**GF Machining Solutions**

**+GF+**

**AC CUT HMI**
**AC FORM HMI**

C      User Manual
C12     Options
C12.11   eConnectivity

# C12.11.3
# MTConnect

*(Chapter only in English)*

03.2018

Original instructions

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# 1. Introduction

The AC MTConnect Software Option is designed for monitoring and traceability of machining of parts in order to fit request of high-technology industries.

The software, running embedded on the computer of the machine, store machining data (machining time) and maintenance data (wire length, deionization, temperature,...) and published these variables.

The user can be using the MTConnect by opening (PC and machine are connected at the internal LAN) on your PC's browser and entering http:// "IPadresse":5000/FORM/current

The current state of the machine will be displayed in XML format.

MTConnect is an open standard protocol. The user, can employ a standard software avalaible on the market, or provided by a external supplier to view these datas.

This document describes the information published by the AC CUT and FORM machines.

MTConnect is a manufacturing industry standard to facilitate the organized retrieval of process information from numerically controlled machine tools.

MTConnect is a lightweight, open, and extensible protocol designed for the exchange of data between shop floor equipment and software applications used for monitoring and data analysis. In its current form, MTConnect is referred to as a read-only standard, meaning that it only defines the extraction (reading) of data from control devices, not the writing of data to a control device. Freely available, open standards are used for all aspects of MTConnect. Data from shop floor devices is presented in XML format, and is retrieved from information providers, called Agents, using Hypertext Transfer Protocol (HTTP) as the underlying transport protocol. MTConnect provides a restful interface, which means the interface is stateless. No session must be established to retrieve data from an MTConnect Agent, and no logon or logoff sequence is required (unless overlying security protocols are added which do).

To understand indeed the protocol, it is necessary to read the information of the Standard MTConnect group : http://www.mtconnect.org/

# 2. What is MTConnect standard

**MTConnect is based on existing standards and protocols that have proven their extensibility:**

- HTTP for communication
- XML for data representation

**MTConnect is a very simple protocol:**

- Request to an MTConnect Agent is encoded in URI
- URI transmitted to the Agent as HTTP request Machine data is "just another" thing or website on the Web. In fact you can use a Web browser to examine it directly.
- MTConnect is NOT an application. MTConnect is a protocol

**What MTConnect Must and Must Not Do:**

- MTConnect must
  - Collect data from devices
  - Normalize the units
  - Deliver the data in a standard format
- MTConnect must not
  - Analyze the data
  - Derive additional meaning

**MTConnect commands:**

How does Client know what data a particular machine can report, in what units, with what sampling frequency...?
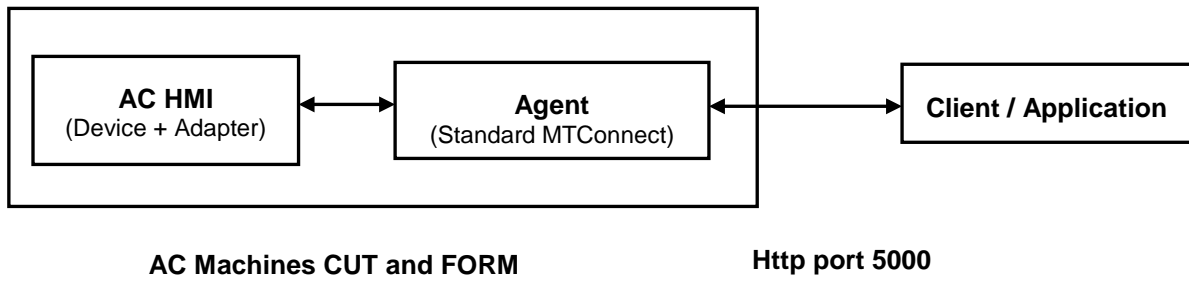
- probe command reports this

How does client specify how to collect data (sample rate, what subset of measurements, how much to gather...)?

- sample and current commands allow this

| Command | Arguments | Returns | Representation |
|---------|-----------|---------|----------------|
| **probe** | *none* | Metadata describing reportable machine data | Devices<br>Device<br>Components<br>DataItems |
| **current** | path | Only return items from probe that match path.<br><br>If path not given, match everything. | Streams<br>DeviceStream<br>ComponentStream<br>Events<br>Samples |
| **sample** | path start<br><br>count | As for current begin at this sequence # (if omitted, start with oldest sample you have)<br><br>max # samples to return (if omitted, Agent decides) | |

# 3. AC MTConnect general diagram



**AC Machines CUT and FORM**                    **Http port 5000**

# 4. FORM Machines data

| COMPONENTS/ELEMENTS | | | | |
|---|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Electrical Power | | | | |
| | Electrical power | Status of the power of the machine | | |
| | Power | Status of the power | POWER_STATUS | - |

| COMPONENTS/ELEMENTS | | | | |
|---|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Process Management | | | | |
| | Machine Health | Information from the machine | | |
| Alarm | | Alarm | ALARM | - |
| System | | System | SYSTEM | - |

| COMPONENTS/ELEMENTS | | | | |
|---|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Linear motion | | | | |
| | Linear motion | Physical data for the linear axis movement | | |
| | Linear X | Linear axis X | POSITION | MILLIMETER |
| | Linear Y | Linear axis Y | POSITION | MILLIMETER |
| | Linear Z | Linear axis Z | POSITION | MILLIMETER |

| COMPONENTS/ELEMENTS | | | |
|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Rotary motion | | | |
| | Rotary motion | Physical data for the axis movement | | |
| | Rotary C | Rotary axis C | ANGLE | DEGREE |

| COMPONENTS/ELEMENTS | | | |
|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Path | | | |
| | Process control fol-low-up | Monitoring of the main actions of the machine | | |
| | estop | State of the emergen-cy of the machine | EMERGENCY_STOP | - |
| | exec | State of the machine | EXECUTION | READY, ACTIVE, INTERRUPTED, STOPPED |
| | prg | Program name cur-rently in execution | PROGRAM | - |
| | toolnum | Tool number (unique for the job). If empty, that means there is no current tool | TOOL_NUM | - |
| | toolname | Tool name (unique for the job). | TOOL_NAME | - |
| | toolpos | Position into the mag-azine. If there's a current tool and the value of tool-pos is 0, that means it has to be load-ed/unloaded manually If there's a current tool and the value of tool-pos is empty, that means it has to be later specified | TOOL_POS | - |
| | tooljobname | Name of the job in which the current tool has been defined | TOOL_JOBNAME | - |

| | partnum | | Part number (unique for the job).<br><br>If empty, that means there is no current part | PART_NUM | - |
|---|---|---|---|---|---|
| | partname | | Part name (unique for the job). | PART_NAME | - |
| | partpos | | Position into the magazine.<br><br>If there's a current part and the value of partpos is 0, that means it has to be loaded/unloaded manually<br><br>If there's a current part and the value of partpos is empty, that means it has to be later specified | PART_POS | - |
| | partjobname | | Name of the job in which the current part has been defined | PART_JOBNAME | - |
| | joblist | | Job list of the machine | JOB_LIST | - |
| | sequence | | CodeS number of machining pass | MACH_SEQUENCE | - |
| | sequencepass | | EDM current setting number | MACH_SEQUENCE_PASS | - |
| | sequencetime | | Machining duration for this machining | MACH_SEQUENCE_TIME | - |
| | machiningtime | | Total execution time | MACH_EXE_TIME | - |
| | machiningspeed | | Machining speed of the current setting | MACH_SPEED | - |
| | lmachcavity | | Machining position of the current setting from top of cavity | POSITION | MILLIMETER |
| | rlmachcavity | | Machining radius of the current setting from top of cavity | POSITION | MILLIMETER |
| | pulsationbn | | Count of pulsation "low level" of current setting<br>Charmilles generator | CAVITY_MACH_BN | PERCENT |
| | pulsationct | | Count of on contamination of current setting<br>Charmilles generator | CAVITY_MACH_CT | PERCENT |

| | pulsationcc | | Count of pulsation on short circuit of current setting<br>Charmilles generator | CAVITY_MACH_CC | PERCENT |
|---|---|---|---|---|---|
| | pulsationtl | | Count of pulsation "temps long" current setting<br>Charmilles generator | CAVITY_MACH_TL | PERCENT |
| | pulsationta | | Count of pulsations "TA" of current setting<br>Charmilles generator | CAVITY_MACH_TA | PERCENT |
| | pulsationno | | Count of normal pulsations of current setting<br>Charmilles generator | CAVITY_MACH_NO | COUNT |
| | efficiency | | Average efficiency of the current setting<br><br>Charmilles generator | CAVITY_MACH_EFF | PERCENT |
| | arcvoltage | | Bad sparks due to arc voltage<br><br>IPG generator | CAVITY_MACH_ARCVOLT | PERCENT |
| | delay | | Bad sparks due to delay<br><br>IPG generator | CAVITY_MACH_ARCDELAY | PERCENT |
| | good | | Good sparks<br><br>IPG generator | CAVITY_MACH_ARCGOOD | PERCENT |
| | shortcircuit | | Bad sparks due to short-circuit<br><br>IPG generator | CAVITY_MACH_ARCSHORT | PERCENT |
| | arckill | | Actions taken on bad sparks<br><br>IPG generator | CAVITY_MACH_ARCKILL | PERCENT |

# 5. CUT Machines data

| COMPONENTS/ELEMENTS | | | |
|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Electrical Power | | | | |
| Electrical power | | Status of the power of the machine | | |
| Power | | Status of the power | POWER_STATUS | - |

| COMPONENTS/ELEMENTS | | | |
|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Process Management | | | | |
| Machine Health | | Information from the machine | | |
| Alarm | | Alarm | ALARM | - |
| System | | System | SYSTEM | - |

| COMPONENTS/ELEMENTS | | | |
|---|---|---|---|
| Component | | Description | DataItems Available | Unity |
| Device components / Linear motion | | | | |
| Linear motion | | Physical data for the linear axis movement | | |
| Linear X | | Linear axis X | POSITION | MILLIMETER |
| Linear Y | | Linear axis Y | POSITION | MILLIMETER |
| Linear Y | | Linear axis Y | POSITION | MILLIMETER |
| Linear U | | Linear axis U | POSITION | MILLIMETER |
| Linear V | | Linear axis V | POSITION | MILLIMETER |

## COMPONENTS/ELEMENTS

| Component | | Description | DataItems Available | Unity |
|---|---|---|---|---|
| Device components / Path | | | | |
| Process control follow-up | | Monitoring of the main actions of the machine | | |
| estop | | State of the emergency of the machine | EMERGENCY_STOP | - |
| exec | | State of the machine | EXECUTION | READY, ACTIVE, INTERRUPTED, STOPPED |
| prg | | Program name currently in execution | PROGRAM | - |
| prgnum | | Number of the current execution program number (o…) | | - |
| wirename | | Name of the currently Wire table file (without extension) | | - |
| wirediam | | Currently selected wire diameter | | MILLIMETER |
| wireleftlength | | Wire characteristic | | METER |
| wirespeed | | Wire speed | | - |
| sequence | | Name of the currently selected TEC table file without extension | | - |
| sequencepass | | EDM setting number (ex 501) | | - |
| executiontime | | Total execution time | | - |
| genontime | | Time with generator ON | | - |
| machiningspeed | | Wire speed in machining | | - |
| machinecounter | | Total time machine ON | | - |
| deio | | Deionisation | | - |
| temperature | | Temperature | | TEMP |
| pressureupper | | Upper injection pressure | | - |
| pressurelower | | Lower injection pressure | | - |
| pressurefilter | | Pressure in filters | | - |

# 6. Machine User interface

## 6.1 Dialog box

\<Module **Services** - Step **Connections** - Tag **MTConnect**\>
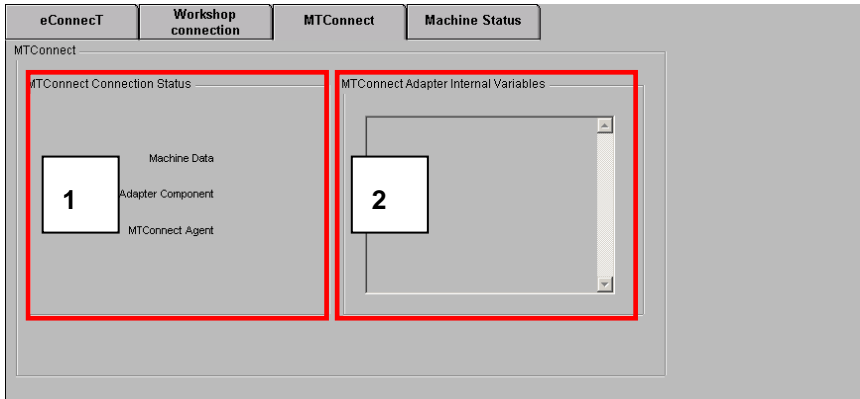


1. Connection Status
2. Connection Parameters

## 6.2 Protocol example

\<?xml version="1.0" encoding="UTF-8" ?\>
**–** \<MTConnectStreams xmlns:m="**urn:mtconnect.org:MTConnectStreams:1.2**"
xmlns="**urn:mtconnect.org:MTConnectStreams:1.2**" xmlns:xsi="**http://www.w3.org/2001/XMLSchema-instance**" xsi:schemaLocation="**urn:mtconnect.org:MTConnectStreams:1.2 http://www.mtconnect.org/schemas/MTConnectStreams_1.2.xsd**"\>
  \<Header creationTime="**2012-10-05T11:24:24Z**" sender="**GFAC-52D837FDEB**" instanceId="**1349275743**" version="**1.2.0.11**" bufferSize="**131072**" nextSequence="**623286**" firstSequence="**492214**" lastSequence="**623285**" /\>
**–** \<Streams\>
**–** \<DeviceStream name="**FORM**" uuid="**001**"\>
**–** \<ComponentStream component="**Controller**" name="**Controller**" componentId="**cn1**"\>
**–** \<Condition\>
....................
......................
.........................
name="**toolnum**" sequence="**623274**"\>**1**\</ToolNum\>
  \<ToolPos dataItemId="**toolpos**" timestamp="**2012-10-05T13:24:21.0343+01:00**" name="**toolpos**" sequence="**623276**"\>**0**\</ToolPos\>
  \</Events\>
  \</ComponentStream\>
  \</DeviceStream\>
  \</Streams\>
  \</MTConnectStreams\>