/07/2019 9:04	90507	2496826172	0	146317	3843
1563519858	19/07/2019 9:04	90507	2497558594	0	146317	3843
1563519859	19/07/2019 9:04	90510	2497558594	0	146317	3843
1563519860	19/07/2019 9:04	90510	2497558594	0	146317	3843
1563519861	19/07/2019 9:04	90510	2497998047	0	146317	3843
1563519862	19/07/2019 9:04	90513	2497998047	0	146317	3843
1563519863	19/07/2019 9:04	90513	2497998047	0	146317	3843
1563519864	19/07/2019 9:04	90513	2497998047	0	146317	3843
1563519865	19/07/2019 9:04	90515	2497998047	0	146317	3843
1563519866	19/07/2019 9:04	90515	2497998047	0	146317	3843
1563519867	19/07/2019 9:04	90515	2497119141	0	146317	3843

1563519868	19/07/2019 9:04	90518	2497119141	0	146317	3843
1563519869	19/07/2019 9:04	90518	2497119141	0	146317	3843
1563519870	19/07/2019 9:04	90521	2497412109	0	146317	3843
1563519871	19/07/2019 9:04	90521	2497412109	0	146317	3843
1563519872	19/07/2019 9:04	90521	2497412109	0	146317	3843
1563519873	19/07/2019 9:04	90524	2497851563	0	146317	3843
1563519874	19/07/2019 9:04	90524	2497851563	0	146317	3843
1563519875	19/07/2019 9:04	90524	2497851563	0	146317	3843
1563519876	19/07/2019 9:04	90527	2497265625	0	146317	3843
1563519877	19/07/2019 9:04	90527	2497265625	0	146317	3843
1563519878	19/07/2019 9:04	90527	2497265625	0	146317	3843
1563519879	19/07/2019 9:04	90530	2496972656	0	146317	3843
1563519880	19/07/2019 9:04	90530	2496972656	0	146317	3843
1563519881	19/07/2019 9:04	90530	2496972656	0	146317	3843
1563519882	19/07/2019 9:04	90533	2497558594	0	146317	3843
1563519883	19/07/2019 9:04	90533	2497558594	0	146317	3843
1563519884	19/07/2019 9:04	90533	2497558594	0	146317	3844
1563519885	19/07/2019 9:04	90536	1935058594	0	146317	3844
1563519886	19/07/2019 9:04	90536	1935058594	0	146317	3844
1563519887	19/07/2019 9:04	90536	1935058594	0	146317	3844
1563519888	19/07/2019 9:04	90539	0	0	146317	3844
1563519889	19/07/2019 9:04	90539	0	0	146317	3844
1563519890	19/07/2019 9:04	90539	0	0	146317	3844
1563519891	19/07/2019 9:04	90542	3955078125	0	146317	3844
1563519892	19/07/2019 9:04	90542	3955078125	0	146317	3844
1563519893	19/07/2019 9:04	90542	2497705078	0	146317	3844
1563519894	19/07/2019 9:04	90545	2497705078	0	146317	3844
1563519895	19/07/2019 9:04	90545	2497705078	0	146317	3844
1563519896	19/07/2019 9:04	90545	2497558594	0	146317	3844
1563519897	19/07/2019 9:04	90548	2497558594	0	146317	3844
1563519898	19/07/2019 9:04	90548	2497558594	0	146317	3844
1563519899	19/07/2019 9:04	90550	2497558594	0	146317	3844
1563519900	19/07/2019 9:05	90550	2497558594	0	146317	3845
1563519901	19/07/2019 9:05	90550	2497558594	0	146317	3845
1563519902	19/07/2019 9:05	90550	2498730469	0	146317	3845
1563519903	19/07/2019 9:05	90553	2498730469	0	146317	3845
1563519904	19/07/2019 9:05	90553	2498730469	0	146317	3845
1563519905	19/07/2019 9:05	90556	2496826172	0	146317	3845
1563519906	19/07/2019 9:05	90556	2496826172	0	146317	3845
1563519907	19/07/2019 9:05	90556	2496826172	0	146317	3845
1563519908	19/07/2019 9:05	90559	2497412109	0	146317	3845
1563519909	19/07/2019 9:05	90559	2497412109	0	146317	3845
1563519910	19/07/2019 9:05	90559	2497412109	0	146317	3845
1563519911	19/07/2019 9:05	90602	0	0	146317	3845

1563519912	19/07/2019 9:05	90602	0	0	146317	3845
1563519913	19/07/2019 9:05	90602	0	0	146317	3845
1563519914	19/07/2019 9:05	90605	0,5859375	0	146317	3845
1563519915	19/07/2019 9:05	90605	0,5859375	0	146317	3845
1563519916	19/07/2019 9:05	90605	0,5859375	0	146317	3845
1563519917	19/07/2019 9:05	90608	2999267578	0	146317	3845
1563519918	19/07/2019 9:05	90608	2999267578	0	146317	3845
1563519919	19/07/2019 9:05	90608	2999267578	0	146317	3845
1563519920	19/07/2019 9:05	90611	2999707031	0	146317	3845
1563519921	19/07/2019 9:05	90611	2999707031	0	146317	3845
1563519922	19/07/2019 9:05	90611	2999707031	0	146317	3845
1563519923	19/07/2019 9:05	90614	2998828125	0	146317	3845
1563519924	19/07/2019 9:05	90614	2998828125	0	146317	3845
1563519925	19/07/2019 9:05	90614	2998828125	0	146317	3845
1563519926	19/07/2019 9:05	90617	2998974609	0	146317	3845
1563519927	19/07/2019 9:05	90617	2998974609	0	146317	3845
1563519928	19/07/2019 9:05	90617	2999414063	0	146317	3845
1563519929	19/07/2019 9:05	90619	2999414063	0	146317	3845
1563519930	19/07/2019 9:05	90619	2999414063	0	146317	3845
1563519931	19/07/2019 9:05	90619	2998681641	0	146317	3845
1563519932	19/07/2019 9:05	90623	2998681641	0	146317	3845
1563519933	19/07/2019 9:05	90623	2998681641	0	146317	3845
1563519934	19/07/2019 9:05	90625	0	0	146317	3845
1563519935	19/07/2019 9:05	90625	0	0	146317	3845
1563519936	19/07/2019 9:05	90625	0	0	146317	3845
1563519937	19/07/2019 9:05	90628	0	0	146317	3845
1563519938	19/07/2019 9:05	90628	0	0	146317	3845
1563519939	19/07/2019 9:05	90628	0	0	146317	3845
1563519940	19/07/2019 9:05	90631	1601513672	0	146317	3845
1563519941	19/07/2019 9:05	90631	1601513672	0	146317	3845
1563519942	19/07/2019 9:05	90631	1601513672	0	146317	3845
1563519943	19/07/2019 9:05	90634	1601513672	0	146317	3845
1563519944	19/07/2019 9:05	90634	1601513672	0	146317	3845
1563519945	19/07/2019 9:05	90634	1601513672	0	146317	3845
1563519946	19/07/2019 9:05	90637	1599755859	0	146317	3845
1563519947	19/07/2019 9:05	90637	1599755859	0	146317	3845
1563519948	19/07/2019 9:05	90637	1599755859	0	146317	3845
1563519949	19/07/2019 9:05	90640	1599755859	0	146317	3845
1563519950	19/07/2019 9:05	90640	1599755859	0	146317	3845
1563519951	19/07/2019 9:05	90640	1599755859	0	146317	3845
1563519952	19/07/2019 9:05	90643	1600488281	0	146317	3845
1563519953	19/07/2019 9:05	90643	1600488281	0	146317	3845
1563519954	19/07/2019 9:05	90643	1600488281	0	146317	3845
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1563519956	19/07/2019 9:05	90646	1601220703	0	146317	3845
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1563519959	19/07/2019 9:05	90649	1601074219	0	146317	3845
1563519960	19/07/2019 9:06	90649	1601074219	0	146317	3845
1563519961	19/07/2019 9:06	90652	1599902344	0	146317	3845
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1563519963	19/07/2019 9:06	90654	1600195313	0	146317	3845
1563519964	19/07/2019 9:06	90654	1600195313	0	146317	3845
1563519965	19/07/2019 9:06	90654	1600195313	0	146317	3845
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1563519967	19/07/2019 9:06	90657	1600048828	0	146317	3845
1563519968	19/07/2019 9:06	90657	1600048828	0	146317	3845
1563519969	19/07/2019 9:06	90700	1600634766	0	146317	3845
1563519970	19/07/2019 9:06	90700	1600634766	0	146317	3845
1563519971	19/07/2019 9:06	90700	1600634766	0	146317	3845
1563519972	19/07/2019 9:06	90703	1600927734	0	146317	3845
1563519973	19/07/2019 9:06	90703	1600927734	0	146317	3845
1563519974	19/07/2019 9:06	90703	1600927734	0	146317	3845
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1563519980	19/07/2019 9:06	90709	0	0	146317	3846
1563519981	19/07/2019 9:06	90712	1797949219	0	146317	3846
1563519982	19/07/2019 9:06	90712	1797949219	0	146317	3846
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1563519984	19/07/2019 9:06	90715	1798681641	0	146317	3846
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1563519986	19/07/2019 9:06	90715	1798681641	0	146317	3846
1563519987	19/07/2019 9:06	90718	1797802734	0	146317	3846
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1563519989	19/07/2019 9:06	90718	1797802734	0	146317	3846
1563519990	19/07/2019 9:06	90721	1798681641	0	146317	3846
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1563519995	19/07/2019 9:06	90723	1798095703	0	146317	3846
1563519996	19/07/2019 9:06	90726	1798388672	0	146317	3846
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1563519998	19/07/2019 9:06	90729	1797949219	0	146317	3846
1563519999	19/07/2019 9:06	90729	1797949219	0	146317	3846

1563520000	19/07/2019 9:06	90729	1797949219	0	146317	3846
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1563520004	19/07/2019 9:06	90735	1797949219	0	146317	3847
1563520005	19/07/2019 9:06	90735	1797949219	0	146317	3847
1563520006	19/07/2019 9:06	90735	1797949219	0	146317	3847
1563520007	19/07/2019 9:06	90738	1798242188	0	146317	3847
1563520008	19/07/2019 9:06	90738	1798242188	0	146317	3847
1563520009	19/07/2019 9:06	90738	1798242188	0	146317	3847
1563520010	19/07/2019 9:06	90741	1797802734	0	146317	3847
1563520011	19/07/2019 9:06	90741	1797802734	0	146317	3847
1563520012	19/07/2019 9:06	90741	1797802734	0	146317	3847
1563520013	19/07/2019 9:06	90744	1798828125	0	146317	3847
1563520014	19/07/2019 9:06	90744	1798828125	0	146317	3847
1563520015	19/07/2019 9:06	90744	1798828125	0	146317	3847
1563520016	19/07/2019 9:06	90747	0	0	146317	3847
1563520017	19/07/2019 9:06	90747	0	0	146317	3847
1563520018	19/07/2019 9:06	90747	0	0	146317	3847
1563520019	19/07/2019 9:06	90750	0	0	146317	3847
1563520020	19/07/2019 9:07	90750	0	0	146317	3847
1563520021	19/07/2019 9:07	90750	0	0	146317	3847
1563520022	19/07/2019 9:07	90753	0	0	146317	3847
1563520023	19/07/2019 9:07	90753	0	0	146317	3847
1563520024	19/07/2019 9:07	90753	0	0	146317	3847
1563520025	19/07/2019 9:07	90756	0	0	146317	3847
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1563520027	19/07/2019 9:07	90758	0	0	146317	3847
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1563520031	19/07/2019 9:07	90801	0	0	146317	3847
1563520032	19/07/2019 9:07	90801	0	0	146317	3848
1563520033	19/07/2019 9:07	90804	0	0	146317	3848
1563520034	19/07/2019 9:07	90804	0	0	146317	3848
1563520035	19/07/2019 9:07	90804	0	0	146317	3848
1563520036	19/07/2019 9:07	90807	0	0	146317	3848
1563520037	19/07/2019 9:07	90807	0	0	146317	3848
1563520038	19/07/2019 9:07	90807	0	0	146317	3848
1563520039	19/07/2019 9:07	90810	0	0	146317	3848
1563520040	19/07/2019 9:07	90810	0	0	146317	3848
1563520041	19/07/2019 9:07	90810	0	0	146317	3848
1563520042	19/07/2019 9:07	90813	0	0	146317	3848
1563520043	19/07/2019 9:07	90813	0	0	146317	3848

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
1563520044	19/07/2019 9:07	90813	0	0	146317	3848
1563520045	19/07/2019 9:07	90816	0	0	146317	3848
1563520046	19/07/2019 9:07	90816	0	0	146317	3848

Tabla 2.1 Datos en tiempo real de la fresadora HAAS.

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
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1563520048	19/07/2019 9:07	90819	0	263	146317	3848
1563520049	19/07/2019 9:07	90819	0	263	146317	3848
1563520050	19/07/2019 9:07	90819	0	263	146317	3848
1563520051	19/07/2019 9:07	90822	0	263	146317	3848
1563520052	19/07/2019 9:07	90822	0	263	146317	3848
1563520053	19/07/2019 9:07	90822	0	263	146317	3848
1563520054	19/07/2019 9:07	90825	0	263	146317	3848
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1563520057	19/07/2019 9:07	90827	0	263	146317	3848
1563520058	19/07/2019 9:07	90827	0	263	146317	3848
1563520059	19/07/2019 9:07	90827	0	263	146317	3848
1563520060	19/07/2019 9:07	90830	0	263	146317	3848
1563520061	19/07/2019 9:07	90830	0	263	146317	3848
1563520062	19/07/2019 9:07	90833	0	263	146317	3848
1563520063	19/07/2019 9:07	90833	0	263	146317	3848
1563520064	19/07/2019 9:07	90833	0	263	146317	3848
1563520065	19/07/2019 9:07	90836	0	263	146317	3848
1563520066	19/07/2019 9:07	90836	0	263	146317	3848
1563520067	19/07/2019 9:07	90836	0	263	146317	3848
1563520068	19/07/2019 9:07	90839	0	263	146317	3848
1563520069	19/07/2019 9:07	90839	0	263	146317	3848
1563520070	19/07/2019 9:07	90839	0	263	146317	3848
1563520071	19/07/2019 9:07	90842	0	263	146317	3848
1563520072	19/07/2019 9:07	90842	0	263	146317	3848
1563520073	19/07/2019 9:07	90842	0	263	146317	3848
1563520074	19/07/2019 9:07	90845	0	263	146317	3849
1563520075	19/07/2019 9:07	90845	0	263	146317	3849
1563520076	19/07/2019 9:07	90845	0	263	146317	3849
1563520077	19/07/2019 9:07	90848	0	263	146317	3849
1563520078	19/07/2019 9:07	90848	0	263	146317	3849
1563520079	19/07/2019 9:07	90848	0	263	146317	3849
1563520080	19/07/2019 9:08	90851	0	263	146317	3849
1563520081	19/07/2019 9:08	90851	0	263	146317	3849
1563520082	19/07/2019 9:08	90851	0	263	146317	3849

1563520083	19/07/2019 9:08	90854	0,87890625	263	146317	3849
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1563520090	19/07/2019 9:08	90900	0	0	146317	3849
1563520091	19/07/2019 9:08	90902	0	0	146317	3849
1563520092	19/07/2019 9:08	90902	2496679688	0	146317	3849
1563520093	19/07/2019 9:08	90902	2496679688	0	146317	3849
1563520094	19/07/2019 9:08	90905	2496679688	0	146317	3849
1563520095	19/07/2019 9:08	90905	2498291016	0	146317	3849
1563520096	19/07/2019 9:08	90905	2498291016	0	146317	3849
1563520097	19/07/2019 9:08	90908	2498291016	0	146317	3849
1563520098	19/07/2019 9:08	90908	2497998047	0	146317	3849
1563520099	19/07/2019 9:08	90908	2497998047	0	146317	3849
1563520100	19/07/2019 9:08	90911	2497998047	0	146317	3849
1563520101	19/07/2019 9:08	90911	2497265625	0	146317	3849
1563520102	19/07/2019 9:08	90911	2497265625	0	146317	3849
1563520103	19/07/2019 9:08	90914	2497265625	0	146317	3849
1563520104	19/07/2019 9:08	90914	2497412109	0	146317	3849
1563520105	19/07/2019 9:08	90914	2497412109	0	146317	3849
1563520106	19/07/2019 9:08	90917	2497412109	0	146317	3849
1563520107	19/07/2019 9:08	90917	2497851563	0	146317	3849
1563520108	19/07/2019 9:08	90917	2497851563	0	146317	3849
1563520109	19/07/2019 9:08	90920	2497851563	0	146317	3849
1563520110	19/07/2019 9:08	90920	249609375	0	146317	3849
1563520111	19/07/2019 9:08	90920	249609375	0	146317	3849
1563520112	19/07/2019 9:08	90923	249609375	0	146317	3849
1563520113	19/07/2019 9:08	90923	2497412109	0	146317	3849
1563520114	19/07/2019 9:08	90923	2497412109	0	146317	3849
1563520115	19/07/2019 9:08	90926	2497412109	0	146317	3849
1563520116	19/07/2019 9:08	90926	2496826172	0	146317	3849
1563520117	19/07/2019 9:08	90926	2496826172	0	146317	3849
1563520118	19/07/2019 9:08	90929	2498291016	0	146317	3849
1563520119	19/07/2019 9:08	90929	2498291016	0	146317	3849
1563520120	19/07/2019 9:08	90929	2498291016	0	146317	3849
1563520121	19/07/2019 9:08	90931	2498144531	0	146317	3849
1563520122	19/07/2019 9:08	90931	2498144531	0	146317	3849
1563520123	19/07/2019 9:08	90931	2498144531	0	146317	3849
1563520124	19/07/2019 9:08	90934	2496972656	0	146317	3849
1563520125	19/07/2019 9:08	90934	2496972656	0	146317	3849
1563520126	19/07/2019 9:08	90937	2496972656	0	146317	3849

1563520127	19/07/2019 9:08	90937	0	0	146317	3849
1563520128	19/07/2019 9:08	90937	0	0	146317	3849
1563520129	19/07/2019 9:08	90940	0	0	146317	3849
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1563520132	19/07/2019 9:08	90943	0	0	146317	3849
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1563520134	19/07/2019 9:08	90943	2498730469	0	146317	3849
1563520135	19/07/2019 9:08	90946	2498730469	0	146317	3849
1563520136	19/07/2019 9:08	90946	2496826172	0	146317	3849
1563520137	19/07/2019 9:08	90946	2496826172	0	146317	3849
1563520138	19/07/2019 9:08	90949	2496826172	0	146317	3849
1563520139	19/07/2019 9:08	90949	2496972656	0	146317	3849
1563520140	19/07/2019 9:09	90949	2496972656	0	146317	3849
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1563520142	19/07/2019 9:09	90952	2496972656	0	146317	3849
1563520143	19/07/2019 9:09	90952	2496972656	0	146317	3849
1563520144	19/07/2019 9:09	90955	2496972656	0	146317	3849
1563520145	19/07/2019 9:09	90955	2497705078	0	146317	3849
1563520146	19/07/2019 9:09	90955	2497705078	0	146317	3849
1563520147	19/07/2019 9:09	90958	2497705078	0	146317	3849
1563520148	19/07/2019 9:09	90958	2497265625	0	146317	3849
1563520149	19/07/2019 9:09	90958	2497265625	0	146317	3849
1563520150	19/07/2019 9:09	91000	1025390625	0	146317	3849
1563520151	19/07/2019 9:09	91000	1025390625	0	146317	3849
1563520152	19/07/2019 9:09	91000	1025390625	0	146317	3849
1563520153	19/07/2019 9:09	91004	0	0	146317	3849
1563520154	19/07/2019 9:09	91004	0	0	146317	3849
1563520155	19/07/2019 9:09	91006	0	0	146317	3849
1563520156	19/07/2019 9:09	91006	1829150391	0	146317	3849
1563520157	19/07/2019 9:09	91006	1829150391	0	146317	3849
1563520158	19/07/2019 9:09	91009	1829150391	0	146317	3849
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1563520160	19/07/2019 9:09	91009	2998828125	0	146317	3849
1563520161	19/07/2019 9:09	91012	2998828125	0	146317	3849
1563520162	19/07/2019 9:09	91012	2999267578	0	146317	3849
1563520163	19/07/2019 9:09	91012	2999267578	0	146317	3849
1563520164	19/07/2019 9:09	91015	2999267578	0	146317	3849
1563520165	19/07/2019 9:09	91015	2998681641	0	146317	3849
1563520166	19/07/2019 9:09	91015	2998681641	0	146317	3849
1563520167	19/07/2019 9:09	91018	2998681641	0	146317	3849
1563520168	19/07/2019 9:09	91018	2999707031	0	146317	3849
1563520169	19/07/2019 9:09	91018	2999707031	0	146317	3849
1563520170	19/07/2019 9:09	91021	2999707031	0	146317	3849

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1563520173	19/07/2019 9:09	91024	2999853516	0	146317	3849
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1563520176	19/07/2019 9:09	91027	5390625	0	146317	3849
1563520177	19/07/2019 9:09	91027	0	0	146317	3849
1563520178	19/07/2019 9:09	91027	0	0	146317	3849
1563520179	19/07/2019 9:09	91030	0	0	146317	3849
1563520180	19/07/2019 9:09	91030	0	0	146317	3849
1563520181	19/07/2019 9:09	91030	0	0	146317	3849
1563520182	19/07/2019 9:09	91033	0	0	146317	3849
1563520183	19/07/2019 9:09	91033	1599169922	0	146317	3849
1563520184	19/07/2019 9:09	91035	1599169922	0	146317	3850
1563520185	19/07/2019 9:09	91035	1600488281	0	146317	3850
1563520186	19/07/2019 9:09	91035	1600488281	0	146317	3850
1563520187	19/07/2019 9:09	91035	1600488281	0	146317	3850
1563520188	19/07/2019 9:09	91038	1600195313	0	146317	3850
1563520189	19/07/2019 9:09	91038	1600195313	0	146317	3850
1563520190	19/07/2019 9:09	91041	1600195313	0	146317	3850
1563520191	19/07/2019 9:09	91041	1599316406	0	146317	3850
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1563520193	19/07/2019 9:09	91044	1599316406	0	146317	3850
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1563520195	19/07/2019 9:09	91044	1601220703	0	146317	3850
1563520196	19/07/2019 9:09	91047	1601220703	0	146317	3850
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1563520199	19/07/2019 9:09	91050	1600341797	0	146317	3850
1563520200	19/07/2019 9:10	91050	1599609375	0	146317	3851
1563520201	19/07/2019 9:10	91050	1599609375	0	146317	3851
1563520202	19/07/2019 9:10	91053	1599609375	0	146317	3851
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1563520204	19/07/2019 9:10	91053	1601220703	0	146317	3851
1563520205	19/07/2019 9:10	91056	1601220703	0	146317	3851
1563520206	19/07/2019 9:10	91056	1600195313	0	146317	3851
1563520207	19/07/2019 9:10	91056	1600195313	0	146317	3851
1563520208	19/07/2019 9:10	91059	1600195313	0	146317	3851
1563520209	19/07/2019 9:10	91059	1600195313	0	146317	3851
1563520210	19/07/2019 9:10	91059	1600195313	0	146317	3851
1563520211	19/07/2019 9:10	91102	1600195313	0	146317	3851
1563520212	19/07/2019 9:10	91102	1599902344	0	146317	3851
1563520213	19/07/2019 9:10	91102	1599902344	0	146317	3851
1563520214	19/07/2019 9:10	91104	8263183594	0	146317	3851

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1563520216	19/07/2019 9:10	91104	1688964844	0	146317	3851
1563520217	19/07/2019 9:10	91107	0	0	146317	3851
1563520218	19/07/2019 9:10	91107	0	0	146317	3851
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1563520220	19/07/2019 9:10	91110	0,146484375	0	146317	3851
1563520221	19/07/2019 9:10	91110	0,146484375	0	146317	3851
1563520222	19/07/2019 9:10	91113	0,146484375	0	146317	3851
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1563520224	19/07/2019 9:10	91113	1797509766	0	146317	3851
1563520225	19/07/2019 9:10	91116	1797509766	0	146317	3851
1563520226	19/07/2019 9:10	91116	1797363281	0	146317	3851
1563520227	19/07/2019 9:10	91116	1797363281	0	146317	3851
1563520228	19/07/2019 9:10	91119	1797363281	0	146317	3851
1563520229	19/07/2019 9:10	91119	179765625	0	146317	3851
1563520230	19/07/2019 9:10	91119	179765625	0	146317	3851
1563520231	19/07/2019 9:10	91122	179765625	0	146317	3851
1563520232	19/07/2019 9:10	91122	1797949219	0	146317	3851
1563520233	19/07/2019 9:10	91122	1797949219	0	146317	3851
1563520234	19/07/2019 9:10	91125	1797949219	0	146317	3851
1563520235	19/07/2019 9:10	91125	1797802734	0	146317	3851
1563520236	19/07/2019 9:10	91125	1797802734	0	146317	3851
1563520237	19/07/2019 9:10	91128	1797802734	0	146317	3851
1563520238	19/07/2019 9:10	91128	1797949219	0	146317	3851
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1563520240	19/07/2019 9:10	91131	1797949219	0	146317	3851
1563520241	19/07/2019 9:10	91131	1798242188	0	146317	3851
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1563520244	19/07/2019 9:10	91134	179765625	0	146317	3851
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1563520246	19/07/2019 9:10	91137	179765625	0	146317	3851
1563520247	19/07/2019 9:10	91137	179765625	0	146317	3851
1563520248	19/07/2019 9:10	91139	179765625	0	146317	3851
1563520249	19/07/2019 9:10	91139	1798535156	0	146317	3851
1563520250	19/07/2019 9:10	91139	1798535156	0	146317	3851
1563520251	19/07/2019 9:10	91139	1798535156	0	146317	3851
1563520252	19/07/2019 9:10	91142	179765625	0	146317	3851
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1563520254	19/07/2019 9:10	91145	179765625	0	146317	3851
1563520255	19/07/2019 9:10	91145	1798681641	0	146317	3851
1563520256	19/07/2019 9:10	91145	1798681641	0	146317	3851
1563520257	19/07/2019 9:10	91148	1798681641	0	146317	3851
1563520258	19/07/2019 9:10	91148	0	0	146317	3851

1563520259	19/07/2019 9:10	91148	0	0	146317	3851
1563520260	19/07/2019 9:11	91151	0	0	146317	3851
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1563520283	19/07/2019 9:11	91214	0	0	146317	3852
1563520284	19/07/2019 9:11	91214	0	0	146317	3852
1563520285	19/07/2019 9:11	91214	0	0	146317	3852
1563520286	19/07/2019 9:11	91217	0	0	146317	3852
1563520287	19/07/2019 9:11	91217	0	0	146317	3852
1563520288	19/07/2019 9:11	91217	0	0	146317	3852
1563520289	19/07/2019 9:11	91220	0	0	146317	3852

Tabla 2.2 Datos en tiempo real de la fresadora HAAS.

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
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1563520292	19/07/2019 9:11	91223	0	264	146317	3852
1563520293	19/07/2019 9:11	91223	0	264	146317	3852
1563520294	19/07/2019 9:11	91223	0	264	146317	3852
1563520295	19/07/2019 9:11	91226	0	264	146317	3852

1563520296	19/07/2019 9:11	91226	0	264	146317	3852
1563520297	19/07/2019 9:11	91226	0	264	146317	3852
1563520298	19/07/2019 9:11	91229	0	264	146317	3852
1563520299	19/07/2019 9:11	91229	0	264	146317	3852
1563520300	19/07/2019 9:11	91229	0	264	146317	3852
1563520301	19/07/2019 9:11	91232	0	264	146317	3852
1563520302	19/07/2019 9:11	91232	0	264	146317	3852
1563520303	19/07/2019 9:11	91232	0	264	146317	3852
1563520304	19/07/2019 9:11	91235	0	264	146317	3853
1563520305	19/07/2019 9:11	91235	0	264	146317	3853
1563520306	19/07/2019 9:11	91235	0	264	146317	3853
1563520307	19/07/2019 9:11	91237	0	264	146317	3853
1563520308	19/07/2019 9:11	91237	0	264	146317	3853
1563520309	19/07/2019 9:11	91237	0	264	146317	3853
1563520310	19/07/2019 9:11	91241	0	264	146317	3853
1563520311	19/07/2019 9:11	91241	0	264	146317	3853
1563520312	19/07/2019 9:11	91243	0	264	146317	3853
1563520313	19/07/2019 9:11	91243	0	264	146317	3853
1563520314	19/07/2019 9:11	91243	0	264	146317	3853
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1563520319	19/07/2019 9:11	91249	0	264	146317	3853
1563520320	19/07/2019 9:12	91249	0	264	146317	3853
1563520321	19/07/2019 9:12	91252	0	264	146317	3853
1563520322	19/07/2019 9:12	91252	0	264	146317	3853
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1563520330	19/07/2019 9:12	91301	2458447266	0	146317	3853
1563520331	19/07/2019 9:12	91301	2458447266	0	146317	3853
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1563520333	19/07/2019 9:12	91304	2497558594	0	146317	3854
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1563520335	19/07/2019 9:12	91304	2497998047	0	146317	3854
1563520336	19/07/2019 9:12	91307	2497998047	0	146317	3854
1563520337	19/07/2019 9:12	91307	2497998047	0	146317	3854
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1563520346	19/07/2019 9:12	91315	2497998047	0	146317	3854
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1563520350	19/07/2019 9:12	91321	2496679688	0	146317	3854
1563520351	19/07/2019 9:12	91321	2496679688	0	146317	3854
1563520352	19/07/2019 9:12	91321	2496679688	0	146317	3854
1563520353	19/07/2019 9:12	91324	2497558594	0	146317	3854
1563520354	19/07/2019 9:12	91324	2497558594	0	146317	3854
1563520355	19/07/2019 9:12	91324	2497851563	0	146317	3854
1563520356	19/07/2019 9:12	91327	2497851563	0	146317	3854
1563520357	19/07/2019 9:12	91327	2497851563	0	146317	3854
1563520358	19/07/2019 9:12	91327	2497998047	0	146317	3854
1563520359	19/07/2019 9:12	91330	2497998047	0	146317	3854
1563520360	19/07/2019 9:12	91330	2497998047	0	146317	3854
1563520361	19/07/2019 9:12	91330	2497412109	0	146317	3854
1563520362	19/07/2019 9:12	91333	2497412109	0	146317	3854
1563520363	19/07/2019 9:12	91333	2497412109	0	146317	3854
1563520364	19/07/2019 9:12	91333	2497558594	0	146317	3854
1563520365	19/07/2019 9:12	91336	2497558594	0	146317	3854
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1563520377	19/07/2019 9:12	91347	2497119141	0	146317	3855
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1563520386	19/07/2019 9:13	91356	2497851563	0	146317	3855
1563520387	19/07/2019 9:13	91356	2497851563	0	146317	3855
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1563520402	19/07/2019 9:13	91411	2999121094	0	146317	3855
1563520403	19/07/2019 9:13	91414	2999121094	0	146317	3855
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1563520405	19/07/2019 9:13	91416	2999267578	0	146317	3855
1563520406	19/07/2019 9:13	91416	2999267578	0	146317	3855
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1563520408	19/07/2019 9:13	91419	2998681641	0	146317	3855
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1563520432	19/07/2019 9:13	91443	1600634766	0	146317	3855
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1563520438	19/07/2019 9:13	91448	1601074219	0	146317	3855
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1563520440	19/07/2019 9:14	91451	1601513672	0	146317	3855
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1563520442	19/07/2019 9:14	91451	1601513672	0	146317	3855
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1563520467	19/07/2019 9:14	91517	1797949219	0	146317	3855
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1563520470	19/07/2019 9:14	91520	1798388672	0	146317	3855
1563520471	19/07/2019 9:14	91520	1798388672	0	146317	3855

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1563520474	19/07/2019 9:14	91523	1798242188	0	146317	3855
1563520475	19/07/2019 9:14	91526	1798095703	0	146317	3855
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1563520485	19/07/2019 9:14	91535	1798681641	0	146317	3856
1563520486	19/07/2019 9:14	91535	1798681641	0	146317	3856
1563520487	19/07/2019 9:14	91538	1798535156	0	146317	3856
1563520488	19/07/2019 9:14	91538	1798535156	0	146317	3856
1563520489	19/07/2019 9:14	91538	1797509766	0	146317	3856
1563520490	19/07/2019 9:14	91541	1797509766	0	146317	3856
1563520491	19/07/2019 9:14	91541	1797509766	0	146317	3856
1563520492	19/07/2019 9:14	91541	1798681641	0	146317	3856
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1563520496	19/07/2019 9:14	91547	3515625	0	146317	3856
1563520497	19/07/2019 9:14	91547	3515625	0	146317	3856
1563520498	19/07/2019 9:14	91549	0	0	146317	3856
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1563520523	19/07/2019 9:15	91613	0	0	146317	3857
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1563520525	19/07/2019 9:15	91616	0	0	146317	3857
1563520526	19/07/2019 9:15	91616	0	0	146317	3857
1563520527	19/07/2019 9:15	91616	0	0	146317	3857
1563520528	19/07/2019 9:15	91618	0	0	146317	3857
1563520529	19/07/2019 9:15	91618	0	0	146317	3857

Tabla 2.3 Datos en tiempo real de la fresadora HAAS.

timestamp	datetime utc	MACHINE_TIME	RPM_SPINDLE	PARTS	ENERGY_ACTIVE	TOOL_CHANGES
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1563520533	19/07/2019 9:15	91624	0	265	146317	3857
1563520534	19/07/2019 9:15	91624	0	265	146317	3857
1563520535	19/07/2019 9:15	91624	0	265	146317	3857
1563520536	19/07/2019 9:15	91627	0	265	146317	3857
1563520537	19/07/2019 9:15	91627	0	265	146317	3857
1563520538	19/07/2019 9:15	91627	0	265	146317	3857
1563520539	19/07/2019 9:15	91630	0	265	146317	3857
1563520540	19/07/2019 9:15	91630	0	265	146317	3857
1563520541	19/07/2019 9:15	91630	0	265	146317	3857
1563520542	19/07/2019 9:15	91633	0	265	146317	3857
1563520543	19/07/2019 9:15	91633	0	265	146317	3857
1563520544	19/07/2019 9:15	91633	0	265	146317	3857
1563520545	19/07/2019 9:15	91636	0	265	146317	3857
1563520546	19/07/2019 9:15	91636	0	265	146317	3857
1563520547	19/07/2019 9:15	91636	0	265	146317	3857
1563520548	19/07/2019 9:15	91639	0	265	146317	3857
1563520549	19/07/2019 9:15	91639	0	265	146317	3857
1563520550	19/07/2019 9:15	91639	0	265	146317	3857
1563520551	19/07/2019 9:15	91642	0	265	146317	3857
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1563520574	19/07/2019 9:16	91705	2497265625	0	146317	3857
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1563520597	19/07/2019 9:16	91728	2497265625	0	146317	3858
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1563520606	19/07/2019 9:16	91737	1935058594	0	146317	3859
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1563520615	19/07/2019 9:16	91746	2497705078	0	146317	3859
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1563520617	19/07/2019 9:16	91746	2497558594	0	146317	3859
1563520618	19/07/2019 9:16	91749	2497558594	0	146317	3859
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1563520624	19/07/2019 9:17	91754	2498730469	0	146317	3859
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1563520668	19/07/2019 9:17	91838	1599755859	0	146317	3860
1563520669	19/07/2019 9:17	91838	1599755859	0	146317	3860
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1563520714	19/07/2019 9:18	91924	1798535156	0	146317	3861
1563520715	19/07/2019 9:18	91924	1798095703	0	146317	3861
1563520716	19/07/2019 9:18	91927	1798388672	0	146317	3861
1563520717	19/07/2019 9:18	91927	1798388672	0	146317	3861
1563520718	19/07/2019 9:18	91927	1797949219	0	146317	3861
1563520719	19/07/2019 9:18	91930	1797949219	0	146317	3861
1563520720	19/07/2019 9:18	91930	1797949219	0	146317	3861
1563520721	19/07/2019 9:18	91930	1797802734	0	146317	3861
1563520722	19/07/2019 9:18	91933	1797802734	0	146317	3861
1563520723	19/07/2019 9:18	91933	1797802734	0	146317	3861
1563520724	19/07/2019 9:18	91933	1797949219	0	146317	3861
1563520725	19/07/2019 9:18	91936	1797949219	0	146317	3861
1563520726	19/07/2019 9:18	91936	1797949219	0	146317	3861
1563520727	19/07/2019 9:18	91936	1798242188	0	146317	3861
1563520728	19/07/2019 9:18	91939	1798242188	0	146317	3861
1563520729	19/07/2019 9:18	91939	1798242188	0	146317	3861
1563520730	19/07/2019 9:18	91939	1797802734	0	146317	3861
1563520731	19/07/2019 9:18	91942	1797802734	0	146317	3861

1563520732	19/07/2019 9:18	91942	1797802734	0	146317	3861
1563520733	19/07/2019 9:18	91942	1798828125	0	146317	3861
1563520734	19/07/2019 9:18	91945	1798828125	0	146317	3861
1563520735	19/07/2019 9:18	91945	1798828125	0	146317	3861
1563520736	19/07/2019 9:18	91945	0	0	146317	3861
1563520737	19/07/2019 9:18	91947	0	0	146317	3861
1563520738	19/07/2019 9:18	91947	0	0	146317	3861
1563520739	19/07/2019 9:18	91947	0	0	146317	3861
1563520740	19/07/2019 9:19	91951	0	0	146317	3861
1563520741	19/07/2019 9:19	91951	0	0	146317	3861
1563520742	19/07/2019 9:19	91953	0	0	146317	3861
1563520743	19/07/2019 9:19	91953	0	0	146317	3861
1563520744	19/07/2019 9:19	91953	0	0	146317	3861
1563520745	19/07/2019 9:19	91956	0	0	146317	3861
1563520746	19/07/2019 9:19	91956	0	0	146317	3861
1563520747	19/07/2019 9:19	91956	0	0	146317	3861
1563520748	19/07/2019 9:19	91959	0	0	146317	3861
1563520749	19/07/2019 9:19	91959	0	0	146317	3861
1563520750	19/07/2019 9:19	91959	0	0	146317	3861
1563520751	19/07/2019 9:19	92002	0	0	146317	3861
1563520752	19/07/2019 9:19	92002	0	0	146317	3861
1563520753	19/07/2019 9:19	92002	0	0	146317	3861
1563520754	19/07/2019 9:19	92005	0	0	146317	3861
1563520755	19/07/2019 9:19	92005	0	0	146317	3861
1563520756	19/07/2019 9:19	92005	0	0	146317	3861
1563520757	19/07/2019 9:19	92008	0	0	146317	3861
1563520758	19/07/2019 9:19	92008	0	0	146317	3861
1563520759	19/07/2019 9:19	92008	0	0	146317	3861
1563520760	19/07/2019 9:19	92011	0	0	146317	3861
1563520761	19/07/2019 9:19	92011	0	0	146317	3861
1563520762	19/07/2019 9:19	92011	0	0	146317	3861
1563520763	19/07/2019 9:19	92014	0	0	146317	3861
1563520764	19/07/2019 9:19	92014	0	0	146317	3861
1563520765	19/07/2019 9:19	92014	0	0	146317	3861
1563520766	19/07/2019 9:19	92017	0	0	146317	3861

Tabla 2.4 Datos en tiempo real de la fresadora HAAS.

Datos de la máquina torno PINACHO

tiempo (s)	t/60 (m)	Energía activa KWh	Potencia Activa kwh	Rpm	Nº pza
257	4,28333333	107360,5698	1072,697674	1314,96221	1
281	4,68333333	107440,6596	1048,921986	1520,41781	2

Tabla 3. Características del funcionamiento del torno PINACHO.

Media	269
Desviación	16,9705627

ENERGY_ACTIVE	POWER_ACTIVE	OPERATING_MODE	PART_COUNTER	PROGRAM_STATUS	RPM_SPINDLE	ACTIVE_TOOL
106681	806	JOG	81	RESET	493,5	3
106681	806	JOG	81	RESET	493,5	3
106681	1713	JOG	81	RESET	493,5	3
106682	1209	JOG	81	RESET	1000,5	3
106682	1234	JOG	81	RESET	1000,5	3
106682	1234	JOG	81	RESET	1000,5	3
106682	1247	JOG	81	RESET	1000,5	3
106683	1247	JOG	81	RESET	1000,5	3
106684	1247	JOG	81	RESET	1003,5	3
106684	1234	JOG	81	RESET	1001,25	3
106684	1234	JOG	81	RESET	1001,25	3
106685	1171	JOG	81	RESET	1001,25	3
106685	1134	JOG	81	RESET	1001,25	3
106685	1121	JOG	81	RESET	1001,25	3
106686	1108	JOG	81	RESET	1002,75	3
106686	1108	JOG	81	RESET	1002,75	3
106686	1134	JOG	81	RESET	1002,75	3
106686	1134	JOG	81	RESET	1002,75	3
106686	1134	JOG	81	RESET	1002,75	3
106687	1146	JOG	81	RESET	1000,5	3
106688	1121	JOG	81	RESET	1000,5	3
106688	1121	JOG	81	RESET	1000,5	3
106688	1121	JOG	81	RESET	1000,5	3
106688	1134	JOG	81	RESET	1000,5	3
106688	1146	JOG	81	RESET	1000,5	3
106689	1146	JOG	81	RESET	1002,75	3
106689	1159	JOG	81	RESET	1002,75	3
106690	1134	JOG	81	RESET	1002,75	3
106690	1121	JOG	81	RESET	1002	3
106690	1121	JOG	81	RESET	1002	3
106690	1134	JOG	81	RESET	1000,5	3
106691	1134	JOG	81	RESET	1000,5	3
106691	277	JOG	81	RESET	1000,5	3
106691	277	JOG	81	RESET	1000,5	3
106699	1549	JOG	81	RESET	1002	1

106699	1549	JOG	81	RESET	1002	1
106699	1146	JOG	81	RESET	1002	1
106699	1171	JOG	81	RESET	1002	1
106699	1171	JOG	81	RESET	1002	1
106700	1121	JOG	81	RESET	1002	1
106700	1134	JOG	81	RESET	1002	1
106701	1134	JOG	81	RESET	1002	1
106701	1171	JOG	81	RESET	1001,25	1
106701	1171	JOG	81	RESET	1001,25	1
106701	1108	JOG	81	RESET	1001,25	1
106702	1121	JOG	81	RESET	1001,25	1
106702	1121	JOG	81	RESET	1001,25	1
106703	1096	JOG	81	RESET	1002,75	1
106703	1096	JOG	81	RESET	1002,75	1
106703	1058	JOG	81	RESET	1002,75	1
106703	1121	JOG	81	RESET	1002,75	1
106704	1146	JOG	81	RESET	1002,75	1
106704	1146	JOG	81	RESET	1002,75	1
106704	1171	JOG	81	RESET	1001,25	1
106705	1146	JOG	81	RESET	1001,25	1
106705	1146	JOG	81	RESET	1001,25	1
106705	1083	JOG	81	RESET	1001,25	1
106706	1083	JOG	81	RESET	999,75	1
106706	1083	JOG	81	RESET	999,75	1
106706	1083	JOG	81	RESET	999,75	1
106707	1096	JOG	81	RESET	1002	1
106707	1108	JOG	81	RESET	1000,5	1
106707	1171	JOG	81	RESET	1000,5	1
106708	1171	JOG	81	RESET	1000,5	1
106708	1171	JOG	81	RESET	1000,5	1
106708	1184	JOG	81	RESET	1000,5	1
106708	1096	JOG	81	RESET	1000,5	1
106709	1096	JOG	81	RESET	1000,5	1
106709	1108	JOG	81	RESET	1000,5	1
106709	1146	JOG	81	RESET	1002,75	1
106710	1146	JOG	81	RESET	1002,75	1
106710	1134	JOG	81	RESET	1002,75	1
106710	1134	JOG	81	RESET	1002,75	1
106711	1146	JOG	81	RESET	1002,75	1
106711	1096	JOG	81	RESET	1002,75	1
106711	1096	JOG	81	RESET	1002,75	1
106712	1083	JOG	81	RESET	1002,75	1
106712	1083	JOG	81	RESET	1002	1
106712	1134	JOG	81	RESET	1002	1

106713	1159	JOG	81	RESET	1002	1
106713	1159	JOG	81	RESET	1002	1
106713	1108	JOG	81	RESET	1002	1
106714	1121	JOG	81	RESET	1000,5	1
106714	1121	JOG	81	RESET	1000,5	1
106714	1159	JOG	81	RESET	1000,5	1
106714	1108	JOG	81	RESET	1000,5	1
106715	1083	JOG	81	RESET	1000,5	1
106715	1083	JOG	81	RESET	1002	1
106715	1108	JOG	81	RESET	1002	1
106716	1209	JOG	81	RESET	1002	1
106716	970	JOG	81	RESET	1000,5	1
106716	970	JOG	81	RESET	1000,5	1
106716	252	JOG	81	RESET	1000,5	1
106716	390	JOG	81	RESET	1000,5	1
106716	441	JOG	81	RESET	1000,5	1
106743	1121	JOG	81	RESET	1001,25	7
106743	1121	JOG	81	RESET	1001,25	7
106744	1134	JOG	81	RESET	1001,25	7
106744	1134	JOG	81	RESET	1001,25	7
106744	1134	JOG	81	RESET	1001,25	7
106745	1146	JOG	81	RESET	1001,25	7
106745	1134	JOG	81	RESET	1001,25	7
106745	1134	JOG	81	RESET	1001,25	7
106746	1134	JOG	81	RESET	1002	7
106746	1134	JOG	81	RESET	1002	7
106746	1096	JOG	81	RESET	1002	7
106746	1096	JOG	81	RESET	1002	7
106747	1096	JOG	81	RESET	1002	7
106747	1096	JOG	81	RESET	999,75	7
106747	1134	JOG	81	RESET	999,75	7
106748	1121	JOG	81	RESET	999,75	7
106748	1121	JOG	81	RESET	999,75	7
106748	1121	JOG	81	RESET	1001,25	7
106748	1121	JOG	81	RESET	1001,25	7
106749	1121	JOG	81	RESET	1001,25	7
106750	1096	JOG	81	RESET	1001,25	7
106750	1108	JOG	81	RESET	1001,25	7
106750	1108	JOG	81	RESET	1000,5	7
106750	1134	JOG	81	RESET	1000,5	7
106750	1134	JOG	81	RESET	1002	7
106751	1146	JOG	81	RESET	1002	7
106751	1121	JOG	81	RESET	1002	7
106751	1096	JOG	81	RESET	1002	7

106752	1096	JOG	81	RESET	1002	7
106752	1096	JOG	81	RESET	1002	7
106752	1096	JOG	81	RESET	999,75	7
106753	1096	JOG	81	RESET	999,75	7
106753	1096	JOG	81	RESET	999,75	7
106753	1108	JOG	81	RESET	999,75	7
106754	1146	JOG	81	RESET	999,75	7
106754	1146	JOG	81	RESET	999,75	7
106754	1108	JOG	81	RESET	999,75	7
106754	1071	JOG	81	RESET	999,75	7
106755	1083	JOG	81	RESET	1001,25	7
106755	1083	JOG	81	RESET	1001,25	7
106755	1083	JOG	81	RESET	1001,25	7
106756	1108	JOG	81	RESET	1001,25	7
106756	1121	JOG	81	RESET	1001,25	7
106756	1071	JOG	81	RESET	1001,25	7
106757	1071	JOG	81	RESET	1001,25	7
106757	1108	JOG	81	RESET	1001,25	7
106757	1134	JOG	81	RESET	1002,75	7
106758	1134	JOG	81	RESET	1002,75	7
106758	1146	JOG	81	RESET	1002,75	7
106758	1146	JOG	81	RESET	1002,75	7
106758	1146	JOG	81	RESET	1002,75	7
106759	1159	JOG	81	RESET	1002,75	7
106759	1159	JOG	81	RESET	1002,75	7
106759	1134	JOG	81	RESET	1001,25	7
106760	1121	JOG	81	RESET	1001,25	7
106760	1071	JOG	81	RESET	1001,25	7
106761	1146	JOG	81	RESET	1001,25	7
106761	1146	JOG	81	RESET	1001,25	7
106761	1146	JOG	81	RESET	1000,5	7
106761	1159	JOG	81	RESET	1000,5	7
106761	1159	JOG	81	RESET	1000,5	7
106762	1096	JOG	81	RESET	1000,5	7
106763	1108	JOG	81	RESET	1002	7
106763	1108	JOG	81	RESET	1002	7
106763	1134	JOG	81	RESET	1002	7
106763	1184	JOG	81	RESET	1002	7
106763	1096	JOG	81	RESET	1002	7
106764	1146	JOG	81	RESET	1002	7
106764	1146	JOG	81	RESET	1002	7
106764	1184	JOG	81	RESET	1001,25	7
106765	1096	JOG	81	RESET	1001,25	7
106765	1096	JOG	81	RESET	1001,25	7

106765	1096	JOG	81	RESET	1001,25	7
106766	1159	JOG	81	RESET	1001,25	7
106766	1159	JOG	81	RESET	1001,25	7
106766	1159	JOG	81	RESET	1000,5	7
106767	1146	JOG	81	RESET	1000,5	7
106767	1146	JOG	81	RESET	1000,5	7
106767	1121	JOG	81	RESET	1000,5	7
106768	1071	JOG	81	RESET	1000,5	7
106768	1071	JOG	81	RESET	1000,5	7
106768	1071	JOG	81	RESET	1000,5	7
106768	1083	JOG	81	RESET	1001,25	7
106769	1071	JOG	81	RESET	1001,25	7
106769	1083	JOG	81	RESET	1000,5	7
106769	1083	JOG	81	RESET	1000,5	7
106770	1083	JOG	81	RESET	1000,5	7
106770	1096	JOG	81	RESET	1000,5	7
106771	1096	JOG	81	RESET	1000,5	7
106771	1134	JOG	81	RESET	1000,5	7
106771	1134	JOG	81	RESET	1001,25	7
106771	1159	JOG	81	RESET	1001,25	7
106772	1159	JOG	81	RESET	1002	7
106772	1134	JOG	81	RESET	1000,5	7
106772	1096	JOG	81	RESET	1000,5	7
106772	1159	JOG	81	RESET	1000,5	7
106773	1159	JOG	81	RESET	1001,25	7
106773	1171	JOG	81	RESET	1001,25	7
106774	1096	JOG	81	RESET	1001,25	7
106774	1096	JOG	81	RESET	1001,25	7
106774	1096	JOG	81	RESET	1001,25	7
106774	1134	JOG	81	RESET	1001,25	7
106774	1134	JOG	81	RESET	999,75	7
106775	1171	JOG	81	RESET	999,75	7
106776	1083	JOG	81	RESET	999,75	7
106776	1083	JOG	81	RESET	999,75	7
106776	1096	JOG	81	RESET	999,75	7
106776	1108	JOG	81	RESET	999,75	7
106777	1184	JOG	81	RESET	999,75	7
106777	1184	JOG	81	RESET	1000,5	7
106777	1108	JOG	81	RESET	1000,5	7
106778	1121	JOG	81	RESET	619,5	7
106778	264	JOG	81	RESET	619,5	7
106778	264	JOG	81	RESET	619,5	7
106778	453	JOG	81	RESET	619,5	7
106778	378	JOG	81	RESET	619,5	7

106778	378	JOG	81	RESET	619,5	7
106789	390	JOG	81	RESET	0,75	7
106789	390	JOG	81	RESET	0,75	7
106789	365	JOG	81	RESET	0,75	7
106789	390	JOG	81	RESET	0,75	7
106797	1209	JOG	81	RESET	1002	1
106797	1209	JOG	81	RESET	1002,75	1
106797	1045	JOG	81	RESET	1002,75	1
106798	1071	JOG	81	RESET	1002,75	1
106798	1197	JOG	81	RESET	1002,75	1
106798	1197	JOG	81	RESET	1002,75	1
106799	1209	JOG	81	RESET	1002,75	1
106799	1197	JOG	81	RESET	1002,75	1
106800	1071	JOG	81	RESET	1002	1
106800	1071	JOG	81	RESET	1002	1
106800	1058	JOG	81	RESET	1002	1
106800	1083	JOG	81	RESET	1002	1
106800	1121	JOG	81	RESET	1002	1
106801	1121	JOG	81	RESET	1002	1
106801	1146	JOG	81	RESET	1002	1
106801	1184	JOG	81	RESET	1002	1
106802	1184	JOG	81	RESET	1002	1
106802	1159	JOG	81	RESET	1000,5	1
106802	1134	JOG	81	RESET	1000,5	1
106803	1134	JOG	81	RESET	1000,5	1
106803	1159	JOG	81	RESET	1000,5	1
106804	1171	JOG	81	RESET	1000,5	1
106804	1045	JOG	81	RESET	1000,5	1
106804	1045	JOG	81	RESET	1000,5	1
106804	1058	JOG	81	RESET	1002	1
106805	1045	JOG	81	RESET	1002	1
106805	1171	JOG	81	RESET	1002	1
106805	1171	JOG	81	RESET	1002	1
106805	1121	JOG	81	RESET	1002	1
106805	1121	JOG	81	RESET	1001,25	1
106806	1083	JOG	81	RESET	1001,25	1
106806	1121	JOG	81	RESET	1001,25	1
106807	1184	JOG	81	RESET	1001,25	1
106807	1184	JOG	81	RESET	1001,25	1
106807	1184	JOG	81	RESET	1001,25	1
106808	1171	JOG	81	RESET	1001,25	1
106808	1108	JOG	81	RESET	1000,5	1
106808	1108	JOG	81	RESET	1000,5	1
106809	1071	JOG	81	RESET	1000,5	1

106809	1033	JOG	81	RESET	1000,5	1
106809	1121	JOG	81	RESET	1000,5	1
106809	1121	JOG	81	RESET	1000,5	1
106810	1096	JOG	81	RESET	999,75	1
106810	1108	JOG	81	RESET	999,75	1
106810	1108	JOG	81	RESET	0,75	1
106810	264	JOG	81	RESET	0,75	1
106810	264	JOG	81	RESET	0,75	1
106811	378	JOG	81	RESET	0,75	1
106811	352	JOG	81	RESET	0,75	1
106811	365	JOG	81	RESET	0,75	1
107214	869	JOG	81	RESET	500,25	5
107214	831	JOG	81	RESET	500,25	5
107215	793	JOG	81	RESET	500,25	5
107215	856	JOG	81	RESET	500,25	5
107215	856	JOG	81	RESET	500,25	5
107215	844	JOG	81	RESET	500,25	5
107216	856	JOG	81	RESET	499,5	5
107216	793	JOG	81	RESET	499,5	5
107216	793	JOG	81	RESET	499,5	5
107216	793	JOG	81	RESET	499,5	5
107216	793	JOG	81	RESET	499,5	5

Tabla 4. Datos en tiempo real del torno PINACHO.