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BÜHLER

Manual 1

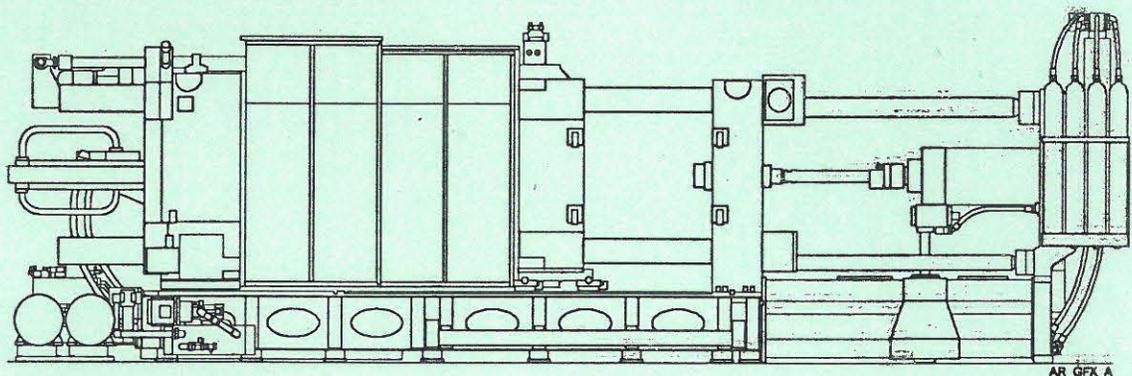
Operating instructions

Toral Cast Divison
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CDN Concord Ontario

90011-en
9412

Die casting machine

SC10/120



Preface/Introduction

1 Safety

2 Technical Data

3 Preparing the site of installation

4 Preparing the electrical system

5 Preparing the energy connections

6 Operating materials

7 Transport

8 Preparations for setting into operation

Preface

This instruction manual substantiates the technological standard of the Bühler die-casting machine type SC10/120 - SC16/250 with the ACRON control system.

It embraces the design features and method of operation, setting up (installation), setting into operation, operating and maintenance of the machine and control system.

It is assumed that the operators are qualified and trained. For this reason, such descriptions as do not require any special knowledge have been omitted. Instructions for repairs that go beyond the normal maintenance and servicing, are not described here.

The machine has been built along the lines of the current technological development and recognized safety-technical rules and regulations. Despite this the risk for danger to life and limb of the users and of third parties or for the impair of the machine and other tangibles cannot be excluded. Therefore, safety is given the greatest priority.

**CAUTION !**

Do not set the machine into operation before you have read and understood the entire instruction manual, in particular Chapter 1 "Safety"!

It is important that this documentation is understood and the necessary activities are carried out in accordance with the instructions so as to achieve reliable and safe operation of the die-casting machine. The instructions are written in a easily understandable manner with the necessary illustrations, so that the machine can be taken into operation quickly and can be operated safely and efficiently.

The entire technical documentation should be kept in the neighbourhood of the machine.

If, despite our endeavours, difficulties should arise, or if there are queries, please contact our customer service or one of our representatives, who will gladly help you.

Bühlers reserve the rights to alter the instruction manuals in accordance with experience gained and to update them with the latest technical developments.

Bühler AG, Uzwil/Switzerland

0.1 Introduction

0.1.1 The documentation of die-casting machines

Manual 1: Instructions for operation

Contents: safety, planning, working materials, transportation, preparing start-up, erecting and starting up (is submitted to the customer in advance).

Manual 2: Instructions for operation

Contents: installation, setting into operation, operating the machine, machine setting and die changing, maintenance, spare parts etc. (is delivered together with the machine).

Manual 3: Electrical diagrams

Contents: electrical diagrams, description of interfaces, flow diagrams, spare parts for the control system, etc. (is delivered together with the machine)

0.1.2 Presentation of the documents

Header

Page of all pages of this chapter

2/14

Title of this chapter

Safety

Machine type

SC 16/180

Footer

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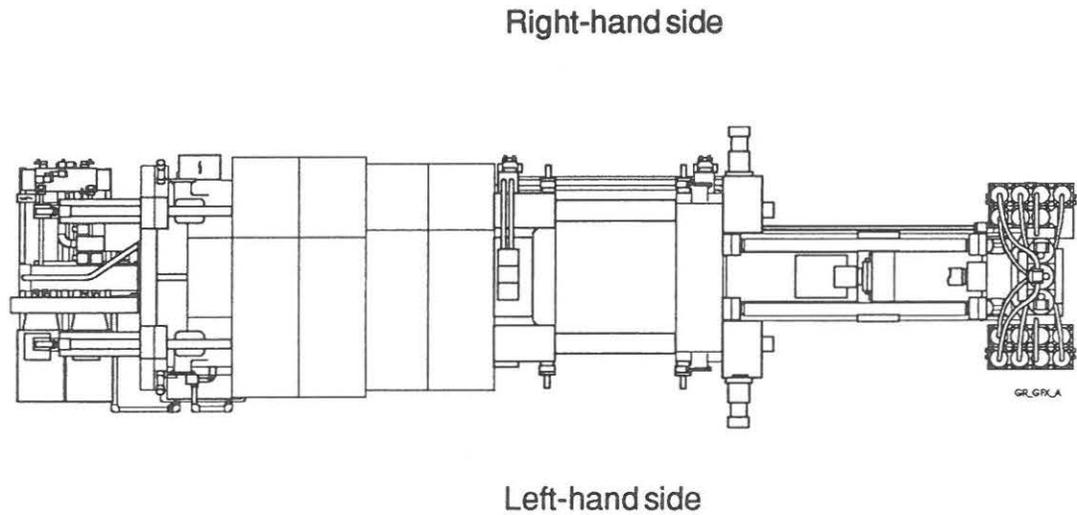
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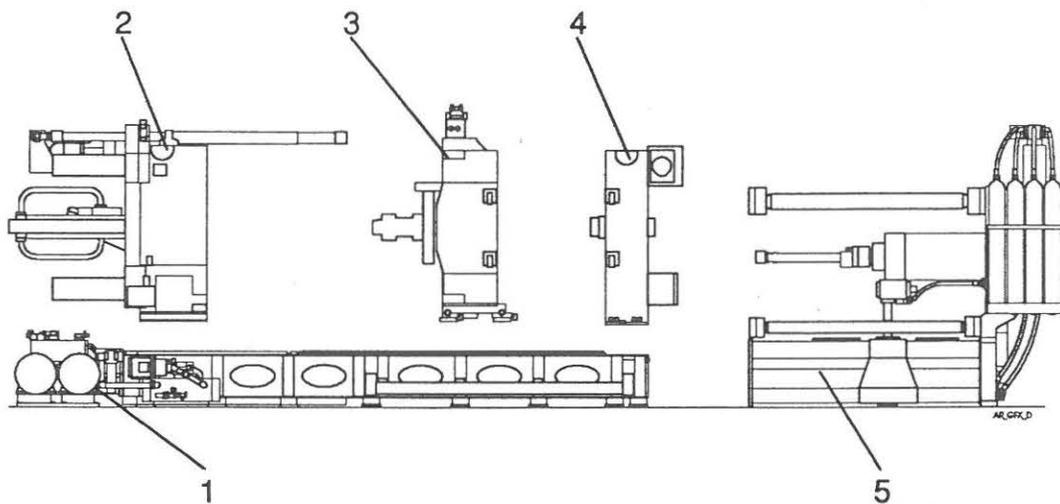
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0.1.3 Designation of the machine sides



0.1.4 Functional groups of the Buhler die-casting machine

- 1) Driving group
- 2) Stress platen
- 3) Moving platen
- 4) Fixed platen
- 5) Injection unit



0.1.5 Abbreviations

Following abbreviations are used in the operating manuals and on the screen:

- DCM Die-casting machine
- DCI Die-casting installation
- MMI Man Machine Interface

1 Safety

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1.1 Symbol for safety of labour



This symbol will be found near all references concerning safety of labour in this instruction manual and in connection with the relevant titles, can mean

- **"DANGER!"** immediate danger to life and limb
- **"WARNING!"** possible danger of injury or life
- **"CAUTION!"** possible danger of injury, damage.

Take notice of these references and act with necessary care in these cases. Pass on all instructions for safety of labour also to users. Besides the references in this manual also the local regulations for safety and accident prevention must be observed.

1.2 Observation of the safety regulations

The user of Buhler die-casting machines is obliged to observe the following regulations in order to obtain the highest possible standard of safety for the operating personnel at the machines.

1.3 Directed use

Buhler horizontal die-casting machines are designed exclusively for the pressure die-casting of aluminium, magnesium, zinc and copper alloys. Any use beyond this scope is regarded as non-directed.

The manufacturer can **not** be made liable for any damages that are a result of non-directed use. The user is the sole bearer of the risk for such damage

The observance of the conditions for installation, start-up, operation and maintenance as instructed by the manufacturer are inherent with the directed use.

1.4 Directions on protection of labour

- Buhler die-casting machines and Buhler die-casting installations (hereafter mentioned as DCM and DCI) are built in keeping with the latest technological developments and **in accordance with current standards of safety of labour and operation**. However, there are dangers connected with these machines if they are not appropriately used by untrained personnel or if they are not used as directed.
- Therefore, Buhler DCM or DCI must be operated and serviced exclusively by authorised, trained and instructed personnel. This personnel must have received special instruction on the dangers that may occur. (See also Paragraph "Instruction of personnel".)
- The competencies of the personnel regarding operation, machine setting and die changing, programming and servicing of machine and control system must be clearly defined and adhered to, so as to avoid any confusion of responsibilities related to the aspect of safety.
- For all activities concerning setting into operation, operating, machine setting and servicing of the DCM or DCI the switching off procedures described in the operating manuals must be observed.

**WARNING!**

All activities in connection with setting, repairing and servicing of DCM or DCI must be carried out exclusively with the DCM or DCI switched off and while it is at standstill.

**WARNING!**

Every method of working by which safety at the DCM or DCI is impaired is forbidden.

**WARNING!**

Wilful modifications and changes which impair safe operation of the DCM or DCI are not allowed.

**WARNING!**

Safety and protective devices must be kept in perfect working condition under all conditions. The removal, making ineffective or putting out of order of these devices is strictly forbidden.

**WARNING!**

Before starting up after repairing or maintenance work always make sure that all safety devices have been installed.

**WARNING!**

By all means observe notices and danger signs, keep these clean, do not remove or cover them.

- The user is obliged to keep the DCM or DCI always in perfect operating condition.
- Local regulations concerning safety and accident prevention under all conditions are applicable for operation of Buhler DCM or DCI.

1.5 Instruction of personnel

**CAUTION!**

Every person in the company of the user who is concerned with the installation, setting into operation, machine setting and die changing, operating and maintenance (inspection, maintenance, repairing) of the DCM or DCI must have read and understood the complete instruction manual and in particular Chapter „Safety“.

Persons who cannot read these instruction manuals, must be specially instructed upon these dangers by the user.

- The user must make sure that his personnel is able to operate, set and service the DCM or DCI and knows the safety instructions.
- The user is recommended to have this confirmed in writing by his personnel.

Note

By "user" is understood whoever uses the DCM or DCI for economic reasons. The user is not identical with the person who operates the DCM or DCI.

1.6 Safety for operator and machine setter

- The operator and machine setter are **jointly responsible** for not letting persons work on the DCM or DCI who are not qualified to do so.
- The operator and machine setter are **obliged** to immediately notify any changes which impair the safety of the DCM or DCI.
- The operator and machine setter are **obliged** to wear clothing as prescribed (see Paragraph "Protective clothing for personnel").

**DANGER!**

It is strictly forbidden for any persons to be within the hazardous area while at the same time a person is operating the DCM or DCI at the operating unit.

Filling or letting off nitrogen

Nitrogen: see Chapter "Working materials".

**DANGER!**

Use exclusively purest quality nitrogen (N₂ more than 99,99 Vol. %) !
Compressed air or other media are not permitted as gas filling!
Under no conditions use oxygen! Danger of explosion!

**CAUTION!**

When letting off nitrogen close the drain valve before removing the blind plug.
When opening the drain valve it is possible that seepage oil emerges!

Note

In the event that accidents happen due to neglecting of these instructions, Buhler AG reserve the right of recourse to the customer or to litigate against him in case Buhler AG is made liable.

1.7 Emissions

1.7.1 Noise

Sources:

- the drive unit
- during the casting process

Conditional: on the load of the machine during production

Regulations: local regulations are to be observed



WARNING !

**If the noise emission levels lie above the permissible values
the personnel should use appropriate ear protectors!**

Sound level of the DCM (see Chapter "Technical data").

1.7.2 Emission of vapours and smoke



WARNING !

Health impeding substances in the air !

Sources:

- From spraying the die

Conditional:

- on the type of spraying agent
- on the quantities of spraying agent used
- on the temperature of the die

Remedies:

- provide exhaust ducts for the DCM or DCI
- ventilation / filter system for the entire die-casting plant

Regulations: Observe the local regulations.

1.7.3 Liquids that are detrimental to health and the environment.



WARNING !
Harmful to environment and health !

These liquids collect on the floor or escape into the atmosphere in form of vapours and smoke

- hydraulic fluid
- lubricants
- spraying agents

Remedies:

- Collect fluids in a tray and dispose of them in accordance with the local regulations.
- Vapours and smoke are to escape into the atmosphere only after having been purified in filtering systems.

Regulations: Observe the local regulations.

1.7.4 Service water



CAUTION !
Service water is polluted by substances such as hydraulic fluid, spraying agents etc., which are harmful to the environment and health !



WARNING !
Water poured into liquid metal (furnace, metal ladling device etc.) will cause explosive reactions and burning of people from hot metal spray.

Application:

- for cooling hydraulic fluid
- for cooling the die and shot unit
- for spraying the die

Measures to be taken:

- Use a closed-circuit service water system with water treatment unit.
- Service water only to be drained after passing a treatment installation.

Regulations: observe the local regulations.

1.8 Protective clothing for the personnel

- The personnel should wear eye protectors, gloves, headgear, good shoes and outerwear of robust material that is resistant to high temperatures.
- Inappropriate or wrong clothing can be a cause for burning.
- Observe the local regulations.

1.9 Instructions for transport

- Before transporting the DCM always first empty the hydraulic tanks and nitrogen systems.
- Transport the DCM according to the instructions for lifting (see Chapter "Transport")

**DANGER!**

Check the lifting equipment for permissible load. Standing under suspended loads is dangerous to life.

1.10 Avoidance of accidents by careful maintenance

(see also Manual 2, Chapter "Mechanical maintenance")

- Cleaning the DCM or DCI at regular intervals according to maintenance scheme protects the personnel against accidents and raises the operative reliability.
 - Inspection of the safety devices at regular intervals according to maintenance scheme is imperative for the protection of the operating personnel.
 - Maintenance at regular intervals according to maintenance scheme reduces down time during production and avoids additional stress upon the personnel because of time pressure. Stress through time pressure can be a cause for blunders by the personnel, leading to accidents.
-

1.11 Hazardous areas

The hazardous areas are explained under Chapter "Preparing the site of installation" and are briefly described hereafter

The moving elements of the DCM

(see also Chapter "Design and method of function")

- Toggle system: squashing and shearing points
- Die area: squashing points, high temperatures, metal spray
- Injection unit: squashing points and possibly metal spray

The peripheral units

(see the instruction manuals of the peripheral units)

- Spraying unit
- Extractor
- Metal ladling unit
- Trimming press, etc.

Safety-gate area when program selected "with/without safety gate"

- Program selection "with/without safety gate" is an **extremely dangerous** condition, even when "**with safety gate**" is selected, because the monitoring system of the safety gate is partially out of action. The user is therefore, **under the obligation** to fence in the safety gate area (see Paragraph "Fencing").
- When casting "**without safety gate**", in addition the fencing, also a **splash plate, e.g. of steel plate, must be mounted against metal spray from the die.**

1.12 Protective devices

In order to protect the personnel against hazards as described under Paragraph "Hazardous areas"

- **the DCM is equipped with shields, covers, protection grids, safety gates etc. (see Chapter "Design and method of function").**
- **every peripheral unit is fitted with the necessary protective devices (see instruction manuals of the peripherals).**
- **the DCI should be safeguarded by a fencing (see paragraph "Fencing").**

1.13 Fencing

- Fences are protective devices which surround the hazardous area in such a manner, that these alone, or in connection with other parts, inhibit access to the hazardous areas from outside.
 - Surmounting or passing through the fencing without aids must not be possible.
 - Access to the safeguarded area must be exclusively via doors. The doors are interlocked with the control system of the installation in such a manner, that access to the hazardous areas is possible only in non-hazardous condition.
 - For example of a DCM or DCI fencing see Chapter "Preparing the site of installation".
-

1.14 Mechanical maintenance

**WARNING!**

Mechanical maintenance of the DCM or DCI to be carried out exclusively by qualified, trained and authorized personnel.

Defective parts are to be immediately repaired or replaced.

- Switch off the DCM or DCI by means of the main switch, while it is at its initial position.

**WARNING!**

For repairs and maintenance work always lock the main switch with a padlock and keep the key under control.

**CAUTION!**

When cleaning with compressed air foreign particles which are blown between moving parts will cause early wearing.

**CAUTION!**

When cleaning with steam blast do not aim the jet between moving parts, bearings, onto valves, electrical connections, limit switches, terminal boxes etc.

Immediately after cleaning remove water collected in hollows. Apply grease to blank surfaces.

Water and foreign matter collected between moving parts cause forming of rust and early wearing.

**WARNING!**

When working on the hydraulic system relieve pressure from the system by carefully loosening the vent plugs (marked in yellow) on the casting, die-closing, ejector core pull cylinders etc.

**CAUTION!**

The (piston type) accumulator is automatically discharged (pressureless) when the driving motor is switched off.

In addition to that, drain the accumulator by hand by opening the accumulator valve.

**WARNING!**

When working on the nitrogen system it is imperative to empty the nitrogen (see Manual 2, Chapter "Retooling").

**CAUTION!**

High frequency units e.g. welding gear!
For electrical welding work directly on the DCM or DCI switch off the control system by means of the main switch and lock it.

Always when welding clamp the earthing clamp (minus pole) as near as possible to the welding point.

1.15 Electrical maintenance

**WARNING!**

Electrical maintenance of the electrical system with the control unit only to be carried out by qualified, trained and authorized personnel.

**WARNING!**

Before carrying out any maintenance or repair work always lock the main switch with a padlock and keep the key under control.

**CAUTION!**

Protect the control system against spray, dirt and influx of heat. In the course of the maintenance scheme check if doors and covers of the control cabinet, power-current cabinet and terminal boxes are closed.

**WARNING!**

PCBs and plug-in boards must be pulled out or inserted only when the main switch is switched off.

- Local regulations are to be observed under all circumstances.

1.16 DCM or DCI control systems

- The control systems delivered by Buhler are an integrated part of the safety concept for prevention of accidents of our DCM or DCI.
 - Before setting the DCM or DCI into operation, these control systems must be tested according to a check list by a Buhler specialist who releases them by signature.
 - In case control systems for DCIs are supplied by third parties, these must be built in accordance with Buhler specifications and profoundly tested by a Buhler specialist who is authorised to release the system for use with a signature.
 - Only under these conditions can Buhlers be made liable for personal and material damages, who, however, reserve the right of having recourse to the suppliers of the control system.
 - Buhler is not liable to the contracting party for faults and their consequential damages ensuing from control systems which have been obtained by the contracting party from third parties.
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2 Technical data

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2.1 Identification data

Customer Toral Cast Division
Machine designation die-casting machine
Machine type SC 10/120
Machine number 10 248 255
Order number 531 125
Year of construction 1995

Machine-type designation:

SC = Machine serial (Shot Control)
10 = Maximum injection force (1000 kN)
120 = Maximum locking force (12000kN)

2.2 Directed use

Buhler horizontal die-casting machines are designed exclusively for the pressure die-casting of aluminium, magnesium, zinc and copper alloys. Any use beyond this scope is regarded as non-directed.

The manufacturer can **not** be made liable for any damages that are a result of non-directed use. The user is the sole bearer of the risk for such damage

The observance of the conditions for installation, start-up, operation and maintenance as instructed by the manufacturer are inherent with the directed use.

2.3 Protection class

The electrical operating substance is executed in protection class IP 55.

2.4 Ambience

In order to determine a suitable location for the DCM or DCI a number of important aspects will have to be taken into account.

See Chapter "Preparing the site of installation".

2.5 Electrical system

Data and connections: see Chapter "Preparing the electrical system".

2.6 Hydraulic system

- Filling quantity 2600 dm³
- Maximum system pressure 210 bar
- Hydraulic fluid: see Chapter "Operating materials".

2.7 Central lubrication

- Tank capacity 15 dm³

Central-lubricating oil: see Chapter "Operating materials".

2.8 Pneumatic system

- Mechanical die closing safety
- Plunger lubrication with spraying

Data and connections: see Chapter "Preparing the energy connections".

Lubricating oil: see Chapter "Operating materials"

2.9 Water cooling

- Hydraulic fluid
- Die moving platen
- Die fixed platen
- Shot unit

Data and connections: see Chapter "Preparing the energy connections".

2.10 Automatic plunger lubricator with spraying

- Tank capacity 20 dm³

Lubricants: see Chapter "Operating materials".

2.11 Nitrogen system injection unit

- Maximum filling pressure 156 bar
- Filling quantity 370 l

Nitrogen: see Chapter "Operating materials".



DANGER!

**Use exclusively purest quality nitrogen (N₂ more than 99,99 vol. %) !
Compressed air and other media are not allowed as gas filling!
Never use oxygen! Danger of explosion!**

2.12 Machine data

- Maximum locking force (strain gauge tested) 12000 kN
- Maximum dynamic casting force 1000 kN
- Plunge stroke 800 mm
- Effective plunger stroke 770 mm
- Casting positions (standard) 0.- 420 mm
- Ejecting force forward / backward 680 / 360 kN
- Ejector stroke (adjustable) 220 mm
- Size of fixed platen (L x H) 1100 x 1100 mm
- Size of moving platen (L x H) 1690 x 1690 mm
- Smallest permissible die mounting area 800 x 800 mm
- Maximum permissible surface pressure 100 N/mm²
- Clearance between the tie bars 1100 x 1100 mm
- Tie bar diameter 220 mm
- Minimum die height 400 mm
- Maximum die height 1200 mm
- Stroke length of the moving platen 1100 mm

2.13 Production data

- Plunger diameter 90...125 mm
- Theoretical casting volume acc. to DIN 24480 3393...6545 cm³
- Theoretical casting weight for Al* 8.5...16.4 kg
- Maximum specific casting pressure 1572...815 bar

* The maximum theoretical casting weight according to DIN 24480 is calculated from:
 $\frac{2}{3} \times \text{plunger stroke} \times \text{plunger area} \times \text{density (for Al = 2.5 g/cm}^3\text{)}$

2.14 Dimensions

Machine

- Length 10.476 m
- Width 2.850 m
- Height 3.600 m

Dimension sketch of die-casting machine: see enclosed sheets in this chapter

Control system

- Length 4.400 m
- Width 1.000 m
- Height 2.300 m

Dimension sketch of control cabinet: see Chapter "Preparing the electrical system"

2.15 Weights

- Machine weight ready for operation 75000 kg

Transport: see Chapter "Transport".