INDEX

1 Introduction.................................................................................................................................................. 3
  1.1 Symbols .................................................................................................................................................... 3
  1.2 Terms ......................................................................................................................................................... 3
  1.3 Transport .................................................................................................................................................. 3
  1.4 Receipt ..................................................................................................................................................... 3
2 General information......................................................................................................................................... 4
  2.1 Safety ....................................................................................................................................................... 4
  2.2 Certification ............................................................................................................................................. 4
  2.3 Operating environmental conditions ....................................................................................................... 4
3 Operation........................................................................................................................................................ 5
  3.1 The Interface ............................................................................................................................................. 5
  3.2 Start-up & Login ....................................................................................................................................... 7
  3.3 System Configuration ............................................................................................................................... 8
  3.4 Material curves ......................................................................................................................................... 12
    3.4.1 Offline Material curve learn function ............................................................................................... 12
    3.4.2 Selecting a learned material curve ................................................................................................. 13
    3.4.3 Save data function ........................................................................................................................... 14
  3.5 Recipe function ......................................................................................................................................... 15
    3.5.1 Creating a new recipe ...................................................................................................................... 15
    3.5.2 Load / edit a recipe ......................................................................................................................... 16
    3.5.3 Delete a recipe ................................................................................................................................. 16
  3.6 USB menu ............................................................................................................................................... 17
    3.6.1 Backup / Restore ............................................................................................................................... 17
    3.6.2 Remove USB stick ............................................................................................................................ 17
  3.7 Screenlock ............................................................................................................................................... 17
  3.8 Consumption counters ............................................................................................................................ 18
    3.8.1 Batch consumption counter ............................................................................................................ 18
    3.8.2 Total consumption counter ............................................................................................................. 18
4 MCBalance Powder Operation................................................................................................................... 19
  4.1 MCBalance Powder Component overview ............................................................................................ 19
    4.1.1 MCBalance Powder motor ........................................................................................................... 20
  4.2 MCBalance Powder dosing system .......................................................................................................... 21
    4.2.1 Emptying/cleaning/material change ............................................................................................... 21
    4.2.2 Reassembly of the MCBalance Powder dosing system .................................................................. 22
    4.2.3 Exchange of dosing spiral type ....................................................................................................... 22
    4.2.4 Exchange of dosing tube ............................................................................................................... 22
  4.3 MCBalance Powder metering principle .................................................................................................... 23
    4.3.1 MCBalance Powder dosing system / capacities ........................................................................... 23
  4.4 MCBalance Powder mechanical installation .......................................................................................... 24
    4.4.1 MCBalance Powder electrical installation .................................................................................... 24
    4.4.2 MCBalance Powder loadcell calibration ....................................................................................... 25
    4.4.3 MCBalance Powder device configuration ...................................................................................... 26
    4.4.4 MCBalance Powder production ..................................................................................................... 28
5 Alarms............................................................................................................................................................ 33
  5.1 General ..................................................................................................................................................... 33
  5.2 Configuration .......................................................................................................................................... 33
  5.3 History .................................................................................................................................................... 33
  5.4 Warnings .................................................................................................................................................. 34
  5.5 Alarms .................................................................................................................................................. 34
6 System performance........................................................................................................................................ 35
  6.1 General ................................................................................................................................................ 35
  6.2 Reset regulation ..................................................................................................................................... 35
7 Outputs.......................................................................................................................................................... 36
8 Trouble shooting.......................................................................................................................................... 37
APPENDIX A: MC-TC Wiring Diagram........................................................................................................ 38
APPENDIX B: Mechanical dimensions.......................................................................................................... 39
APPENDIX C: Exploded view.......................................................................................................................... 40
APPENDIX D: MC-TC Technical Specifications .............................................................................................. 41
APPENDIX D: MC-TC. Declaration of Conformity .......................................................................................... 42
1 Introduction

Thank you for purchasing a Movacolor metering device. This manual is addressed to operators and qualified technicians taking care of the metering of dry additives to ensure correct use of the Movacolor dosing unit.

① IMPORTANT NOTE: THIS MANUAL MUST BE READ BEFORE INSTALLING THE DOSING UNIT. KEEP THIS MANUAL IN A PLACE ACCESSIBLE FOR ALL OPERATORS.

1.1 Symbols

① Important note

⚠️ Attention; safety regulations for the operator

1.2 Terms

Operator: A person charged to operate, adjust, maintain and clean the machine.

Qualified Technician: A specialized, suitable trained person authorized to execute the installation, non-routine maintenance, or repairs requiring special knowledge of the machine and how it operates.

Multi component: Two ore more dosing systems on one machine.

1.3 Transport

To protect the Movacolor unit against damage during transport, the unit is packed in a cardboard box filled with polyurethane foam. Delivery terms are Ex-Works Sneek, The Netherlands. Buyer is responsible for the transport. Movacolor cannot be held liable for any damage during transport.

1.4 Receipt

Check the unit thoroughly upon receipt. Pass any remarks to the local agent or Movacolor within 8 days upon receipt of goods.
2 General information

2.1 Safety

⚠️ The equipment is only designed and may only be used for the dosing of dry additives. Any use that is not in conformity with the instructions is considered improper and as such frees the manufacturer from any liability regarding damage to things and/or persons.

⚠️ Before switching on the unit for the first time, ensure that the mains power voltage applied is between 95 and 250VAC.

⚠️ Always switch off the Movacolor control cabinet and disconnect the mains power plug from electrical power before performing maintenance.

⚠️ Ensure that all parts are securely fixed to the extruder or injection molding machine.

⚠️ Dangerous voltages are present inside the control cabinet for up to 2 minutes after it has been switched off.

2.2 Certification

The Movacolor dosing unit is designed and produced in conformity with the following European regulations:
- CE standards for machinery (health, safety, environment)
- EMC (electromagnetic compatibility)
- VEM (safety electric material)
- 2006/42/EG

2.3 Operating environmental conditions

- The unit must be protected against weather conditions
- Operating temperature -20 to +70 degr. C.
- Protection class: IP-50
3 Operation

3.1 The Interface

MC-TC Touchscreen

Alarm LED is lighted: alarm / warning

Input LED is lighted: input signal is ON

Start LED blinking: motor is stand by / waiting for start signal
Start LED lighted: motor is running

External communication / Network

USB Host port

Load cell

CAN bus cable

Motor cable

Output for:
- Alarm
- Warning
- Running

Valve output for hopper loader

Optional communications

Mains power indicator: ON / OFF

Mains power switch: ON / OFF

Mains power cable
MC-BC Blind controller

- Load cell
- CAN bus cable
- Motor cable
- Mains power cable
- Valve output for hopper loader

Mains power switch: ON / OFF
Mains power indicator: ON / OFF
3.2 Start-up & Login

After switching on the mains power of the MC-TC, the screen will remain black for about 15 seconds, followed by various screens where the last is showing the software version.

After about 90 seconds the home screen appears.

The MC-TC controller has three user levels:
1. Operator
2. Tooling
3. Supervisor

The functions which are accessible per user level is shown in the table below.

The operator level is the standard level, only the important settings for production can be done. The rest of the settings / menus are invisible or locked.

For changing to another user level, press on the menu icon (left bottom corner) and the user button appears. When pressing the user button, the login menu is entered.

Press the LOGIN button and enter the password (4 numerals) and confirm. The passwords for the Tooling and Supervisor user levels can be defined by the supervisor in the “System Configuration” menu.

Forgot your supervisor password, enter the overall supervisor password 1689.
When entering a wrong password the user level will be set automatically to operator level.
3.3 System Configuration

For initial setup the MC-TC controller needs to be configured. The following settings are for the entire system and there for needs te be altered once. It is not possible to change these settings for each separate configured component. For component specific configuration (MCBalance, MCHigh Output, MCWeight) see the device specific chapters.

The global settings can be changed in the “System Configuration” menu, to enter this menu:

Language : ENG / DE / FR / ……
Production mode : INJ / EXT
Input type : Timer / Relay / Tacho
Auto start : OFF / ON
Recipe function : OFF / ON
Start login : Operator / Tooling / Supervisor
Tooling passw. : xxxx 1111
Supervisor passw. : xxxx 2222
IP address : 0.0.0.0 (For example: 192.168.1.100)
Netmask : 0.0.0.0 (For example: 255.255.255.0)
Gateway : 0.0.0.0 (For example: 192.168.1.1)
Date / Time : (dd / mm / yy) (hh / mm)
Device name : MCTC
Number of groups : 1 - 15
Number of components in group: 1 - 15
Kg/h units : ON / OFF
Imperial units : OFF / ON
I/O module: : NONE / ANALOG / PRO.BUS / PRO.NET
Device address : 1 - 231

System Configuration: Language
Standard language is English. If your language is not listed you can put a request at your local Movacolor representative for a translation.

System Configuration: Production mode
Selection of type of machine on which the Movacolor dosing system is placed. (EXT) extruder or (INJ) injection molding

System Configuration: Input type
Type of input signal. Relay, Timer or Tacho
Timer mode is the standard setting for Injection molding.

<table>
<thead>
<tr>
<th></th>
<th>EXT</th>
<th>INJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>timer</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>relay</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>tacho</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

For INJ in timer mode the start pulse should be min. 0.2 seconds.
For INJ in relay mode the start signal should be as long as the dosing time.

If INJ - Relay is selected the dosing machine will follow the machine relay time.
The controller will filter small changes out so that the regulation is not being influenced.
Big changes will be followed.
The production screen shows the real machine relay time.

Input (start) signal
The MC-TC needs an input signal from the production machine in order to operate. Three different input signals can be used to control the MC-TC.

1.) **A potential free relay contact.**
   Use the white and brown wire for the potential free contact.

2.) **A relay signal 24 Volt DC*.**
   In case of a powered relay signal connect the white wire to +24 VDC and the yellow wire to the 0 VDC.
   * Note potential contact
   Guaranteed OFF: 0-8VDC
   Guaranteed ON: 18-30VDC

3.) **A tacho signal up to 30 Volt DC.**
   This is used when the dosing system needs to be connected to an extruder that has a tacho generator that produces a voltage linear to the extruder speed. When using a tacho generator signal, make a connection between the white and brown wire. It will function as a start signal. Connect green to + VDC and yellow to the - side of the generator.

The maximum voltage that can be applied to the MC-TC is 30 VDC. The tacho voltage has to be reduced to 30 VDC if the tacho generator has a higher voltage output than 30 VDC at the maximum extruder output capacity. See the diagram below.

\[
Rx \text{(kilo-Ohm)} = (2.684 \times (\text{Max. tacho output VDC} - 5)) - 66
\]

If the extruder stops when connected to the metering unit, an isolated signal converter is needed. Contact your agent or Movacolor for more information.

**Tacho function**

The tacho function is only available in extrusion mode.

This function can be used with extrusion when it is necessary that the dosing rate is automatically adjusted to the extruder speed. In tacho mode an input voltage is linked to a dosing speed setting. If the extruder speed changes, the tacho input voltage and speed of the dosing unit will change accordingly.

A linear correlation between extruder speed (tacho input signal) and the needed dosing speed is assumed. See graph.

The tacho function can be set in the PRODUCTION screen.
Tacho can be set manually or be synchronised:

**Manual:**
Fill in the voltage the tacho produced by the tacho generator at maximum extruder speed.

**Synchronize:**
Let the extruder run and select synchronize. The tacho voltage P1 will be taken over automatically, enter the actual extruder capacity. This is linked to the set motor speed P2 (in RPM mode) or calculated motor speed (in GRAVI mode).

During production, the motor speed P2 can be changed. The new speed is linked to the previous stored voltage and the graph will change accordingly.

During production, the voltage P1 can be adjusted to the current tacho input voltage (manually or automatically) as shown above. The new voltage is linked to the previous stored speed and the graph will change accordingly.

- The maximum voltage that can be applied to the MC-TC tacho input is 30 VDC.
- The tacho signal must be a clear signal. Any failure in the voltage signal will be followed by dosing variations.

**System Configuration: Auto start**
Enable / disable auto startup after Voltage dip or mains power has been switched OFF. When enabled the unit will continue dosing automatically after a Voltage dip or mains power has been switched OFF and ON again.

**System Configuration: Recipe function**
Enable / disable recipe functionality

**System Configuration: Start login**
User level to start up with, when switching on the controller’s mains power. Operator, Tooling or Supervisor.

**System Configuration: Tooling passw.**
Password for Tooling user level, 4 numerals, default 1111

**System Configuration: Supervisor passw.**
Password for Supervisor user level, 4 numerals default 2222

**System Configuration: IP address**
IP-address for use in a network environment (TCP/IP protocol). (For example 192.168.1.100)
When the Movacolor dosing system is part of a network, the controller must have an IP-address for identification.

📍 This IP-address has to correspond with the IP-address of your computer. Ask your network administrator for a unique address.

**System Configuration: Netmask**
Netmask for use in a network environment (TCP/IP protocol). (For example 255.255.255.0)
When the Movacolor dosing system is part of a network, the controller must have a Netmask for accessing the TCP/IP network.

**System Configuration: Gateway**
Gateway address for use in a network environment (TCP/IP protocol). (For example 192.168.1.1)
When the Movacolor dosing system is part of a network, the controller must have a Gateway for accessing the TCP/IP network.

📍 This Gateway-address has to correspond with the Gateway-address of your computer. Ask your network administrator for the correct gateway setting.
**System Configuration: Date / Time**
Actual date (dd / mm / yy), Actual time (hh / mm)
1. Date and Time will be stored for minimal 1500 hrs. with controller switched OFF.

**System Configuration: Device name**
Controller name, shows up in MCLAN 2 and displayed in login screen (max 27 characters)

**System Configuration: Number of groups**
Select the number of groups units (1..15) for co-injection moulding or co-extrusion the system can be divided in groups with separate input signals/production settings.

**System Configuration: Number of components in group 1..15**
Displays the configured number of dosing/measuring components per group. Opens the group configuration menu.

**System Configuration: kg/h units**
Kilogram per hour units, enable / disable. Setpoints and actuals displayed in kg/h or g/s (gram per second)

**System Configuration: Imperial units**
Imperial units, enable / disable. Setpoints and actuals displayed in lb/h or kg/h

**System Configuration: I/O module**
Enable external communication, None, analogue, profibus, profinet (requires a special hardware extension board)
1. Modbus TCP/IP is enabled by default

**System Configuration: Device address**
If the controller is used in a Modbus or Profibus network, the unique identity can be filled in here (1-231)

**Group Configuration: Group nr: 1 (1..15)**
Displays the current group to be configured.

**Group Configuration: Name**
Group name, for example “EXTR A” (max 7 characters)

**Group Configuration: Nr of components**
Set the number of measuring/dosing devices within the current group. A maximum of 15 components can be configured in total.

**Group Configuration: Configuration**
Opens the group component configuration menu. Within this menu the type of dosing/measuring device is selected. Click the component icon to select the type of dosing equipment to be configured.
3.4 Material curves

3.4.1 Offline Material curve learn function

Each material has its own flowing characteristic. This results in a material curve which is used for accurate volumetric dosing. During system start, when there is not enough measurement info available, the dosing system uses this curve. The speed of the dosing tool is then adjusted according to the learned curve. Using a pre-calibration results in a faster system start, the system will operate faster within the set specification.

The material curve learn function can be performed offline, to avoid waste of material. To do so, slide the unit backwards and use a cup to gather the dosed powder.

Before starting the material curve learn function, be sure that:
- during calibration the dosing unit is horizontally fixed and also vibration free.
- the correct dosing tool is mounted.
- the hopper is filled with sufficient material.
- the loadcell cable is connected to the controller.
- the loadcell is calibrated.

The following parameters will be stored with a Material calibration, depending on the configuration:
- CONFIGURATION parameters:
  - Cylinder type: type of dosing cylinder or feed screw
  - Material Type: Normal or micro-granules
- PRODUCTION parameters:
  - Shotwth.: Shot weight
  - color%: Color amount (%)
  - dos.time: Dosing time (sec)
  - Ext. cap.: Extruder capacity (kg/h)
- CALIBRATION parameters:
  - Material name: Name of calibrated material

How to start the material curve learn function:

1. Press

2. Press the material "name" button and enter a material description.
3. Enter the production settings, recommended is to use the same settings as will be used in the final production.

For injection molding:
- the shotweight
- the dosing time
- dosing percentage
For extrusion:
- extruder capacity (production rate)
- dosing percentage

1. The ideal situation is to choose the same settings as used during actual production, however when the output is too high and learn function cannot be completed within one hopper fillen, choose a lower capacity.

4. Press the start button
5. A question will appear that you need to check if the motor is connected, the hopper is filled and if you want to prime the dosing tool, confirm the question.
6. The learning will take minimal about 3 minutes but can take more time depending on the used material and production parameters.

   It is possible to stop during the learning (for example to refill the hopper). When “Stop&Save” is selected the learning will pause. There are 3 options:

   - Stop learning and save the collected data.
   - Stop learning without saving.
   - Continue with learning.

7. The unit will execute the calibration procedure, the procedure will stop when the dosing is within the calibration deviation range (default 5%), the material curve will be stored. This material is now automatically selected for the current unit.

During the calibration the unit is regulating to his Setpoint. When this point is reached the calibration will be saved automatically. On the basis of this point a complete curve is made on bases of default pre-programmed curves.

### Material Calibration

When more material curve calibrations have been made, a curve can be loaded to the device. To do this:

1. In a multi component setup, select from the home screen the unit to load the material
2. Press the material selection button

### 3.4.2 Selecting a learned material curve

When more material curve calibrations have been made, a curve can be loaded to the device. To do this:

1. In a multi component setup, select from the home screen the unit to load the material
2. Press the material selection button
3. Select with the up and down buttons the required material name and confirm, you will be prompted when the wrong dosing tool is configured.

When the list of materials is big, it can be time consuming to find the material. It is possible to search in the list of materials using the search button. You can enter part of the material name you need to search for. Example, you need to load the material named “pp-color-145”, when you enter “pp” in the search field, all material names containing “pp” will be displayed in the list.

Deleting materials/curves can be done by selecting it from the material list followed by the delete selected button.

Renaming materials can be done by selecting it from the material list followed by the rename selected button.

To go back to the production menu without selecting a material from the list press the cancel button.

The standard Mova curve can be selected by pressing the “default material” button located below the material list.

3.4.3 Save data function

This function allows to store the actual data during production. A material description needs to be entered to save this data. A full material curve on basis of the stored point will be saved in the memory of the controller under the entered name.

Starting a new production run with a previous stored material calibration/speed is now possible,

Press on the curve description (1) when the unit is activated. The “SAVE MATERIAL” screen appears.

Enter a material description (max.10 positions) and press to store the material curve.
3.5 Recipe function

With the MC-TC it is possible to store the current production settings into a recipe. All production settings of all units will be stored within this recipe. An easy recall of this production settings is possible by loading the previous stored recipe.

1. The Recipe function must be enabled in the System Configuration screen.

3.5.1 Creating a new recipe

From the home screen, press the recipe button.

The Recipe screen will appear, select the “New Recipe” button:

The following screen will appear:

1. **Recipe name**: Enter desired recipe name.
2. **Injectionmolding**: Shot weight
   - **Extrusion**: Extruder throughput kg/h
3. **Injectionmolding** (Timer only): Shot time
4. **Component name**
5. **Prelearned material curve**: Select the pre-learned material curve per component
   - In case of no prelearned materials it is recommended to select the movacolor default curve
6. **Dosing percentage**: Enter dosing percentage per component
7. **Select button**: Loads the current recipe as active production setting
8. **Save recipe**: Saves current recipe settings
9. **Cancel**: leave this screen
3.5.2 Load / edit a recipe

From the HOME screen, press the recipe button:

Select the desired recipe by using the up and down buttons:

When the list of recipes is big, it can be time consuming to find the recipe. It is possible to search in the list of recipes using the search button. You can enter part of the recipe name you need to search for. Example, you need to load the recipe named “Recipe RED 1”, when you enter “RED” in the search field, all recipes names containing “RED” will be displayed in the list.

Confirm the selection with the accept button:

The next screen will show the settings of the selected recipe. Here you can check the settings of the recipe.

By pressing the accept button the recipe will be loaded.

-OR-

Edit the production parameters within the recipe to your needs and save the recipe.

To save the recipe, just press the save recipe button, you will be prompted to overwrite the recipe:

: Overwrite current selected recipe (changes in the recipe will be saved)

: Do not overwrite, you will be prompted to enter a new recipe name (create a copy/new recipe)

The new recipe is not immediately selected, go back to the main recipe screen to select the new recipe.

A recipe can also be edited from the HOME screen. When a recipe is loaded and a production setting is changed, the recipe button icon will change:

By pressing this button, you will be prompted to overwrite the recipe, or to store the current settings under a new recipe name.

3.5.3 Delete a recipe

From the HOME screen, press the recipe button:

Select the desired recipe by using the up and down buttons:

To delete the selected recipe.

To delete all recipes in the list at once.
3.6 USB menu

The MC-TC is equipped with a USB host port. This port can be used for production and configuration settings backup/restore and MC-TC software updates.

1. For software updates, contact your local Movacolor representative.
2. Your USB memory stick should be formatted FAT32.

3.6.1 Backup / Restore

Insert your USB memory device into the USB host port (See chapter 3.1)

Press:

The USB menu will be shown, containing 3 options

1. Copy files from USB to Controller  Restore files from USB stick to Controller
2. Copy files from Controller to USB  Backup files from Controller to USB stick
3. Remove USB stick  Safely remove USB stick

When choosing option 1 (restore) or option 2 (backup), a new screen will be shown with the next options:

1. Materials and Recipes  Transfer of material, recipe and configuration files
2. Configuration and Settings  Transfer of production log, event log and configuration files
3. All  Transfer of all files (materials, recipes, configuration, log)

After copy of the files to the USB stick, you can store the backup files to a network drive or backup folder. The USB stick contains a folder named MC_TC, this folder contains the backed up files.

The restore function can also be used to copy configuration, system and recipes to other MC-TC devices with the same hardware configuration, it is not recommended to copy material files between MC-TC controllers.

3.6.2 Remove USB stick

When you are ready with the required USB operations, it is mandatory to press the Remove USB stick button prior to unplugging the USB memory stick. You will be prompted when the synchronisation is finished and it is safe to remove the USB memory stick. This synchronizes the files of your USB stick for safe removal.

Risk of damaging your USB stick when not safely removed.

3.7 Screenlock

To avoid any unwanted modification in the production settings by an unauthorized person, the touchscreen can be locked. With this function enabled, you are still able to see actual production data, but you cannot change production settings. To enable and disable the lock function, you need to be logged on with at least TOOLING level.

To unlock, follow the same sequence.
3.8 Consumption counters

The MCTC is equipped consumption counters, counting the consumed material of each unit. To reset the consumption counters you need at least TOOLING level login.

In multicomponent setups it can be necessary to use the button to select the unit to be shown.

The consumption counters can have an error due to inaccurate measurement during hopper filling.

3.8.1 Batch consumption counter

This counter can be used for batch counting of material consumption. It counts the amount of consumed material for the selected unit. The batch counter can be reset separately for each configured unit. To reset the counter, just press the RESET button next to the counter. The batch consumption counter can be used for example:

- Order consumption registration.
- Daily consumption registration.
- Week consumption registration.

3.8.2 Total consumption counter

This second counter can be used for total material consumption. It counts the amount of consumed material for the selected unit. By resetting the Total consumption counter, the batch counter is also reset. To reset the Total counter, just press the RESET button next to the counter. The Total consumption counter can be used for example:

- Daily consumption counter, when the batch counter is used for shifts/batches.
- Week consumption counter.
- Total counter, counting all consumed material by the unit.

For MCWeight + MCBalance(s), the consumption counters display only the material fed through the MCWeight, not the complete total consumed by the extruder. For a grand total you need to summarize the totals of all units.
4 MCBalance Powder Operation

4.1 MCBalance Powder Component overview

1. Stepper motor with gearbox
2. Dosing twin spiral with seal
3. Agitator
4. Dosing tube with detachable thorn
5. Neckpiece
6. MCBalance Load frame
7. Slide frame
8. Slide locking bolt (locking the slide-out position)
9. Open insert
10. Safety grid
The black part is the weighing frame. **Do not touch this weighing frame (and dosing unit) while dosing.** It will have influence on the dosing. Do not touch the safety bolts under the weighing platform. These are for overload protection. There must be some space between the safety bolts and the frame.

### 4.1.1 MCBalance Powder motor

**The MCBalance Powder dosing unit is standard equipped with the stepper motor 4A (HT)**

During configuration of the software, do not select the LT motor. This will cause influence the accuracy or the dosing or motor blocking.
4.2 MCBalance Powder dosing system

SP15: quadric shaped, co-rotating, non intermeshing spirals, non rotating thorn

SP19: quadric shaped, co-rotating, intermeshing spirals, non rotating thorn

4.2.1 Emptying/cleaning/material change

The motor can be disconnected with quick release clamps. When the motor is disconnected, the dosing spirals can be taken out without tools. To remove the agitator, the motor needs to be disconnected, and the safety grid needs to be removed (4 screws to be removed)
4.2.2 Reassembly of the MCBalance Powder dosing system
Before assembly the spiral quick connection to the motor needs to be aligned. First position the spirals to the motor assembly before inserting in the hopper and dosing tube.

4.2.3 Exchange of dosing spiral type

4.2.4 Exchange of dosing tube
4.3 MCBalance Powder metering principle

The Powder dosing augers of Movacolor combined with a very precise adjustable stepper motor ensures that the additive output is accurate and regular. The neckpiece (a mixing chamber) is designed to blend the main material and the additive homogeneously. Movacolor has on stock a large range of machine neckpieces that usually make a perfect fit to the injection molding machine or extruder. The most common mounting of the neckpiece is between the production machine and the hopper. In the figure below a cut through of the NST40 neckpiece can be seen.

**Standard neckpiece**

During operation, the virgin material runs from the machine hopper through the neckpiece into the machine. Inside the neckpiece the Virgin material flow is divided into two streams by the cover plate. In the space below the cover plate, the rotating cylinder is dosing additive.

Additive is added directly into the center of the virgin material flow, just before it enters the production machine. This is a great advantage over metering devices that use batch pre-mixing because pre-mixing can actually cause material separation. Separation of materials results in an irregular additive flow into the production machine.

4.3.1 MCBalance Powder dosing system / capacities

Depending on the application a different dosing system might be needed. Use the following table to determine roughly the best system for the application. For more detailed information please contact your agent or Movacolor.

<table>
<thead>
<tr>
<th>Dosing system</th>
<th>Accuracy</th>
<th>Dosing capacity Gram/sec.</th>
<th>Dosing capacity Kg/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP15</td>
<td>++</td>
<td>0,023 – 4,6</td>
<td>0,1 – 16,4</td>
</tr>
<tr>
<td>SP15 without thorn</td>
<td>+</td>
<td>0,027 – 7,2</td>
<td>0,1 – 25,9</td>
</tr>
<tr>
<td>SP19</td>
<td>++</td>
<td>0,077 – 12,5</td>
<td>0,3 – 45,1</td>
</tr>
<tr>
<td>SP19 without thorn</td>
<td>+</td>
<td>0,113 – 21,3</td>
<td>0,4 – 76,6</td>
</tr>
</tbody>
</table>

Note * measured with free flowing powder 0,60 kg/dm3.
4.4 MCBalance Powder mechanical installation

Most mechanical parts are pre-assembled, making installation quick and simple.

1. When installing a foreign main material hopper on top of a neckpiece, the top flange of the neckpiece needs to be adapted. The lid of the neckpiece can be dismounted for easy machining.

2. -Install the neckpiece directly on top of the entrance of the production machine.
   -Install the neckpiece in a 90-degree angle to the machine barrel. This will optimize the dosing accuracy in relation to vibrations of the production machine.
   -Make sure that the complete unit is mounted horizontally levelled and fixed securely.
   -Assure proper grounding to control cabinet, neckpiece and dosing unit

3. Connect the hopper assembly to the neckpiece by turning the curled knob clockwise. Make sure that the curled knob is tightened firmly.

4. Mount the controller vibration free and conform specified temperatures.

4.4.1 MCBalance Powder electrical installation

The MC-TC or MC-BC controller delivered together with the MCBalance is standard equipped with 3 connections:
- Mains power cable
  · Before switching on the unit for the first time, ensure the mains power voltage being applied is between 80 and 250 Vac 50/60Hz.
- Input cable
- Motor cable

- In case of a multi component system, the controller can be equipped with an additional CANbus cable to interconnect between the MC-TC and other MC-BC’s

- Be aware that the cables will not be influenced by external circumstances as electromagnetic fields!
- Mount the controller on a place which is vibrations free and not hot!

The MCBalance is standard equipped with 2 connections:
- Loadcell cable
- Motor cable

Connect the loadcell connector to the MC-TC or MC-BC and tighten the locking screws gently. The motor connectors are equipped with a positioning notch and can be connected in one way only. Fixate the connector with the locking mechanism to prevent loosening of the connector due to vibrations.

To connect the input cable, please see Appendix A

Optional are:
- Alarm flash light, complete with cable
- Compressed air solenoid valve complete with cable (for automatic hopper loader)
4.4.2 MCBalance Powder loadcell calibration

When using a MCBalance Powder for the first time perform an initial load cell calibration as follows:
- The unit must be mounted horizontally (water levelled)
- Avoid vibrations during the load cell calibration. This will influence the calibration.
- Do not touch the unit during load cell calibration.
- When using a slide the whole unit has to be slid in against the neckpiece and fixed.

- Be sure that the Balance load cell is connected to the controller
- Enter the “Device configuration” menu and press the loadcell button
- Select calibrate
- Confirm to start calibrating the load cell of the MCBalance (500gr. calibration weight required)
- Follow the instructions on the screen and place the weight when instructed
- After approx. 1 minute the load cell calibration is ready, press confirm to go back to the home menu.

To check if the load cell calibration was OK, the weight check menu will be shown. Check the current object weight (for example the 500gr. calibration weight)

- Recommended is to perform a weight check a regular basis. To do to the WEIGHT CHECK enter the “Device configuration” menu and press the loadcell button followed by the weight check button
- Place 500 gr. calibration weight on the Hopper and check the displayed weight

If the actual weight is not corresponding with the placed weight, perform a new load cell calibration.

⚠️ In multicomponent setups it can be necessary to use the button to select the unit to be calibrated.
4.4.3 MCBalance Powder device configuration

When the MCBalance Powder is used for the first time, it needs to be configured. The unit is delivered pre-configured, but some settings need to be altered to the process needs.

In multicomponent setups it can be necessary to use the button to select the unit to be configured.

**MCBalance Powder settings:**

1. Motor type: LT / HT
2. Loader type: LOADER OFF / ME / MV / EX
3. Dosing tool: A8 / A20 / A30
4. Hopper levels: See “Hopper level settings”
5. Material type: NG / MG

- Do not select HT motor if LT motor is connected.
- Highlighted is default setting.

**Hopper level settings:**

To adjust the hopper levels, determine the Max fill level by manual filling the hopper to the maximum hopper level. Recommended settings for the other 3 levels is 75%, 25% and 10% respectively.

To manual fill the hopper, the manual fill button can be used. The EX knife gate valve will be open or the ME/MV system will be activated as long as the button is pressed.

For more detailed information about hopper loading, see chapter 4.1.10

**Advanced loader settings:**

When the system is unable to load material the decision can be made to stop the filling cycle after a certain time period and generate an Alarm.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill time</td>
<td>Time that MV will vacuum the material per cycle</td>
<td>20 seconds</td>
</tr>
<tr>
<td>Empty time</td>
<td>Time that MV needs for releasing material into the hopper</td>
<td>5 seconds</td>
</tr>
<tr>
<td>Alarm time</td>
<td>Maximum filltime period</td>
<td>180s</td>
</tr>
<tr>
<td>Fill alarm mode</td>
<td>Continue filling or stop filling</td>
<td>ON = continue fill, OFF = stop fill</td>
</tr>
</tbody>
</table>
### Control mode:
The MCBalance is able to run in Gravimetric mode or in RPM mode. In gravimetric mode, the unit will control its motor speed to achieve an accurate/stable output in gr/sec. In RPM mode, the user can set the motor speed in the production settings, the motor speed will not automatically be adjusted to achieve an accurate/stable output.

In both Gravimetric and RPM mode the automatic filling system can be used.

### Tolerance settings:

**Deviation alarm:**
Setting for the “Maximum deviation exceeded” message.

The MCBalance automatically adjusts his motor speed to the desired setpoint. The controller is able to detect and alarm when the setpoint is not reached within a set percentage. If after the normal performed speed adjustments the setpoint is consistently not reached, the controller will give an alarm signal and message in the display.

If the setpoint it not reached within the set percentage this can be caused by:
- Partial or complete blockage by sticky or hard flowing material.
- Inaccurate dosing because material is not uniform in size.
- Disturbance of the weight signal, for example by mechanical blocking of the MCBalance loadframe.

**Deviation alarm:** xx% (1-99%)

![Deviation Graph](image)

**Example:**
The Deviation alarm setting in the configuration menu is default set to 25%

- The set point (color set) is set to: 1,060 gr/sec
- the MAXIMUM limit value will be: 1,250 gr/sec
- the MINIMUM limit value will be: 0.750 gr/sec

When the maximum deviation message (Error 08) appears in the display of the controller it shows the measured deviation in percentage of the setpoint.

**Calibration deviation**
The maximum allowed deviation from the Calibration setpoint can be set with this Parameter. (For more information see chapter 3.4)
4.4.4 MCBalance Powder production

The rotation direction of the dosing at the front view must be to the right

When all configuration settings have been entered production can start. For Injection molding and extrusion the operating differs. Both processes will therefore be explained separately. The production menu can be accessed by pressing the Home button.

In multicomponent setups it can be necessary to use the button to select the unit to be used.

INJECTION MOLDING

Injection molding / gravimetric mode

Production settings:

The following parameters can be seen in the production screen, depending on operation or settings:

The production data can be entered by touching the corresponding field.

1. Ref.Curve/material
   Movacolor pre-programmed curve (dosing tool/granule type), or USER defined curve (material name) is displayed. (not available when recipe function is activated)
2. Color amount (%)
3. Shot weight (gr.)
4. Dosing set time (sec.) Dosing set time only visible in Timer mode, otherwise relay time will be displayed
5. Prime. Filling the dosing cylinder before start.
   The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm to start priming.
6. Production (Motor On/Off)
   Press to start dosing. The motor on/off switch will turn from green to red when dosing is started. The start LED blinks when the unit is waiting for an input signal. If the unit is dosing the Start LED lights continuously.
   For stopping production press again. The motor on/off switch will turn to green again.

Please note that it is possible that the first dosing(s) are not sufficient, because of the cylinder filling with material. It takes some time to stabilize.
**Injection molding / gravimetric mode**

**Actual production data:**

Using the scroll button 🔄, you can switch between production settings and production data.

1. **Set and actual output.**
   - Set. : Calculated output (gr/sec)
   - Act. : Actual color output (gr/sec)
   - Actual color output is only visible after the first automatic RPM adjustment.

2. **Speed:** Actual motor speed (RPM)

3. **Hopperweight ;** Material weight in the hopper

4. **Time;** set dosing time (sec), when working TIMER input mode.
   - The average dosing time (sec), when working in RELAY input mode.

5. **Act. Time;** count down of the actual dosing time (sec)
**Injection molding / RPM mode**

**Production settings:**

The production data can be entered by touching the corresponding field.

1. **Set motor speed (RPM)**
2. **Dosing time (sec.)**
3. **Prime.** Filling the dosing cylinder before start. The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm to start priming.
4. **Production (Motor On/Off)**
   Press to start dosing. The motor on/off switch will turn from green to red when dosing is started. The start LED blinks when the unit is waiting for an input signal. If the unit is dosing the Start LED lights continuously. For stopping production press again. The motor on/off switch will turn to green again.

⚠️ RPM mode needs always a set dosing time, relay function is not functional.

**Actual production data:**

Using the scroll button , you can switch between production settings and production data.

- **Speed;** Actual motor speed (RPM)
- **Hopperweight;** Material weight in the hopper
- **Set Time;** set dosing time (sec),
- **Act. Time;** count down of the actual dosing time (sec)

⚠️ Please note that it is possible that the first dosing(s) are not sufficient, because of the cylinder filling with material. It takes some time to stabilize.
Production settings:

The production data can be entered by touching the corresponding field.

1. **Ref.Curve/material**
   Movacolor pre-programmed curve (dosing tool/granule type), or USER defined curve (material name) is displayed. (not available when recipe function is activated)
2. **Color amount (%)**
3. **Extruder capacity (kg/h)**: In tacho mode the actual capacity is displayed. In Relay mode the extruder capacity can be entered.
4. **Tacho Voltage.** (only visible in tacho mode)
   - **Manual:** Tacho voltage with corresponding extruder capacity can be entered manually.
   - **Synchronize:** Tacho voltage can be read from extruder and actual extruder capacity can be entered.
5. **Prime.** Filling the dosing cylinder before start.
   The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm to start priming.
6. **Production (Motor On/Off)**
   Press to start dosing. The motor on/off switch will turn from green to red when dosing is started. The start LED blinks when the unit is waiting for an input signal. If the unit is dosing the Start LED lights continuously.
   For stopping production press again. The motor on/off switch will turn to green again.


① Please note that it is possible that the first dosing(s) are not sufficient, because of the cylinder filling with material. It takes some time to stabilize.
Extrusion / Gravimetric mode

Actual production data:

Using the scroll button , you can switch between production settings and production data.

1. **Set and actual output.**
   - **Set.** : Calculated output (gr/sec)
   - **Act.** : Actual color output (gr/sec)
     - actual color output is only visible after the first automatic RPM adjustment.

2. **Speed;** Actual motor speed (RPM)

3. **Hopperweight ;** Material weight in the hopper

4. **Actual extruder capacity (kg/h)**
   - Only visible in Tacho mode. In Relay mode the set extruder capacity is displayed.

5. **Actual tacho voltage.**
   - Only visible in Tacho mode.

Extrusion / RPM mode

Production settings:

In RPM mode the dosing can be done in relay mode or in tacho mode. In relay mode dosing is done at a set rpm. The RPM of the motor has to be entered manually.

In tacho mode the tacho voltage with corresponding RPM can be entered manually. Or with the synchronize function the tacho voltage can be read from extruder and corresponding RPM of the dosing unit can be entered.

Actual production data:

During production the motor RPM, hopper weight, and tacho voltage (only in tacho function) will be displayed.
5 Alarms

5.1 General
To reset an alarm / warning during production press to Stop dosing or / and confirm .
When an error occurs using the MC-TC, the display will indicate an error code and description.
Together with the displayed error an output contact will be switched.
The controller itself gives a beeping signal and the alarm LED will lighten up.

We distinguish Warning and Alarm:
Warning: Alarm / warning output is ON, but the dosing unit continues running
Alarm: Alarm / warning output is ON and the dosing unit stops running.

5.2 Configuration
Free programmable errors can be configured to an Alarm or Warning.
For setting the free programmable outputs into alarm or warning, enter the ALARMS menu. The
alarm menu can be accessed in the advanced settings menu.

In the alarm configuration menu a list of warnings/alarms is displayed

Here you can select if the error will act as an alarm or warning, by pressing the warning symbol
you can toggle between alarm and warning

5.3 History
The alarm history can be opened through the home screen by pressing (not in operator
mode). A list with the alarms that occurred will appear.

We have the following Errors:

<table>
<thead>
<tr>
<th>Code</th>
<th>Warnings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Filling system unable to load material</td>
<td>Fill system is not working correct</td>
</tr>
<tr>
<td>2</td>
<td>Low level</td>
<td>Material is below the hopper start filling weight</td>
</tr>
<tr>
<td>3</td>
<td>Empty level</td>
<td>Material is below the hopper empty weight</td>
</tr>
<tr>
<td>4</td>
<td>High-High level</td>
<td>Hopper weight has reached the EX-HH level</td>
</tr>
<tr>
<td>5</td>
<td>Minimum motor speed (&lt; 0.1 RPM)</td>
<td>Calculated motor speed is too low</td>
</tr>
<tr>
<td>6</td>
<td>Maximum RPM exceeded, change dosing tool for higher capacity</td>
<td>Calculated motor speed is too high</td>
</tr>
<tr>
<td>8</td>
<td>Maximum deviation exceeded!</td>
<td>The deviation of the material output is too high</td>
</tr>
<tr>
<td>9</td>
<td>Master /slave connection failure!</td>
<td>Connection failure between multi component controllers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Alarms</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Motor connection failure!</td>
<td>Motor not connected / Motor or connection damaged</td>
</tr>
<tr>
<td>102</td>
<td>Load cell connection failure!</td>
<td>Load cell connection is not correct</td>
</tr>
</tbody>
</table>
5.4 Warnings

All warnings are self-elimininating. It is possible to cancel a warning, but when the error remains, the warning will return after 60 seconds. This gives the operator the time to solve the problem without having the alarm on.

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Error 01** | “Filling system unable to load material"  
If this warning appears the alarm time (ME hopper loader) or alarm cycles (MV hopper loader) are exceeded.  
- Check if there is enough material.  
- Check if the material is stuck somewhere.  
- Check the operation of the hopper loader.  
- Check the hopper loader settings. |
| **Error 02** | “Low level!”  
“Level is less than xxx g”  
If this warning appears the material in the hopper is below the hopper low weight (800 gr.)  
In DEVICE CONFIGURATION this setting can be changed.  
- Check if there’s enough material in the hopper.  
- Check the hopper Low setting in DEVICE CONFIGURATION <menu>  
- Check if the hopper loader is working right. |
| **Error 03** | “Empty level!”  
“Level is less than xxx g”  
If this warning appears the material in the hopper is below the hopper empty weight (700 gr.)  
In CONFIGURATION <menu> this setting can be changed.  
- Check if there’s enough material in the hopper.  
- Check the hopper empty setting in CONFIGURATION <menu>  
- Check if the hopper loader is working right. |
| **Error 04** | “High High level”  
“Level is higher than xxx g”  
- Check if the knife gate valve is in closed position.  
- Check if the knife gate is sliding.  
- Check if the parameters EX-H level and EX-HH level are set OK. |
| **Error 05** | “Minimum motor speed (< 0,1 RPM)”  
Calculated motor speed is lower than the minimum of 0,1 RPM  
- Check if there’s enough material in the hopper.  
- Check the production settings.  
- Decrease the dosing time (if possible)  
- Take another dosing type with lower output, for example a GLX-cylinder  
- Check the rotation direction of the dosing cylinder. Front view to the right |
| **Error 06** | “Maximum RPM exceeded, change dosing tool for higher capacity”  
“Change dosing tool for higher capacity”  
Calculated motor speed is higher than the maximum of 200 RPM  
- Check the material output on 200 RPM.  
- Check the production settings.  
- Increase the dosing time (if possible)  
- Take another dosing type with higher output, for example a feed screw A20 |
| **Error 07** | “Maximum deviation exceeded”  
If this warning appears the dosing unit output (grams/sec) is not within 90% of the set percentage. This warning is based on a faster measurement than used for Error 08.  
- Check if the dosing tool is blocked  
- Check if there is enough material |
| **Error 08** | “Maximum deviation exceeded”  
If this warning appears the dosing output (grams/sec) is consistently not within set percentage. See page 18 for more information. |
| **Error 09** | “Master/Slave connection failure”  
Connection failure between multi component controllers  
- Check wiring. |

5.5 Alarms

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Error 100** | “Motor connection failure”  
Motor connection is not correct.  
- Make sure the motor is connected.  
- Check cable and connectors for damage. |
| **Error 102** | “Loadcell connection failure”  
- Load cell connection is not correct.  
- Load cell connector is not connected to the controller. |
6 System performance

6.1 General

System performance can be characterized by the time it takes the unit to reach the desired set point, the accuracy of the set point and the regularity of the material output.

The algorithm is self-adjusting to the conditions and because the conditions vary, it cannot be predicted how long it will take the unit to adjust itself and reach a set point with certain accuracy.

The following variables influence system performance:

Material properties. Easy flowing, non-sticky and non-static material that comes in the form of small granules or powder can be dosed very accurate and regular. The accuracy and regularity of material output drops with increased granule size. However this is only a problem with extreme low outputs.

Periodical cleaning of the dosing cylinder and seals is necessary for proper operation.

Extreme vibrations and shocks influence system performance noticeably. Normally the system will be able to compensate for vibrations and shocks.

The dosing algorithm needs a certain time to weigh material loss and adjust the RPM accordingly. This time depends largely on the set point and the above mentioned two variables. The system constantly adjusts itself to reach the best possible accuracy for current conditions. Over time it can reach an accuracy within ± 1%.

Under "normal" circumstances the unit will be more accurate than 10% after the first adjustment of the RPM.

Before the unit makes its first RPM adjustment it might be running already very close to the desired set point because it uses a cylinder and material reference system to determine the first RPM setting. This accuracy however cannot be guaranteed because material properties can vary substantially from material to material.

An unstable relay or tacho signal has a negative effect on the accuracy, repeatability and speed of the system because it will adjust to these parameter changes.

A long cycle time combined with low dosage per shot can result in a slow system.

6.2 Reset regulation

- Changing one parameter during production will cause the MC-TC to adjust to the changes but it will not reset the regulation totally.
- Changing more production parameters during production within 10 seconds after each other will cause the MC-TC regulation to reset. This is necessary for the system to adjust quickly to these big changes in the settings.
- Switching the power OFF and ON again will also cause the regulation to reset.
- Motor OFF and ON again will only cause the regulation to pause. The start-up RPM will be the same as the last RPM before the stop.
- Changing one parameter with motor OFF causes total reset of the regulation.
- With auto start = ON (CONFIGURATION <menu>) the motor follows the last status (motor Standby or motor Stop status) and causes total reset of the regulation.
7 Outputs

For the location of the output connections, see appendix A

**Alarm / Warning Output**
Connection 27 and 28.

*Warning:* this output is on (24V), the system continues running

*Alarm:* this output is on (24V), the system stops running

Free programmable errors can be programmed to an **Alarm** or **Warning**. See Chapter 6 for configuring alarms and warnings.

**Valve Output**
Connection 29 and 30
This output is on (24V) to start the hopperloader or open the knife gate.

**Alarm Output (OUT-1)**
Normally open contact, connection 32 and 33
Normally closed contact, connection 32 and 34

*Alarm:* this output is activated, the system stops running

**Run Output (OUT-2)**
Normally open contact, connection 35 and 36
Normally closed contact, connection 35 and 39 (mainboard software version S6H2 and lower)

The “RUN signal” can be used as a Start/Stop condition for the molding machine.
For example: Moulding machine can only start in case dosing unit is also started.
Default the Run output 2 (OUT-2) is always on in production mode (status Dosing or Standby)

Status = STANDBY or DOSING  → output 35/36 is CLOSED
Status = OFF  → output 35/36 is OPEN

Remark:
In case of alarm, the alarm output (OUT-1) is switched and the system is stopped. This also switches output OUT-2

**AUX Output (OUT-3)** (mainboard software version S8H3 and higher)
Normally open contact, connection 41 and 42
8 Trouble shooting

Problem: The dosing system does not come into specification or a Maximum deviation alarm occurred.

Possible causes:
1. Check if all cables are connected correctly.
2. Check if the transport protection is removed from the load cell safety bolt.
3. Check if the hopper assembly is fixed tightly to the weighing platform and that the neckpiece is fixed tightly to the production machine.
4. Check if the dosing cylinder is tightly fixed to the motor shaft.
5. Excessive build-up of material on the dosing cylinder may have impact on proper dosing. To avoid this, be sure that the seals and dosing cylinder are clean.
6. Check if there is no tension on the cables connected to the weighing platform.
7. Use the weight check function with the reference weight to determine the correct function of the weighing system.
8. If the weight check gives the correct result, check if the material flow into the cylinder has been blocked.
9. Another cause may be an obstruction to the weighing system. Check if there is at least ≈ 1mm space between all the pointed screws and the load cell frame or platform and that there is no material or dirt blocking the movement.
10. In case of a water cooled neckpiece, check if there is material build up around the dosing cylinder and the water cooled pipe that can obstruct the free movement of the weighing system.
11. Check if the input signal is stable.
12. If none of the above causes the problem, recalibrate the system and try the weight check again.

Problem: The dosing system does come into specification but seems to be slow.

Possible causes:
1. Extreme vibrations and shocks to the system.
2. Extreme low Setpoint. See Chapter 7: SYSTEM PERFORMANCE
3. Check in case of use of an automatic hopper loader if the hoses are connected in the right way.

Problem: The input/start-signal is connected but the unit does not recognize this start signal.

Possible causes:
1. Check if the correct wires are connected for potential free contact, potential contact or tacho. Also check if the + and – side are connected correctly.
2. Automatic fuse is activated, this can for example happen when there was a short-circuit at the input connection. To deactivate the automatic fuse the controller needs to be switched OFF for a while and ON again, but first check and repair the short-circuit.

Problem: The hopper weight is not stable.

Possible causes:
1. Check if the weighing signal is not influenced by external circumstances, for example that the loadcell cable passes near to electromagnetic fields or electro motors.
2. Extreme vibrations and shocks to the system.
3. Check if there is no obstruction to the weighing frame.
4. Check in case of use of an automatic hopper loader if the hoses are connected in the right way.
APPENDIX B: Mechanical dimensions
APPENDIX C: Exploded view
APPENDIX D: MC-TC Technical Specifications

Controls:
- Set and actual % setting for injection molding and extrusion
- Extrusion control by relay or tacho
- Injection molding control
- Automatic metering time synchronization or by manual timer
- Manual speed and time setting
- Speed: Manual setting from 0,1 to 200 RPM max. in increments of 0,1 RPM.
- Time: Manual settings from 0,1 to 999 sec in increments of 0,1 sec.
- 3 keyboard lock levels
- Integrated hopper loader controller

Monitoring/System Information/External communication
- External Communication: PC link using TCP/IP internet protocol
- ModBus TCP/IP
- Optional: Profinet DP slave
- Alarm: 2 user alarm levels

Specifications/Standards & Directives/Technical data:
- Power supply: Operating power from 95 VAC to 250 VAC, 50 and 60 Hz
  by integrated automatic voltage selector
- Power consumption: 150 Watt maximum
- Stepper motor: (1,8deg/step) max 2A or 4A(high output) at 40 Volt.
- Operating Temperature: -20 to +70 degr. C.
- Load cell and electronics: 20 bits A/D resolution with a full digital filtering

Input signal(s):
- Injection molding: Start/Stop trigger input, potential free or 24VDC*
- Extrusion: Start/Stop trigger input, potential free or 24VDC*
  Tacho input 0..30VDC

* Note potential contact
- Guaranteed OFF: 0-8VDC
- Guaranteed ON: 18-30VDC

Output(s):
- Stepper motor max. output 2A or 4A(high torque) at 40VDC
- Solid state 24VDC/0.5 A output for valve hopper loader
- Solid state 24VDC/0.5 A output for external warning
- Relay for alarm level (max. 230Vac/30Vdc, 5A)
- Relay for running contact (max. 230Vac/30Vdc, 5A)
- Maximum total output power: 12 Watt (Valve output + alarm output)

Standard Directives:
- Protection class: IP-50
- According to CE standards

Safety
- In case of overload due to short-circuit or incorrect connection, the power supply automatically shuts down.
- Opto insulated start input for connection to production machine.

MC Balance
Machine connection flange:
- Standard flange NS40-neckpiece with cleaning opening.
- Inlet/outlet ø50mm/.40mm, steel epoxy coated RAL 9002

Loadframe:
- Balance frame: Steel, epoxy coated RAL 3002
- Weighing frame: Aluminum, epoxy coated RAL 9005
- Loadcell: Nominal Load: 20 kg.
  Temp. compensated
  Temp. range: -20...+60 gr. Celcius
  Protection level: IP63 EN60529

Optional parts
- External Alarm Flash light.
- External Alarm Siren.
- Profinet DP slave module
APPENDIX D: MC-TC. Declaration of Conformity

DECLARATION OF CONFORMITY
(According to 2006/42/EC)

Manufacturer's name: MOVACOLOR BV

Address: P.O. Box 3016
8600 DA Sneek
The Netherlands

Declare under our sole responsibility that the product:

Name: Movacolor
Model: MC-TC
Year: 20…..
Serial nr.: .................

- Complies with the definition of the Machine Directive (2006/42/EC), and
  complies with the national legislation to enforcement of this directive;

- complies with the requirements of:
  Low Voltage Directive (2006/95/EC)

- complies with the following standards or other normative documents:
  NEN-EN 12100:2010 Safety of machinery, general principles for
design, risk assessment and risk reduction.

(Signature) Place: Sneek the Netherlands
Managing Director Date: .................