# The Hermes Standard Change Proposal

## Define minimum requirements for strings

**Voting meeting:**
23th of April 2018 (NEPCON / Shanghai)

**Requesting company:**
GÖPEL electronic GmbH

# Version change:

Revision

# Service description tag:

-

# Description:

If using PLCs to implement The Hermes Standart it is very helpful to have fixed dimensions for strings.

# Use cases:

-

# Functionality / communication sequences:

-

# New / changed XML messages:

-

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 2 of 10

# Proposed changes to standard:

# 3 Message definition

## 3.1 Message format

Messages use the Extensible Markup Language (XML) format, where at least version 1.1 of XML shall be supported **Fehler! Verweisquelle konnte nicht gefunden werden.**.

For character encoding UTF-8 has to be used (No other encoding may be specified in the XML declaration).

In the following sections of the document, for a better readable description of the XML data structures, tables are used instead of commonly used schema definitions.

Maximum size for every message is 64 kByte, i.e. 65536 bytes. For every string parameter there is either a fixed or minimum size that must be supported (individual values see tables).

In the tables, XML attributes are marked with the image "♦" and XML child nodes are marked with the image "🗀", which in turn may consist of more XML structures.

The representation of data types (e.g. floating point numbers, boolean attributes …) shall comply with the W3C XML schema recommendation **Fehler! Verweisquelle konnte nicht gefunden werden.**.

To keep upward compatibility, any message or attribute unknown by an implementation can be ignored and discarded.

## 3.4 ServiceDescription

The ServiceDescription message is sent by both machines after a connection is established. The downstream machine sends its ServiceDescription first whereupon the upstream machine answers by sending its own ServiceDescription.

| ServiceDescription | Type | Range | Optional | Description |
|---|---|---|---|---|
| ♦MachineId | string | any string (minimum supported length: 80 bytes) | no | ID/name of the sending machine for identifying it in a Hermes enabled production line. |
| ♦LaneId | int | 1 .. n | no | The sending machine's lane of this connection relates to Lanes are enumerated looking downstream from right to left beginning with 1 |
| ♦Version | string | xxx.yyy (7 bytes) | no | The implemented interface version of the machine |
| 🗀SupportedFeatures | Feature [] | | no | List of supported features (empty for version 1.0) |

The features specified in version 1.0 of this protocol have to be provided by any implementation and thus are not listed in the SupportedFeatures list of the ServiceDescription explicitly.

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 3 of 10

## 3.5 Notification

The Notification message is sent by both machines before a connection is terminated, e.g. after protocol errors or before shutdown. It could also be used for general notification purposes.

| Notification | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆NotificationCode | int | 1 .. n | No | A notification code of the list below. Notification codes above 1000 are not defined by this protocol and may be used by the application |
| ◆Severity | int | 1 .. 4 | No | A severity of the list below |
| ◆Description | string | any string (minimum supported length: 254 bytes) | No | An English textual description of the notification. |

The following NotificationCodes are defined:
  1  Protocol error (invalid transition in the state machine, see section **Fehler! Verweisquelle konnte nicht gefunden werden.**)
  2  Connection refused because of an established connection
  3  Connection reset because of changed configuration
  4  Configuration error
  5  Machine shutdown


Possible values for Severity:
  1  Fatal error
  2  Error
  3  Warning
  4  Info


## 3.6 BoardAvailable

The BoardAvailable message is sent to the downstream machine to indicate the readiness of the upstream machine to handover a PCB. When an optional attribute is received from an upstream machine, then it must be passed on (possibly altered) to the next downstream machine.

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 4 of 10

| BoardAvailable | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆BoardId | string | GUID<br>(36 bytes) | no | Indicating the ID of the available board |
| ◆BoardIdCreatedBy | string | ~~non-empty~~ any string (minimum supported length: 80 bytes) | no | MachineId of the machine which created the BoardId (the first machine in a consecutive row of machines implementing this protocol). The MachineId is part of the Hermes configuration. |
| ◆FailedBoard | Int | 0 .. 2 | no | A value of the list below |
| ◆ProductTypeId | String | any string (minimum supported length: 254 bytes) | yes | Identifies a collection of PCBs sharing common properties |
| ◆FlippedBoard | Int | 0 .. 2 | no | A value of the list below |
| ◆TopBarcode | String | any string (minimum supported length: 254 bytes) | yes | The barcode of the top side of the PCB |
| ◆BottomBarcode | String | any string (minimum supported length: 254 bytes) | yes | The barcode of the bottom side of the PCB |
| ◆Length | float | positive numbers | yes | The length of the PCB in millimeter. |
| ◆Width | float | positive numbers | yes | The width of the PCB in millimeter. |
| ◆Thickness | float | positive numbers | yes | The thickness of the PCB in millimeter. |
| ◆ConveyorSpeed | float | positive numbers | yes | The conveyor speed preferred by the upstream machine in millimeter per second |
| ◆TopClearanceHeight | float | positive numbers | yes | The clearance height for the top side of the PCB in millimeter. |
| ◆BottomClearanceHeight | float | positive numbers | yes | The clearance height for the bottom side of the PCB in millimeter. |

GUID must match the regular expression

```
[0-9a-f]{8}-[0-9a-f]{4}-[0-9a-f]{4}-[0-9a-f]{4}-[0-9a-f]{12}
```

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 5 of 10

FailedBoard may be one of the following values:
- 0   Board of unknown quality available
- 1   Good board available
- 2   Failed board available

FlippedBoard may be one of the following values:
- 0   Side up is unknown
- 1   Board top side is up
- 2   Board bottom side is up

If FlippedBoard is 2 (Board bottom side is up) then TopBarcode is facing downwards and BottomBarcode is facing upwards. Same applies for TopClearanceHeight and BottomClearanceHeight.
The definition of board bottom and board top side is outside of the scope of The Hermes Standard and left to the customer.
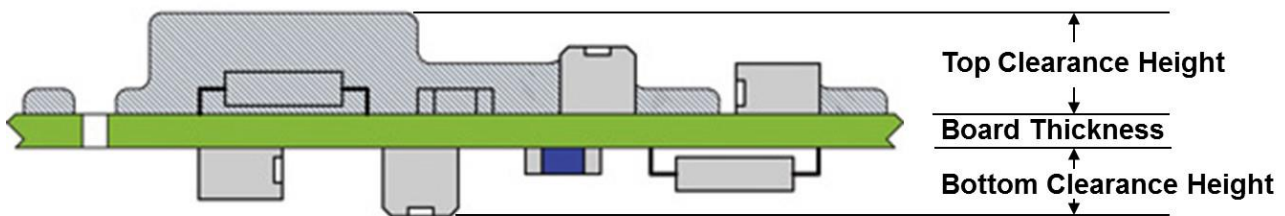


**Fig. 1 Explanation for top and bottom clearance height**

## 3.7  RevokeBoardAvailable

With the RevokeBoardAvailable message, the upstream machine signals that it is not ready anymore to handover a PCB.

| RevokeBoardAvailable | Type | Range | Optional | Description |
|---|---|---|---|---|
| | | | | |

## 3.8  MachineReady

The MachineReady message is sent to the upstream machine to indicate the readiness of the downstream machine to accept a PCB.

| MachineReady | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆FailedBoard | int | 0 .. 2 | no | A value of the list below |

FailedBoard may be one of the following values:
- 0   Ready to accept any board
- 1   Ready to accept good boards.
- 2   Ready to accept failed boards

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 6 of 10

## 3.9  RevokeMachineReady

With the RevokeMachineReady message, the downstream machine signals that it is not ready anymore to accept a PCB.

| RevokeMachineReady | Type | Range | Optional | Description |
|---|---|---|---|---|
| | | | | |

## 3.10 StartTransport

The StartTransport message is sent to the upstream machine to initiate the PCB handover process. There is no response to this message.

| StartTransport | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆BoardId | string | GUID (36 bytes) | no | The ID of the board for which the transport shall be started. |
| ◆ConveyorSpeed | float | positive numbers | yes | Optional parameter indicating the selected conveyor speed for the handover in millimeter per second |

The downstream machine is responsible for selecting the actual conveyor speed according to the preferred conveyor speed sent in the BoardAvailable message. In general the highest possible speed supported by both machines will be selected.

If a StartTransport message is received for a BoardId which is not the one received with the last BoardAvailable message, the transport shall be canceled. This case is not to be treated as a protocol error.

## 3.11 StopTransport

The StopTransport message is sent by the downstream machine after it has finished the transport.

| StopTransport | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆TransferState | int | 1 .. 3 | no | See list below for possible values |
| ◆BoardId | string | GUID (36 bytes) | no | The ID of the board to which the message relates to |

Transfer states:
1. NotStarted: The PCB never left and hence is fully inside the upstream machine.
2. Incomplete: The transfer was cancelled in progress.
3. Complete: The transfer ended successfully.

If the BoardId does not match the one from StartTransport, this shall be treated as a protocol error: hence the connection would need to be re-established.

## 3.12 TransportFinished

The TransportFinished message is sent by the upstream machine after it finished the transport.

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 7 of 10

| TransportFinished | Type | Range | Optional | Description |
|---|---|---|---|---|
| ◆TransferState | int | 1 .. 3 | no | See list below for possible values |
| ◆BoardId | string | GUID (36 bytes) | no | The ID of the board to which the message relates to |

Transfer states:

1. NotStarted: The PCB never left and hence is fully inside the upstream machine.
2. Incomplete: The transfer was cancelled in progress.
3. Complete: The transfer ended successfully.

If the BoardId does not match the one from StartTransport, this shall be treated as a protocol error; hence the connection would need to be re-established.

## 3.13 SetConfiguration

The SetConfiguration message is sent by an engineering station to configure the Hermes interfaces of a machine. If the sent configuration is not accepted, the machine is expected to send a Notification message (see section 3.5).

| SetConfiguration | Type | Range/ Multiplicity | Optional | Description |
|---|---|---|---|---|
| ◆MachineId | string | any string 80 bytes | no | ID/name of this machine for identifying it in a Hermes enabled production line. |
| 📁UpstreamConfigurations | UpstreamConfiguration [] | 0 .. n | no | Configuration for upstream lanes |
| 📁DownstreamConfigurations | DownstreamConfiguration [] | 0 .. n | no | Configuration for downstream lanes |

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**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 8 of 10

| UpstreamConfiguration | Type | Range/ Multiplicity | Opti onal | Description |
|---|---|---|---|---|
| ◆UpstreamLaneId | int | 1 .. n | no | The lane on the upstream side<br><br>Lanes are enumerated looking downstream from right to left beginning with 1 |
| ◆HostAddress | string | valid IP address or hostname (minimum supported length: 254 bytes) | no | The IP address or hostname of the upstream machine for this lane |
| ◆Port | int | 0 .. 65535 | no | Port number on which connections shall be established |

| DownstreamConfiguration | Type | Range/ Multiplicity | Opti onal | Description |
|---|---|---|---|---|
| ◆DownstreamLaneId | int | 1 .. n | no | The lane on the downstream side<br>Lanes are enumerated looking downstream from right to left beginning with 1 |
| ◆ClientAddress | string | valid IP address or hostname (minimum supported length: 254 bytes) | yes | The IP address or hostname of the downstream machine for this lane. If not specified, then connections from any IP address are accepted. |
| ◆Port | int | 0 .. 65535 | no | Port number on which the server shall accept connections for this lane |

It is up to the user to keep MachineIds unique.

## 3.14 GetConfiguration

The GetConfiguration message is sent by an engineering station to read out the current configuration of the Hermes interfaces of a machine. The machine is expected to answer with a CurrentConfiguration message.

| GetConfiguration | Type | Range/ Multiplicity | Optional | Description |
|---|---|---|---|---|

## 3.15 CurrentConfiguration

The CurrentConfiguration message is sent by a machine in response to the GetConfiguration message.

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 9 of 10

| CurrentConfiguration | Type | Range/ Multiplicity | Optio nal | Description |
|---|---|---|---|---|
| ◆MachineId | string | any string (minimum supported length: 80 bytes) | yes | ID/name of this machine for identifying it in a Hermes enabled production line. |
| 🗀UpstreamConfigurations | UpstreamConfiguration [] | 0 .. n | no | Configuration of upstream lanes |
| 🗀DownstreamConfigurations | DownstreamConfiguration [] | 0 .. n | no | Configuration of downstream lanes |

For the definition of UpstreamConfiguration and DownstreamConfiguration see section 3.13.

If no MachineId has been configured yet, the CurrentConfiguration message does not contain the attribute MachineId.

**The Hermes Standard** for vendor independent machine-to-machine communication in SMT Assembly.

Page 10 of 10