

## MCTC manual



# MANUAL

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## 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.

❗ This manual must be read before installing the dosing unit. Keep this manual in a place accessible for all operators.

### 1.1 Symbols

❗ Important note.



Attention; safety regulations for the operator.

### 1.2 Terms

<b>Operator:</b>	A person charged to operate, adjust, maintain and clean the machine.
<b>Qualified Technician:</b>	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.
<b>Multi component:</b>	Two or 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 for damages or missing parts. Pass any remarks to the local agent or Movacolor within 8 days upon receipt of goods.

### 1.5 Disclaimer

Movacolor does not warrant that the hardware or software will work properly in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability or fitness for a particular purpose.

Movacolor has made every effort to ensure that this user's manual is accurate; Movacolor disclaims liability for any inaccuracies or omissions that may have occurred.

Information in this user's manual is subject to change without notice and does not represent a commitment on the part of Movacolor. Movacolor assumes no responsibility for any inaccuracies that may be contained in this user's manual. Movacolor makes no commitment to update or keep the current information in this user's manual, and reserves the right to make improvements to this user's manual and/or to the products described in this user's manual, at any time without notice.

If you find information in this manual that is incorrect, misleading or incomplete, we would appreciate your comments and suggestions.

## 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.



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



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



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



Always disconnect the main compressed air connection before performing maintenance.

### 2.2 Certification

The Movacolor dosing unit is designed and produced in conformity with the following European regulations:

1. CE standards for machinery (health, safety, environment).
2. EMC (electromagnetic compatibility).
3. 2006/42/EG.
4. RoHS.

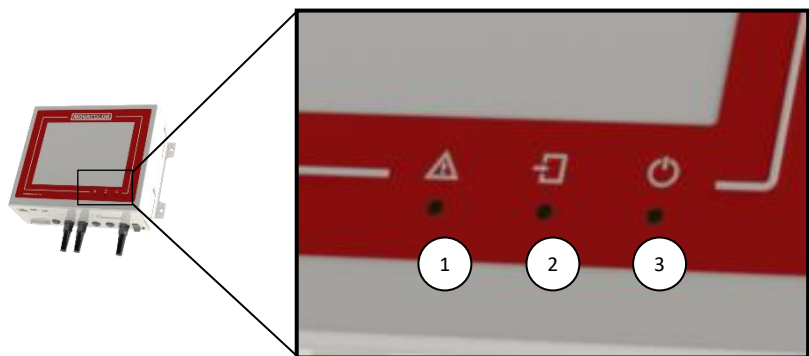
### 2.3 Operating environmental conditions

1. The unit must be protected against weather conditions.
2. Operating temperature -20 to +70 degrees Celsius.
3. Protection class: IP-50.

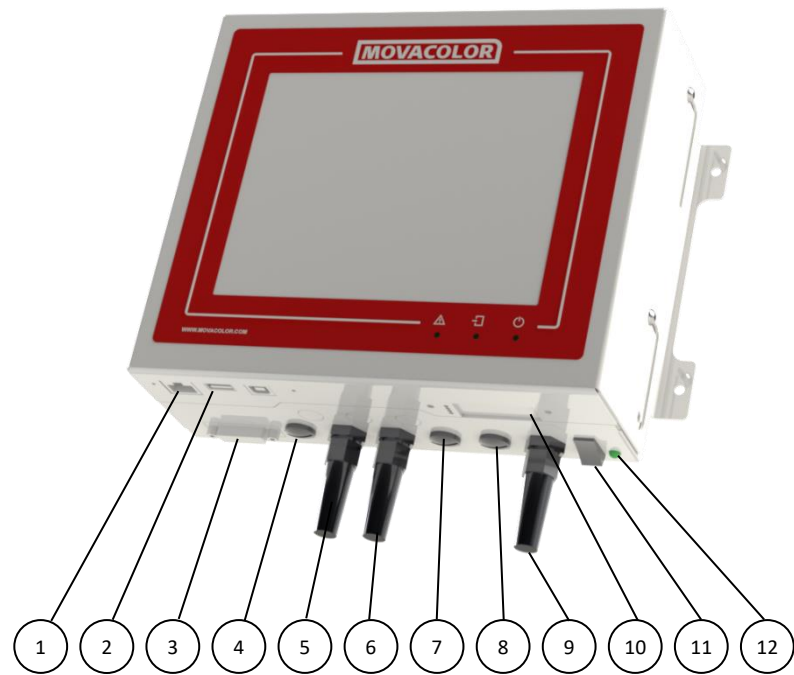
### 3 General operation

#### 3.1 The Interface

##### 3.1.1 MCTC Touchscreen



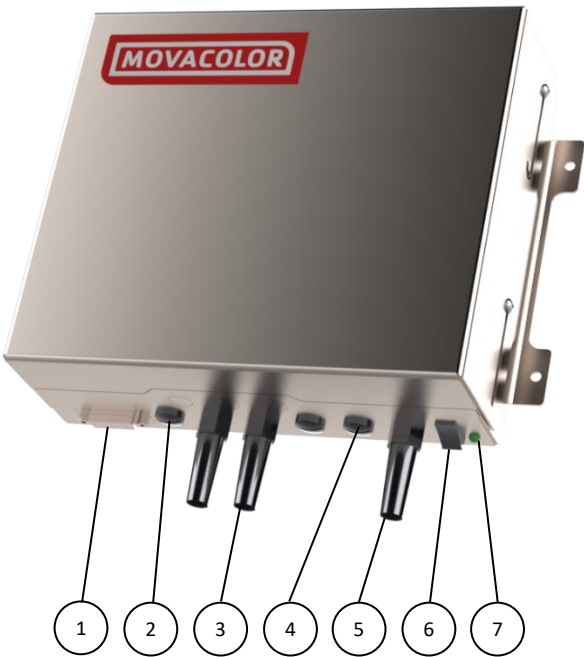
1.	Alarm LED
2.	Input signal LED
3.	Start LED (blinking = standby / waiting for start input, steady = motor running)



1.	External communication / network
2.	USB Port
3.	Load cell
4.	CAN bus cable
5.	Start input cable
6.	Motor cable
7.	Output for: Alarm, Warning, Running
8.	Valve output for hopper loader
9.	Mains power cable
10.	Optional communications
11.	Mains power switch
12.	Main power indicator

**3.1.2 MC-BC Blind controller**

The image below shows the MC-BC in a standard configuration. In multicomponent or remote setups, refer to chapter Multicomponent.



1.	Load cell
2.	CAN bus cable
3.	Motor cable
4.	Valve output for hopper loader
5.	Mains power cable
6.	Mains power switch
7.	Mains power indicator

## 3.2 Start-up & Login

After switching on the mains power of the MCTC, the screen will remain black for about 15 seconds, followed by various loading screens. After about 90 seconds the home screen appears. When the unit is used for the first time, a Configuration Wizard appears.

### 3.2.1 Configuration wizard

When the machine is powered up for the first time a configuration wizard will pop up. In this wizard, the date/time can be set and a weight tare can be done for each unit. For the weight tare, it is necessary to have the unit(s) installed as they will be during production, but not yet filled with material.

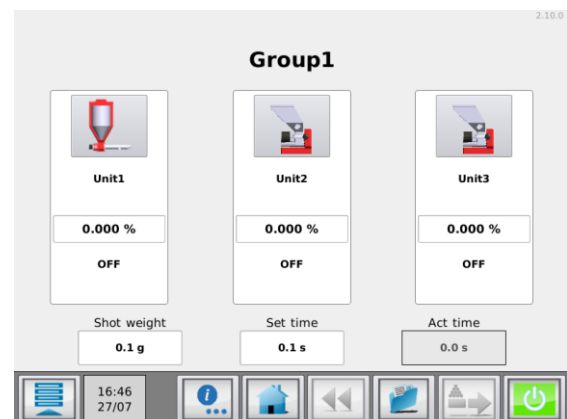
① Weight tare does not improve the dosing accuracy. If the dosing accuracy is a problem, please perform a loadcell calibration.



### 3.2.2 Home screen



Single component



Multi component



### 3.2.3 Help function

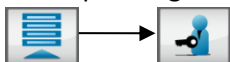


On most screens and popups a button is available. By pressing this button a new window will open with context sensitive information.

### 3.2.4 User levels

The MCTC controller has three user levels, each level has other rights to access or change functions and/or options. The three user levels are: Operator, Tooling and Supervisor

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.

The accessible menus and settings per user level are shown in the table below. For some settings, the rights can be configured in the Login rights configuration menu.

For "Operator" and "Tooling" level, some functionality is limited. These limitations can be found in the corresponding chapter.

Menu access	User Level		
	Operator	Tooling	Supervisor
Login	✓	✓	✓
Component configuration	✗	✓	✓
Active alarms	✓	✓	✓
Consumption	✓	✓	✓
USB options	✓	✓	✓
<b>Advanced settings</b>			
System configuration	✗	✗	✓
Materials	✗	✓	✓
<b>Configurable</b>			
Select/Load recipes			
Production parameters			
Open tools form			
Disable filling systems			
Change dosing tool by recipe			
System start/stop			
Change/reset consumption			

Forgot your supervisor password? Contact Movacolor service to retrieve an overall supervisor password. When entering a wrong password the user level will be set automatically to operator level.

#### Screen time out:

After 180 seconds (default setting) of inactivity the system will automatically logout to Start login level and the home-screen will be shown. The Time out time and Start login level can be set in the configuration menu.

### 3.3 System Configuration

For initial setup, or a big change in the setup, the MCTC controller needs to be configured. This can be done manually by the changing the settings of the system, or by using the configuration wizard. Both options can be found in the “System Configuration” menu (only accessible for Supervisor), to enter this menu press:



To start the configuration wizard press , and follow the steps of the wizard.

The following settings are for the entire system and there for need to be altered once. It is not possible to change these settings for each separate configured component. For component specific configuration (MCBalance, MCHigh Output, MCWeight, MCLiquid, MCNexus, MCNumera, MCPowder, MCHybrid) see the device specific chapters. For multicomponent setups ( 2 or more components) refer to chapter Multi component.

<b>Language</b>	: ENG - DE - FR - .....
<b>Production mode</b>	: INJ – EXT - BATCH
<b>Input type</b>	: Timer - Relay - Tacho
<b>Auto start</b>	: OFF - ON
<b>Startup login</b>	: Operator - Tooling – Supervisor
<b>Login Rights</b>	: Login rights configuration menu
<b>Tooling passw.</b>	: xxxx 1111
<b>Supervisor passw.</b>	: xxxx 2222
<b>IP address</b>	: 0.0.0.0 (For example: 192.168.1.100)
<b>Netmask</b>	: 0.0.0.0 (For example: 255.255.255.0)
<b>Gateway</b>	: 0.0.0.0 (For example: 192.168.1.1)
<b>Nameserver</b>	: 0.0.0.0 (For example: 8.8.8.8)
<b>MCSmart IP Address</b>	: 0.0.0.0 (For example: 192.168.1.10)
<b>Screen Time Out</b>	: OFF - ON
<b>Date / Time</b>	: (dd / mm / yy) (hh / mm)
<b>Device name</b>	: MCTC
<b>Number of groups</b>	: 1-15
<b>Group configuration</b>	: Group configuration menu
<b>Recipe enabled</b>	: ON – OFF
<b>Purge enabled</b>	: OFF – ON
<b>Setpoint units</b>	: % - Parts
<b>Display units</b>	: % - Parts – g/s – kg/h
<b>Imperial units</b>	: OFF - ON
<b>I/O module:</b>	: NONE - ANALOG - PRO.BUS - PRO.NET*
<b>Modbus Device Address</b>	: 1-231
<b>Line Control</b>	: OFF – ON*

\* For extra options, please refer the corresponding manual.

#### System Configuration: Language

The 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 process in which the Movacolor dosing system is used.  
Extrusion (EXT), Injection Molding (INJ) or Batch.

## System Configuration: Input type

Type of input signal used for synchronizing the dosage: relay, timer or tacho.

	EXT		INJ		BATCH
timer			X	X	
relay	X	X	X		X
tacho	X	X			
	GRAVI	VOLU	GRAVI	VOLU	

❗ In VOLU prod. Mode. Timer is used automatically.

❗ 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 system will follow the machine relay time.

The controller will filter out small changes 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 MCTC needs an input signal from the production machine in order to operate.

Three different input signals can be used to control the MCTC. Please also have a look at chapter Electrical Connections.

❗ WARNING: make sure the input signals of different units are not connected to each other. This might cause damage to the controller.

1. A potential free relay contact.

Use the white and brown wire of the input cable for the potential free contact.

2. A potential contact (24 Volt DC\*).

In case of a powered relay signal (wet contact) connect the white wire to +24 VDC and the yellow wire to the 0 VDC.

\* Note potential contact

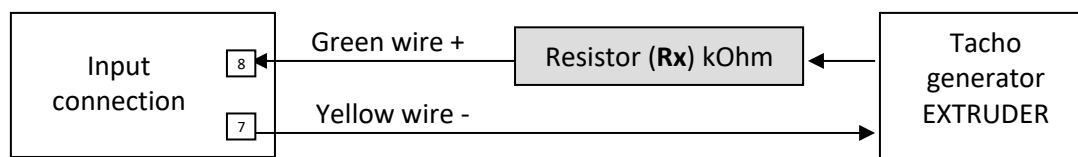
Guaranteed OFF: 0-8VDC

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 MCTC 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.



$$R_x \text{ (kilo-Ohm)} = (2,684 \times (\text{Max. tacho output VDC} - 5)) - 66$$

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

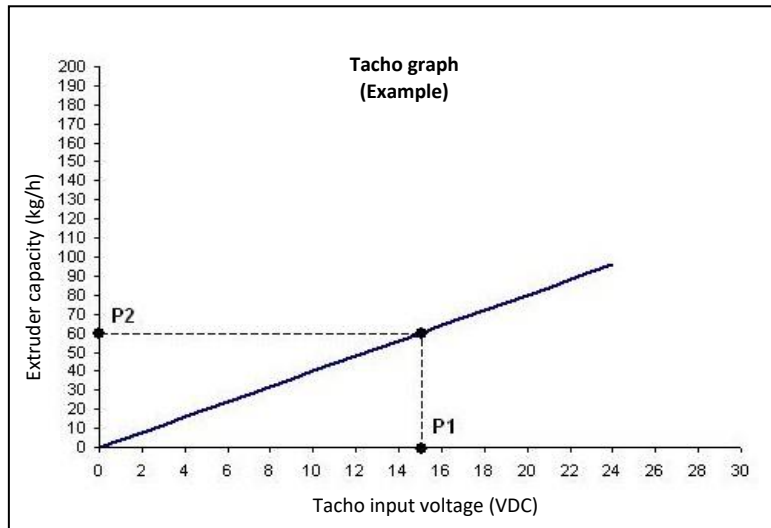
### Tacho function:

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 and can be set **manually** or be **synchronized**:

#### 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 extruder capacity and the graph will change accordingly.

- The maximum voltage that can be applied to the MCTC 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.

❗ In case of a MCWeight, input type needs to be set to relay!

#### System Configuration: Auto start

Enable / disable auto start up 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.

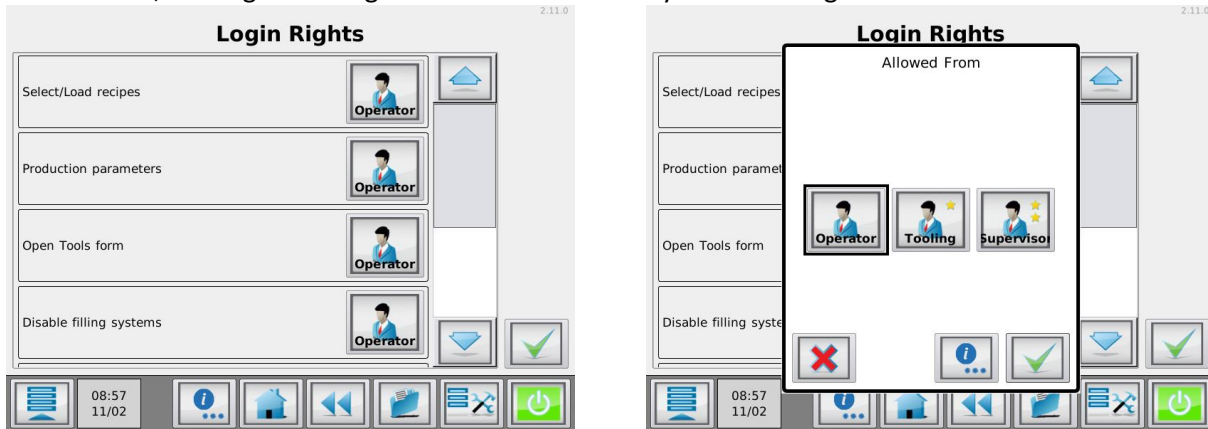
#### System Configuration: Startup login

User level to start up with, when switching on the controller's mains power.

Operator, Tooling or Supervisor. This is the level to which the controller will switch back at screen time-out.

### System Configuration: Login Rights configuration menu

In this menu, the Login level rights of some functionality can be changed.



### System Configuration: Tooling password

Password for Tooling user level, 4 numerals, default 1111.

### System Configuration: Supervisor password

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: Nameserver

The nameserver setting sets the IP address of the to use DNS Server. This is only needed when a fixed IP address has been set and the use of the customer support function is needed. When setting a fixed IP address, the nameserver will by default be set to the 8.8.8.8 public free DNS server from Google.

### System Configuration: MCSmart IP Address

IP Address of the computer where MCSmart agent software is active. MCSmart is a monitoring, logging, reporting PC software application. See MCSmart manual for more details.

### System Configuration: Screen Time out

This button can be used to enable or disable the screen time out. If set to ON, the screen time out time can be set, as well as the screen backlight level. If enabled, the user level will reset to operator and the unit will navigate to the production screen, after the time out time has elapsed.

### System Configuration: Date / Time

Actual date (dd / mm / yy), Actual time (hh / mm).

① Date and Time will be stored for approx. 5 years with controller switched OFF.

### System Configuration: Device name

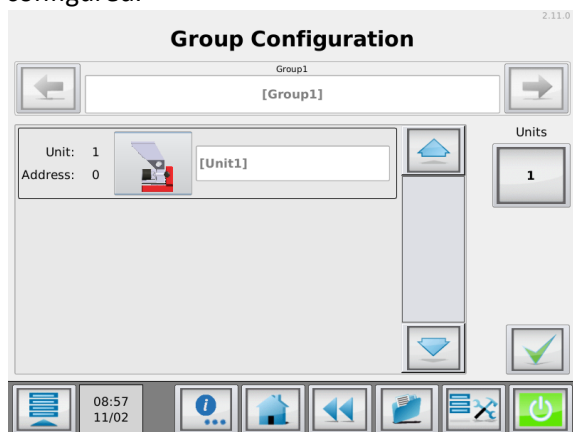
Controller name, shows up in MCSmart and displayed in login screen (max 27 characters).

### System Configuration: Number of groups

Select the number of groups (1..15) for co-injection molding or co-extrusion the system can be divided in groups with separate input signals/production settings.

### System Configuration: Group configuration

Displays the group configuration menu, within this menu the number and type of used dosing devices can be configured.



Group configuration

### Group Configuration: Group selection

Displays/select the group to be configured.

### Group Configuration: Name

Group name, for example: "EXTR A" (max 8 characters).

### Group Configuration: Units

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

### Group Configuration: Unit type

Unit type selection button, by using this button a wizard will start to configure the right dosing unit type the corresponding position.

MCNumera **	MCBalance	MCHigh Output	MCPowder	MCWeight * **	MCLiquid	MCHybrid **	MCNexus

\* MCWeight can only be selected when production mode equals EXT.

\*\* MCWeight, MCHybrid and MCNumera can only be assigned to the first position in a group.

### Group Configuration: Unit name

Unit name, for example: UNIT 1 (max 8 characters).

### System Configuration: Recipe enabled

Enable/Disable the recipe functionality.

**System Configuration: Purge enabled.**

Enable/Disable the purge functionality.

**System Configuration: Set point units**

Select the dosing set point input format, % of total or “parts of” (parts per hundred).

**System Configuration: Display units**

Select the output format of set values and actual values. For MCHybrid only % can be displayed. For MCHigh Output and MCWeight only kg/h are displayed.

① when imperial units enabled only %(parts) or lb/h can be selected.

**System Configuration: Imperial units**

Imperial units, enable / disable. Set points and actuals displayed in lb/h or kg/h.

**System Configuration: I/O module**

Enable external communication, NONE, ANALOG, PROFIBUS or PROFIBUS (requires a special hardware extension board).

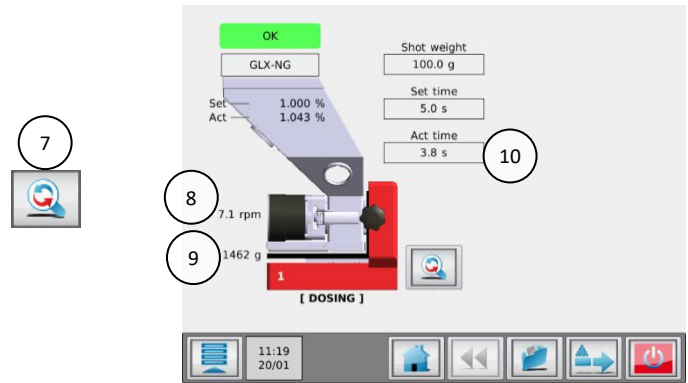
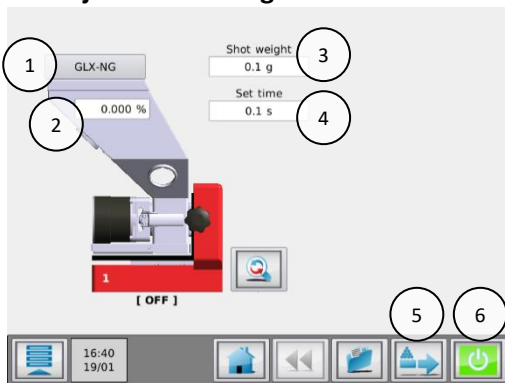
① Modbus TCP/IP is enabled by default.

**System Configuration: Modbus Device address**

If the controller is used in a Modbus network, the unique identity can be filled in here (1-231).

### 3.4 The MCTC production screen

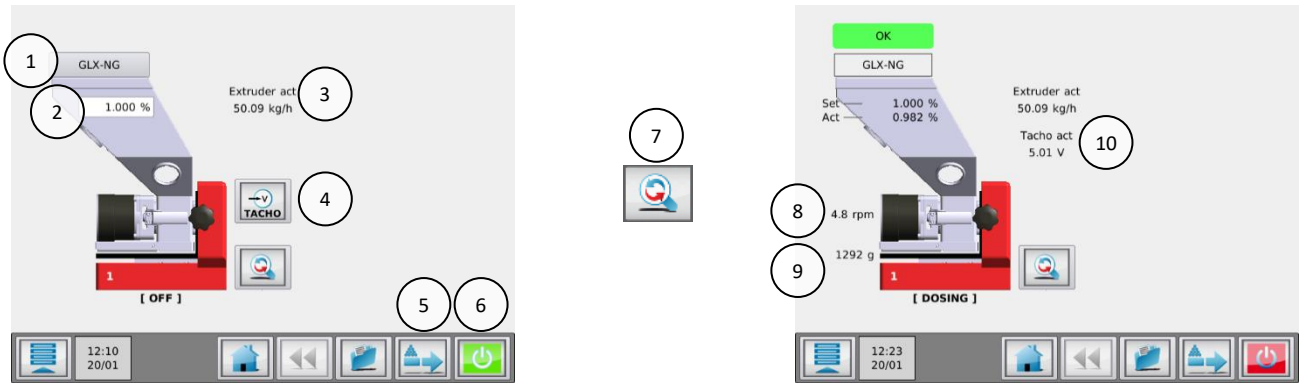
#### 3.4.1 Injection Molding mode



1.	Material selection button. Through this button the material can be stored during production.
2.	Percentage of additive to be dosed in relation to the entered shot weight.
3.	Shot weight of the injection molding machine. Used for calculating the additive to be dosed.
4.	Set dosing time (only visible in INJ – TIMER mode).
5.	Tools menu. In this menu different settings can be made to the system. Check the “MCTC_Manual_General” for more detailed information.
6.	Start/Stop button. When the button is colored green, the system is OFF (safe). In red condition the system is ON.
7.	Toggle button. With this button you can toggle between the normal and the detailed view.
8.	Actual RPM.
9.	Actual Hopper weight.
10.	Actual dosing time. Starting at the set time (4) and counting down to 0 seconds. Only visible in INJ - TIMER mode.

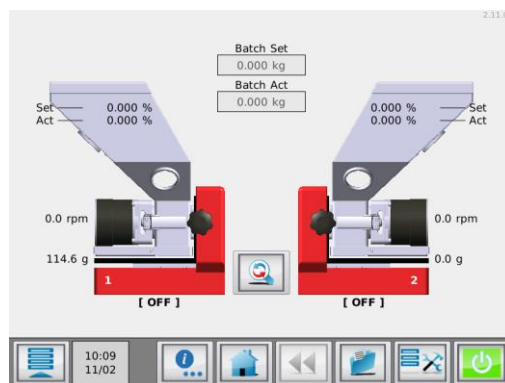
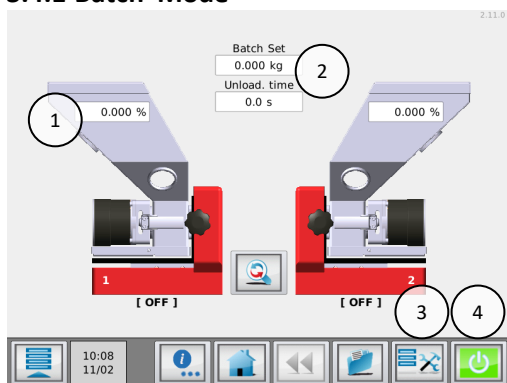


### 3.4.2 Extrusion mode



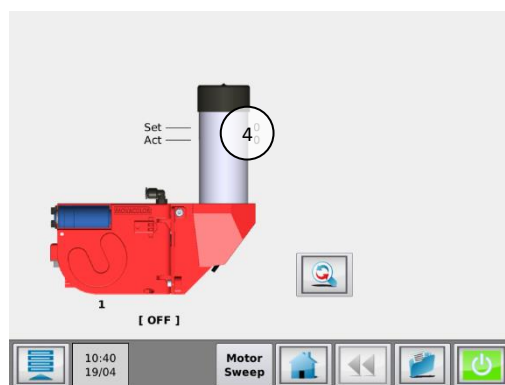
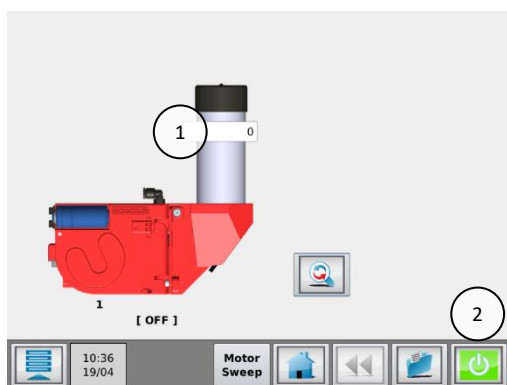
1.	Material selection button. Through this button the material can be stored during production.
2.	Percentage of additive to be dosed in relation to the set extruder capacity.
3.	Capacity of the extruder. Used for calculating the additive to be dosed. To be set by the user when the controller is in EXT – RELAY mode.
4.	Tacho ratio button. Here you can link the applied voltage to a extruder capacity (only in EXT – TACHO mode)
5.	Tools menu. In this menu different settings can be made to the system. Check the “MCTC_Manual_General” for more detailed information.
6.	Start/Stop button. When the button is colored green, the system is OFF (safe). In red condition the system is ON.
7.	Toggle button. With this button you can toggle between the normal and the detailed view.
8.	Actual RPM.
9.	Actual Hopper weight.
10.	Actual tacho voltage.

### 3.4.1 Batch Mode



1.	Percentage of additive to be dosed in relation to the set batch weight.
2.	Batch weight
3.	Tools menu. In this menu different settings can be made to the system. Check the “MCTC_Manual_General” for more detailed information.
4.	Start/Stop button. When the button is colored green, the system is OFF (safe). In red condition the system is ON.

### Batch Mode MCNexus



1.	Number of pellets to be dosed in one batch.
2.	Start/Stop button. When the button is colored green, the system is OFF (safe). In red condition the system is ON.
3.	Toggle button. With this button you can toggle between the normal and the detailed view.
4.	Actual dosing

## 3.5 System performance

### 3.5.1 General

System performance can be characterized by the time it takes the component 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.

### 3.5.2 MCBalance, MCPowder, MCHigh Output and MCLiquid

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  $\pm 1\%$  of the set point

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.

#### Reset regulation

- Changing one parameter during production will cause the MCTC 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 MCTC 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.

### 3.5.3 MCHybrid

The dosing algorithm of the MCHybrid is a self-learning algorithm. The system adapts automatically to the material flow characteristics.

Together with the default dosing characteristics related to the mounted and configured dosing valve, the system is able to learn and dose within 10% of its set point within about 3 batches.

During system start up the material flow characteristics are unknown, to avoid overloading of the weighing bin the self-learning algorithm starts at 50% of the configured batch weight. As soon the material flow characteristics have been determined, 100% of the configured batch weight will be dosed.

When the dosing accuracy cannot be met, a notification will arise mentioning the wrong dosing valve is used or configured.

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






























Changing set points during dosing of a batch will be adopted the next batch.

Periodical cleaning of the dosing valves, weigh bin and mixer is necessary for proper operation.

#### **Reset regulation**

- Reloading the material file resets the actual learned material flow characteristics;
- Switching the power OF and ON again will cause a total reset of the regulation.

### 3.6 Quick start configuration after system reset

1	Login with supervisor level	 → 
2	Open system configuration menu	 →  → 
3	Press the configuration wizard and follow the steps, <b>or</b> follow the steps below.	
4a	Select required operating mode (INJ, EXT, BATCH)	  
4b	Select required input type	   
4c	Configure the number of groups (1..15) If installed to one IMM or EXT → set to “1”	
5	Open the group configuration menu	
5a	Set the number of units for the group	
5b	Open the component types menu and select the right unit type for each position in the list	
6	Confirm all screens	
7	Open the device configuration menu	 → 
7a	Make all required settings, consult the appropriate chapter for setting the right settings (motor type, loader type, valves, etc.) 	   
7b	Perform a load cell calibration (follow the onscreen instructions)	 →  →  → 
6	Ready for production!	

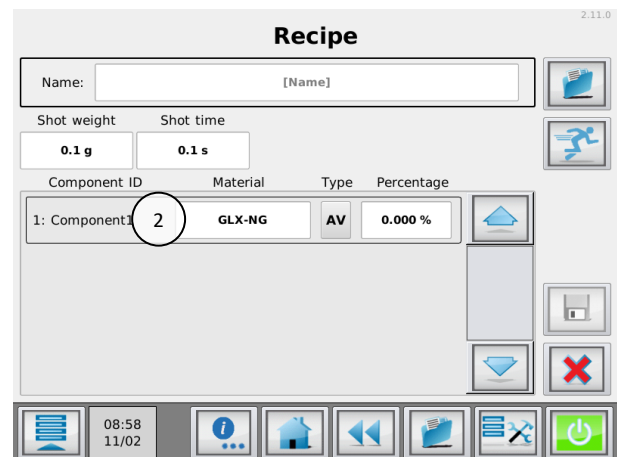
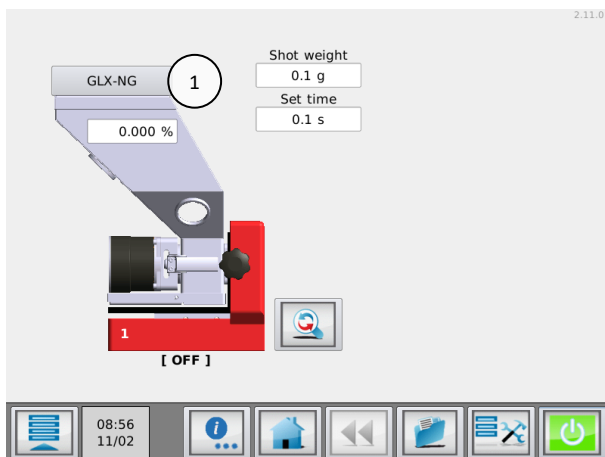
### 3.7 Material files

To optimize the dosing system, the MCTC uses material files. These files contain information for different purposes and can be generated by the user.

The information in a material file varies, depending on the type of dosing system which is used. For gravimetric units, the file contains information about the flow characteristics of the material. For optometric systems, the file contains information which can be used for consumption counting and dosing quantity. For each system, new material files can be generated by the user.

For each dosing system type, this material file generation is explained in the dedicated operation chapter of the device. The Material files menu can be accessed by pressing the material name on the production screen (1), or by pressing the material name in the recipe menu (2).

🔧 tooling or higher login required



### 3.8 Recipe function

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

In case of a multi group configuration, one recipe includes all components and all groups.

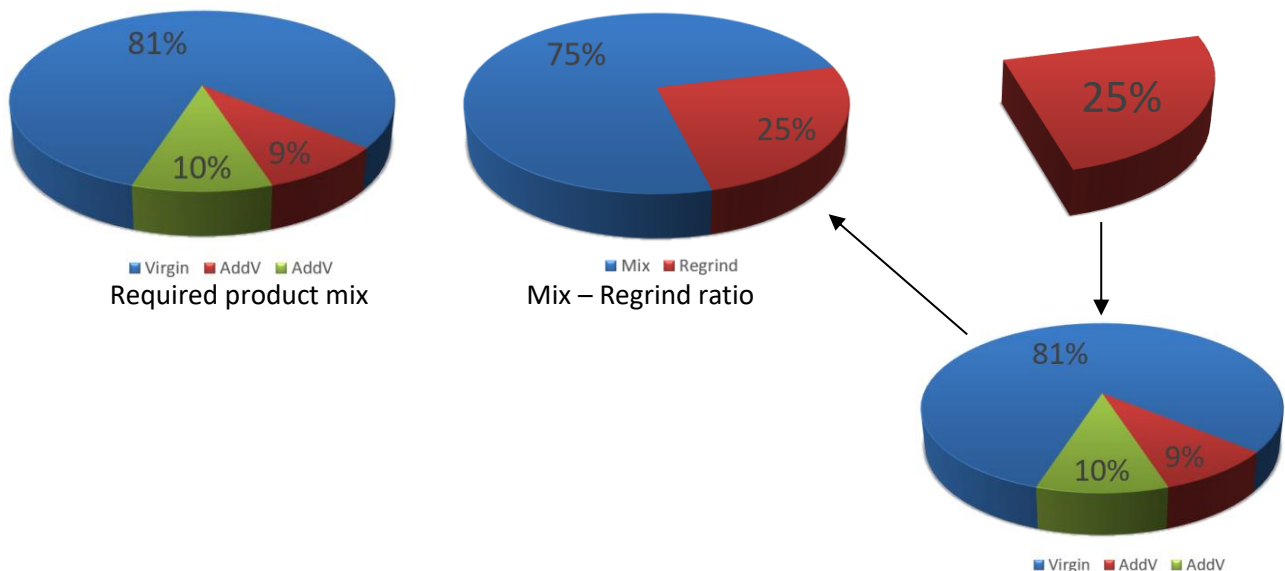
❗ The Recipe function has to be enabled in the System Configuration screen.

#### 3.8.1 Material functions

The MCTC defines 4 different material types or component functions, each function represents another behavior in how the material dosing quantity is calculated/dosed. Add is only available in combination with Regrind.

V	Virgin	“Main material” or “Natural”
AddV	Additive Virgin	Amount additive material related to the amount of Virgin material
R	Regrind	Grinded end product containing the right mix of Virgin and Additives
Add	Additive	Amount additive material related to the Shotweight, Batch or total EXT capacity

Regrind is defined as “Grinded end product containing the right mix ratio of the required materials”. Other additives will be recalculated depending on the amount of Regrind added to the product mix. In the recipe editor the entered percentage of Regrind is **not** part of the 100% product mix.



“Add” or Additive will be added to the product mix as specified in the recipe. The amount of material is based on the full shotweight, extruder throughput or batch and will **not** be changed / reduced by the amount of Regrind added.

#### 3.8.2 Calculations

The amount of dosed material is calculated with the following formulas:

$$\text{Virgin} \quad V = \text{BATCH} - \text{Regrind} - \text{Add} - \text{AddV}$$

$$\text{AddV} \quad \text{AddV} = (\text{BATCH} - R) * \text{AddV}\%$$

$$\text{Regrind} \quad R = \text{BATCH} * R\%$$

$$\text{Add} \quad \text{Add} = \text{BATCH} * \text{Add}\%$$

BATCH can also be read as shotweight or kg/h

### 3.8.3 Calculation examples

#### Example 1:

Single MCBalance unit, injection molding. Shotweight = 150gr, AddV = 5%

$$\text{AddV} = 150\text{gr} * 5\% = 7,5\text{gr}$$

$$\text{Virgin} = 150\text{gr} - 7,5\text{gr} = 142,5\text{gr}$$

#### Example 2:

Double MCBalance unit, injection molding. Shotweight = 250gr, AddV = 5%, Re grind = 25%

$$\text{Re grind} = 250\text{gr} * 25\% = 62,5\text{gr}$$

$$\text{AddV} = (250\text{gr} - 62,5\text{gr}) * 5\% = 9,4\text{gr}$$

$$\text{Virgin} = 250\text{gr} - 62,5\text{gr} - 9,4\text{gr} = 178,1\text{gr}$$

#### Example 3:

Triple MCBalance, shotweight 180gr, AddV = 2%, Add = 1%, Re grind = 20%

$$\text{Re grind} = 180\text{gr} * 20\% = 36\text{gr}$$

$$\text{Add} = 180\text{gr} * 1\% = 1,8\text{gr}$$

$$\text{AddV} = (180\text{gr} - 36\text{gr}) * 2\% = 2,9\text{gr}$$

$$\text{Virgin} = 180\text{gr} - 36\text{gr} - 1,8\text{gr} - 2,9\text{gr} = 139,3\text{gr}$$

#### Example 4:

3 component MCHybrid Batch weight = 500gr, C1 = Virgin, C2 = 20% Re grind, C3 = 5% AddV

1 MCBalance inline dosing AddV = 2%.

Shotweight 100gr.

The mix to the injection molding machine will contain:

$$\text{Re grind} = 100\text{gr} * 20\% = 20\text{gr}$$

$$\text{AddV} = (100\text{gr} - 20\text{gr}) * 5\% = 4\text{gr}$$

$$\text{AddV} = (100\text{gr} - 20\text{gr}) * 2\% = 1,6\text{gr}$$

$$\text{Virgin} = 100\text{gr} - 20\text{gr} - 4\text{gr} - 1,6\text{gr} = 74,4\text{gr}$$



### 3.8.4 Recipe editor screen

From the horizontal menu bar, press the recipe button:



The Recipe editor screen will appear:


① Image is for reference only and can be different depending on the system configuration.


The screenshot shows the 'Recipe' editor interface. At the top, there's a title bar 'Recipe' and a version number '2.9.0'. Below it, a form contains various input fields and buttons. Callouts 1 through 13 point to specific elements: 1. Name field, 2. Shot weight (0.1 g), 3. Shot time (0.1 s), 4. Component ID (Component1), 5. Material (V400-NG), 6. Type (V), 7. Dosing percentage (0.000 %), 8. Group selection ([Group1]), 9. Recipe browser button, 10. QuickStart button, 11. Dosing order button, 12. Save button, 13. Cancel button. The bottom of the screen features a horizontal menu bar with icons for home, back, forward, and power.

1.	<b>Recipe name</b>	Enter desired recipe name.
2.	<b>Injection molding</b>	Shot weight.
	<b>Extrusion</b>	Extruder throughput kg/h.
	<b>Batch</b>	Batch weight.
3.	<b>Injection molding</b>	(Timer only): Shot time.
	<b>Batch</b>	Unloading time
4.	<b>Component name</b>	Component name (can be set in configuration menu).
5.	<b>Pre-learned material curve</b>	Select the pre-learned material curve per component. ① In case of no pre-learned materials it is recommended to select the Movacolor default material file.
6.	<b>Material/component function</b>	how the material should be treated, regrind, virgin, additive.
7.	<b>Dosing percentage</b>	Enter dosing percentage per component. ① To disable a component (OFF), set the dosing percentage to 0%.
8.	<b>Group selection</b>	Select the current group to be edited. ① Only visible when more than one group configured.
9.	<b>Recipe browser</b>	Search and select existing recipes
10.	<b>QuickStart</b>	Start "quick start" wizard ① Only visible for single group configurations.
11.	<b>Dosing order</b>	Select the dosing order for available components ① Only available when a MCHybrid is configured.
12.	<b>Save button</b>	Save the recipe and load as active recipe.
13.	<b>Cancel</b>	leave this screen discarding all changes.


### 3.8.5 Creating a new recipe

A recipe can be created in three ways.

- 1) Saving the current production parameters
- 2) Entering the required production parameters in the recipe editor
- 3) Using the QuickStart button: 

- 1) During production press the recipe button from the horizontal menu bar: 

The recipe editor screen will appear. Enter a recipe name and click the save button. The current recipe has been stored to the controller internal memory and will be applied immediately.


- 2) Open the recipe editor from the horizontal menu bar: 

Open the recipe browser window  and select "new" 

Enter the required production parameter settings and choose a name for the recipe. Click the save button.



- 3) When using the QuickStart to generate a new Recipe, a wizard will come up. This wizard will generate a new recipe.


### 3.8.6 Load / edit a recipe

From the horizontal menu bar, press the recipe button: 

The Recipe editor screen will appear press the recipe list button (1).



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

 When there is a long list of stored recipes, 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 apply 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 to the following: 

By pressing this button, the recipe editor screen will be shown where you can decide to accept and save the changes to the current or a new recipe.

### 3.8.7 Deleting a recipe

From the HOME screen, press the recipe  button, from the recipe editor screen choose the list button(1).

Name:

 1

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.

### 3.9 Tools Menu -NEW-

The tools menu can be used to setup, prepare or empty a unit without the need for a supervisor login. By default, this menu is accessible for every login level, this can be changed in the system configuration menu.



#### 3.9.1 Fill System

On this tab, some changes to the fill system can be made:

(1) *Disable filling*

This setting can be used to disable the loader of a unit.

(2) *Start 1x fill*

Switching this button will start the loader to fill the hopper to the set hopper level once.

#### 3.9.2 Prime

On this tab, the dosing unit can be primed after it is filled with new material or when it has run empty.

#### 3.9.3 Purge

On this tab, the purge speed can be set if required. More detailed information about the Purge function can be found in the corresponding paragraph.

#### 3.9.4 One Shot

① Only accessible by supervisor or higher login level. Production mode should be INJ – Timer.

A single shot can be dosed via this tab, the production settings from the production screen are used. Also the actual values (RPM and Dosing time) are displayed when this mode is activated.

### 3.10 Purge function -NEW-

For most injection molding processes it is required to purge the machine barrel before production start. In case of a big barrel size related to the shot weight, it is required to purge with already colored material.


With this purging function the dosing motor of the MCBalance can be started at a pre-set speed as long as the purge signal from the Injection Molding Machine is active.

Be aware of the following remarks:

- Material dosed during purge is not counted by the MCTC consumption counters.
- The purge function is using VOLUMETRIC mode. There is no feedback on dosed amount of material.
- The speed of the dosing tool is set by the user, the user is responsible for entering the right RPM of the dosing tool used during purge.
- The right mix ratio of the end mix during purging cannot be guaranteed by Movacolor.

Two types of purging are available:

#### 1) Purging via Tools menu screen

This mode can be used to purge at any time by activating the purge mode through the Tools menu . Purging can be started with a purge signal (connected to INP-3) or the normal “start dosing” or “screw active” signal.

#### 2) Purging when unit is “ON”

This mode can be used In cases where the MCTC is not stopped in between two production runs, purging can be started in between two Injection molding cycles. Therefore a separate signal is required to start the purging (connected to INP-3), the so called “purge signal”

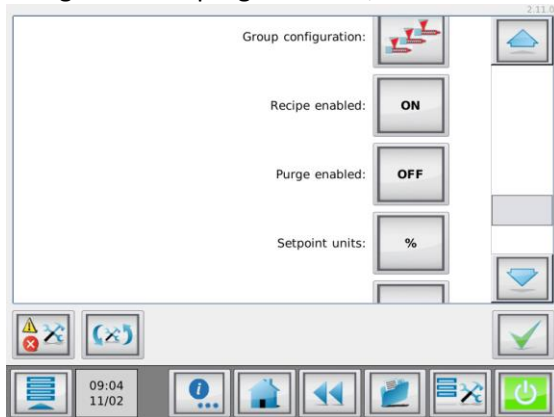
① This functionality requires service settings to be changed. Contact your distributor or Movacolor representative for more info.



### 3.10.1 Configure the purge functionality

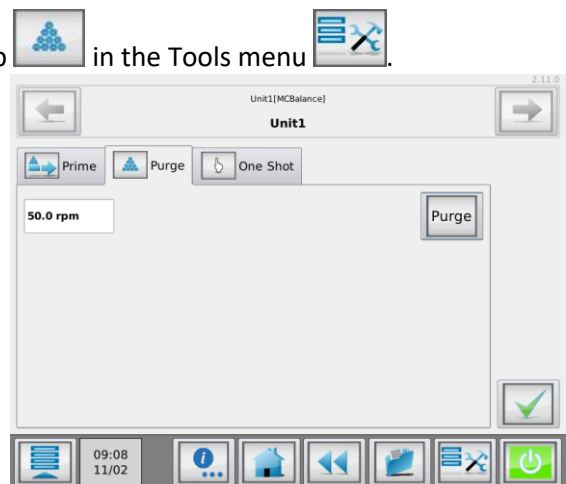
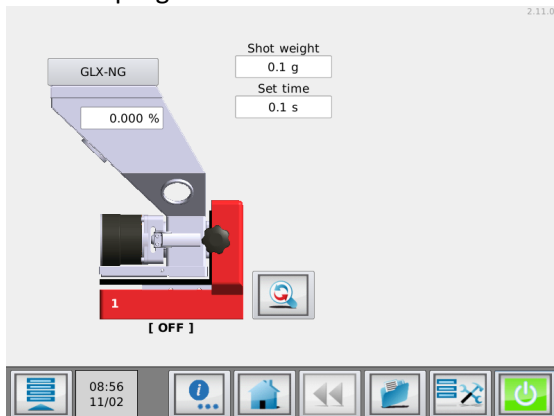
By default, the purge function is not available. It needs to be enabled in the system configuration menu (only accessible by Supervisor).



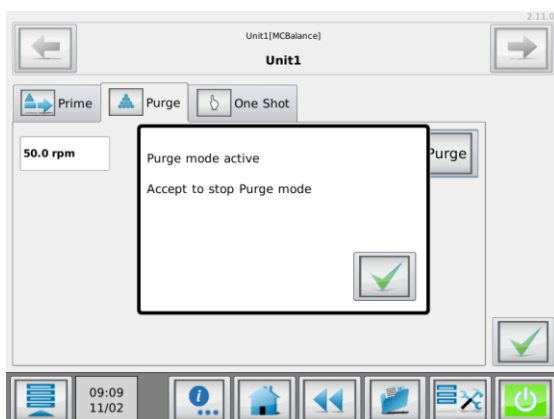
Navigate to the purge enabled, and set to “ON”.



Now the purge function can be accessed via the “Purge” tab  in the Tools menu .



To activate the purge mode, press the purge button. A “Purge mode active” pop-up will appear. When the “OK” button is pressed, purging is stopped and the display goes back to the home screen.




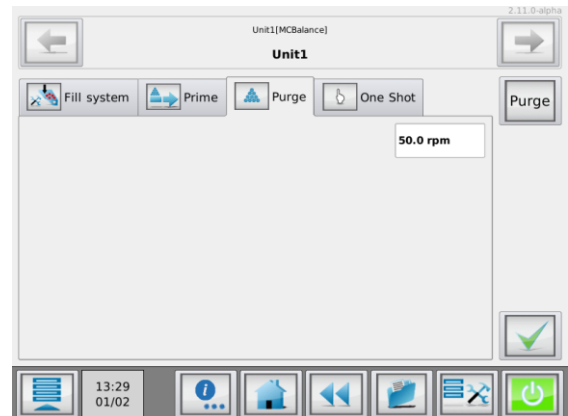
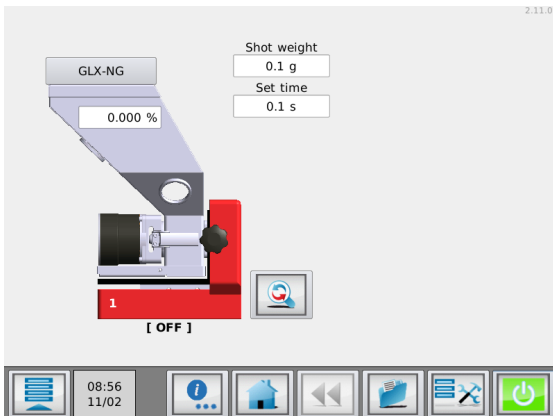
### 3.10.2 Setting the required purging RPM


The MCTC material file calibration procedure can be used to determine a starting point for the purging speed. When the material calibration has ended successfully, the last used speed is copied to the purging speed parameter.

For more information about material files, refer to paragraph “Material files” in the manual of the used unit.

### 3.10.3 Adjusting the purge motor speed

In case the color of the end product is not as required, the speed of the motor during purging can be changed. The purge motor speed can be adjusted from the “Operator menu”. 



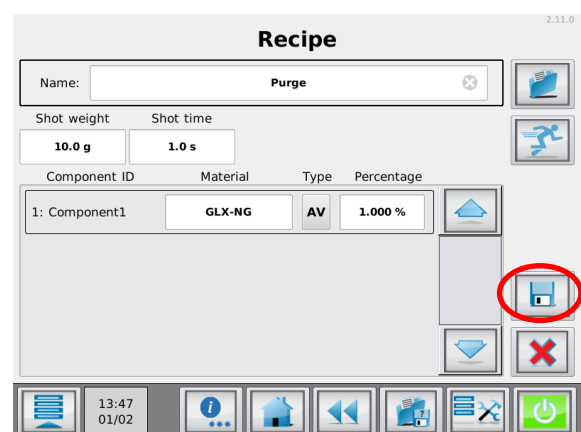
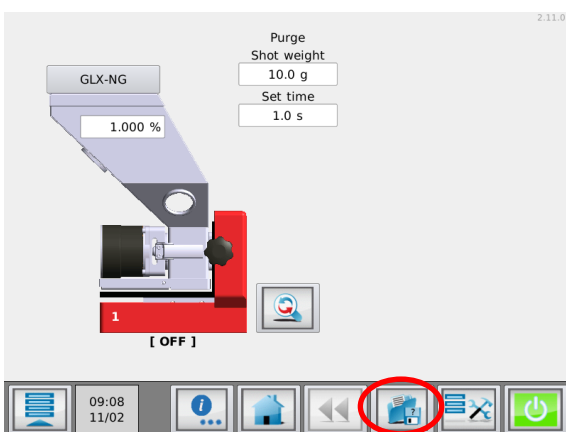
 In multicomponent setups, make sure the right dosing unit is selected prior to entering the prime menu.

### 3.10.4 Purge recipe function

It is recommended to use the recipe function, the used purge speed can be stored to the recipe. For multicomponent systems, the purge speed is saved for all components within the recipe.

Loading a recipe will also recall the purge speed stored to the selected recipe.







Changing the purge speed will activate the “save recipe indicator”, the recipe needs to be saved to save the last made change for future use.



### 3.10.5 Using the purge function

#### Purge function type 1

Purging can be done before or during production by activating the purge mode:

1	Select the right recipe for the next production order (optional)	
2	Go to the Operator menu	
3	Press the Purge tab	
4	Change the purge speed if required and press the purge button	
5	Purge the Injection Molding Machine	
6	When purging finished, press OK	
7	Start production (only when production is not started yet)	

Before starting the purge function, be sure the material hoppers of the components used during the purge are sufficient filled with material. When purging is activated while the system is “OFF”, the hopper loaders will not be activated and no alarms will show.



When the purge mode is active, the MCTC will now wait for a start input signal or a purge signal. As soon the one of the signals is activated, the dosing tool will rotate as long as the signal is active.

- ❗ Then purge speed cannot be changed when purging is activated.
- ❗ Purging will be activated for ALL components simultaneously within one group.
- ❗ To deactivate a component in a multi component group, set the purge speed of the component to 0 RPM.

#### Purge function type 2

- ❗ Purge function type 1 is also available when using purge function type 2.
- ❗ This functionality requires service settings to be changed. Contact your distributor or Movacolor representative for more info.

#### Step by step instructions for the Operator

1	Select the right recipe for the next production order	
2	Start production on the MCTC	
3	Purge the Injection Molding Machine	
4	Start production on the Injection Molding Machine	

Before starting the purge function, be sure the material hoppers of the components used during the purge are sufficient filled with material. When purging is activated while the system is “OFF”, the hopper loaders will not be activated and no alarms will show.

When during production status “STANDBY” INP-3 is activated, the dosing motor will start running at purge speed.

The motor will run at purge speed as long as INP-3 is activated or until the normal dosing start input is activated.

### 3.11 Customer Support -NEW-

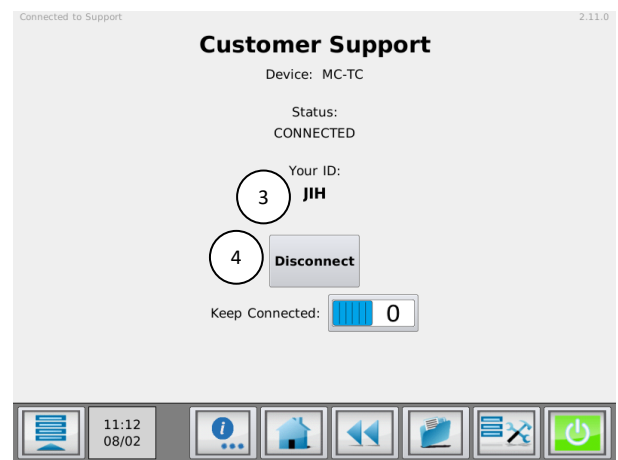
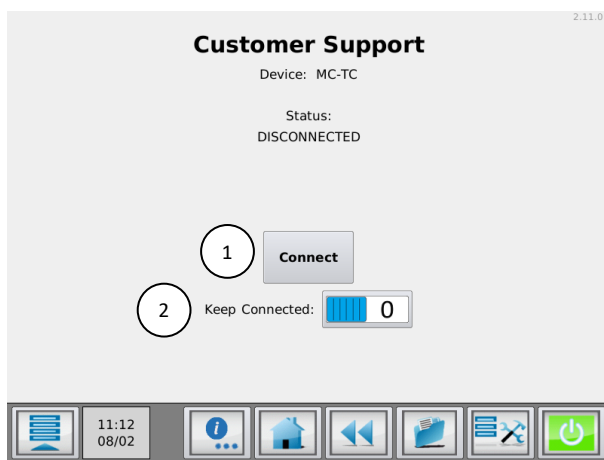
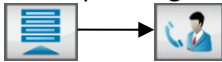
① Supervisor login required

From software version 2.11.x onward Customer Support is available. This is an online service which makes it possible to get remote support from a support employee. To use this function, the MCTC needs to be connected to the internet via the ethernet port on the MCTC.

The connection between the MCTC and the remote server is entirely secured using several encryption and authentication techniques and thus can be used safely. No data will be saved to the remote support servers.

Once the MCTC is connected to the remote server, a 3-digit ID will be displayed on this screen. A support employee will ask for this ID as it's used to identify the MCTC.

When pressing the Customer Support button, a new window is opened.



#### *Connect/Cancel (1)*

Connects the MCTC to the remote server. Make sure the MCTC meets the usage requirements. After pressing the connect button, but before the MCTC is connected, this button can be used to cancel the active connection attempt.

#### *Keep Connected (2)*

When this option is enabled, the MCTC will reconnect automatically when the connection is lost.

#### *Code (3)*

3-digit ID to be communicated to the support employee to establish a connection.

#### *Disconnect (4)*

Disconnects the MCTC from the remote server. The ethernet cable can be safely removed after this if it is undesirable to stay connected to the internet at all times.



### 3.12 USB menu

The MCTC is equipped with a USB port. This port can be used for exporting consumption reports, material, recipe and configuration files. Material, configuration and configuration setting files can also be imported for backup/restore purposes. This USB port is also used for MCTC software updates.

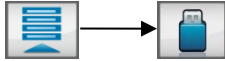
- ① For software updates, contact your local Movacolor representative.
- ① Your USB memory stick should be formatted FAT32.

#### 3.12.1 Export and Backup / Restore

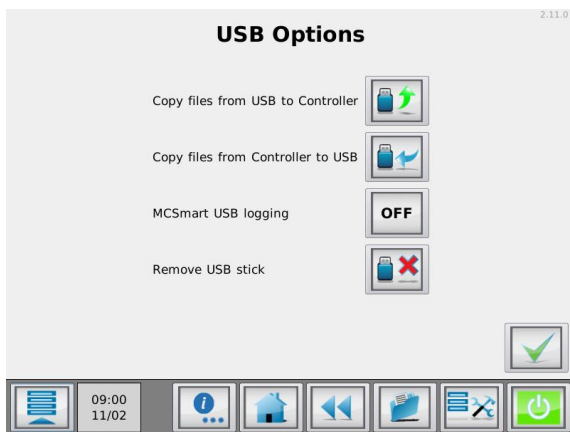
- ① Supervisor login required

Insert your USB memory device into the USB port ( See chapter: The Interface )

Press:



The USB menu will be shown, containing 4 options



- |                                      |   |
|--------------------------------------|---|
| 1. Copy files from USB to Controller | Import files from USB memory stick to controller. |
| 2. Copy files from Controller to USB | Export files from Controller to USB memory stick. |
| 3. MCSmart USB Logging               | Enable or disable MCSmart USB logging.            |
| 4. Remove USB memory stick           | Safely remove USB memory stick.                   |

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

- |                               |   |
|-------------------------------|---|
| 1. Recipes and Materials      | Transfer of material and recipe files only.                     |
| 2. Configuration and Settings | Transfer of configuration and settings files only.              |
| 3. Consumption Reports        | Transfer of consumption reports only ( export only ).           |
| 4. All                        | Transfer of all files (materials, recipes, configuration, log). |

After copy of the files to the USB memory stick, you can store the backup files to a network drive or backup folder on your computer. The USB memory stick contains a folder named MC\_TC, this folder contains the transferred files.

#### 3.12.2 MCSmart USB logging

- ① Supervisor login required

When the controller is not connected to a LAN network and therefore not able to log data to MCSmart real time, it is possible to log MCSmart data to a USB stick. This data can be imported in the MCSmart software. This option can only be enabled with a supervisor login.

### 3.12.3 Remove USB stick

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

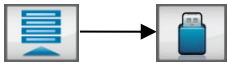


Risk of damaging the data on your USB memory stick when it is not safely removed.

### 3.12.4 Insert USB memory stick

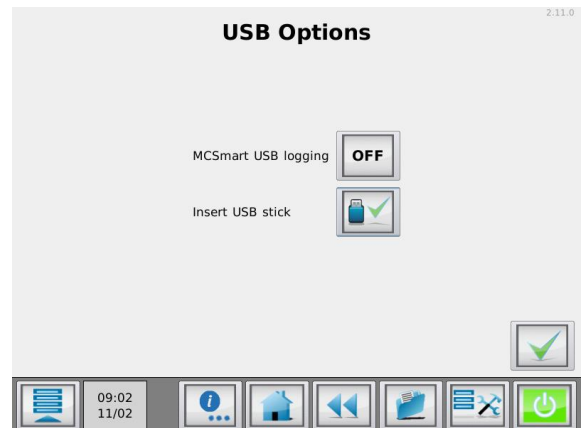
When the Remove USB stick option is used, but the USB stick is not physically removed from the MCTC, it is possible to “insert” the USB stick again. In this way the USB stick does not have to be reinserted to be activated again. This might be useful when a MCTC is remotely controlled or when you forgot to copy files.

The “Insert USB stick” function can be accessed by navigating to the USB menu again.



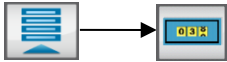
The controller detects if a USB stick is present in the USB port of the MCTC. If a USB stick is available, the screen aside appears.

When the Insert USB stick button is pressed, the USB stick will be activated again.



### 3.13 Consumption counters

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



#### 3.13.1 Consumption counter by order

Consumption can be counted by order number. By changing the order number all consumption counters will be reset!

The screenshot shows the 'Consumption' screen with the following elements:

- 1**: Order input field.
- 2**: Group total display showing 0.0 g.
- 3**: Total display showing 0.0 g.
- 4**: Group selection buttons (left arrow and right arrow).
- 5**: Component ID input field.
- 6**: Material input field showing GLX-NG.
- 7**: Consumption display showing 0.0 g.
- 8**: Reset button (trash can icon).
- 9**: Export Report button (floppy disk icon).
- 10**: Exit button (checkmark icon).

The bottom status bar shows the time 16:13, date 03/01, and navigation icons for home, back, forward, and power.

1.	<b>Order number</b>	Enter a production order number. ① Can be left blank, consumption will still be counted. Can be filled in afterwards.
2.	<b>Group total</b>	Total consumption for selected group (sum of all components).
3.	<b>Total</b>	Total consumption of the whole machine (sum of all groups).
4.	<b>Group selection</b>	Select the current group to be shown. ① Only visible when more than one group configured.
5.	<b>Component ID</b>	The ID and name of the components in the current selected group.
6.	<b>Material</b>	Material name of current loaded material file.
7.	<b>Consumption</b>	Current component consumption.
8.	<b>Reset</b>	Reset all consumption counters.
9.	<b>Export Report</b>	Generate a consumption report and export the last 5 to USB memory stick.
10.	<b>Exit</b>	Leave current screen.

### 3.14 Consumption report

A text formatted consumption report can be exported to a USB memory stick. This consumption report contains information about material usage per group and per component.


```
#####  
#  
# CONSUMPTION REPORT #  
#  
#####  
  
Generated: 17/01/2017 15:45  
Order: PO_123456789  
  
#####  
Device: MC-TC  
Device Total: 0.0 g  
#####  
Group: EXT_A  
Group Total: 0.0 g  
#####  
  
Component Material Consumption  
1: ADD_A1 GLX-NG 0.0 g  
2: ADD_A2 GLX-NG 0.0 g  
  
#####  
Group: EXT_B  
Group Total: 0.0 g  
#####  
  
Component Material Consumption  
1: ADD_B1 GLX-NG 0.0 g  
2: ADD_B2 GLX-NG 0.0 g  
  
#####  
# END OF REPORT #  
#####
```

Each time an order number has been changed the consumption counters will be reset. At the same time a consumption report will generated and stored to the MCTC internal memory. The last 15 generated reports will be stored at the controller. See chapter USB menu for the data export function.

## 4 Events

### 4.1 General

In case of an error, the MCTC can generate events. When an error occurs using the MCTC, an event display will pop up indicating the event type, code, source and description.

Together with the displayed event an output contact will be switched (Warning/Alarm output), this event screen can be confirmed with the acknowledge button: 

The controller itself gives a beeping signal and the red alarm LED will lighten up.

The MCTC keeps track of all active events (multiple simultaneous events are possible).

Movacolor distinguishes 3 different events:

**Warning:** Alarm/warning output is ON, but the system continues running and dosing.

**Soft Alarm\*:** Alarm/warning output is ON, the inline dosing units continue dosing, MCHybrid is in pause.

**Alarm:** Alarm/warning output and the Alarm relay output are ON and the system **stops running (no dosing)**.

\* A soft Alarm is only applicable for a MCHybrid

We distinguish 4 different event source levels:

**System:** events like aux module events, production settings errors.

**Group:** events like main material events.

**Unit:** events like motor connection failures, load cell connection errors, CAN bus errors.

**Component:** events like low hopper event, deviation errors.

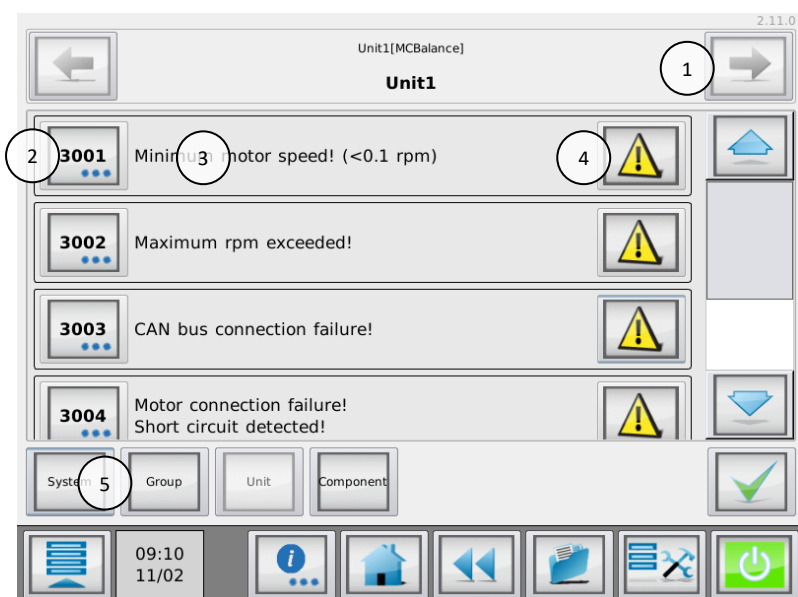
### 4.2 Configuration

(When working with multiple components, some configurations can be made on group level, other event configurations have to be made for each unit or component separately).

For setting the free programmable events into Alarm Soft Alarm, Warning or off, enter the event configuration menu. The event configuration menu can be accessed in the advanced settings menu.



By default the unit event configuration list is displayed

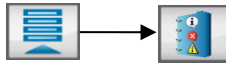


1	Unit/Component navigation buttons
2	Event identifier
3	Event description
4	Event configuration
5	Event level selection buttons




Here you can select if the error will act as an alarm, soft alarm, warning or OFF. When OFF selected, no events will be displayed of this event.

### 4.3 Active events

A list of all active events can be displayed by opening the event screen: 

An event is active as long the root cause of the event has not been solved. A message pop up of an active event will return every 60 seconds.

### 4.4 Operator events

Operator events can be shown by pressing: 

All (production) settings changed by the operator are recorded and can be reviewed in this list. A maximum of 50 events will be displayed in this list. More events are stored at the controller and can be downloaded by using MCSmart PC application or the USB function.

*Tooling login or higher required for recalling this list.*

### 4.5 Alarm history

The warning/alarm event history list can be opened by pressing: 

A list with warning/alarms that occurred will appear. A maximum of 50 events will be displayed. More events are stored at the controller and can be downloaded by using MCSmart PC application or the USB function (csv file). The alarm history can be cleared using the reset button, only when logged in as supervisor.

*Tooling login or higher required for recalling this list.*

### 4.6 Events

#### 4.6.1 System events

These events apply to the whole system.

Code	Event	Description	Default
501	AUX module error!	Cannot connect to AUX module	Warning
502	Invalid MCSmart Address Range	Wrong IP address for MCSmart server	Warning*
503	No MCSmart communication	Cannot connect to MCSmart server	Warning*
1001	Write failed!	Internal I <sup>2</sup> C write to memory failed	Alarm*
1002	Production settings error	Production parameters not set (correctly).	Alarm
1501	Product weight deviation!	LineControl output product weight is not within deviation limits of set product weight.	Warning*
1502	Maximum puller speed!	LineControl maximum puller speed exceeded	Warning*

#### 4.6.2 Group events

Group events can be set separately for each group in the system.

Code	Event	Description	Default
2001	Main material empty!	Main hopper is empty	Off
2501	Extruder capacity deviation!	LineControl Extruder capacity deviation between set and act capacity.	Warning*
2502	Minimum extruder speed!	LineControl Extruder speed below minimum	Warning*
2503	Maximum extruder speed!	LineControl Maximum extruder speed exceeded	Warning*

#### 4.6.3 Unit events

Unit events can be set separately for each unit in a group.

Code	Event	Description	Default
3001	Minimum motor speed! (<0.1 RPM)	Required motor speed is too low	Warning
3002	Max RPM Exceeded	Required motor speed is too high	Warning
3003	CAN bus connection failure	CAN bus communication error	Warning
3004	Motor connection failure! Short circuit detected!	Motor or cabling short circuit detected	Warning
3005	Motor connection failure! Open connection detected!	Motor defect or not connected	Warning
3007	Load cell connection failure!	Load cell not connected or defective	Alarm
3008	Door open!	MCHybrid door open during production	Softalarm
3009	Weigh bin not empty	MCHybrid weigh bin not empty at production start	Softalarm
3010	Weigh bin missing	MCHybrid weigh bin not placed, or placed wrong	Alarm
3011	Actual batch weight exceeds maximum batch weight!	More material is dosed in the weigh bin than allowed	Warning
3012	Emergency button pressed!	MCHybrid emergency button activated (Future use)	Alarm
3013	Pause time exceeded!	MCHybrid paused for more 10 minutes	Alarm
3014	Low mixer	MCHybrid200 mixer empty	Warning
3015	Pellets not loaded	Pellets are not sucked to disk	Alarm
3016	Not calibrated	MCNexus disk is not calibrated	Alarm*

#### 4.6.4 Component events

Component events can be set separately for each component in a unit.

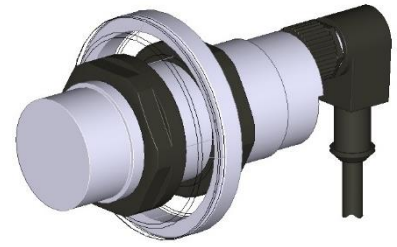
Code	Event	Description	Default
4001	Empty level!	Hopper level below empty level	Warning
4002	Low level!	Hopper level below low level	Warning
4003	High high level!	Hopper level above High High level (no RPM regulation)	Warning
4004	Maximum deviation exceeded!	Deviation between set and act detected based on a rough weight measurements	Warning
4005	Maximum deviation exceeded!	Deviation between set and act consistently bigger than deviation alarm setting [default: 25%] based	Warning
4006	Maximum deviation exceeded!	MCHybrid deviation between set and act detected	Warning
4007	Suggested correction to high!	Suggested RPM correction too big, wrong dosing tool, material rat-holing or hopper empty	Off
4008	Total correction to high	RPM correction too big, wrong dosing tool!	Off
4009	Filling system unable to load material!	Fill system cannot complete filling within the set time period	Warning
4010	Slide not closed!	Optional slide not closed	Warning
4011	Calculated dosing weight too small, component skipped!	MCHybrid component dosing too small, component skipped for this batch	Warning
4012	Material flow error! Hopper empty?	MCHybrid component hopper material flow detected, hopper (almost) empty?	Warning
4013	Minimum valve capacity reached! Check valve configuration.	MCHybrid component skipped continuously, wrong dosing valve mounted?	Warning
4014	Hopper Missing	Hopper is removed from unit	Alarm
4015	Pellets Deviated	MCNexus deviation between set and act detected.	Off
4016	Pellets Missing	MCNexus is missing pellets during dosing cycle.	Warning
4017	Filling limiting measurement time!	Time between filling cycles too short, system cannot measure accurately.	Warning

\* This event cannot be configured.

## 5 System

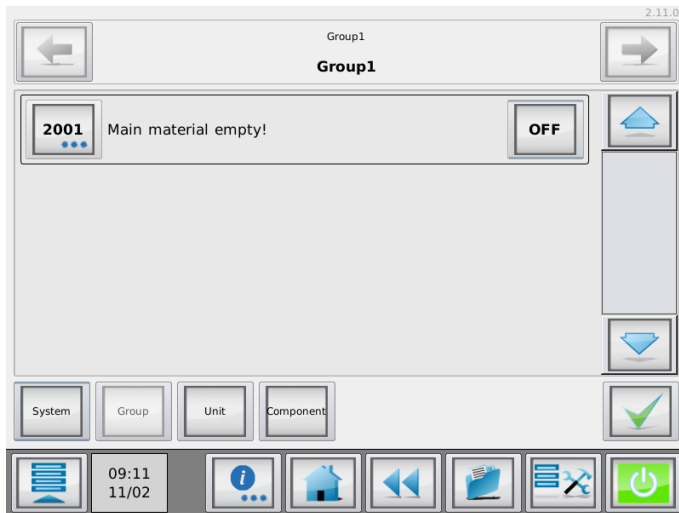
### 5.1 Main Material Sensor

The MCTC or MCBC can be provided with a Main Material Sensor. This sensor can be used to detect a low material level in the main hopper.



#### 5.1.1 Alarm settings

When a Main Material Sensor is used, the alarm (event 2001) for this sensor needs to be set. Standard, the event is configured “OFF”. (Refer to chapter “Events” about how to setup events)



#### 5.1.2 Electrical connections

The main material sensor has 4 wires: brown, blue, white and black. The black wire should not be connected. The sensor needs to be connected to input 1 of the MCTC.

MCTC Terminal	Wire color
12	Blue
13	White
14	Brown



## 6 Batch mode

In batch mode, the system doses a predefined batch when a start input is supplied. When dosing is ready, the MCTC gives a dosing ready signal.

### 6.1 Batch mode component configuration

Each component in the batch setup can be configured separately. When the unloading option is required, this should be set in component 1 of the system. When the “BATCH” button of Figure 1 is pressed, the screen of Figure 2 appears.

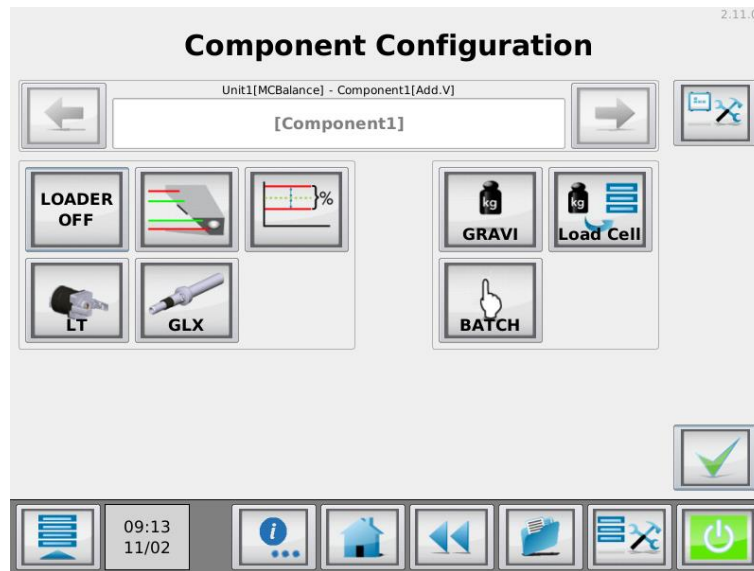


Figure 1 Component Configuration screen

### 6.1.1 Batch Settings

For each batch dosing, the settings in the screen below can be made, except for the Batch unloading settings (5 and 6). These settings can only be set for component 1 in the system.

The screenshot shows the 'Batch Settings' screen with the following parameters:

- Fine Dosing Set:** 10.0 g (labeled 1)
- Change Delay:** 2.0 s (labeled 2)
- Motor Speed Coarse:** 100.0 rpm (labeled 3)
- Motor Speed Fine:** 25.0 rpm (labeled 4)
- Batch unloading:**
  - Unloading enabled:** 0 (labeled 5, with a blue bar indicator)
  - Unloading Delay:** 0.0 s (labeled 6)

At the bottom, there are navigation icons, a status bar showing '09:13 11/02', and a power button.

Figure 2 Batch Settings screen

1.	Fine dosing set: this setpoint determines when the dosing unit switches from coarse to fine dosing speed.
2.	Change delay: the time in which the motor speeds changes from coarse to fine dosing speed
3.	Motor Speed Coarse: RPM when batch dosing is started
4.	Motor Speed Fine: RPM setting for fine dosing.
	<b>Only component 1:</b>
5.	Unloading enabled: Enables or disables the unloading option
6.	Unloading delay: Time before unloading output is activated

#### Example:

Batch weight: 100 g, Batch settings as in Figure 2

When the MCTC gets a start input, the dosing unit will start dosing at 100RPM, when the last 10g (Fine Dosing Set) is reached, the RPMs are changed from 100 to 25 in a time of 2 seconds. The dosing unit will continue dosing at 25RPM until the total batch weight of 100 g is reached.

### 6.1.2 Batch unloading

In some systems the batch needs to be unloaded from a buffer. This can be done with the Batch unloading option. When the option Batch unloading is enabled (5), potential free output 3 of the MCTC will close when batch dosing is ready. Now the batch can be unloaded by closing input 1 of the MCTC. When this input is activated, output 1 of the MCTC closes after the unloading delay time (6). This output can for example be used to control a valve.

6.2 Batch mode production screen

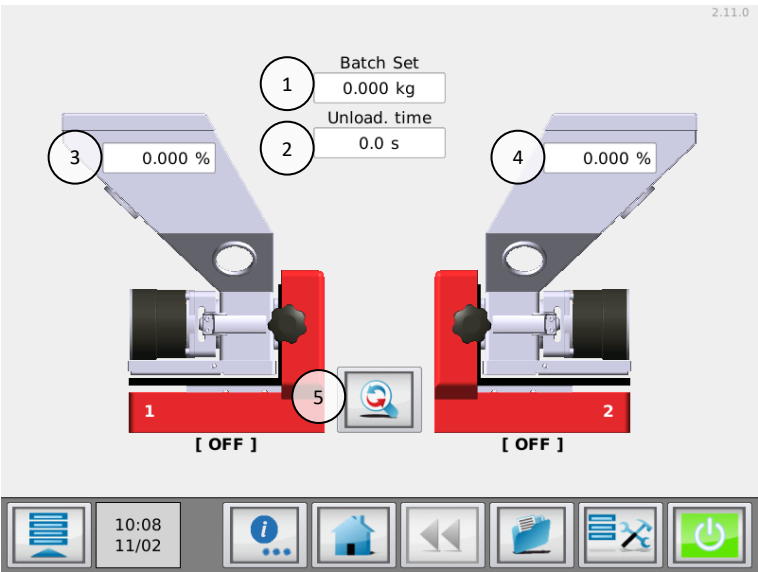


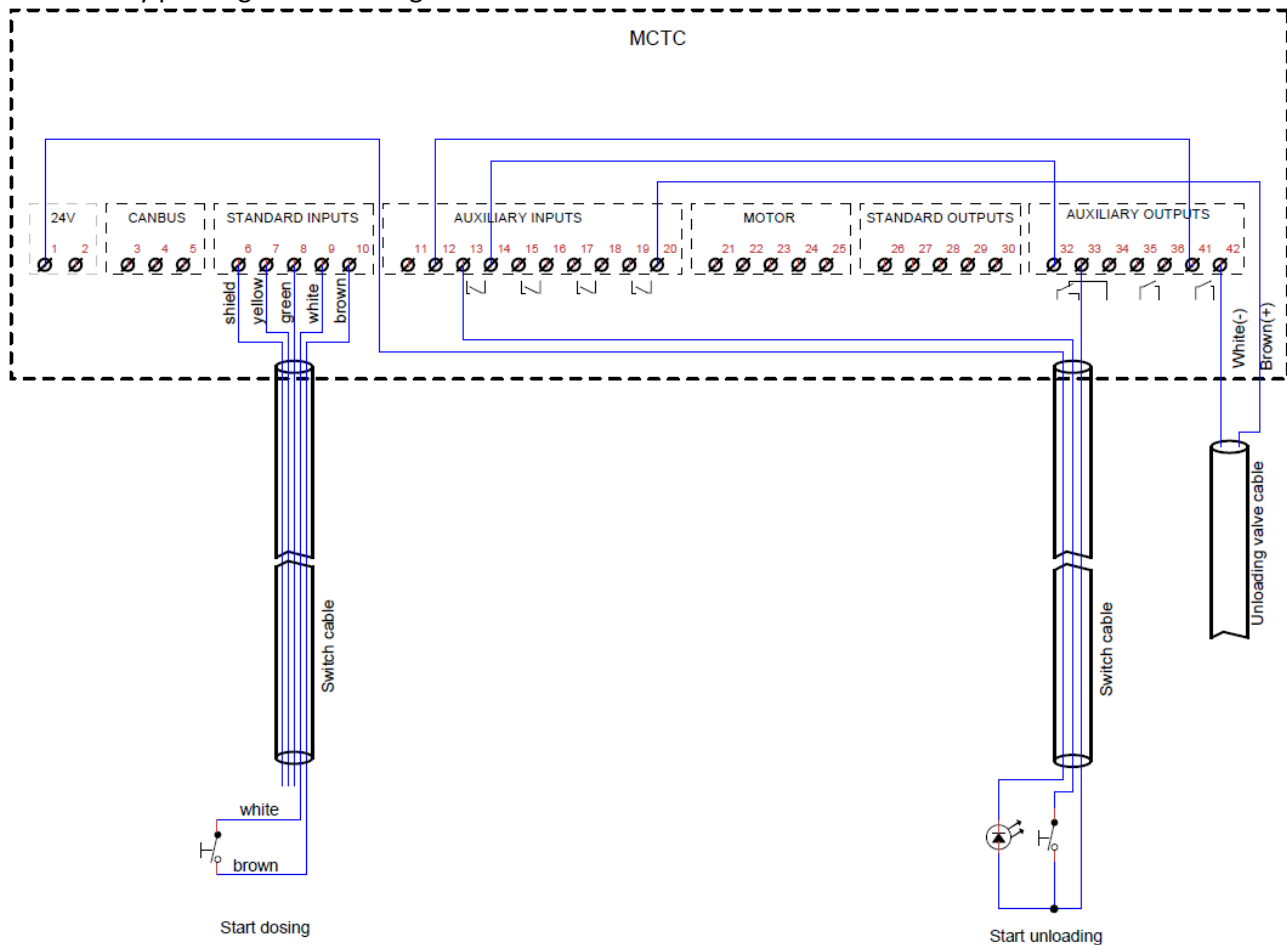
Figure 3 Batch mode production screen

1.	Total batch weight
2.	Time unloading output is activated ( <b>only available when unloading option is enabled</b> )
3.	Set point unit 1, percentage of the total batch weight
4.	Set point unit 2, percentage of the total batch weight
5.	Toggle button. With this button you can toggle between the normal and the detailed view.

## 6.3 Connection examples batch unloading

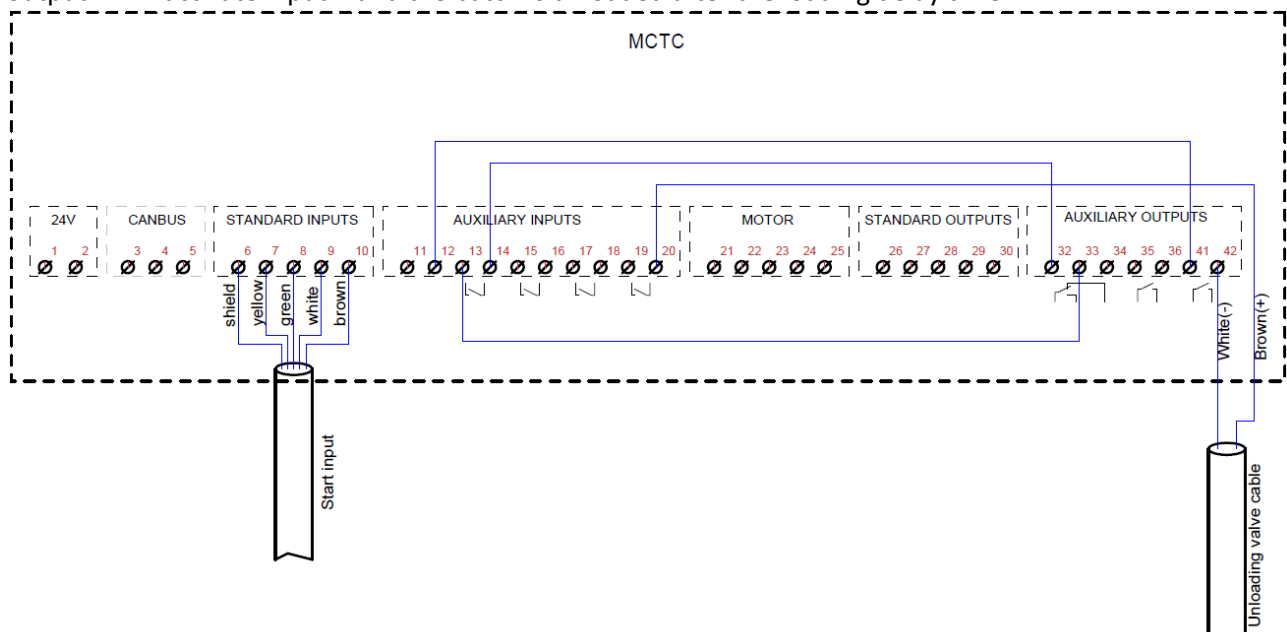
### 6.3.1 Example 1 – Batch with unloading controlled manually

In this example, the start input and the unloading input are both controlled manually. When the Start dosing button is pushed, the system starts dosing. When dosing is ready, a light turns on and unloading can be activated by pushing the unloading button.



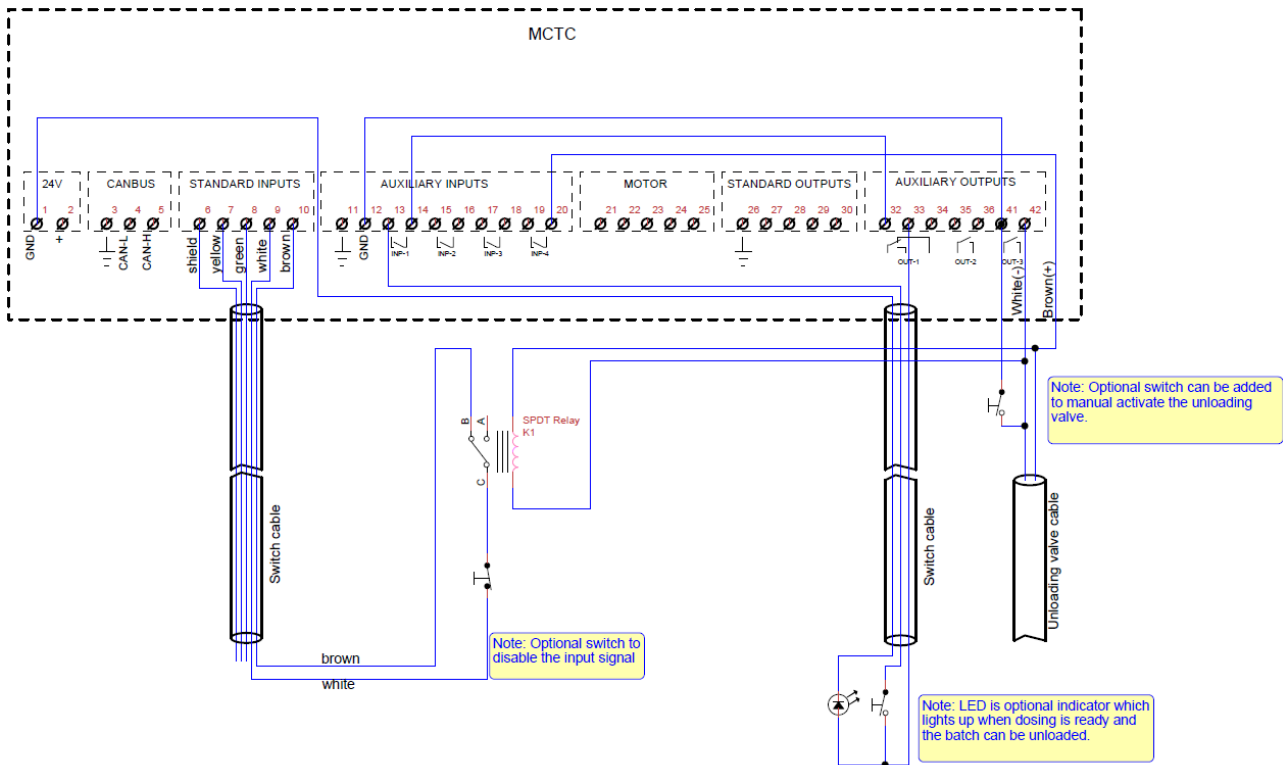
### 6.3.2 Example 2 – Batch with unloading controlled by MCTC

In this example, the systems starts dosing when an external start input is given. When a batch is ready, output 1 will activate input 1 and the batch is unloaded after the loading delay time.



### 6.3.3 Example 3 – Batch with unloading option activated by pushbutton

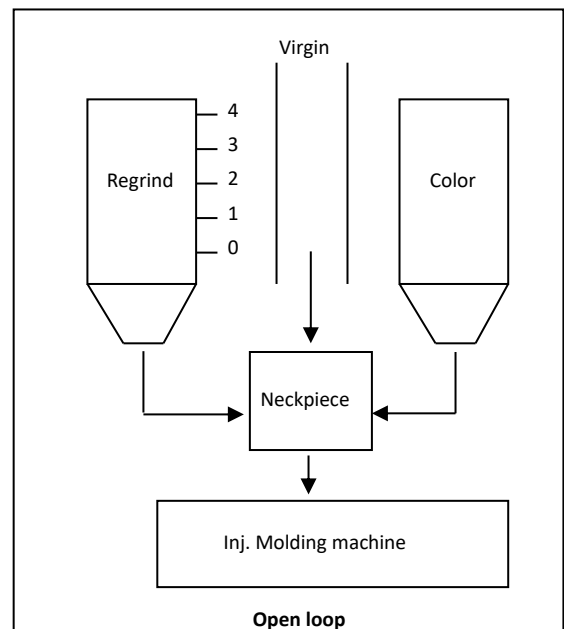
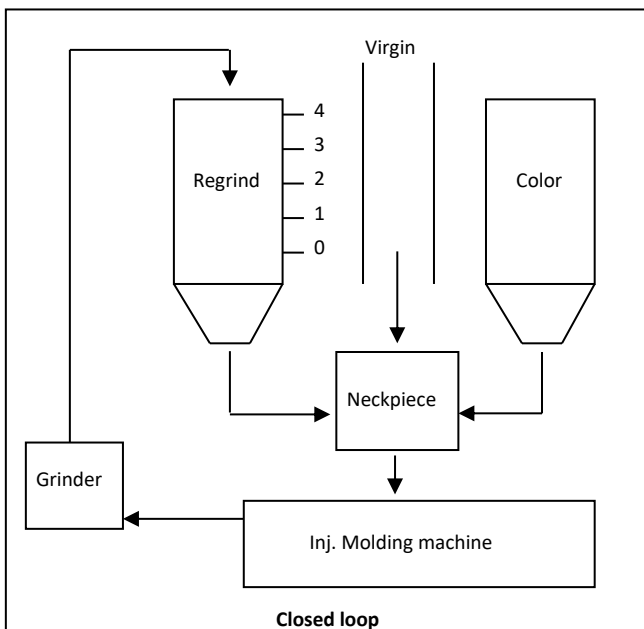
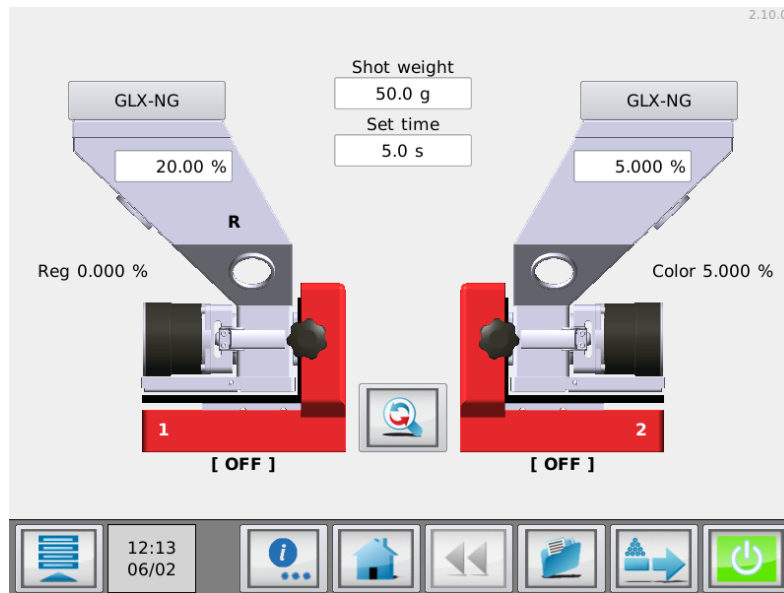
In this example the system starts dosing when the start button is pressed. The start input is controlled by an external relay. This relay will interrupt the start input when the unloading valve is activated. When unloading is finished, the relay will give a new start input to the system for the next batch. No external start input is used.



## 7 MCTwin

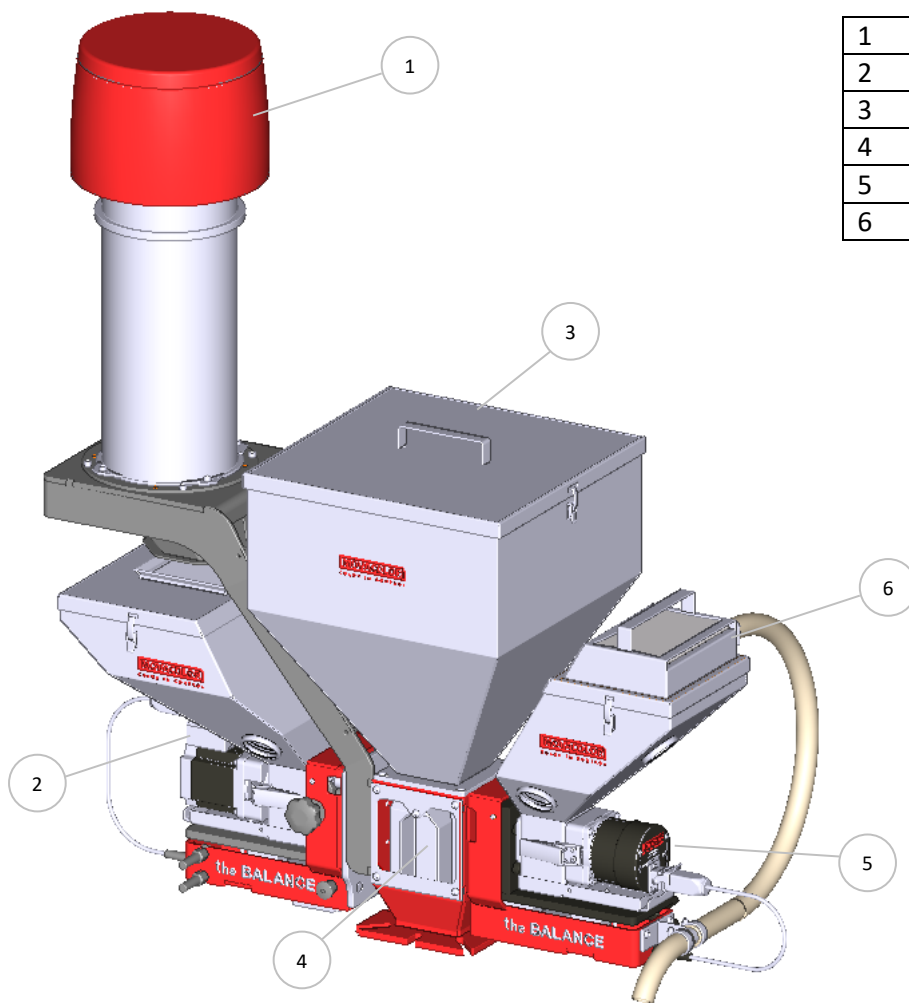
### 7.1 Introduction

MCTwin is a software configuration of a double station MCBalance. One of the two units is adding regrind to the process, the other unit is adding the master batch (color) to the process. There are two available control modes for the MCTwin software, closed loop and open loop. In closed loop mode, the regrind is fed directly from the grinder to the dosing system, the dosed amount of colorant is automatically adjusted to the availability of regrind. In open loop mode, the regrind fed to the dosing system from a big regrind storage tank, assuming there is more than enough regrind available.



## 7.2 Closed loop

### Hardware example



1	Single phase motor loader (MFD)
2	Regrind dosing system
3	Main material hopper
4	Neckpiece with regrind insert
5	Color dosing system
6	ME loader system

### Working principle

At system start, the regrind unit starts loading regrind from the grinder into the dosing unit hopper. If no regrind or insufficient regrind is available, the unit will repeat the loading sequence with a time interval. During this wait time, the regrind unit is not dosing. The color unit is dosing its nominal amount of color. When sufficient regrind is loaded the regrind unit starts dosing, the dosing amount of the color unit is lowered according to the level of regrind added.

If during processing the level of regrind in the hopper slowly increases, the regrind dosing will be increased automatically. The color dosing is lowered according to the amount of regrind dosed to maintain constant coloring. When no process disturbance occur, the system will continue running in this state. If for some reason the amount of regrind fed to the regrind dosing unit increases (an operator fills the bin of the grinder manually) the regrind unit will increase its dosing.

In case no regrind is available anymore, the regrind unit stops and attempts to load material with a time interval. The nominal regrind percentage is the weight part of the sprue / runner.


❗ Closed loop configuration requires a MV, ME, MFD or 3PH hopper loader to be used with the regrind dosing unit.

### 7.2.1 Configuration

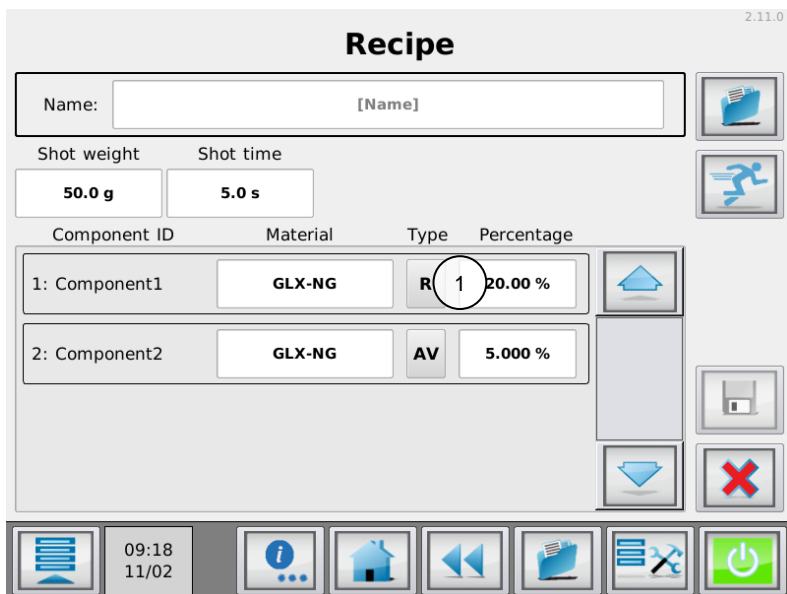
The MCTC needs to be configured as double station, see chapter 6 for more information about multicomponent configuration. MCTwin functionality is not available when a MCWeight is configured in the system

#### MCBalance settings:

See chapter MCBalance component configuration for more detailed MCBalance configuration.




Enabling the MCTwin software operation, the material function has to be set to Regrind (R) using the recipe editor. From the horizontal menu bar, press the recipe button. 




Select material function “Regrind” (1) and press the save button.

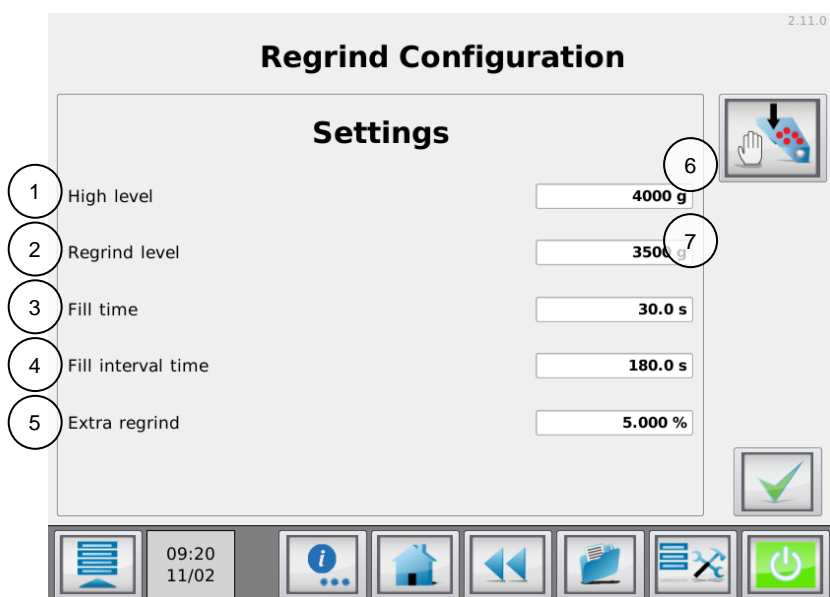


The screenshot shows the 'Recipe' configuration window. At the top, there's a 'Name' field with a placeholder '[Name]' and a save icon. Below this are 'Shot weight' (50.0 g) and 'Shot time' (5.0 s) fields. The main table lists components with their IDs, materials, types, and percentages. Component 1 is 'Component1' with material 'GLX-NG', type 'R' (Regrind), and percentage '20.00 %'. Component 2 is 'Component2' with material 'GLX-NG', type 'AV', and percentage '5.000 %'. The 'R' type for Component 1 is circled with a '1'. To the right of the table are icons for adding, deleting, and saving components. At the bottom is a navigation bar with various icons, including a power button.

Next configure the regrind parameters via the “Regrind Configuration menu”

Regrind component configuration:  →  → 

 Be sure the right component is selected by using the   button.



The screenshot shows the 'Regrind Configuration' window. It has a 'Settings' section with five rows of configuration options, each with a numbered circle on the left: 1. High level (4000 g), 2. Regrind level (3500 g), 3. Fill time (30.0 s), 4. Fill interval time (180.0 s), and 5. Extra regrind (5.000 %). On the right side, there are two more numbered circles: 6 next to a 'Manual fill' icon and 7 next to an 'Advanced loader settings' icon. At the bottom right is a green checkmark icon. The bottom navigation bar is identical to the one in the previous screenshot.

1.	Max fill level
2.	Fill level for Nominal regrind dosing
3.	Maximum time used for one fill sequence
4.	Time between fill retry, when no regrind is available.
5.	% of additional regrind when hopper level is above Regrind level
6.	Manual fill
7.	Advanced loader settings



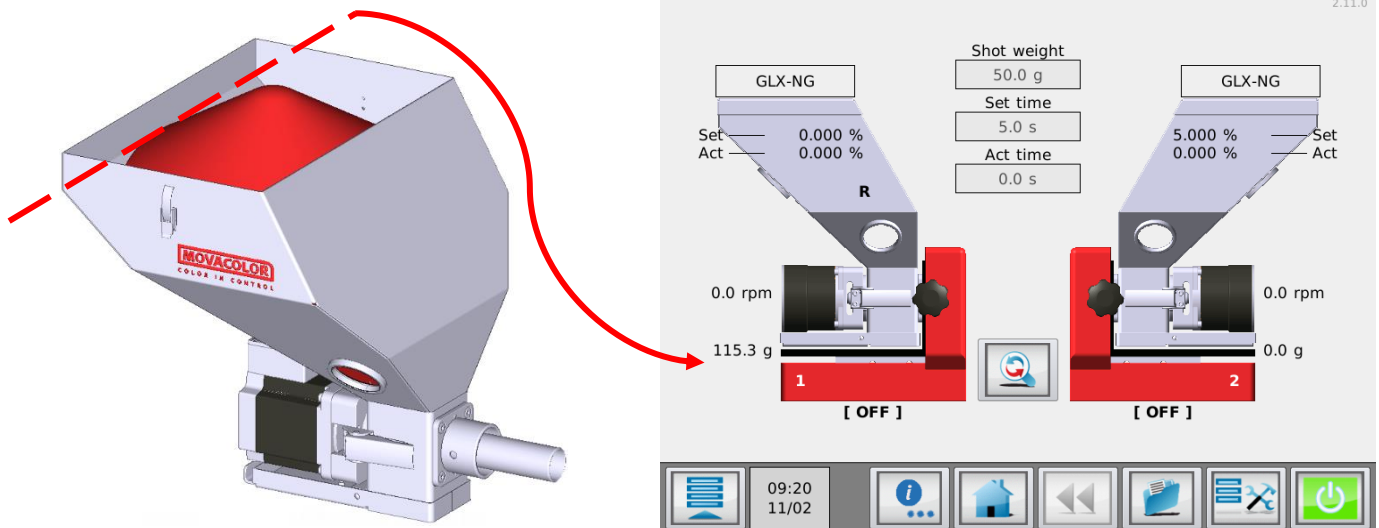
**High level [default 4000gr]:**

When hopper level above this level the unit will freeze its motor speed because inaccurate weight measurement. The regrind unit will dose extra regrind. As soon the hopper weight is below this level the unit returns to normal gravimetric operation. This level is related to the maximum volume of the regrind dosing unit hopper [~10 liters].

Method 1:      Regrind bulk density: 700 gr/liter.

High level:  $700 \times 10 = 7000\text{gr}$ .

Method 2:      Take the hopper from the machine and fill manually with material until the mark shown in picture below and put back the hopper on the machine. Read out the weight on the MCTC .

**Regrind level [default 3500gr]:**

The weight used to calculate all internal fill start levels and regrind dosing rate levels. This setting depends on the size of the storage hopper of the grinder.

Method 1:      Grinder hopper volume: 5 liter.  
Regrind bulk density: 700 gr/liter.  
Regrind level:  $5 \times 700 = 3500\text{gr}$ .

Method 2:      Set Regrind level 500 grams below High level.

**Fill time [default 30sec]:**

Maximum time the unit tries to load material from the grinder. In case a ME or EX loader system is configured, this is the maximum time the loader is activated or the knife gate of the support frame is opened. In case of a MFD loader, this time setting should not be set longer than the MFD Fill time + MFD Empty time + MFD blow back time (see advanced loader settings)

In case of a 3PH loader, this time setting should not be set longer than the 3PH Fill sequence time set on the 3PH loader controller (see 3PH loader manual for detailed information).

**Fill interval time [default 180sec]:**

Time between two attempts to load material from the grinder when the dosing hopper is empty eg. regrind unit standby.

**Extra regrind [default 5%]:**

When more regrind is available, the dosing percentage of the regrind unit is increased with this %.

Example:

- Regrind percentage in production settings: 20% (nominal);
- Extra regrind: 5%;
- Regrind level: 3500gr;
- Hopper level after a fill sequence: 3750gr;

- This results in a regrind dosing set point: 20% +5% = 25%.

### 7.2.2 Production

The regrind percentage setting can be calculated as follows:

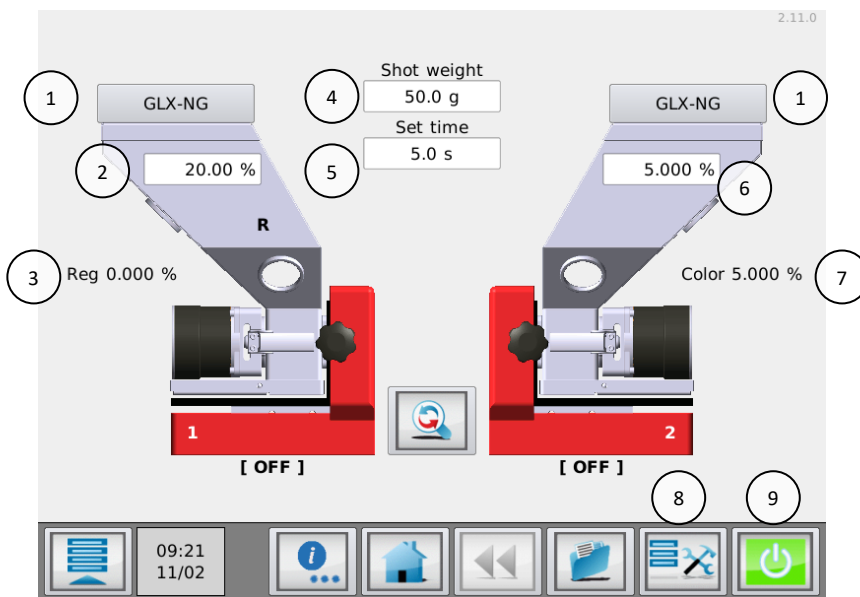
(Sprue weight / shot weight) \* 100 = Regrind percentage.

### Injection Molding – closed loop regrind - 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. 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. Nominal regrind amount (%)

#### 3. Recalculated regrind amount (%)

#### 4. Shot weight (gr.)

#### 5. Dosing set time (sec.)

ⓘ Dosing set time only visible in Timer mode, otherwise relay time will be displayed

#### 6. Nominal color amount (%)

#### 7. Recalculated color amount (%), reduced by regrind amount

#### 8. Prime. Filling the dosing cylinder before start.

The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm to start priming.

#### 9. 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.

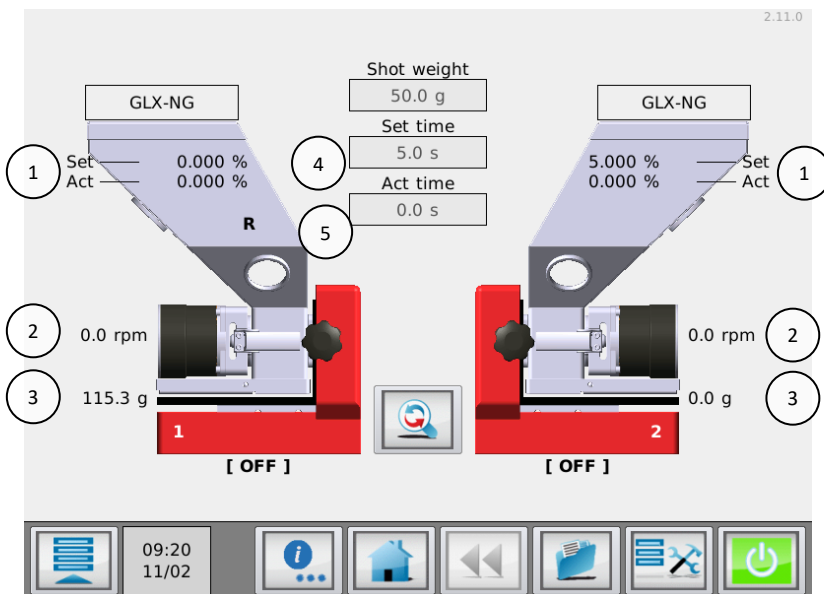
For stopping production press again. The motor on/off switch will turn to green again.

ⓘ 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 – closed loop - gravimetric mode

### Actual production data:

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



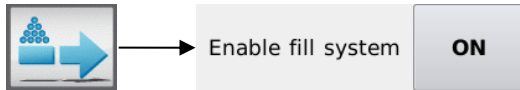
- 1. Set and actual output:** Set.: Re-calculated output (% kg/h, gr/sec).  
Act.: Actual additive output (% kg/h, gr/sec).  
① actual additive output is only visible after the first automatic RPM adjustment.
- 2. Speed:** Actual motor speed (RPM).
- 3. Hopper weight:** Material weight in the hopper.
- 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).

### 7.3 Open Loop

#### Working principle

In open loop configuration the amount of dosing of the color unit is adjusted to the level of regrind dosed by the regrind unit, regrind is fed to the system by either a ME, EX, MFD or 3PH hopper loader or knife gate when using a MCHigh Output.

If at system start no regrind is available (hopper weight below EMPTY level), the regrind unit will not start dosing. The color unit will dose it's nominal %. To start the regrind unit, manual activation of the loader system is required.



The loading system will now. Be able to start while the system is switched off!

When during production no regrind is available, the unit will give an alarm. As soon as the regrind material hopper is below EMPTY level, the regrind unit will stop dosing. The color unit dosing amount will increase to nominal to maintain color level. To restart the regrind dosing, the manual activation of the loader system is required.

### 7.3.1 Production

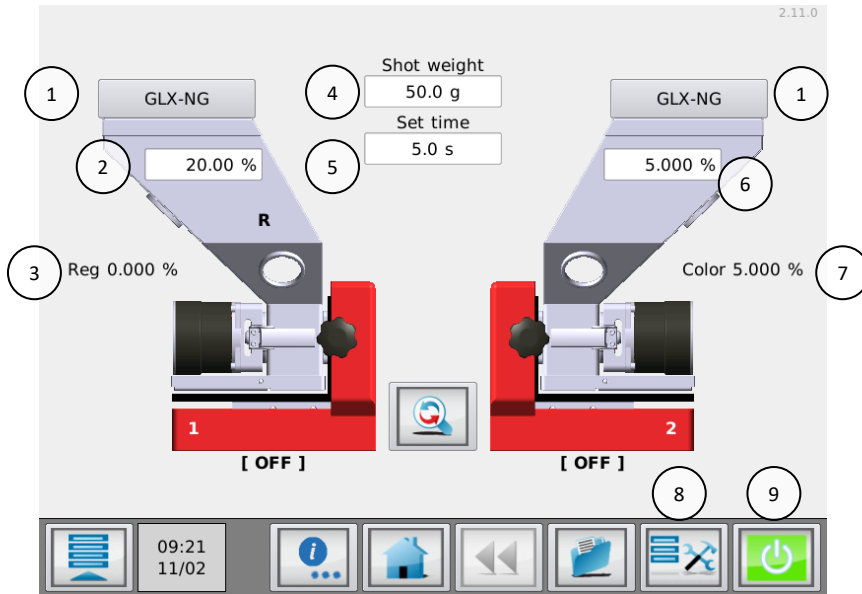
The regrind percentage setting can be calculated as follows:

$(\text{Sprue weight} / \text{shot weight}) * 100 = \text{Regrind percentage.}$

#### Injection molding - open loop regrind - 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




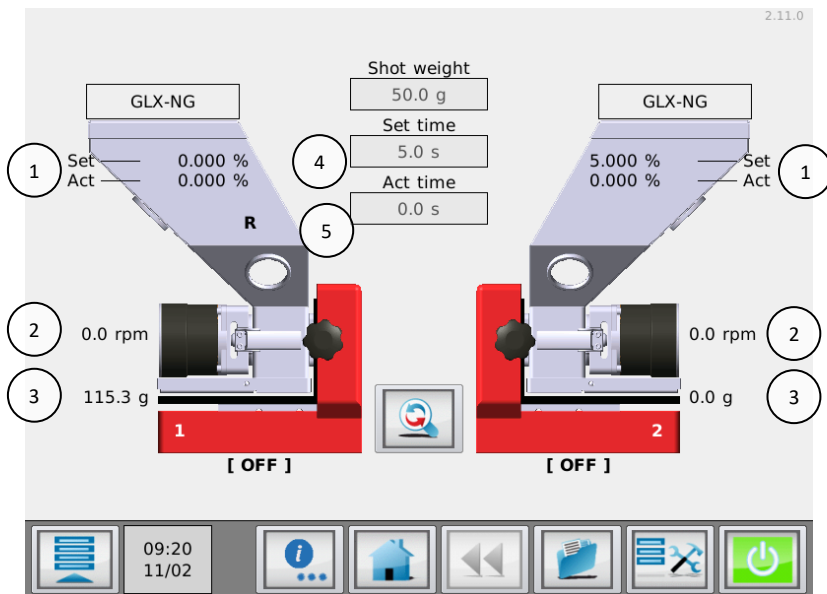
1. **Material:** Movacolor pre-programmed material (dosing tool/granule type), or USER defined material is displayed (not available when recipe function is activated).
2. **Nominal regrind amount (%)**
3. **Recalculated regrind amount (%)**
4. **Shot weight (gr.)**
5. **Dosing set time (sec.)** ⓘ Dosing set time only visible in Timer mode, otherwise relay time will be displayed
6. **Nominal color amount (%)**
7. **Recalculated color amount (%),** reduced by regrind amount
8. **Prime.** Filling the dosing cylinder before start.  
The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm to start priming.
9. **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 – open loop - gravimetric mode

### Actual production data:

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



- 1. Set and actual output:** Set.: Re-calculated output (% kg/h, gr/sec)  
Act.: Actual additive output ((%, gr/s or kg/h)  
① actual additive output is only visible after the first automatic RPM adjustment.
- 2. Speed:** Actual motor speed (RPM)
- 3. Hopper weight:** 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)

## 8 Multi component

### 8.1 MCTC multi component controller

The Movacolor touchscreen controller and modular design of the Movacolor components offers you an enormous flexibility in combining your dosing/measuring devices.

With this system it is possible to connect up to 15 different devices to one neckpiece and directly to your injection molding machine or extruder

With the MCTC it is possible to control and monitor the mixing ratio of these different components from one screen.

The group functionality enables you control and monitor the feeding of additives in co-extrusion co-injection setups from one touchscreen. Each group with its one start/tacho input signal and production parameters. Up to 15 groups can be configured easily.

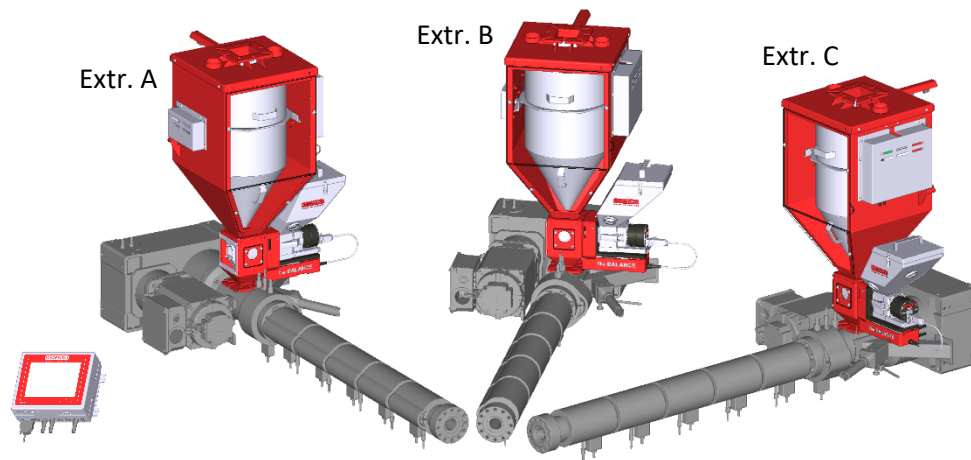


4 component system example

Component	Type	Material example
1	MCWeight 1200.	Main virgin material.
2	MCHigh Output G-500.	Regrind.
3	MCBalance with ME25 loading system.	Color additive.
4	MCBalance with SFG Support frame for external hopper loader.	Foaming additive.

## 8.2 Group structure

With the group structure it is possible to control/monitor the dosing systems of different co-injection molding or co-extrusion separately from one touchscreen controller.



3 group co-extrusion example

In this example co-extrusion of 3 extruders, each with a MCWeight 500 and one MCBalance. All controlled from one MCTC. This example is used in the next paragraph. The units are equipped with MC Blind Controllers (2 MCBC's per extruder, 6 in total)

### Software Group navigation





## Group configuration

Go to the advanced configuration menu:

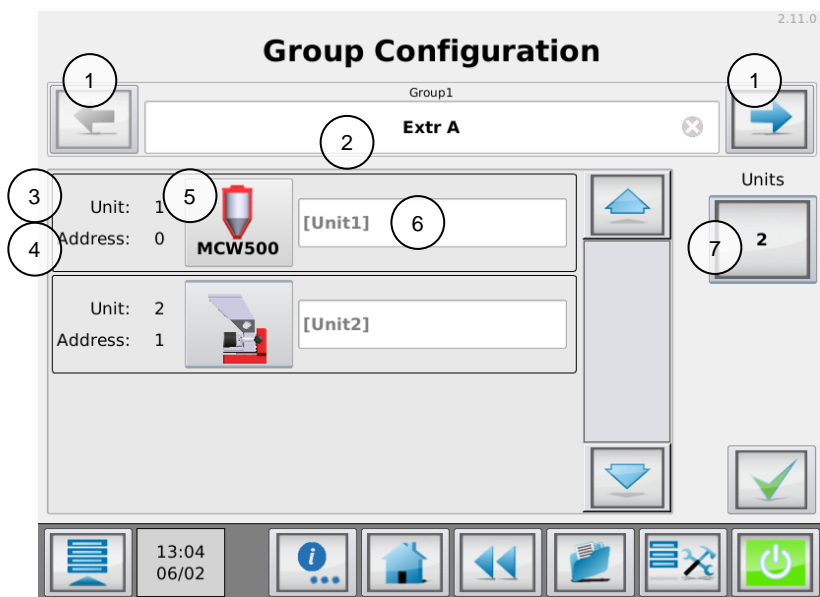


- Set the number of groups to 3;
- Configure the groups by clicking the group configuration button:



The Group configuration menu is shown. Here you can enter the number of units for each group, change the name of the group and select the type of devices used in the current selected group.

**Note:** When a MCNexus is used in a group, no other components than the MCNexus can be configured for this group.

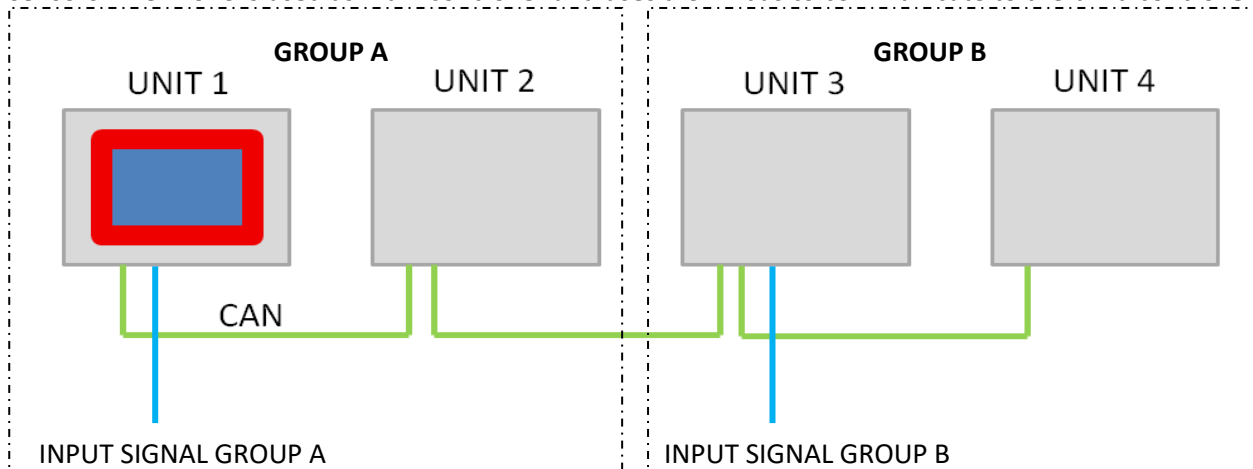


1	Group navigation buttons.
2	Group name.
3	Unit identifier.
4	CAN bus address (dipswitch setting).
5	Unit type.
6	Unit name.
7	Number of units in selected group.

The dipswitch setting of the blind controllers should correspond with the addresses shown in this window (See: Component controller addressing)

### 8.3 MCBC blind controller

For a multicomponent setup you need at least one MCTC touchscreen controller and one MCBC blind controller. For each additional unit you need an additional blind controller. This blind controller is a control box without display and touchscreen, and is used to connect to the unit load cell, stepper motor, valves and sensors. The MCTC is used as main controller and uses a CAN bus to communicate to the blind controllers.



For group configurations, the first controller in each group needs input signals from the (co)extruder / IMM.

ⓘ **WARNING:** make sure the input signals of different units are not connected to each other. This might cause damage to the controller.

#### 8.4 CAN bus connection

The MCTC and MCBC units communicate using a CAN BUS connection. When you order a multicomponent system at Movacolor it will be delivered pre-wired with the correct cabling. In case you need to make adjustments in the cabling, be aware to connect the CAN bus correctly. There can only be one MCTC touchscreen connected to the cable loop.



From previous unit

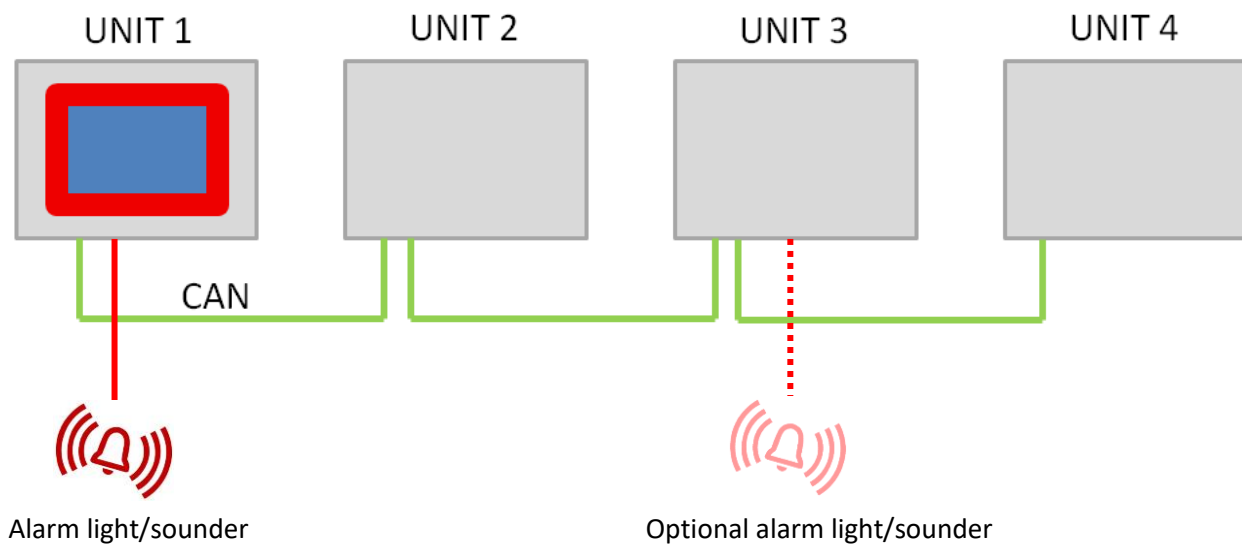
To next unit

Number	Wire color	Function
3	Cable shield	Shielding
4	Blue	CAN Low
5	White	CAN High

ⓘ Always use Movacolor selected CAN bus cable, use of wrong cabling can result in a defective system.

#### 8.5 Alarm/warning output

In a multicomponent configuration, all alarms are centralized to the first unit (MCTC UNIT 1). In case of an alarm on a blind controller unit X, the alarm output of unit 1 and the alarm output of unit X are activated.



## 8.6 Unit controller addressing

Each of the controllers is given a number/address. This is set with the internal dipswitches on the mainboard of the controller. To get access to the dipswitch, untighten the 4 hexagon screws on the side of the controller cabinet (do not completely remove the screw). Now you're able to slide open the cabinet and access the dipswitches.

Addressing is according to the next table

Unit	Address	Switch setting			
		1	2	3	4
Unit 1	0	OFF	OFF	OFF	OFF
Unit 2	1	<b>ON</b>	OFF	OFF	OFF
Unit 3	2	OFF	<b>ON</b>	OFF	OFF
Unit 4	3	<b>ON</b>	<b>ON</b>	OFF	OFF
Unit 5	4	OFF	OFF	<b>ON</b>	OFF
Unit 6	5	<b>ON</b>	OFF	<b>ON</b>	OFF
Unit 7	6	OFF	<b>ON</b>	<b>ON</b>	OFF
Unit 8	7	<b>ON</b>	<b>ON</b>	<b>ON</b>	OFF
Unit 9	8	OFF	OFF	OFF	<b>ON</b>
Unit 10	9	<b>ON</b>	OFF	OFF	<b>ON</b>
Unit 11	10	OFF	<b>ON</b>	OFF	<b>ON</b>
Unit 12	11	<b>ON</b>	<b>ON</b>	OFF	<b>ON</b>
Unit 13	12	OFF	OFF	<b>ON</b>	<b>ON</b>
Unit 14	13	<b>ON</b>	OFF	<b>ON</b>	<b>ON</b>
Unit 15	14	OFF	<b>ON</b>	<b>ON</b>	<b>ON</b>
Unit 16	15	<b>ON</b>	<b>ON</b>	<b>ON</b>	<b>ON</b>

Switch 5 and 6 should always be in the OFF position.

Switches 7 and 8 are used for CAN bus termination according to the CAN bus specification. These need to be switched ON at the **last unit** of the connected string.

Example:

A system with 5 units:

Unit 1



Unit 2



Unit 3



Unit 4



Unit 5



During operation each blind controller needs to be powered on. Even if the unit is not used (dosing percentage at 0%)

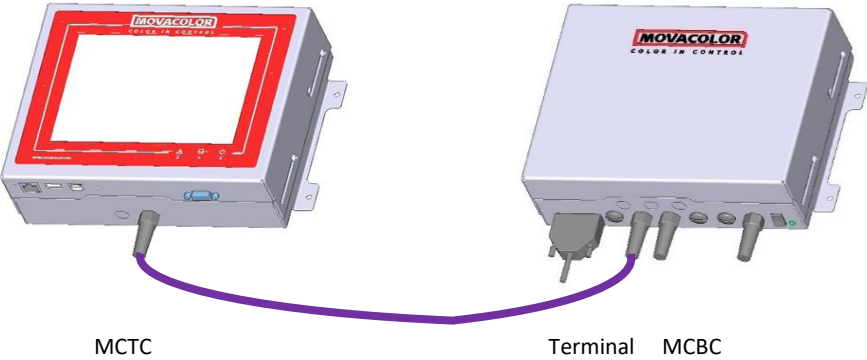
The multi-component setup needs only one input cable to supply the start and/or tacho signal to the system. This input cable needs to be connected to Unit 1

In a multi-group setup each first unit in a group needs an input cable to supply start and/or tacho signal.

8.7 MCTC remote setup

Movacolor recommends keeping the motor and load cell cables as short as possible to avoid interference which could cause an inaccurate measurement system. Therefore it is possible to place the MCTC touchscreen at a different place in your factory. This also useful when your machine (and touchscreen panel) is difficult to reach.

You can order at Movacolor a special modification kit to convert your MCTC controller into a “remote” version. Ask your Movacolor representative for detailed information.



Cable connection scheme:

MCTC TERMINAL		
P	Name	Color
1	Shield	Shield
2	GND	Black
3	+24VDC	Red
4	CAN-L	Blue
5	CAN-H	White

MCBC MAINBOARD		
P	Name	Color
1	GND	Black
2	+24VDC	Red
3	Shield	Shield
4	CAN-L	Blue
5	CAN-H	White



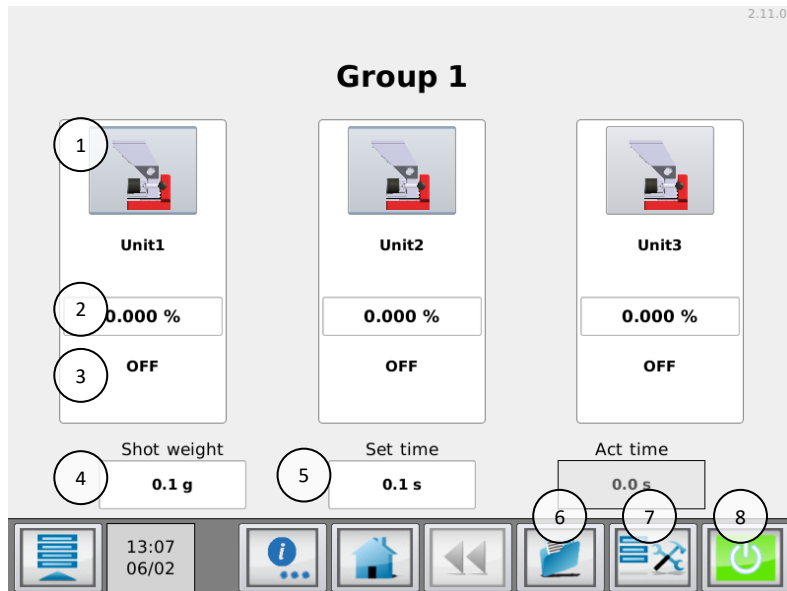
## 8.8 Multi component production

### 8.8.1 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. Unit button

To enter unit screen. Detailed production settings and parameters can be set and read

#### 2. Additive amount (%)

#### 3. Production status



#### 4. Total shot weight (gr.)

#### 5. Dosing set time (sec.)


ⓘ Dosing set time only visible in Timer mode, otherwise relay time will be displayed


#### 6. Recipe menu

#### 7. Prime. Filling the dosing cylinder before start.

The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm  to start priming. Each unit must be primed separately, select the unit to prime before pressing the prime button.

#### 8. 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 units are waiting for an input signal. If the units are dosing the Start LED lights continuously.

For stopping production press  again. The motor on/off switch will turn to green again.

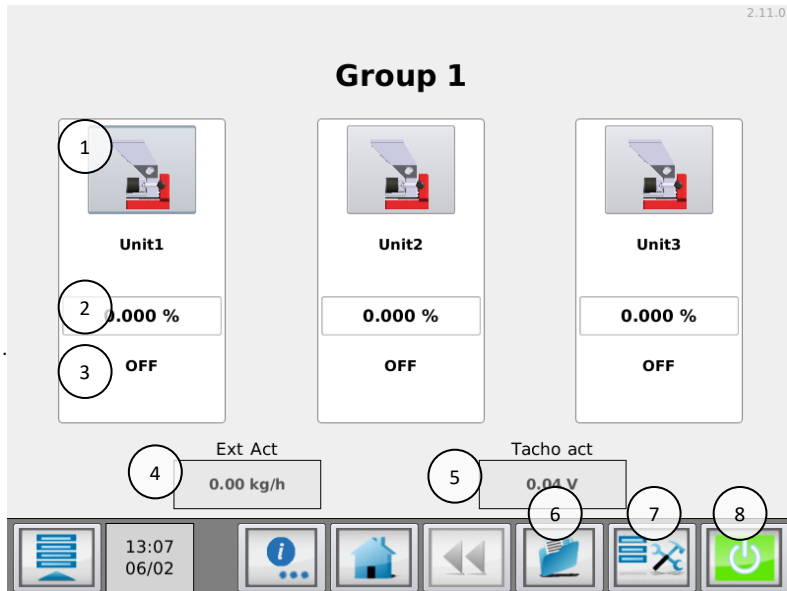
ⓘ Please note that it is possible that the first dosing(s) are not sufficient, because of the cylinder filling with material. It takes some time to stabilize.

## 8.8.2 Extrusion - gravimetric mode - tacho

### 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. Unit button

To enter unit screen. Detailed production settings and parameters can be set and read

#### 2. Additive amount set point (%) (dosing % can be set from this screen)



#### 3. Production status

#### 4. Actual extruder throughput (kg/h.) ⓘ Only visible in tacho mode or with MCWeight.


#### 5. Actual tacho voltage ⓘ Only visible in tacho mode.


#### 6. Recipe menu

#### 7. Prime. Filling the dosing cylinder before start.

The prime menu appears by pressing  Settings (speed/time) can be changed. Press confirm  to start priming. Each unit must be primed separately, select the unit to prime before pressing the prime button.

#### 8. 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 units are waiting for an input signal. If the units are dosing the start LED lights continuously.

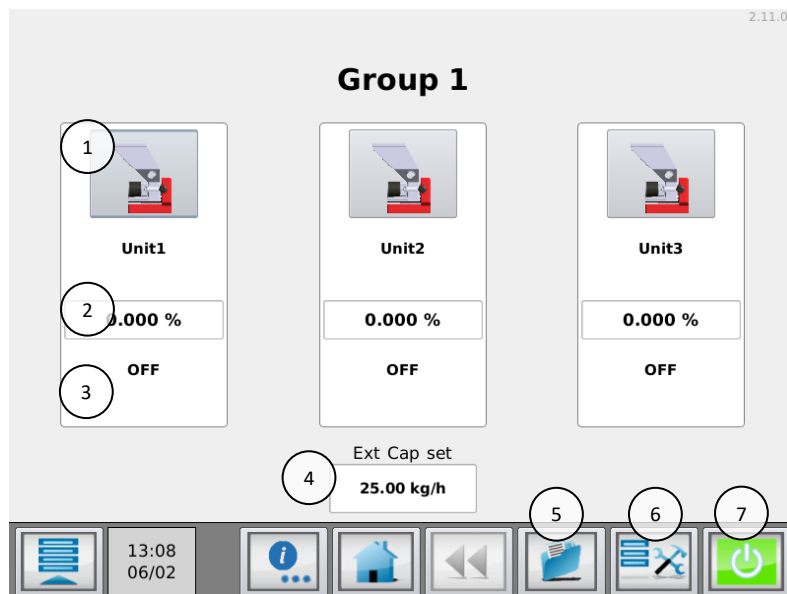
For stopping production press  again. The motor on/off switch will turn to green again.





ⓘ 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.


### 8.8.3 Extrusion - gravimetric mode - relay

#### 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. **Unit button:** To enter unit screen. Detailed production settings and parameters can be set and read
2. **Additive amount set point (%)** (dosing % can be set from this screen)
3. **Production status**
4. **Extruder throughput set point(kg/h.)**
5. **Recipe menu**
6. **Prime:** Filling the dosing cylinder before start.  
The prime menu appears by pressing . Settings (speed/time) can be changed. Press confirm  to start priming. Each unit must be primed separately, select the unit to prime before pressing the prime button.
7. **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 units are waiting for an input signal. If the units are 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.

## 9 Outputs

### 9.1 MCBalance, MCPowder, MCHigh Output, MCLiquid

For the location of the output connections, see Electrical connections

#### Alarm / Warning Output

Connection **27** and **28**.

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

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

Free programmable events can be programmed to an **Alarm** or **Warning**. See chapter: Events. For alarm light connection in multicomponent systems see paragraph: Alarm/warning output in the Multicomponent sector.

#### Valve Output

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

#### Alarm Output (OUT-1)

Normally open contact, connection **32** and **33**.

Normally closed contact, connection **32** and **34**.

**Alarm event:** this output is activated, the systems stops running.

#### Run Output (OUT-2)

Normally open contact, connection **35** and **36**.

The "RUN signal" can be used as a Start/Stop condition for the molding machine.

For example: Molding 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)

Production status = STANDBY or DOSING → output **35** and **36** is CLOSED.

Production status = OFF → output **35** and **36** is OPEN.

❗ 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)

Normally open contact, connection **41** and **42**.

Function of OUT-3 depends on loader configuration.

Loader	Function	Action
ME	No action	No Action
MV	No action (can be used for 3 <sup>rd</sup> party loader)	41 – 42 output <u>CLOSED</u> during fill time
EX	No action	No Action
3PH	Activation of blower loading sequence	41 – 42 output <u>CLOSED</u> during filling
MFD	Activation of compressed air filter cleaning	41 – 42 output <u>CLOSED</u> during blowback time



## 9.2 MCHybrid

For the location of the output connections, see Electrical connections

### **Mixer valve (OUT-10)**

Connection **25** and **26**.

In case a MCHybrid is used OFFLINE, on top of a storage bin. It is required to use a material valve underneath the MCHybrid to guarantee a right mixture. This valve can be connected to this output. See MCHybrid configuration for enabling this function.

Mixer full and mixing finished: this output is on (24V).

**Alarm / Warning Output (OUT-13):** Connection **29** and **30**.

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

**Soft Alarm event:** this output is on (24V), the MCHybrid system is in PAUSE.

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

Free programmable events can be programmed to an **Alarm**, **SoftAlarm** or **Warning**. See chapter: Events - Configuration for configuring events. For alarm light connection in multicomponent systems see chapter: Multicomponent – Alarm/warning output.

### **Alarm Output (OUT-13)**

Normally open contact, connection **34** and **35**

**Alarm event:** this output is activated, the systems stops running.

### **Run Output (OUT-14)**

Normally open contact, connection **36** and **37**

The “RUN signal” can be used as a Start/Stop condition for the molding machine.

For example: Molding 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 Running or Ready)

Production status = STANDBY or DOSING → output **36** and **37** are CLOSED.

Production status = OFF → output **36** and **37** are OPEN.

❗ In case of alarm, the alarm output (OUT-13) is switched (on) and the system is stopped. This also switches output OUT-14 (off).

## 10 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 hopper assembly is fixed tightly to the weighing platform and that the neckpiece is fixed tightly to the production machine.
3. Check if the dosing tool is tightly fixed to the motor shaft.
4. Excessive build-up of material on the dosing tool may have impact on proper dosing.  
To avoid this, be sure that the seals and dosing cylinder are clean.
5. Check if there is no tension on the cables connected to the weighing platform.
6. Use the weight check function with the reference weight to determine the correct function of the weighing system.
7. If the weight check gives the correct result, check if the material flow into the dosing tool has been blocked.
8. Another cause may be an obstruction to the weighing system. Check if there is at least  $\approx 1\text{mm}$  space between all the pointed safety screws and the load cell frame or platform and that there is no material or dirt blocking the movement.
9. 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.
10. Check if the input signal is stable.
11. 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 Set point. See chapter: 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 load cell 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.

**Problem:** USB copy function does not work properly.

**Possible causes:**

1. Some brands of USB memory sticks are not correctly detected by the MCTC. Please try another brand of USB memory stick.
2. The USB memory stick is not properly formatted, be sure the USB memory stick is formatted FAT32.
3. If the USB menu can be opened without USB memory stick, please press “Remove USB stick” and insert USB memory stick again.

## APPENDIX A: MCTC Technical Specifications

### Controls:

Input:	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.
Security:	3 user levels with automatic logout
Loader system:	Integrated hopper loader controller
Recipes:	Up to 1000 materials and up to 1000 recipes can be stored.

### Monitoring/System Information/External communication

External Communication:	PC link using TCP/IP internet protocol Modbus TCP/IP Optional: Profibus DP slave, Profinet slave, Analog output
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:	(1,8degr/step) max 2A or 4A(high output) at 48 Volt.
Operating Temperature:	-20 to +70 degrees Celsius.
Load cell and electronics:	20 bits A/D resolution with a full digital filtering
Battery:	Used for date/time. Lifetime without mains power approx. 5 years. Type: CR2354

### 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 48VDC
- -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.

### Optional parts

External Alarm Flash light.  
External Alarm Siren.  
Profibus DP slave module  
Profinet module  
Analog output module

### MCBalance

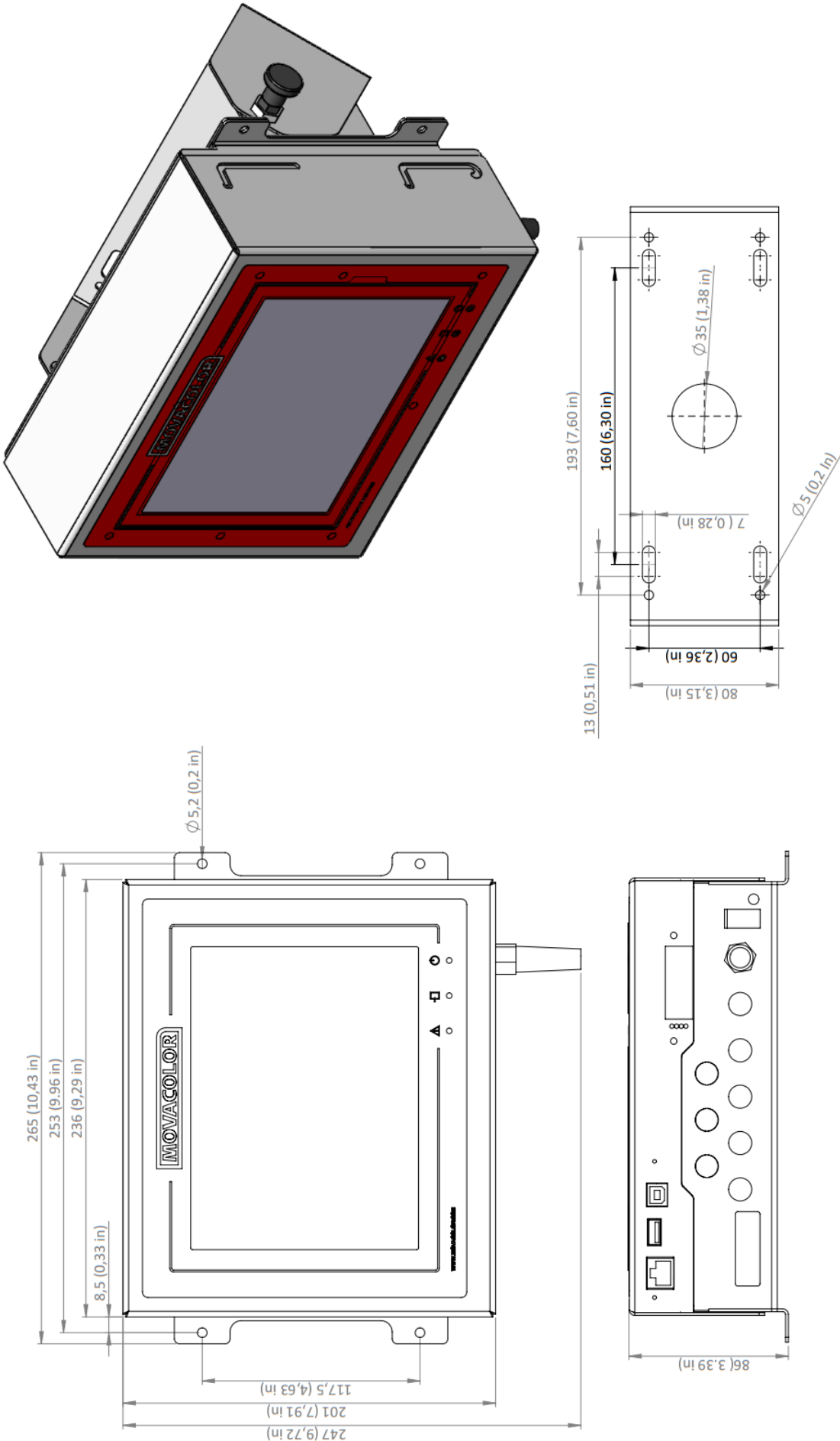
#### Machine connection flange:

Standard flange NSt40-neckpiece with cleaning opening.  
Inlet/outlet ø50mm/□40mm, steel epoxy coated RAL 3002

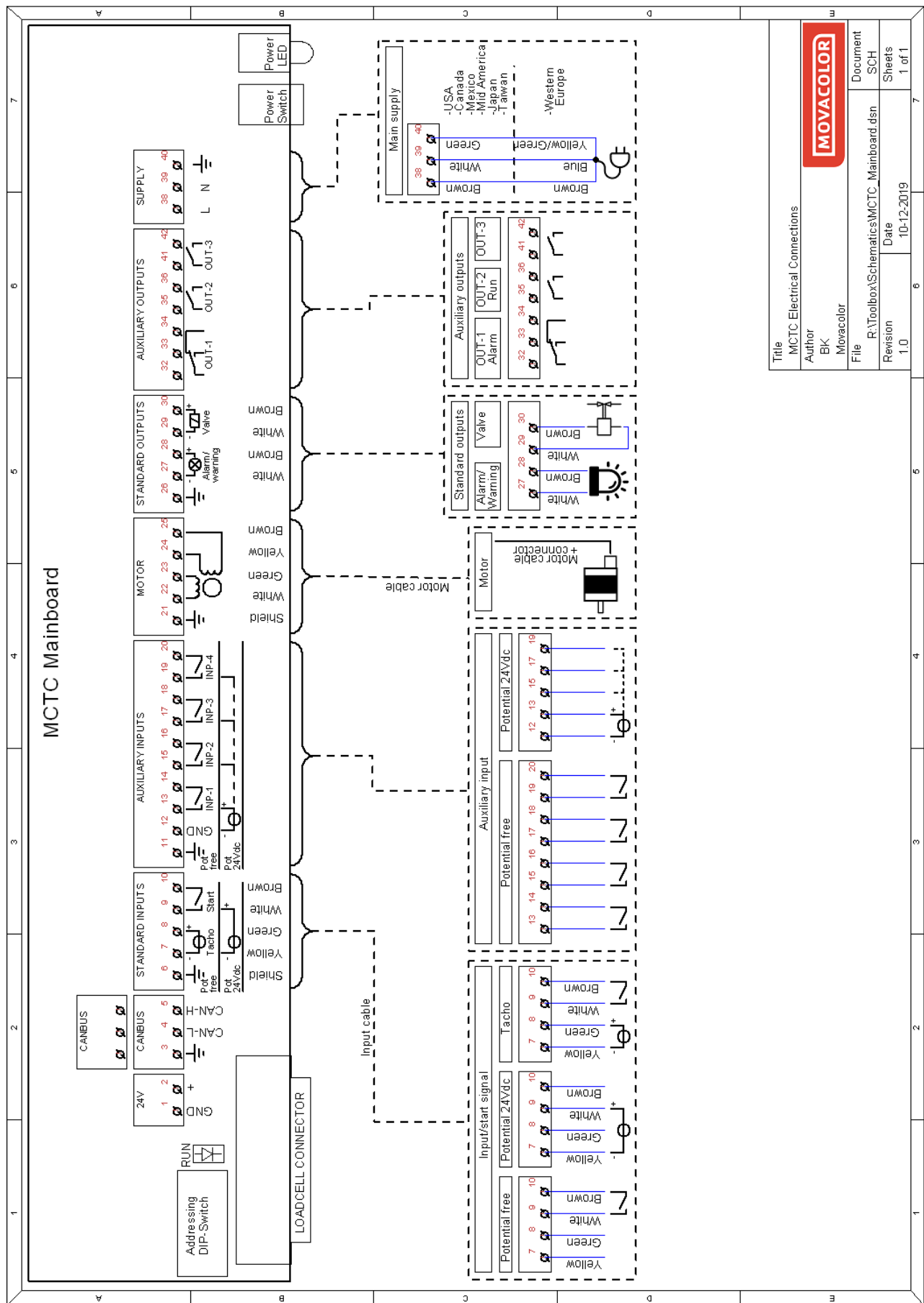
#### Load frame:

- - Balance frame: Steel, epoxy coated RAL 3002
- - Weighing frame: Aluminum, epoxy coated RAL 9005
- - Load cell: Nominal Load: 20 or 50 kg.  
Temp. compensated  
Temp. range: -20...+60 gr. Celsius  
Protection level: IP63 EN60529

APPENDIX B: MCTC Dimensional drawing



APPENDIX C: Standard electrical connections



## APPENDIX D: 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  
www.movacolor.com

**Declare under our sole responsibility that the product:**

Product description : Dosing equipment

Product designation : MCTC, MCBC

In combination with : MCBalance, MCHighOutput, MCWeight, MCLiquid,  
MCPowder, MCHybrid, MCNexus, MCNumera

Year : 2021

Identification : From serial number 27500 onwards

- **The object of the declaration described above is in conformity with the relevant Union harmonization legislation;**

Machine Directive	2006/42/EC
EMC Directive	2014/30/EU
RoHS	2011/65/EU

- **The following harmonized standards and technical specifications have been applied:**

EN 60204-1	Safety of machinery - Electrical equipment of machines. Part 1: General requirements
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements

**Name:** Gerhard Dersjant **Place:** Sneek the Netherlands

**Position:** Managing Director **Date:** February 2021

**Signature:**



