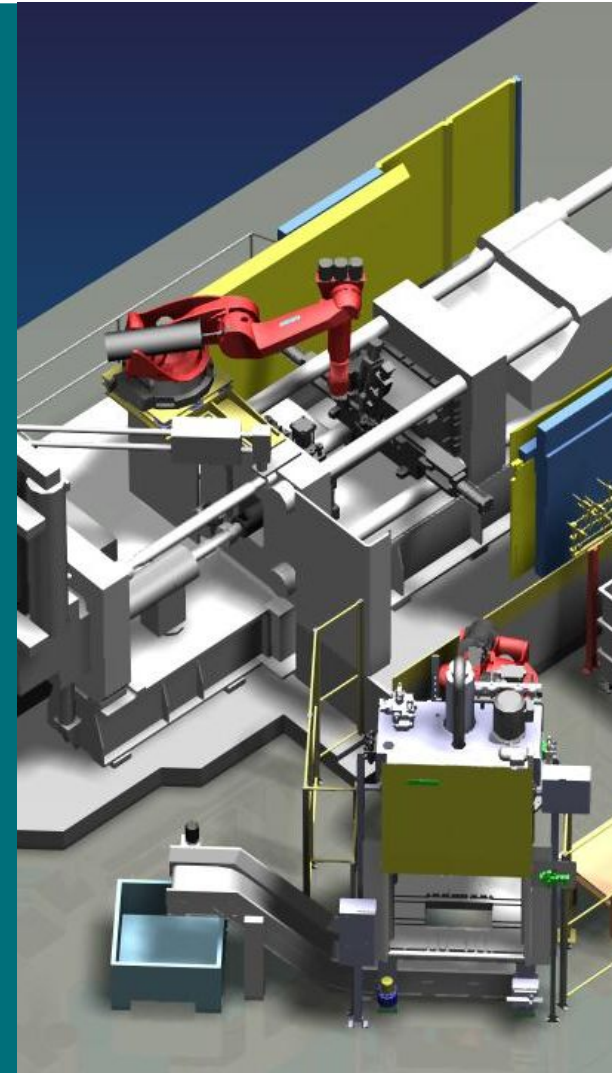


Standardised DCM Interfaces

Winfried Resch
VDMA
German Engineering Federation



Standardised DCM Interfaces

Content

- **Why "Standardisation"?**
- **VDMA-Specifications, a practicable way?**
- **Must (legal) boundary conditions be observed?**
- **Results**
- **Next steps**

Standardised DCM Interfaces

- **Why "Standardisation"?**
 - Process based on consensus, thus application and market penetration likely
 - Interchangeability of components/devices possible
 - Standardisation results in cost reduction
 - NO unexpected/dangerous movements during commissioning due to standardised PIN-configuration
 - NO delayed commissioning due to time-consuming enquiry calls
- **Aim:**
 - Making the planning and realisation stages safer and more effective
 - Providing a common platform for manufacturers and users

Standardised DCM Interfaces



- **VDMA-Specifications, a practicable way?**
 - Defines the state of the art
 - Reflects the interests of the industry
 - Easy to develop and to handle
 - Industry-wide company standard
 - Registered in databases
 - Distribution by *Beuth-Verlag, Berlin*
 - Could be basis for European or international standards
 - Adaptation possible as "Specifications" of a "European Sector Committee"
-> CEMAFON Specification

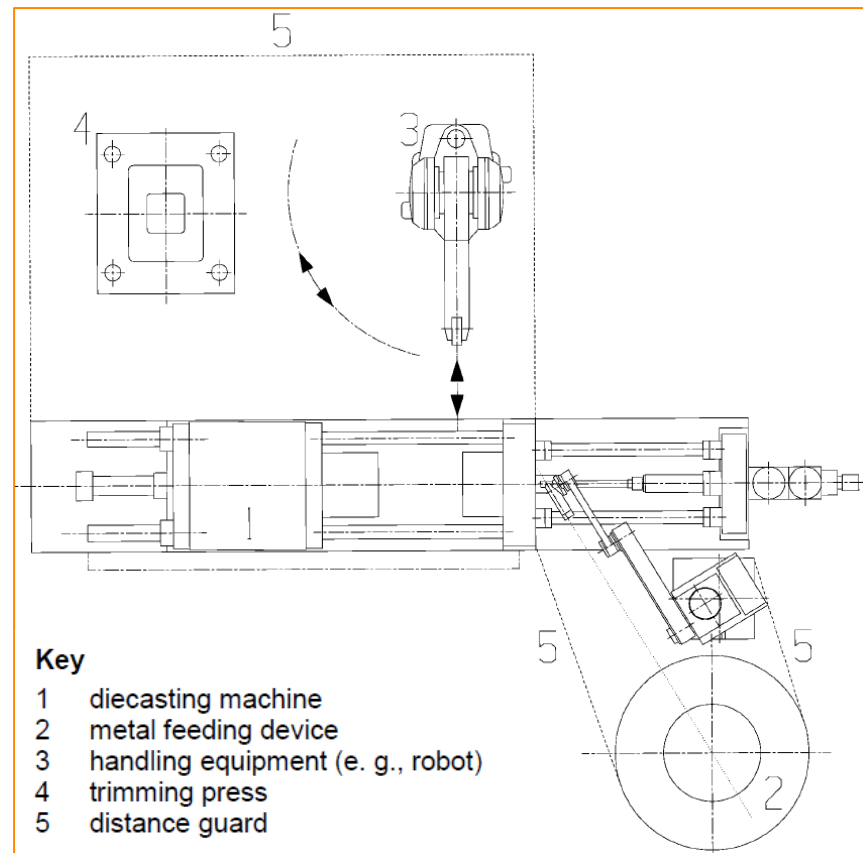


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boundary condition (1)

- **EN 869 "Safety requirements for DCMs"**

- Use of DCMs in focus
- Detailed requirements for protective devices and safety controls
- less detailed information for construction, installation and commissioning



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boundary condition (2)

- **Machinery Directive 2006/42/EG**

- **Article 4** 1. Member States shall take all appropriate measures to ensure that machinery may be placed on the market and/or put into service only if it satisfies the relevant provisions of this Directive and does not endanger the health and safety of persons and, where appropriate, domestic animals or property, when properly installed and maintained and used for its intended purpose or under conditions which can reasonably be foreseen.
- **Article 5** **Placing on the market and putting into service**
 - 1. Before placing machinery on the market and/or putting it into service, the manufacturer or his authorised representative shall:
 - (a) ensure that it satisfies the relevant essential health and safety requirements set out in Annex I;

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boundary condition (2)

- **Machinery Directive 2006/42/EG**

- Annex I, 1.2.4.3. Emergency stop
... The **emergency stop** function must be **available** and **operational at all times**, regardless of the operating mode.
- Annex I, 1.3.9. Risk of uncontrolled movements
When a part of the machinery has been stopped, **any drift** away from the stopping position, for whatever reason other than action on the control devices, **must be prevented** or must be such that it does not present a hazard.
- Annex I, 1.5.4. Errors of fitting
... Where a **faulty connection** can be the source of risk, incorrect connections must be made impossible by design or, failing this, by information given on the elements to be connected and, where appropriate, on the means of connection.
- Annex I, 1.7.4.2. Contents of the instructions
... assembly, installation and **connection instructions**, including drawings, diagrams ...



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boundary condition (3)

- **EUROMAP – Specification**

European Committee of Machinery Manufacturers of the Plastics and Rubber Industries



EUROMAP 67	Electrical Interface between Injection Moulding Machine and Handling Device / Robot
<p>Version 1.6, February 2006 (10 pages)</p>	



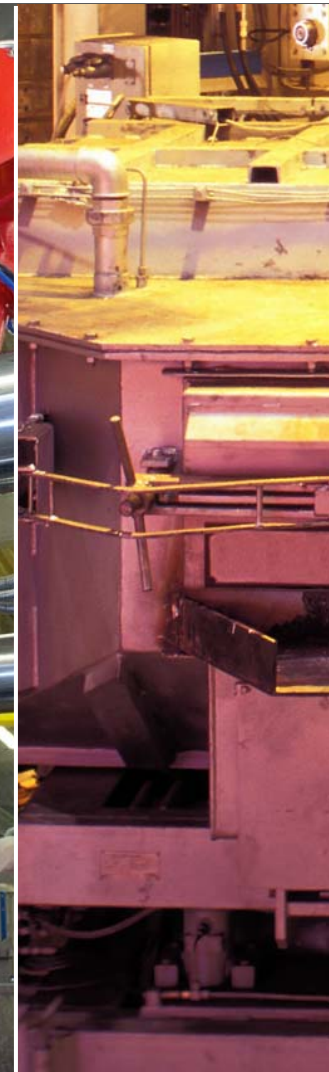
2.2.3 Reference potential (Table 1: ZA9, ZC9 and Table 2: A9, C9)

— Voltage	18 – 36V DC	
— Overlaid ripple	max. 2,5Vpp	
— Withstand against overvoltage	up to 60V	min. 10 ms
— Current	max. 2A	

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who has been involved?

- **DCM**
 - Bühler
 - Frech
- **Robot**
 - ABB Automation
 - Kuka
 - Reis Robotics
- **Spraying devices**
 - Acheson (Henkel)
 - Gerlieva
 - Wollin
- **Dosing furnaces**
 - Rauch
 - StrikoWestofen



Standardised DCM Interfaces

DISPO 010, DISPO 020, DISPO 030

● Results

FINAL DRAFT VDMA-Specification		2009
	DISPO 010 – Interface between the high pressure metal diecasting machine and extracting device	VDMA 24491
FINAL DRAFT VDMA-Specification		2009
	DISPO 020 – Interface between the high pressure metal diecasting machine and die spraying devices	VDMA 24492
FINAL DRAFT VDMA-Specification		2009
	DISPO 030 – Interface between the high pressure metal diecasting machine and metal feeding devices	VDMA 24493

Standardised DCM Interfaces



FINAL DRAFT VDMA-Specification		2009
	DISPO 010 – Interface between the high pressure metal diecasting machine and extracting device	VDMA 24491
ICS ...		
Foreword The aim of this VDMA Specification "DISPO 010 – Interface between the high pressure metal diecasting machine and extracting device" is, to design the engineering and implementation phase for setup more efficient and to develop an common platform to communicate between plant operator an supplier. The experiences are integrated and this document reflects the current state of knowledge. The VDMA Specification was elaborated by a working group of the Foundry Machinery Association within VDMA.		
Content		
		Page
	Foreword	1
1	Scope	2
2	Normative References	2
3	Terms and Definitions	3
4	Description of interface	4
4.1	General	4
4.2	Plug and socket outlet	5
4.3	Contact specification	5
4.4	Plug contact assignment	6
5	Circuit examples	12






Standardised DCM Interfaces

Scope

1 Scope

The recommendations in this VDMA-Specification define the interface between high pressure metal diecasting machines and extracting devices. This is intended to provide interchangeability (see also 4.1).

A basis sector and three options are described:

- | | | |
|---|----------|---|
| – Extracting | (Basis) |  |
| – Extracting, additional signals | (Option) |  |
| – Guard door interlocking by the high pressure metal diecasting machine | (Option) |  |
| – Guard door interlocking by the extracting device | (Option) |  |
| – Insertion | (Option) |  |

In addition, recommendations for signal voltages and intensities of current are given. It must be observed that a risk analysis for the diecasting unit has to be compiled.

This VDMA-Specification applies to:

- high pressure metal diecasting machines (cold- and hot-chamber diecasting machines) and
- extracting devices with/without insertion function.

This VDMA-Specification does not apply to

- die spraying devices (see VDMA 24492) and
- metal feeding devices (see VDMA 24493).

Standardised DCM Interfaces

Normative references

2 Normative References

The following referenced documents are helpful for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 869, *Safety of machinery — Safety requirements for pressure metal diecasting units*

EN 1088, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

EN 61131-2: 2008, *Programmable controllers — Part 2: Equipment requirements and tests*

EN ISO 11161, *Safety of machinery — Integrated manufacturing systems — Basic requirements*

EN ISO 12100-1, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

EN ISO 13850, *Safety of machinery — Emergency stop — Principles for design*

VDMA 24492, *DISPO 020 — Interface between the high pressure metal diecasting machine and die spraying devices*

VDMA 24493, *DISPO 030 — Interface between the high pressure metal diecasting machine and metal feeding devices*

Standardised DCM Interfaces

Terms and definition

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1 apply to this document as well as the following terms and definitions.

3.1

diecasting machine (DCM) [according to EN 869]

a machine that injects molten metal under high pressure into a parted die which is connected to the platens of the machine

3.2

diecasting unit [according to EN 869]

a diecasting machine, together with ancillary equipment, which form a complete production unit

3.3

hot-chamber diecasting machine [according to EN 869]

diecasting machine having the shot sleeve and plunger submerged in the molten metal of the furnace

3.4

cold-chamber diecasting machine [according to EN 869]

diecasting machine where molten metal is delivered to the shot sleeve in measured amounts from a separate furnace

3.5

ancillary equipment [according to EN 869]

devices which automatically carry out process functions additional to those of the diecasting machine itself, e. g., feeding the metal, removing the castings, spraying the die

3.6

extracting device

device necessary for automatic/semi-automatic removal of the casting from the DCM. Optional, this device can also feed inserts to the die

Standardised DCM Interfaces

Description of interface

4 Description of interface

4.1 General

This document references to the interface at the DCM-control.

If a plug and socket outlet is also provided at the extracting device, it will be executed analog to the plug and socket outlet at the DCM-control (i. e. connection lead pin/pin).

The signals of both the DCM and the extracting device are given by contacts of relays, switches, semiconductors, etc. The contact-making is either by dry contacts or related to a reference potential and occupied a contact of the plug at the DCM or the extracting device (see Tables 1 and 2).

All signals which are not optional shall be supported by the DCM and the extracting device.

Standardised DCM Interfaces

Plug-in connection

4.2 Plug and socket outlet

The plug contacts for the DCM (see Figure 2) and the extracting device (see Figure 1) shall be capable to carry at least 250 V and 10 A.

The plug-in connection between the DCM and the extracting device is defined by the following plug contact assignment.

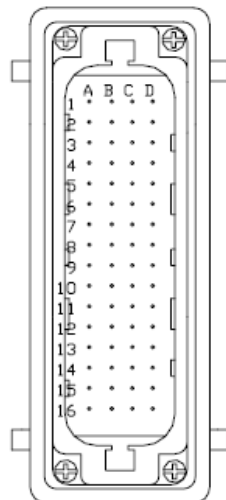


Figure 1: Plug on the extracting device

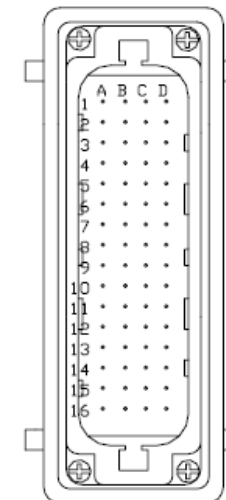


Figure 2: Plug on the DCM

Standardised DCM Interfaces

Contact specifications

4.3 Contact specification

4.3.1 Emergency stop, safety devices

The following conditions shall be fulfilled:

- The voltages shall not exceed 42 V DC;
- A current of at least 6 mA shall be maintained; and
- The maximum current is 6 A.

4.3.2 Logic signals

These signals shall be in accordance with

- 5.2.1.2 of EN 61131-2:2008, Table 8, Type 1
- or
- 5.2.3.1 of EN 61131-2:2008, Table 10, $I_e = 0.1$ A max.

4.3.3 Reference potential

The following conditions shall be fulfilled:

- Voltage 18 - 36 V DC;
- Ripple voltage max. 2,5 Vpp;
- Withstand against overvoltage up to 60 V and min. 10 ms; and
- Current max. 4 A.

Standardised DCM Interfaces

Contact specifications

4.4 Plug contact assignment

4.4.1 Plug on the DCM, signals from the DCM to the extracting device

Details on Table 1:

- All signals shall be given for a minimum time of 200 ms;
- Continuous signals are signals only changing when the condition of the described function changes, thus reflect the condition of the function described;
- Impulses are signals being given for a defined minimum time, independent from the duration of the described function;
- The following signals are not emitted when the interface is deselected, except when explicitly described.

Table 1: Plug on the DCM, signals from the DCM to the extracting device

Contact No. (see figure 2)	Signal name	Signal duration	Related operating modes	Description
A01	power supply	continuous signal	all operating modes, even with deselected interface	24 VDC from extracting device
A02	power supply	continuous signal	all operating modes, even with deselected interface	0 VDC from extracting device

Table 2: Plug on the DCM, signals from the extracting device to the DCM

Contact No. (see figure 2)	Signal name	Signal duration	Related operating modes	Description
C06	24 VDC	continuous signal	all operating modes, even with deselected interface	24 VDC from DCM
C07	0 VDC	continuous signal	all operating modes, even with deselected interface	0 VDC from DCM

Standardised DCM Interfaces

Contact specifications: emergency stop

Table 1: Plug on the DCM, signals from the DCM to the extracting device

Contact No. (see figure 2)	Signal name	Signal duration	Related operating modes	Description
A03 – A04 (K1) A05 – A06 (K2)	emergency stop (safety signals)	continuous signal	all operating modes, even with deselected interface	These two dry contacts shall close, if no emergency stop is activated at the DCM and the connected peripheral equipment. Activating an emergency stop shall open both contacts.

Table 2: Plug on the DCM, signals from the extracting device to the DCM

Contact No. (see figure 2)	Signal name	Signal duration	Related operating modes	Description
C08 – C09 (K1) C10 – C11 (K2)	emergency stop (safety signals)	continuous signal	all operating modes even with deselected interface	<p>All peripheral devices give notice of their emergency stop to the DCM. The administration of all emergency stops is done by the DCM. The dry enabling contacts of the emergency stop are given from the DCM to the peripheral devices.</p> <p>These two dry contacts shall be closed, if no emergency stop is activated at the extracting device. Activating an emergency stop shall open both contacts.</p>

Standardised DCM Interfaces

Contact specifications: emergency stop

Table 1: Plug on the DCM, signals from the DCM to the extracting device

Contact No. (see figure 2)	Signal name	Signal duration	Related operating modes	Description
A03 – A04 (K1) A05 – A06 (K2)	emergency stop (safety signals)	continuous signal	all operating modes, even with deselected interface	<p>These two dry contacts shall close, if no emergency stop is activated at the DCM and the connected peripheral equipment. Activating an emergency stop shall open both contacts.</p> <p>If the contacts are open, no movement of the extracting device shall be possible.</p> <p>These emergency stop contacts are incorporating all emergency stop signals of the diecasting unit. Based on this it is compulsory that these contacts are not part of the emergency stop signals which are provided by the extracting device for the DCM.</p> <p>Otherwise a mutual interlocking of both emergency stop functions takes place.</p> <p>The emergency stop of the DCM has consequently a superordinated function (master function).</p>

● Machinery Directive 2006/42/EG

- Annex I, 1.2.4.3. Emergency stop
... The emergency stop function must be available and operational at all times, regardless of the operating mode.

Standardised DCM Interfaces

Contact specifications: options

Option guard door administration by extracting device

D05 – D06 (K1)	guard door(s) closed (safety signals)	continuous signal	all operating modes even with deselected interface	These two dry contacts shall close, if the guard door(s) around the extracting device is (are) closed. If a guard door is open and simultaneously the safety door of the DCM on the extraction side is open, the DCM shall stop immediately according EN 869:2009; 5.2.4.
D07 – D08 (K2)				

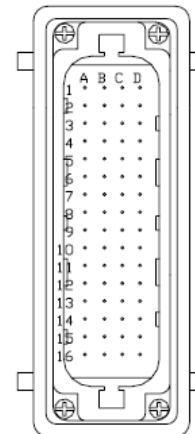
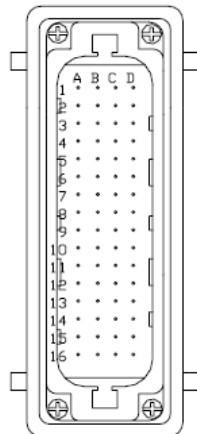
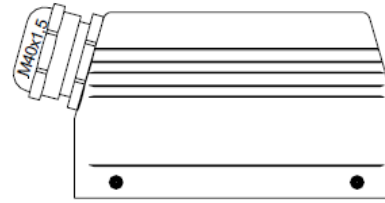
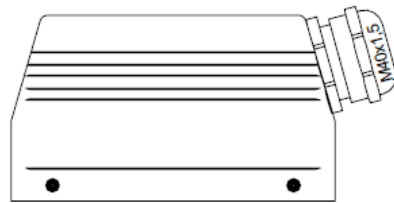
Option additional removal signals

D09	request part release for extraction	continuous signal	automatic, semi-automatic, and manual	This signal can be used to pull cores, after the extracting device has picked the part. Background for this signal is that the part can not fall by itself out of the mould.
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Option insertion

D10	insert in position	continuous signal	automatic, semi-automatic and manual with selected insertion interface	This signal shall be activated, if the insert is in the right position for clamping and shall be deactivated, if the DCM activates the signal "insert clamped into position".
D11	insert device out of the core collision area	continuous signal	all operating modes with selected insertion interface	This signal shall be activated, if all the inserts are inserted and the insert device is out of the cores, so that the cores can enter unrestricted. This signal shall be monitored in all operating modes with selected insertion interface till the signal "extracting device out of the DCM area" is activated"

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- NOTE** Both sides of the interface cable are designed identical:
- 64-pin heavy-duty connector,
 - **product Harting** (hood: HAN 24B-gs-M40; male insert: HAN 64D-M-c; pins: HAN D R15 (0,75 – 1 mm²) **or compatible connectors**,
 - contacts as pin (male) with silver or gold plated contacts,
 - retaining clips on machine side.



Standardised DCM Interfaces



● Next steps

- Publication (DE, EN), *Beuth-Verlag, Berlin*
 - DISPO 010 DCM – Extracting devices
 - DISPO 020 DCM – Spraying devices
 - DISPO 030 DCM – Metal feeding devices
- Publication as "CEMAFON – Specification"?
(checking, if legally protected)
- Discussion in CEN/TC 202 if an integration
in EN 869 is possible/reasonable
- Development of an interface
based on a Bus-System
(kick-off meeting 08 March, 2010)





**Thank you very much for
your attention!**