OPERATING INSTRUCTIONS
Extension of the machine

INDEX

# UNIHAND DP

## Communication interface between the machine and an external workpiece feeding and discharging attachment.

**INDEX Multi spindle turning machines**

**Control System INDEX C200-sl**
**INDEX C200-4D**

**LM16 02.1 054 1 - 2020-12-14**
1221 20065606 ec

## Note on applicability

Illustrations in this publication may deviate from the product supplied. Errors and omissions due to technical progress expected.

## A word on copyright

# Contents

# Specification

The UNIHAND DP interface is a standardised communication interface for the communication between a machine of the MSxx type and an external workpiece feeding and discharging unit.

The interface consists of a DP/DP coupler which has been integrated in the machine.

The control system of the machine and the control system of the external unit are connected via the above mentioned coupler

**The DP/DP coupler cannot be connected unless the external unit has a control system with Profibus-Master-functionality.**

# Description of the signals

The interface has three kinds of signals.

**Status messages** The interface comprises signals for the exchange of status messages (e. g. "Ready for operation", "Ready for start", "Error message", "Reset" and the like)

**Synchronisation** Furthermore, it contains signals which serve the synchronisation of the processes of the machine and of the external unit. (requests and confirmations of actions)

**Material flow** For the control of the material flow of the machine, the machine makes requests to the external unit (e. g. "Make part available").
Moreover, there is communication with respect to the occupation of the grippers.

The UNIHAND DP interface provides part programme commands (M-functions) which can trigger actions at the external unit. The carrying out of the part programme will be interrupted until the external unit has confirmed such actions.

32 different commands are available from the part programme of the machine which can activate 32 different processes at the external unit.

**The UNIHAND DP interface provides neutral commands only. The very function must be programmed in the external unit by the manufacturer of the external unit and is thus not part of this interface..**

This document describes the signals which have been exchanged by the software.

For the hardware signals (door contacts, EMERGENCY-OFF, etc. …) refer to the up-to-date wiring diagrams of the machine, please.

The present document was written from the INDEX machine point of view.

# Signal coupling

## DP signal coupling to the Siemens DP/DP coupler

Signal coupling of the systems happens via a Profibus DP master/master system coupling.

### Currently installed hardware:

Siemens Simatic S7 DP/DP- coupler, order number 6ES7 158-0AD01-0XA0

Baudrate DP1 (INDEX) = 1.5 MBit/s

Baudrate DP2 (EXTERNAL) = arbitrary (requirement: like DP1 set to 1.5 MBit/s)

Address DP1 (INDEX) = 23

Address DP2 (EXTERNAL) = arbitrary (requirement: 23)

Profibus hardware configuration of the in-/outputs

GSD-file = SIEM8070.gsg (for revision level 1)

| Position | INDEX DP1 | Position | EXTERNAL DP2 |
|---|---|---|---|
| 1 | 32 Byte inputs<br>(via universal module) | 1 | 32 Byte outputs |
| 2 | 32 Byte outputs<br>(via universal module | 2 | 32 Byte inputs |

# Signal use

## Which signals can be used?

The interface signals specified in this document represent the overall range of all possible functional signals of this universally usable interface.

The "must signals" column of the interface table below identifies any and all signals required for the basic function of the interface. Said signals must also be used according to their definition.

All other signals may be used according to the application and the degree of integration of the external attachment.

In this way, e.g.

- the spindle number (A113) can be used for purposeful palletising.
- the velocity of the external attachment can be influenced by means of override (A25) via the override switch of the machine,
- a finished part can be discharged separately as reject part by means of the "reject" identification (A85),
- depending on the machine programme, several programmes of the external attachment can be automatically selected via the programme number (A104),
- the machine can be purposefully stopped at the end of the programme cycle via the message "finished part jam" (E16) ,
- additional collision safety between the external attachment and the machine spindles can be achieved via the release of spindle carrier indexing (E9) ,
- depending on the machine settings, the machine may be specially switched OFF by means of the optional process-influencing inputs (E150..E153).

## Up-to-dateness of the signals

The signals described here are in conformity with the up-to-date version of newly supplied INDEX multi-spindle turning machines.

With asset machines, especially in case of machines of former years of construction, it may occur that specific functions (e.g. information on skipped spindles, spindle numbers, etc. …) are not yet supported by the machine and therefore are not available at the UNIHAND-interface.

In such cases confer with the INDEX-SERVICE team concerned (multi-spindle machines), please.

## Limitations

In case of multi-spindle turning machines equipped with 2 NCUs, attachments and range of functions are only possible at the 2nd NCU. That means, that feeding/discharging is only possible in the machining positions of the 2nd NCU, i.e. in positions 4, 5 and 6 in case of 6-soindle-machines and in positions 5, 6, 7 and 8 in case of 8-spindle-machines.

# Assignment of the data interface

## Description of the abbreviations

(AT) = job bit (must always be confirmed)
(AF) = demand or request
(M) = message
(W) = value
(Q) = confirmation bit for (AT)

X = must-signal (indispensable for the range of basic functions)

## Output signals

| Signal no. | Output of the machine | Description | Internal INDEX address module DB92. | Output offset address DPDP coupler | Must in case of part feeding attachment | Must in case of part discharging attachment |
|---|---|---|---|---|---|---|
| A1 | A (AT) | Manipulator ON | DBX32.0 | X+0 | X | X |
| A2 | A (M) | Mode change lock | DBX32.1 | | X | X |
| A3 | A (M) | Cycle active | DBX32.2 | | X | X |
| A4 | A (M) | Production active | DBX32.3 | | | |
| A5 | A (M) | Produce 1 part active | DBX32.4 | | | |
| A6 | A (M) | Workpiece present in machine | DBX32.5 | | | |
| A7 | A | | DBX32.6 | | | |
| A8 | A (AF) | NC-Reset | DBX32.7 | | X | X |
| | | | | | | |
| A9 | A (M) | Spindle carrier indexing active | DBX33.0 | X+1 | | |
| A10 | A | | DBX33.1 | | | |
| A11 | A (AF) | Separate/place ready raw part | DBX33.2 | | | |
| A12 | A (AF) | Make raw part pallet ready | DBX33.3 | | | |
| A13 | A (M) | Motion release:<br>Machine hoods locked | DBX33.4 | | | |
| A14 | A (M) | EMERGENCY-OFF is active | DBX33.5 | | | |
| A15 | A (M) | Compressed air o.k. | DBX33.6 | | | |
| A16 | A (M) | Key switch set to "Set-up" | DBX33.7 | | | |
| A17 | A (M) | Machine hoods closed | DBX34.0 | X+2 | | |
| A18 | A (AF) | Approach parking position | DBX34.1 | | | |
| A19 | A | | DBX34.2 | | | |
| A20 | A | | DBX34.3 | | | |
| A21 | A | | DBX34.4 | | | |
| A22 | A | | DBX34.5 | | | |
| A23 | A | | DBX34.6 | | | |
| A24 | A | | DBX34.7 | | | |
| | | | | | | |

| Signal no. | Output of the machine | Description | | Internal INDEX address module DB92. | Output offset address DPDP coupler | Must in case of part feeding attachment | Must in case of part discharging attachment |
|---|---|---|---|---|---|---|---|
| A25 | A (W) | Override | | DBB35 | X+3 | | |
| | | | | | | | |
| A26 | A (AT) | Action 10 | M1= 66 | DBX36.0 | X+4 | at least 2 of a maximum of 16 actions | |
| A27 | A (AT) | Action 11 | M1=166 | DBX36.1 | | | |
| A28 | A (AT) | Action 12 | M1=266 | DBX36.2 | | | |
| A29 | A (AT) | Action 13 | M1=366 | DBX36.3 | | | |
| A30 | A (AT) | Action 14 | M1=466 | DBX36.4 | | | |
| A31 | A (AT) | Action 15 | M1=566 | DBX36.5 | | | |
| A32 | A (AT) | Action 16 | M1=666 | DBX36.6 | | | |
| A33 | A (AF) | Action 17 | M1=766 | DBX36.7 | | | |
| | | | | | | | |
| A34 | A (AT) | Action 20 | M1=866 | DBX37.0 | X+5 | | |
| A35 | A (AT) | Action 21 | M1=966 | DBX37.1 | | | |
| A36 | A (AT) | Action 22 | M1=1066 | DBX37.2 | | | |
| A37 | A (AT) | Action 23 | M1=1166 | DBX37.3 | | | |
| A38 | A (AT) | Action 24 | M1=1266 | DBX37.4 | | | |
| A39 | A (AT) | Action 25 | M1=1366 | DBX37.5 | | | |
| A40 | A (AT) | Action 26 | M1=1466 | DBX37.6 | | | |
| A41 | A (AT) | Action 27 | M1=1566 | DBX37.7 | | | |
| | | | | | | | |
| A42 | A (AT) | Action 30 | M2= 66 | DBX38.0 | X+6 | | in case INDEX crank shuttle not present: at least 2 of a maximum of 16 actions in case of feeding and discharging units, actions 10 through 27 also possible |
| A43 | A (AT) | Action 31 | M2=166 | DBX38.1 | | | |
| A44 | A (AT) | Action 32 | M2=266 | DBX38.2 | | | |
| A45 | A (AT) | Action 33 | M2=366 | DBX38.3 | | | |
| A46 | A (AT) | Action 34 | M2=466 | DBX38.4 | | | |
| A47 | A (AT) | Action 35 | M2=566 | DBX38.5 | | | |
| A48 | A (AT) | Action 36 | M2=666 | DBX38.6 | | | |
| A49 | A (AF) | Action 37 | M2=766 | DBX38.7 | | | |
| | | | | | | | |
| A50 | A (AT) | Action 40 | M2=866 | DBX39.0 | X+7 | | |
| A51 | A (AT) | Action 41 | M2=966 | DBX39.1 | | | |
| A52 | A (AT) | Action 42 | M2=1066 | DBX39.2 | | | |
| A53 | A (AT) | Action 43 | M2=1166 | DBX39.3 | | | |
| A54 | A (AT) | Action 44 | M2=1266 | DBX39.4 | | | |
| A55 | A (AT) | Action 45 | M2=1366 | DBX39.5 | | | |
| A56 | A (AT) | Action 46 | M2=1466 | DBX39.6 | | | |
| A57 | A (AF) | Action 47 | M2=1566 | DBX39.7 | | | |
| | | | | | | | |

| Signal no. | Output of the machine | Description | | Internal INDEX address module DB92. | Output offset address DPDP coupler | Must in case of part feeding attachment | Must in case of part discharging attachment |
|---|---|---|---|---|---|---|---|
| A58 | A (AT) | Action 50 | M4= 66 | DBX42.0 | X+10 | | In case INDEX crank shuttle is present<br>at least 2 of a maximum of 16 actions |
| A59 | A (AT) | Action 51 | M4=166 | DBX42.1 | | | |
| A60 | A (AT) | Action 52 | M4=266 | DBX42.2 | | | |
| A61 | A (AT) | Action 53 | M4=366 | DBX42.3 | | | |
| A62 | A (AT) | Action 54 | M4=466 | DBX42.4 | | | |
| A63 | A (AT) | Action 55 | M4=566 | DBX42.5 | | | |
| A64 | A (AT) | Action 56 | M4=666 | DBX42.6 | | | |
| A65 | A (AF) | Action 57 | M4=766 | DBX42.7 | | | |
| | | | | | | | |
| A66 | A (AT) | Action 60 | M4=866 | DBX43.0 | X+11 | | |
| A67 | A (AT) | Action 61 | M4=966 | DBX43.1 | | | |
| A68 | A (AT) | Action 62 | M4=1066 | DBX43.2 | | | |
| A69 | A (AT) | Action 63 | M4=1166 | DBX43.3 | | | |
| A70 | A (AT) | Action 64 | M4=1266 | DBX43.4 | | | |
| A71 | A (AT) | Action 65 | M4=1366 | DBX43.5 | | | |
| A72 | A (AT) | Action 66 | M4=1466 | DBX43.6 | | | |
| A73 | A (AF) | Action 67 | M4=1566 | DBX43.7 | | | |
| | | | | | | | |
| A79 | A | | | DBB44 | X+12 | | |
| | | | | | | | |
| A80 | A (AT) | *2nd finished part gripper: part present* | | DBX45.0 | X+13 | | |
| A81 | A (M) | *Part in 2nd finished part gripper is reject* | | DBX45.1 | | | |
| A82 | A (M) | *Part in 2nd fin.part gripper has been marked* | | DBX45.2 | | | |
| A83 | A | | | DBX45.3 | | | |
| A84 | A (AT) | *Finished part gripper: part present* | | DBX45.4 | | | X |
| A85 | A (M) | *Part in finished part gripper is "reject"* | | DBX45.5 | | | |
| A86 | A (M) | *Part in fin. p. gripper has been marked* | | DBX45.6 | | | |
| A87 | A | | | DBX45.7 | | | |
| | | | | | | | |
| A88 | A (M) | Channel 1 active | | DBX46.0 | X+14 | | |
| A89 | A (M) | Channel 2 active | | DBX46.1 | | | |
| A90 | A (M) | Channel 3 active | | DBX46.2 | | | |
| A91 | A (M) | Channel 4 active | | DBX46.3 | | | |
| A92 | A (M) | Channel 5 active | | DBX46.4 | | | |
| A93 | A (M) | Channel 6 active | | DBX46.5 | | | |
| A94 | A (M) | Channel 7 active | | DBX46.6 | | | |
| A95 | A (M) | Channel 8 active | | DBX46.7 | | | |
| | | | | | | | |

| Signal no. | Output of the machine | Description | Internal INDEX address module DB92. | Output offset address DPDP coupler | Must in case of part feeding attachment | Must in case of part discharging attachment |
|---|---|---|---|---|---|---|
| A95.1 | A (M) | Channel 9 active | DBX47.0 | X+15 | | |
| A95.2 | A (M) | Channel 10 active | DBX47.1 | | | |
| | | | | | | |
| A96 | A (AF) | Error delete pulse | DBX48.0 | X+16 | X | X |
| A97 | A | | DBX48.1 | | | |
| A98 | A | | DBX48.2 | | | |
| A99 | A | | DBX48.3 | | | |
| A100 | A | | DBX48.4 | | | |
| A101 | A | | DBX48.5 | | | |
| A102 | A | | DBX48.6 | | | |
| A103 | A | | DBX48.7 | | | |
| | | | | | | |
| A104 | A (W) | Programme number | DBB49 | X+17 | | |
| | | | | | | |
| A105 | A | | DBB52 | | | |
| A106 | A | | DBB53 | | | |
| A107 | A | | DBB54 | | | |
| A108 | A | | DBB55 | | | |
| A109 | A | | DBB56 | | | |
| A110 | A | | DBB57 | | | |
| A111 | A | | DBB58 | | | |
| A112 | A | | DBB59 | | | |
| | | | | | | |
| A113 | A (W) | Spindle number<br>- for workp. in fin.part.gr. in Bit3...0<br>- for workp. in 2nd fin.part.gripper in Bit7...4 | DBB60 | X+28 | | |
| A114 | A | Skipped spindles | DBB61 | X+29 | | |
| | | | | | | |
| A1141 | A (M) | MEL Outputs 3.0 …3.7 (optional) | DBB62 | X+30 | | |
| A115 | A (M) | BDE Output 2.0 (optional) | DBX63.0 | X+31 | | |
| A116 | A (M) | BDE Output 2.1 (optional) | DBX63.1 | | | |
| A117 | A (M) | BDE Output 2.2 (optional) | DBX63.2 | | | |
| A118 | A (M) | BDE Output 2.3 (optional) | DBX63.3 | | | |
| A119 | A (M) | BDE Output 2.4 (optional) | DBX63.4 | | | |
| A120 | A (M) | BDE Output 2.5 (optional) | DBX63.5 | | | |
| A121 | A (M) | BDE Output 2.6 (optional) | DBX63.6 | | | |
| A122 | A (M) | BDE Output 2.7 (optional) | DBX63.7 | | | |
| | | | | | | |

## Input signals

| Signal-No. | Machine input | Description | Module DB92. | Input offset address DPDP coupler | A "must" with part feeding attachment | A "must" with part discharging attachment |
|---|---|---|---|---|---|---|
| E1 | E (M) | External unit READY for operation | DBX0.0 | X+0 | X | X |
| E2 | E (M) | Automatic: READY for operation | DBX0.1 | | X | X |
| E3 | E | | DBX0.2 | | | |
| E4 | E | | DBX0.3 | | | |
| E5 | E | | DBX0.4 | | | |
| E6 | E | | DBX0.5 | | | |
| E7 | E | | DBX0.6 | | | |
| E8 | E | | DBX0.7 | | | |
| | | | | | | |
| E9 | E (M) | Spindle carrier indexing release | DBX1.0 | X+1 | X | X |
| E10 | E (M) | Manipulator: ready to start | DBX1.1 | | X | X |
| E11 | E (M) | Raw part made available | DBX1.2 | | | |
| E12 | E (M) | Raw part present in pallet | DBX1.3 | | | |
| E13 | E (M) | NiO raw part in 1st feeding position | DBX1.4 | | | |
| E14 | E (M) | NiO raw part in 2nd feeding position (reserve) | DBX1.5 | | | |
| E15 | E (M) / (AF) | Finished part jam - interruption of production | DBX1.6 | | | |
| | | | | | | |
| E16 | E (M) / (AF) | Finished part jam causing "Cycle stop" | DBX1.7 | | | |
| | | | | | | |
| E17 | E | | DBX2.0 | X+2 | | |
| E18 | E | | DBX2.1 | | | |
| E19 | E | | DBX2.2 | | | |
| E20 | E | | DBX2.3 | | | |
| E21 | E | | DBX2.4 | | | |
| E22 | E | | DBX2.5 | | | |
| E23 | E | | DBX2.6 | | | |
| E24 | E | | DBX2.7 | | | |
| | | | | | | |
| E25 | E | | DBB3 | X+3 | | |
| | | | | | | |

| Signal-No. | Machine input | Description | Module DB92. | Input offset address DPDP coupler | A "must" with part feeding attachment | A "must" with part discharging attachment |
|---|---|---|---|---|---|---|
| E26 | E (Q) | Confirmation of action 10 | DBX4.0 | X+4 | depending on the use of actions 10...27 | |
| E27 | E (Q) | Confirmation of action 11 | DBX4.1 | | | |
| E28 | E (Q) | Confirmation of action 12 | DBX4.2 | | | |
| E29 | E (Q) | Confirmation of action 13 | DBX4.3 | | | |
| E30 | E (Q) | Confirmation of action 14 | DBX4.4 | | | |
| E31 | E (Q) | Confirmation of action 15 | DBX4.5 | | | |
| E32 | E (Q) | Confirmation of action 16 | DBX4.6 | | | |
| E33 | E (Q) | Confirmation of action 17 | DBX4.7 | | | |
| | | | | | | |
| E34 | E (Q) | Confirmation of action 20 | DBX5.0 | X+5 | | |
| E35 | E (Q) | Confirmation of action 21 | DBX5.1 | | | |
| E36 | E (Q) | Confirmation of action 22 | DBX5.2 | | | |
| E37 | E (Q) | Confirmation of action 23 | DBX5.3 | | | |
| E38 | E (Q) | Confirmation of action 24 | DBX5.4 | | | |
| E39 | E (Q) | Confirmation of action 25 | DBX5.5 | | | |
| E40 | E (Q) | Confirmation of action 26 | DBX5.6 | | | |
| E41 | E (Q) | Confirmation of action 27 | DBX5.7 | | | |
| | | | | | | |
| E42 | E (Q) | Confirmation of action 30 | DBX6.0 | X+6 | | depending on the use of actions 30..47 |
| E43 | E (Q) | Confirmation of action 31 | DBX6.1 | | | |
| E44 | E (Q) | Confirmation of action 32 | DBX6.2 | | | |
| E45 | E (Q) | Confirmation of action 33 | DBX6.3 | | | |
| E46 | E (Q) | Confirmation of action 34 | DBX6.4 | | | |
| E47 | E (Q) | Confirmation of action 35 | DBX6.5 | | | |
| E48 | E (Q) | Confirmation of action 36 | DBX6.6 | | | |
| E49 | E (Q) | Confirmation of action 37 | DBX6.7 | | | |
| | | | | | | |
| E50 | E (Q) | Confirmation of action 40 | DBX7.0 | X+7 | | |
| E51 | E (Q) | Confirmation of action 41 | DBX7.1 | | | |
| E52 | E (Q) | Confirmation of action 42 | DBX7.2 | | | |
| E53 | E (Q) | Confirmation of action 43 | DBX7.3 | | | |
| E54 | E (Q) | Confirmation of action 44 | DBX7.4 | | | |
| E55 | E (Q) | Confirmation of action 45 | DBX7.5 | | | |
| E56 | E (Q) | Confirmation of action 46 | DBX7.6 | | | |
| E57 | E (Q) | Confirmation of action 47 | DBX7.7 | | | |
| | | | | | | |

| Signal-No. | Machine input | Description | Module DB92. | Input offset address DPDP coupler | A "must" with part feeding attachment | A "must" with part discharging attachment |
|---|---|---|---|---|---|---|
| E58 | E (Q) | Confirmation of action 50 | DBX10.0 | X+10 | | depending on the use of actions 50..67 |
| E59 | E (Q) | Confirmation of action 51 | DBX10.1 | | | |
| E60 | E (Q) | Confirmation of action 52 | DBX10.2 | | | |
| E61 | E (Q) | Confirmation of action 53 | DBX10.3 | | | |
| E62 | E (Q) | Confirmation of action 54 | DBX10.4 | | | |
| E63 | E (Q) | Confirmation of action 55 | DBX10.5 | | | |
| E64 | E (Q) | Confirmation of action 56 | DBX10.6 | | | |
| E65 | E (Q) | Confirmation of action 57 | DBX10.7 | | | |
| | | | | | | |
| E66 | E (Q) | Confirmation of action 60 | DBX11.0 | X+11 | | |
| E67 | E (Q) | Confirmation of action 61 | DBX11.1 | | | |
| E68 | E (Q) | Confirmation of action 62 | DBX11.2 | | | |
| E69 | E (Q) | Confirmation of action 63 | DBX11.3 | | | |
| E70 | E (Q) | Confirmation of action 64 | DBX11.4 | | | |
| E71 | E (Q) | Confirmation of action 65 | DBX11.5 | | | |
| E72 | E (Q) | Confirmation of action 66 | DBX11.6 | | | |
| E73 | E (Q) | Confirmation of action 67 | DBX11.7 | | | |
| | | | | | | |
| E90 | E (M) | 2nd raw part gripper: Part present | DBX12.0 | X+12 | | |
| E91 | E | | DBX12.1 | | | |
| E92 | E | | DBX12.2 | | | |
| E93 | E | | DBX12.3 | | | |
| E94 | E (M) | Raw part gripper: Part present | DBX12.4 | | X | |
| E95 | E | | DBX12.5 | | | |
| E96 | E | | DBX12.6 | | | |
| E97 | E | | DBX12.7 | | | |
| | | | | | | |
| E98 | E (M) | 2nd finished part gripper: Part present | DBX13.0 | X+13 | | |
| E99 | E (M) | 2nd finished part gripper open | DBX13.1 | | | |
| E100 | E | | DBX13.2 | | | |
| E101 | E | | DBX13.3 | | | |
| E102 | E (M) | Finished part gripper | DBX13.4 | | X | X |
| E103 | E (M) | Finished part gripper open | DBX13.5 | | X | X |
| E104 | E | | DBX13.6 | | | |
| E105 | E | | DBX13.7 | | | |
| | | | | | | |

| Signal-No. | Machine input | Description | Module DB92. | Input offset address DPDP coupler | A "must" with part feeding attachment | A "must" with part discharging attachment |
|---|---|---|---|---|---|---|
| E106 | E | | DBX14.0 | | | |
| E107 | E | | DBX14.1 | | | |
| E108 | E | | DBX14.2 | | | |
| E109 | E | | DBX14.3 | | | |
| E110 | E | | DBX14.4 | | | |
| E111 | E | | DBX14.5 | | | |
| E112 | E | | DBX14.6 | | | |
| E113 | E | | DBX14.7 | | | |
| E114 | E | | DBB15 | X+15 | | |
| | | | | | | |
| E122 | E (AF) | Collective error | DBX16.0 | X+16 | X | X |
| E123 | E | | DBX16.1 | | | |
| E124 | E | | DBX16.2 | | | |
| | | | | | | |
| E130 | E (W) | Error number | DBB17 | X+17 | X | X |
| E131 | E | | DBB18 | X+18 | | |
| E132 | E (W) | Error number | DBB19 | X+19 | X | X |
| | | | | | | |
| E133 | E | | DBB20 | | | |
| E134 | E | | DBB21 | | | |
| E135 | E | | DBB22 | | | |
| E136 | E | | DBB23 | | | |
| E137 | E | | DBB24 | | | |
| E138 | E | | DBB25 | | | |
| E139 | E | | DBB26 | | | |
| E140 | E | | DBB27 | | | |
| | | | | | | |
| E149 | E | | DBB30 | | | |
| | | | | | | |
| E150 | E (AF) | Process influencing input 1 | DBX31.0 | X+31 | | |
| E151 | E (AF) | Process influencing input 2 | DBX31.1 | | | |
| E152 | E (AF) | Process influencing input 3 | DBX31.2 | | | |
| E153 | E (AF) | Process influencing input 4 | DBX31.3 | | | |
| | | | | | | |

# Description of the interface signals

## From the machine to the external attachment

**(A1) Manipulator ON** (DBX32.0)

The machine is ready for work with the external attachment.

The signal is statically active if hydraulic system and compressed air supply at machine are ok.

**(A2) Operation mode change stoppage** (DBX32.1)

The operation mode of the external attachment must not be changed, i. e. the operation mode which is active must be maintained. By this, it is e. g. prevented that the Automatic mode is impermissibly left at the external attachment while the programme is run at the machine (cycle).

**(A3) Cycle active** (DBX32.2)

The machine is in Automatic mode or in Set-up of individual position mode in the material feeding or discharging position (programme controlled process).

**(A4) Production active** (DBX32.3)

The machine is in the "Production" mode.

The material feeding attachment respectively the workpiece feeding attachment has been released.

In case the signal is active, no material must be fed.

**(A5) "Produce 1 part" is active** (DBX32.4)

The machine is in the**"Produce 1 part" mode**.

The material feeding attachment respectively the workpiece feeding attachment has been released for 1 part

With ascending flank, it is supposed that exactly one part is still to be produced respectively material for 1 part is supposed to be fed.

**(A6) Workpieces present in machine** (DBX32.5)

At least one workpiece is present in the machine, in fact, it is either in the main or counter spindles or in the raw part gripper.

**(A8) NC-Reset** (DBX32.7)

The RESET key of the machine was pressed.

All active jobs must be aborted. Motions must be stopped.

The job related signals (AT) at the interface must be extinguished so that no obsolete feedbacks are existing when the machine is restarted.

**(A9) Spindle carrier indexing active** (DBX33.0)

**Spindle carrier indexing of the ma**chine is active (the spindles of the machine are moved into a different position or are currently being stationed there). Attention: Danger of collision.

**(A11) Separate raw part / make raw part available** (DBX33.2)

The external attachment is supposed to separate raw parts respectively to make raw parts available.

Signal A11 can be used in case of external attachments whose feeding attachment is equipped with workpiece separating units or the like. In such a case, you can request to make a raw part available by pressing a softkey (stop loading) at the machine.

Cancelling this signal and effect thereof:

Evacuating the external attachment after job end, work end is selected via softkeys respectively by means of activation via pre-selection counter.

This results in one of the following two special operation modes "Run until empty" (machine continues running) or "Cut-off" (machine stops after evacuation)

This signal is directly correlated with signal E11 "Raw part made available".

Thus, e.g. production A4 is cancelled if you press softkey "Stop loading" and the external attachment does not signal "Raw part made available" any longer (E11=0).

**(A12) Make raw part pallet** available (DBX33.3)

The external attachment "may" make new raw part pallets available.

Signal A12 can be used in case of external attachments where pallets/magazines or the like are part of the feeding attachment. By pressing a softkey at the machine ("Evacuate magazine"), you may prevent that a new full pallet appears in exchange.

Effect of cancelling this signal via machine softkey "Evacuate magazine":

The pallet which has been just begun will yet be worked off, however, no new pallet will be made available.

This results in one of the following two special operation modes "Run until empty" (machine continues running) or "Cut-off" (machine stops after evacuation)

This signal is directly correlated with signal E12 "Raw part present in pallet".

Thus, e.g. production A4 is cancelled if you press softkey "Evacuate magazine" and the external attachment does not signal "Raw part present" any longer (E11=0 and E12=0).

**(A13) Motion release - machine hoods locked** (DBX33.4)

The hoods of the machine are locked and the external unit "may" carry out motions inside the machine.

Note:

Safe motion release must be implemented via the hardware wiring (see wiring diagrams of the machine)

**(A14) EMERGENCY-OFF is active** (DBX33.5)

**EMERGENCY-OFF is active at the ma**chine.

**(A15) Compressed air ok** (DBX33.6)

Compressed air is present at machine and is ok.

**(A16) Key selector switch set to "Set-up"** (DBX33.7)

The key selector switch of the machine has been set to position "Set-up".

Note::

Even if the key switch is in **"Set-up"** position, the machine can anyhow be in "Automatic"mode and can carry out the programme cycle. In such case, you have to consider the selector switch position as an authorisation and not as an operation mode.

**(A17) Machine hoods closed** (DBX34.0)

The machine hoods of the machine are closed.

Notes:

At this juncture, a locking of the machine hoods (A13) must not yet have been carried out.

**(A18) (Approach) Parking position** (DBX34.1)

Command to external attachment to travel into parking position.

The external attachment is active, however, it is currently not used and therefore must not be addressed, in order to prevent the issue of an error message.

However, the monitoring of safety relevant functions must still be continued.

**(A25) Override** (DBB35)

Here, the override currently indicated to the NC is transferred in the form of a decimal value 0,1,2,4,..90,100 and is limited to 100.

**(A26)-(A57)**

The following actions 10 through 47 must be defined especially for the system

Examples::

- Action x = traversing into home position
- Action x+1 = feeding of raw part
- Action x+2 = make next raw part available
- Action x+3 = discharging of finished part
- etc. …

Mere workpiece feeding attachments must use action 10 through 27 (programmable via **M1**=066…1566).

Mere workpiece discharging attachments must use action 30 through 47 (pro-grammable via **M2**=066…1566).

**(A26) Carry out action 10** (DBX36.0)

Programming in the part programme M1=66.

Job for external attachment to carry out a defined action or process.

Said job must be confirmed by the external attachment.

Confirmation signal:

(E26) Action 10 carried out (DBX4.0)

After confirmation, the job will be deleted.

**(A27)...(A41) Carry out action 11...27** (DBX36.1...DBX37.7)

Programming in the part programme M1=166...M1=1566
Job for external attachment to carry out a defined action or process.
Said job must be confirmed by the external attachment.
Respective confirmation signals:
(E27)..(E41) action 11...27 carried out (DBX4.0...DBX5.7)
After confirmation, the job will be deleted.

**(A42)...(A57) Carry out action 30...47** (DBX38.0…DBX39.7)

Programming in the part programme M2=066…M2=1566
Job for external attachment to carry out a defined action or process.
Said job must be confirmed by the external attachment.
Respective confirmation signals:
(E42)..(E57) **action** 30..47 carried out (DBX6.0…DBX7.7)
After confirmation, the job will be deleted.

***Attention: Do not use this in case the INDEX crank shuttle is active parallelly to UniHand.***

**(A58)...(A73) Carry out action 50...67** (DBX42.0…DBX43.7)

Programming in the part programme M4=066…M4=1566
Job for external attachment to carry out a defined action or process.
Said job must be confirmed by the external attachment.
Respective confirmation signals: (E58)..(E73) **action** 50..67 carried out (DBX10.0…DBX11.7)
After confirmation, the job will be deleted.

***Attention: Only use this in case the INDEX crank shuttle is active parallelly to UniHand.***

***Use signals A80 through A82 only in case of 2·3 / 2·4-spindle machining.***

**(A80) 2nd Finished part gripper: part present** (DBX45.0)

Message to external attachment that a finished part will be handed to it. High active.

The above message is valid at the latest from the start of a "Discharge finished part" action.

The external attachment can monitor the finished part hand-over via this message and by means of its own sensor system.

**(A81) The part in the 2nd Finished part gripper is a reject part** (DBX45.1)

Message to the external attachment that the finished part has been marked as reject part. High active. Only valid together with signal (A80) "2nd **Finished part gripper: part present".**

By means of the above message, the external attachment can sort out the part.

"Reject" identifying elements may for instance be diverse measurement systems like breakage monitoring, length measuring systems, etc..

**(A82) Part in 2nd Finished part gripper has been marked** (DBX45.2)

Message to the external attachment that the finished part has been marked. High active. Only valid together with signal

(A80) "2nd **Finished part gripper: part present"**

The above mentioned marking may be used generally (system specificly). For instance, the 1st part of a material bar can be marked in the part programme.

Such marking can e.g. happen by means of a programmed setting in the NC part programme via an M-function.

**(A84) Finished part gripper: part present** (DBX45.4)

Message to external attachment that a finished part will be handed to it. High active.

The above message is valid at the latest from the start of a "Discharge finished part" action.

The external attachment can monitor the finished part hand-over via this message and by means of its own sensor system.

**(A85)** The part in the Finished part gripper is a reject part (DBX45.5)

Message to the external attachment that the finished part has been marked as reject part. High active. Only valid together with signal (A84) "Finished part gripper: part present.

By means of the above message, the external attachment can sort out the part.

"Reject" identifying elements may for instance be diverse measurement systems like breakage monitoring, length measuring systems, etc.

**(A86) Part in Finished part gripper has been marked** (DBX45.6)

Message to the external attachment that the finished part has been marked. High active. Only valid together with signal (A84) "**Finished part gripper: part present".**

The above mentioned marking may be used generally (system specifically). For instance, the 1st part of a material bar can be marked in the part programme.

Such marking can e.g. happen by means of a programmed setting in the NC part programme via an M-function.

**(A88 through A95.2) channel x active** (DBX46.0 bis 47.1)

Message to external attachment that NC-channel x is active.

This signal is valid from cycle start on.

By this, the external attachment can e. g. be informed on whether the overall cycle is running or only some channels in set-up mode.

In case of machines with double-NCU-control system, "NC channel x" means the one of the 2nd NCU.

The above applies from software version SI08-04.08.06-D03.20BF11 on.

**(A96) Error delete pulse** (DBX48.0)

Pulse of approx. 150 ms duration.

Command to external attachment to delete the active errors. If the error causes were not eliminated, (E122) collective error, (E130) error number and (E132) error effect must be maintained for error re-transmission and for the display of said errors.

This signal will be issued once by means of pressing key S121.1 at the machine control panel. Next pulse only after pressing key S121.1 again.

**(A104) Programme number** (DBB49)

Programme selection, decimal value, value (1-255)

Via the programme number, you can adapt/switch various parameters in the external attachment (e.g. work positions, home position, velocities, etc. …) to the workpieces which are supposed to be produced.

This nominal value is pre-set/stored by means of the workpiece specific settings (Index.ini).

In case of programme number = 0, you can only select manually at the external attachment (an automatic switching will not take place in case of programme number = 0).

**(A113) Spindle number** (DBB60)

Issue of the number of the spindle from which originates the workpiece which is just being discharged (1-6).

A current number is deposited at the latest at the moment when a "Discharge finished part" action starts.

*Only in case of 2·3-spindle machining:*

*Bit 3...0: Number of the spindle from which originates the workpiece in the 1st Finished part gripper*

*Bit 7...4: Number of the spindle from which originates the workpiece in the 2nd Finished part gripper*

**(A114) Skipped spindles** (DBB61)

Bit string "Skipped spindles": Bit0..5 stands for main spindle 1..6.

Bit x =1 means "skipped".

You may use this signal e.g. in order to check at the external attachment why no finished parts are being discharged from a certain spindle any longer.

Background:

At the machine, you can skip spindles. Thereafter, usually no workpiece machining ought to take place at such spindles any longer. If any skipped spindle gets into the machining position, both machining and UNIHAND-actions will be skipped until a "non-skipped" spindle gets into the machining position.

Note:

However, such skipping process must be individually programmed in the NC-programme.

**(A1141) MEL (signal lamp) outputs** (DBB62)

Illustration 8 Bit outputs of the signal lamp.

Parameterisation happens at the machine.

Please refer to machine documents.

**(A115)...(A122) PDA outputs** (DBB63)

Illustration 8 Bit outputs of production data acquisition.

Parameterisation happens at the machine.

Please refer to machine documents.

## From the external attachment to the machine

**(E1) READY** (DBX0.0)

The external attachment is READY. Voltages and communication are in order.

Data can be exchanged, e.g. error messages.

Start pre-conditions must not be present, yet.

Errors may be active at the external attachment.

**(E2) "Automatic" mode** (DBX0.1)

The external attachment is in **"Automatic" mode**.

The cycle cannot be started at the machine, unless the above operation mode has been signalled.

The above mentioned operation mode must not be cancelled in case the machine hoods (hardware) are opened since otherwise no start of the machine cycle is possible without setting the external attachment back to the above mentioned operation mode.

Manual operation of the external attachment via its own operating panel is impossible in the **"Automatic" mode**.

Note:

It is desirable (for it is user-friendly!) that after power ON, the above mentioned **"Automatic" mode is automatically selected at the external attachment.**

**(E9) Release of spindle carrier indexing** (DBX1.0)

The spindle carrier of the machine can be indexed. Such indexing is impossible unless release from external attachment is active. The external attachment shall be outside the collision zone of the spindle carrier.

Information:

The above message may permanently be set, if it is guaranteed that there will be no collision between external attachment and spindle carrier at any time.

**(E10) Manipulator READY to start** (DBX1.1)

All start pre-conditions have been fulfilled.

The external attachment is in home position and in the **"Automatic" mode** (see E2) and is able to react to the "Cycle ON" signal respectively to the action assignment.

Note:

The machine hoods will not be locked unless feedback (E10) has taken place. The message must be generated independently of the condition of the machine hoods.

**(E11) Raw part made available** (DBX1.2)

The external attachment has made a raw part available or can make a raw part available.

I. e. if a raw part is present in the external attachment, the "Make raw part available" signal will be active.

Background:

Signal E11 can be used in case of external attachments whose feeding attachment is equipped with workpiece separating units or the like. In such a case, you can request to make a raw part available by pressing a softkey (stop loading) at the machine or not.

This signal is directly correlated with signal A11 "Make raw part available".

Thus, for instance production A4 is cancelled if the "Stop loading" softkey is pressed and the external attachment signals "No raw part made available any longer" (E11=0).

**(E12) Raw part present on pallet** (DBX1.3)

Raw parts are still on the pallets in the external attachment.

Background:

Signal E12 can be used in case of external attachments where pallets/magazines or the like are part of the feeding attachment. By pressing a softkey at the machine ("Evacuate magazine"), you can prevent that a new full pallet appears in exchange.

This signal is directly correlated with signal A12 "Make raw part pallet available".

Thus, e.g. production A4 is cancelled if you press softkey "Evacuate magazine" and the external attachment does not signal "Raw part present" any longer (E11=0 and E12=0).

**(E13/E14) NiO Raw part** (DBX1.4/DBX1.5)

The raw part which is made available by the external attachment is not in order (checking/measuring unit necessary at external attachment).

The fed part has been marked as reject part and can, e.g. by using the respective NC macros, be discharged or remain unmachined.

**(E15) Finished part jam - Interruption of production** (DBX1.6)

The machine is supposed to interrupt production since a finished part jam begins to show or is already existing.

The message/request shall be generated in such a way that it is still possible that the machine runs until it is empty. I. e. it must be possible that all raw parts which are still on their way to the machine are fed, machined and thereafter deposited as finished parts. Simultaneously, a new raw part feed must be stopped. In case of external attachments which merely discharge parts, the machine sees to it that no new parts or no new material is fed any longer. The machine then continues running empty in the cycle in order to maintain operating state temperature. Once the reason for the jam is removed, new raw parts may again be fed and the production continues quite normal.

**(E16) Finished part jam with cycle stop effect** (DBX1.7)

The message shall be generated in such a way that the machine can still complete the cycle. I. e. it must still be possible to deposit the last finished part. Thereafter, the machine stops at the end of the programme cycle. Once the reason for the jam is removed, the machine can be started via cycle start again.

The following confirmation signals will be set as soon as the respective action was carried out completely respectively as soon as collision freedom was achieved. Example:

– "Feed raw part" cannot be confirmed unless the raw part was de facto taken over by the machine

– "Discharge finished part" can in most cases already be confirmed as soon as the finished part was taken over by the external attachment and was conveyed out of the collision zone. The final depositing of the finished part may happen parallel to the other machining.

**(E26..E41) Action 10..27 carried out** (DBX4.0…DBX5.7)

Confirmation for (A26..A41) action 10..27 (DBX36.0…

**(E42..E57) Action 30..47 carried out** (DBX6.0…DBX7.7)

Confirmation for (A42..A57) action 30..47 (DBX38.0…DBX39.7)

**(E58..E73) Action 50..67 carried out** (DBX10.0…DBX11.7)

Confirmation for (A42..A57) action 30..47 (DBX42.0…DBX43.7)

**Signal E90 only in case of 2·3-spindle machining**

**(E90) 2nd Raw part gripper: Part present** (DBX12.0)

Static status message.

The message is supposed to be generated by a respective existing sensor system.

The message must be valid with confirmation of an action "Feed Raw part" at the latest and must remain valid until the start of the next action. Influencing also via manual input at the external attachment.

**(E94) Raw part gripper: Part present** (DBX12.4)

Static status message.

The message is supposed to be generated by a respective existing sensor system.

The message must be valid with confirmation of an action "Feed Raw part" at the latest and must remain valid until the start of the next action. Influencing also via manual input at the external attachment.

**Signal E98 only in case of 2·3-spindle machining**

**(E98) 2nd Finished part gripper: Part present** (DBX13.0)

Static status message.

The message is supposed to be generated with the order of the machine (A80) **2nd Finished part gripper: Part present** (ascending flank) and to be checked by means of the respective existing sensor system. The signal remains valid until the part is deposited by the external attachment. Influencing also via manual input at the external attachment.

**Signal E99 only in case of 2·3-spindle machining**

**(E99) 2nd Finished part gripper open** (DBX1**3**.1)

Static status message

In case sensor system is missing, the above message must be derived from the respective outputs.

***Important: If no finished part gripper is existing at the external attachment, the above message must statically signal "1".***

**(E102) Finished part gripper: Part present** (DBX1**3**.4)

Static status message

The message is supposed to be generated with the order of the machine (A84) "**Finished part gripper: part present**" and to be checked by the respective existing sensor system. The signal remains valid until the part is deposited by the external attachment. Influencing also via manual input at the external attachment.

**(E103) Finished part gripper open** (DBX1**3**.5)

Static status message

In case sensor system is missing, the above message must be derived from the respective outputs.

***Important: If no finished part gripper is existing at the external attachment, the above message must statically signal "1".***

**(E122) Collective error** (DBX1**6**.0)

One or several error(s) is/are active in the external attachment.

Command to machine, to take the active errors.

There is no confirmation of this order.

**(E131) Error number** (DBB17)

**Error number** of the external attachment. Allowed range of values: 0...127.

**(E132) Error effect** (DBB19)

This message states what effect the active error has on the machine.

In principle, values 0..4 are allowed.

0 = merely display (the display can be extinguished by pressing the error delete key at the machine)

1 = Immediate stop without cutting free

2 = Stop after cutting free

3 = Stop at the end of the cycle

4 = Stop of the affected position.

For external attachments which have no influence on the turning process at the machine, merely values 3 and 4 are to be used.

***Effects 1 and 2 are supposed to be used only in exceptional cases.***

**(E150..153) Process influencing inputs 1..4** (DBX31.0…DBX31.3)

Via these inputs you may for instance stop or abort the part programme (switch-OFF inputs). The effects for any of the above inputs can be parameterised at the machine operating panel.

Concerning this, refer to machine document "Process influencing inputs", please.

(INDEX document number: LM1601.10331).

Note:

Diese Funktion muss an der Maschine freigeschalten sein (Maschinen Option) und entsprechen dann den Maschineneingängen E18.0-E18.3 (E150-E153).

INDEX

TRAUB

**INDEX-Werke GmbH & Co. KG**
**Hahn & Tessky**

Plochinger Straße 92
D-73730 Esslingen

Fon +49 711 3191-0
Fax +49 711 3191-587

info@index-werke.de
www.index-werke.de