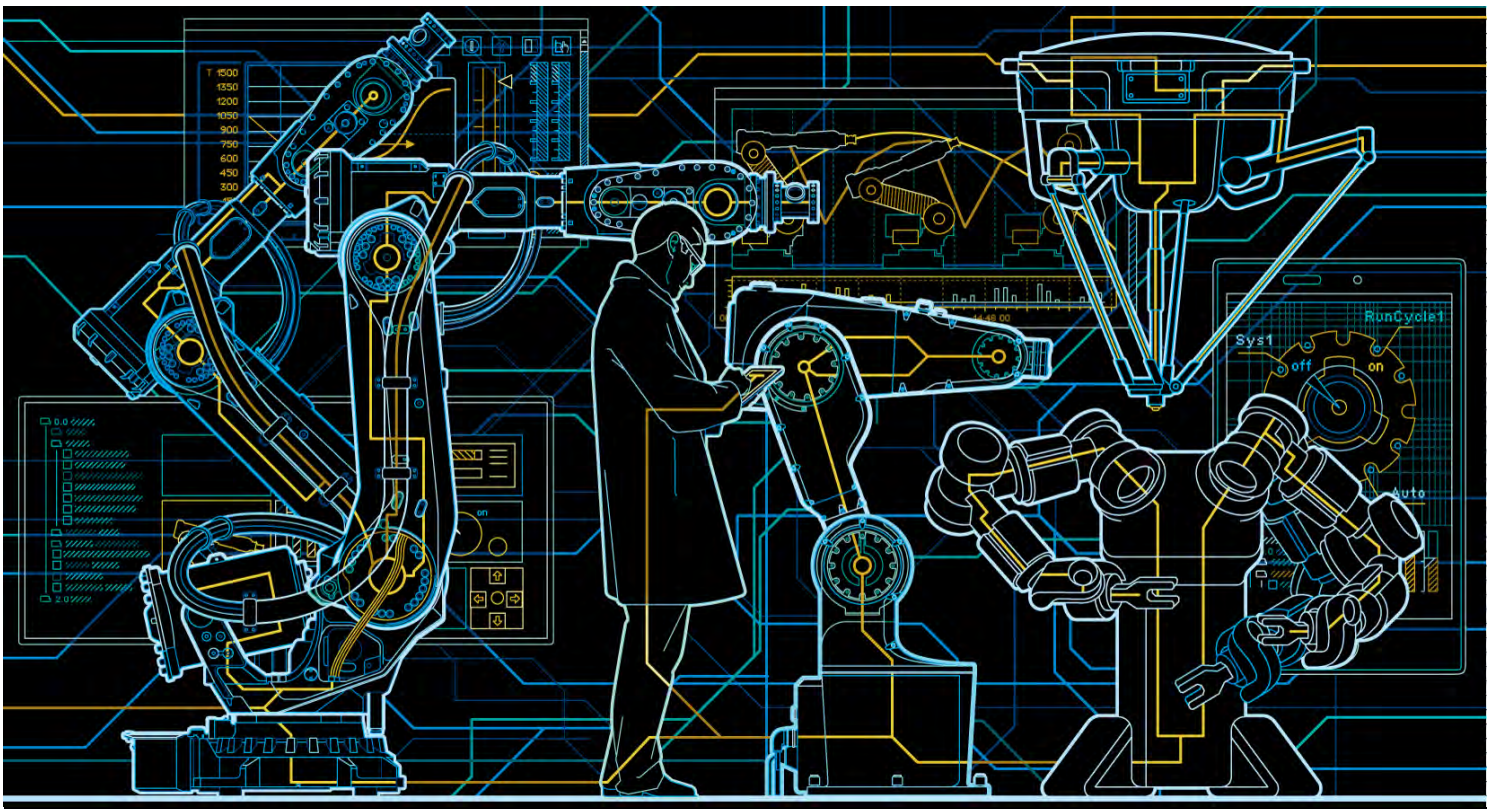


Application manual
Programming Integrated Power Source

Power and productivity
for a better world™

Trace back information:
Workspace R16-2 version a5
Checked in 2016-09-08
Skribenta version 4.6.318

Application manual

Programming Integrated Power Source

RobotWare 6.04

Document ID: 3HAC050972-001

Revision: A

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damages to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

Additional copies of this manual may be obtained from ABB.

The original language for this publication is English. Any other languages that are supplied have been translated from English.

ABB AB
Robotics Products
Se-721 68 Västerås
Sweden

Table of contents

Overview of this manual

About this manual

This manual contains information on how to:

- Create and edit schedules.
- Create user defined synergic lines.
- Read service information and execute service functions.
- Backup and restore SID files.

Usage

This manual is intended to be used for:

- Programming
- Maintenance

Who should read this manual?

This manual is intended for:

- Robot programmers
- Maintenance personnel

Basic knowledge

Readers of this manual must be:

- Familiar with industrial robots and the relevant terminology
- Familiar with RAPID programming language
- Familiar with system parameters and how to configure them.

Reference documents

References	Document ID
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Technical reference manual - System parameters	*3HAC050948-001*
Application manual - Arc and Arc Sensor	*3HAC050988-001*
ESAB user manual	

Revisions

Revision	Comment
-	First revision.
A	Released with RobotWare 6.04 • Updated FlexPendant screen shots. • Minor corrections.

This page is intentionally left blank

1 Safety

1.1 Safety

Safety of personnel

A robot is heavy and extremely powerful regardless of its speed. A pause or long stop in movement can be followed by a fast hazardous movement. Even if a pattern of movement is predicted, a change in operation can be triggered by an external signal resulting in an unexpected movement.

Therefore, it is important that all safety regulations are followed when entering safeguarded space.

Safety regulations

Before beginning work with the robot, make sure you are familiar with the safety regulations described in the manual *Operating manual - General safety information*.

1.2 Safety for arc welding

Safety instructions for arc welding

Safety instructions can be found in the manual *Introduction and Safety - Arc Welding Products* for all steps that involve risk of personal injury or material damage. In addition, they are included in the instructions for each step.

General warnings, where the intention is to avoid problems, are only included in the instructions.

WARNING

All personnel working with the welding robot system must have a full understanding of the applicable safety instructions.

1.3 Safety signals in the manual

Introduction to safety signals

This section specifies all dangers that can arise when doing the work described in the user manuals. Each danger consists of:

- A caption specifying the danger level (DANGER, WARNING, or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel **do not** eliminate the danger.
- Instruction about how to eliminate danger to simplify doing the work.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Significance
 xx0200000022	DANGER	Warns that an accident *will* occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, and so on.
 xx0100000002	WARNING	Warns that an accident *may* occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0200000024	ELECTRICAL SHOCK	Warns for electrical hazards which could result in severe personal injury or death.
 xx0100000003	CAUTION	Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0200000023	ELECTROSTATIC DISCHARGE (ESD)	Warns for electrostatic hazards which could result in severe damage to the product.

Continues on next page

1.3 Safety signals in the manual
Continued

Symbol	Designation	Significance
 xx0100000004	NOTE	Describes important facts and conditions.
 xx0100000098	TIP	Describes where to find additional information or how to do an operation in an easier way.

1.4 DANGER - Make sure that the main power has been switched off!

Description

Working with high voltage is potentially lethal. Persons subjected to high voltage may suffer cardiac arrest, burn injuries, or other severe injuries. To avoid these dangers, do not proceed working before eliminating the danger as detailed below.

1.5 WARNING - The unit is sensitive to ESD!

Description

ESD (electrostatic discharge) is the transfer of electrical static charge between two bodies at different potentials, either through direct contact or through an induced electrical field. When handling parts or their containers, personnel not grounded may potentially transfer high static charges. This discharge may destroy sensitive electronics.

Elimination

	Action	Note
1	Use a wrist strap.	Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.
2	Use an ESD protective floor mat.	The mat must be grounded through a current-limiting resistor.
3	Use a dissipative table mat.	The mat should provide a controlled discharge of static voltages and must be grounded.

Location of wrist strap button

The location of the wrist strap button is shown in the following illustration.

2 Integrated Power Source applications

2.1 Overview

General

Integrated Power Source is an administrative interface for power sources in FlexPendant.

The following power sources are compatible with the Integrated Power Source:

- Arcitec IRC5
- MigRob 500
- AristoMig 500 Integrated

2.2 Start the Integrated Power Source

How to start the Integrated Power Source tool:

	Action	Info/Illustration
1	Tap the ABB menu.	
2	Tap Integrated Power Source. The program starts.	 xx1400001756
3	Once the program has been loaded, a desktop is displayed with a number of icons. The power source functions can be accessed from here. • Tap on the shutdown button (top right corner) to close Integrated Power Source.	 xx1400001757

2.3 Active arc welding system

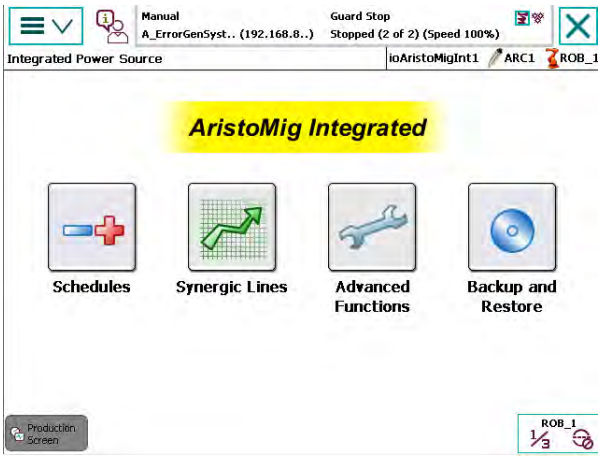
Introduction

The selection of the arc welding system determines which equipment is active when manual operations - i.e. Gas On, Manual Wire feed, Editing schedules - are executed.

See *Application manual - Arc and Arc Sensor* on how to change active arc welding system.

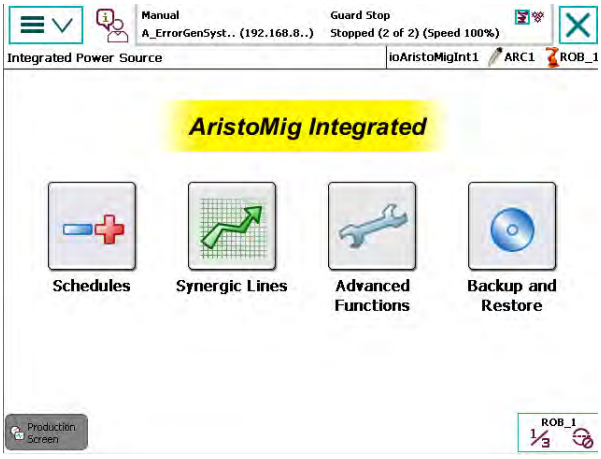
Active power source information

The I/O unit name of the active power source, the name of the active arc welding system and the robot associated with that system, are indicated in the top right.



xx1400001758

The arc welding system *System 1* associated with robot `ROB_1` is active. The power source `B_AW_PROC_40` is configured in that system.



xx1400001758

A	The robot associated with the active arc welding system, e.g ROB_1
B	The name of the active arc welding system, e.g System 1
C	The I/O unit name of the active power source, e.g B_AW_PROC_40

Continues on next page

Note

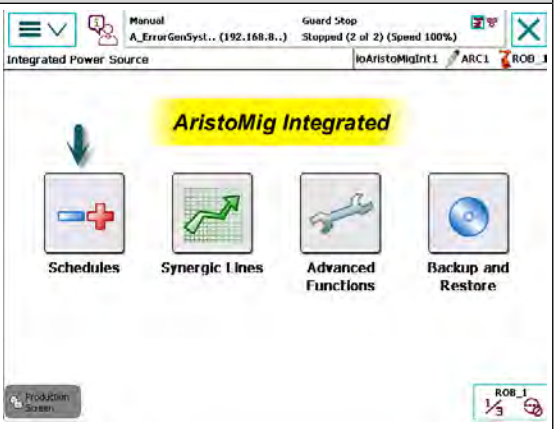
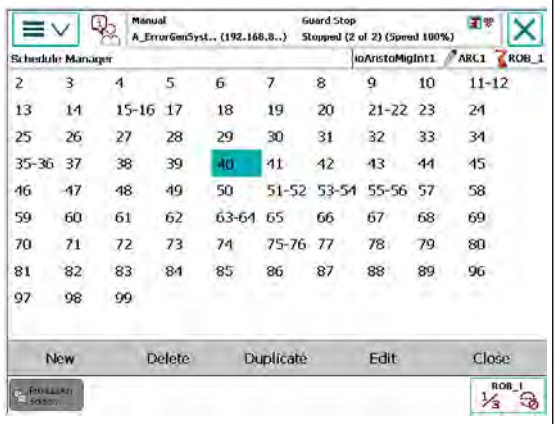
When the active arc welding system or active robot is changed, the Integrated Power Source reverts to desktop mode. If active power source is not compatible with Integrated Power Source or that the power source is unconnected, the Integrated Power Source desktop icons will be grayed out.

3 Integrated Power Source application details

3.1 Schedule management

3.1.1 Open schedule window

Open schedule window

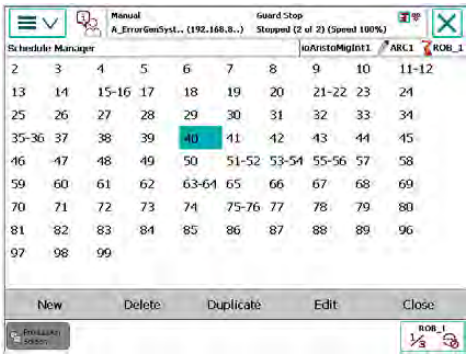
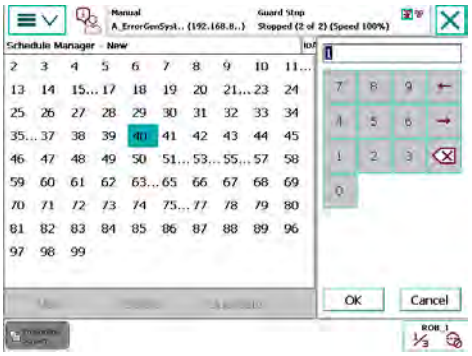
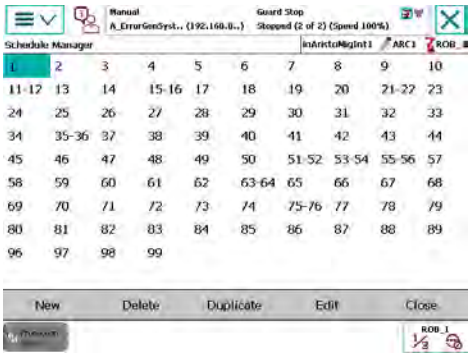
	Action	Info/Illustration
1	Tap **Schedules** in the start window to open the schedule window.	 xx1400001759
2	All schedules stored in the power source are listed.	 xx1400001760

Tip

A schedule with the Super pulse mode activated is followed by a plus character. This schedule occupies two schedule memory positions. E.g if schedule 1 has the Super pulse mode enabled, it is not possible to store a schedule with the number 2.

3.1.2 Create a schedule

Create a schedule

	Action	Info/Illustration
1	In the Schedule window, tap **New**.	 xx1400001760
2	A numerical keypad is displayed. You can add a new schedule number in two different ways: • Use the number suggested by the system. • Enter the new schedule number using the numeric keys.	 xx1400001761
3	Tap **OK** to create a new schedule.	
4	Tap **Cancel** to cancel creating a new schedule.	
5	The schedule window is updating. The created schedule is highlighted.	 xx1400001762

Tip

The content of the new schedule is identical to the most recently activated schedule in the power source. See *Copy a schedule on page 22*.

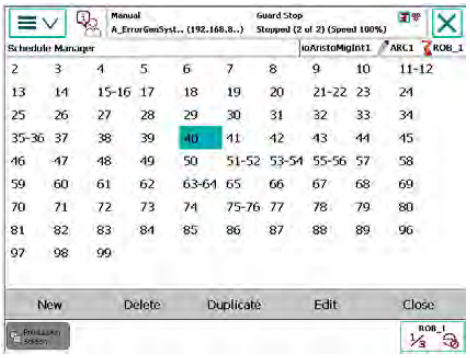
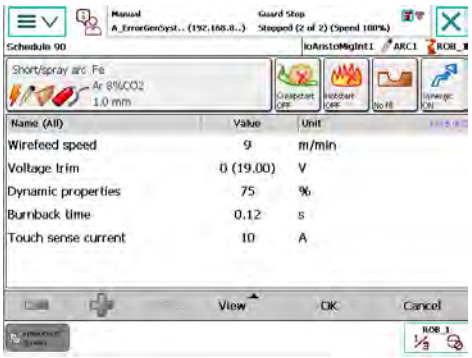
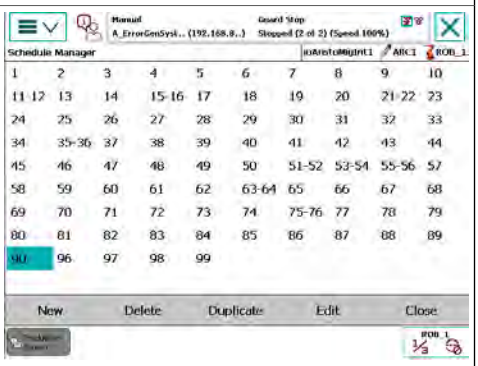
Continues on next page

Note

A new schedule never has Super pulse activated, regardless of what the last activated schedule had.

3.1.3 Copy a schedule

Instructions

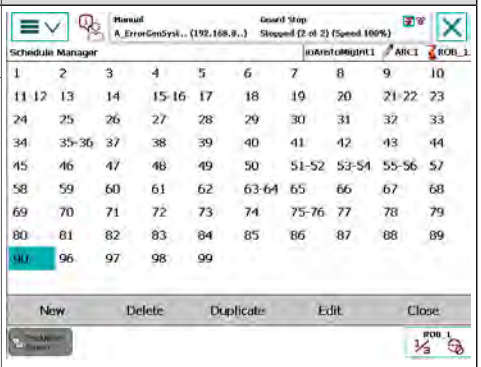
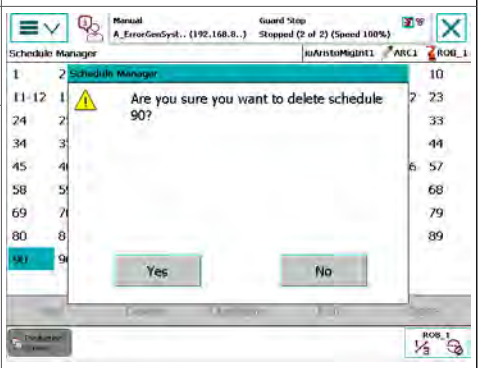
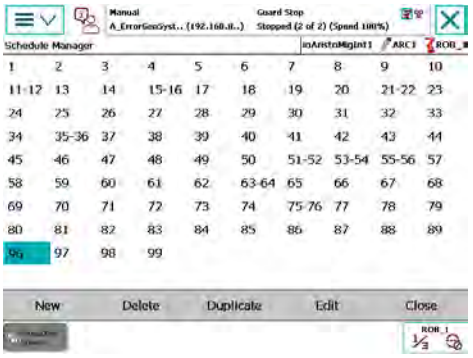
	Action	Info/Illustration
1	In the Schedule window, tap to select the schedule to be copied.	 xx1400001760
2	Tap **Duplicate**.	
3	A numerical keypad is displayed. • Use the schedule number suggested by the system. • Enter the new schedule number using the numeric keys.	 xx1400001763
4	Tap **OK** to copy the schedule number.	
5	Tap **Cancel** to abort the copying.	
6	The schedule window is updating. The created schedule is highlighted.	 xx1400001764

Tip

A schedule with Super pulse can only be copied to an odd schedule number between 1 and 95.

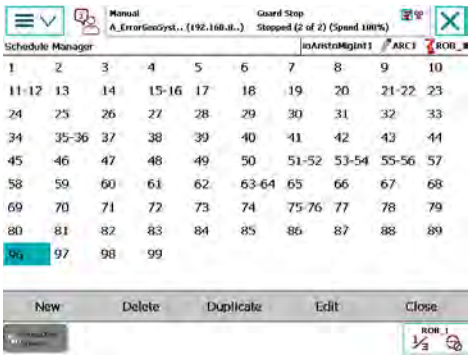
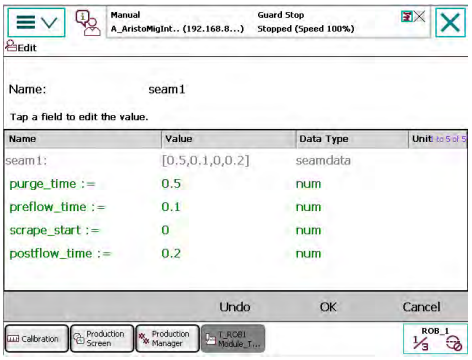
3.1.4 Delete a schedule

Instructions

	Action	Info/Illustration
1	In the schedule window, select the schedule.	 xx1400001764
2	Tap **Delete**.	
3	A dialog box appears to confirm deletion of the selected schedule. • Tap **Yes** to delete the schedule.	 xx1400001765
4	Tap **No** to abort the deletion.	
5	The schedule window is updated.	 xx1400001766

3.1.5 Viewing schedule components

Instructions

	Action	Info/Illustration
1	In the schedule window, select the schedule.	 xx1400001766
2	Tap **Edit**.	
3	A schedule window containing the components of the schedule is displayed. There are two different groups of schedule components: • Non-numeric schedule components • Numeric schedule components	 xx1400001767

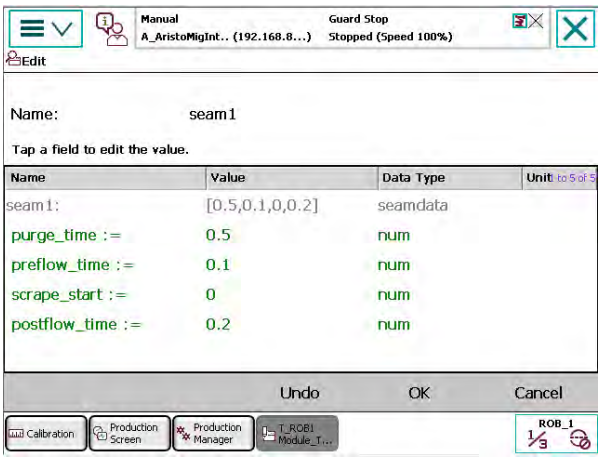
Note

Make a practice of always tapping the **Cancel** button if you are only interested in viewing a schedule and not making unintentional changes.

Continues on next page

Non-numeric schedule components

Non numeric schedule components consists of:



xx1400001767

1.	Mode (switch between primary and secondary schedule for Super pulse)
2.	Method
3.	Material
4.	Gas
5.	Wire size
6.	Creepstart
7.	Hotstart
8.	Craterfill
9.	Synergic

Tip

It is possible to configure whether creepstart and hotstart are to be visible in the schedule editor. See *Advanced functions on page 37*.

Numeric schedule components

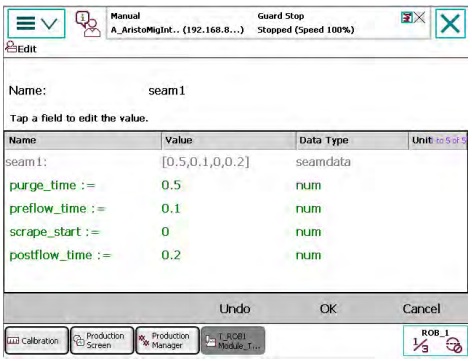
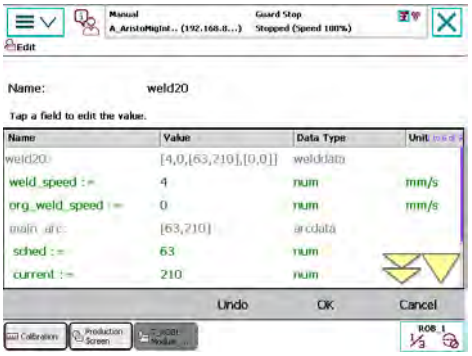
The numeric schedule components used in a schedule are displayed.

Continues on next page

3.1.5 Viewing schedule components
Continued

In addition the user may choose to display only a subset of the components, by selecting a different view.

Changing the view

	Action	Info/Illustration
1	Tap **View**.	 xx1400001767
2	Select a new category.	 xx1400001768

Tip

These categories and the schedule components included in each category are configurable. See *Advanced functions on page 37*.

Note

If there are no categories for view management, the **View** button will be greyed out and all numeric schedule components available in the schedule will be displayed.

3.1.6 Editing schedule components

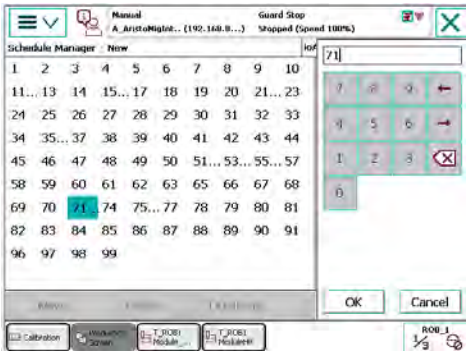
Introduction

Starting from a schedule window as described in *Viewing schedule components on page 24*.

An arbitrary number of components can be changed in the open schedule before closing the schedule window.

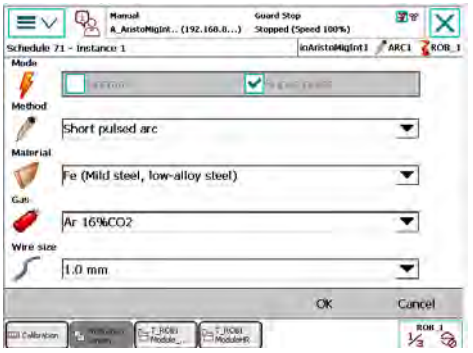
Activating Super pulse

Proceed as follows:

	Action	Info/Illustration
1	Activate Super pulse by selecting Super pulse. Select the normal box to use a normal schedule.	 xx1400001769

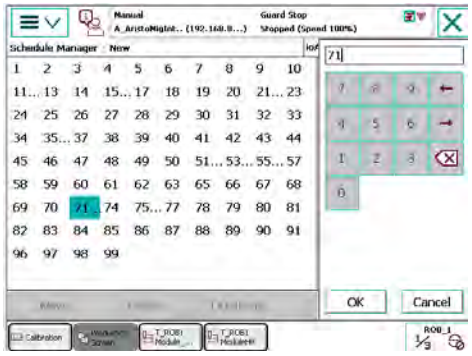
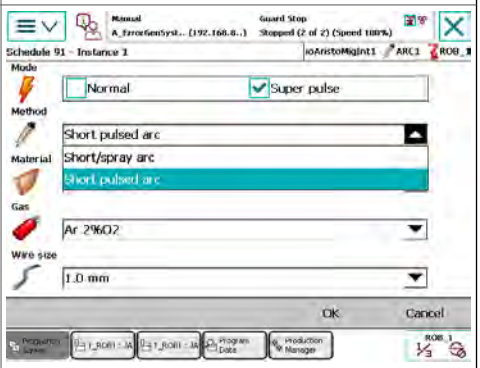
Changing method, material, gas and wire dimension

Proceed as follows to make a change:

	Action	Info/Illustration
1	Tap the button displayed in the image.	 xx1400001770

Continues on next page

3.1.6 Editing schedule components
Continued

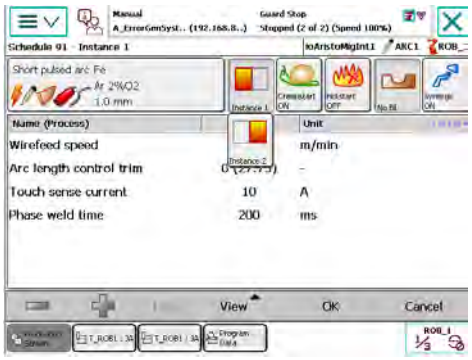
	Action	Info/Illustration
2	A new window is displayed.	 xx1400001769
3	Select method, material, gas and wire size.	
4	To confirm that the changes you have made are to be provisionally saved: tap **OK**.	 xx1400001771

Switch between schedule instances in Super pulse mode

Note

Only applicable to MigRob500 and AristoMig 500 Integrated or similar.

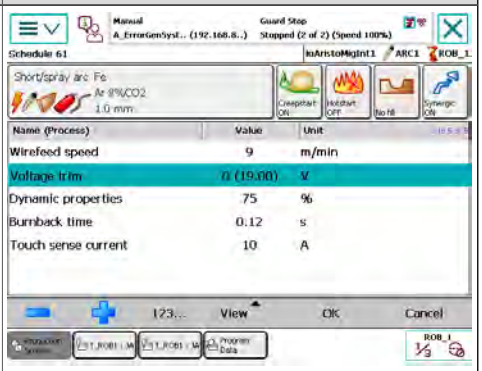
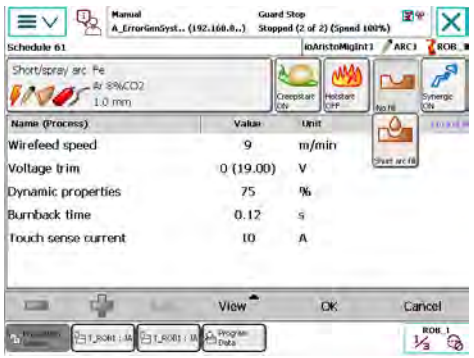
Proceed as follows:

	Action	Info/Illustration
1	Tap the button to switch between start and end schedule.	 xx1400001772
2	Select which schedule is to be shown.	
3	The numeric schedule components are updated.	

Continues on next page

Changing crepstart, hotstart, craterfill and synergic

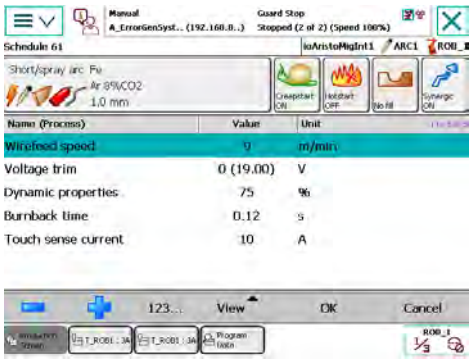
Proceed as follows to make a change:

	Action	Info/Illustration
1	Tap on the schedule component that you want to change.	 xx1400001773
2	The button drops down a list of options. • Tap on the option that you want to change to.	
3	If you do not want to change the selection, click the top button in the list.	 xx1400001774

Note

Depending on the options set, the value of the numeric schedule components can be changed, and also the number of schedule components in the list.

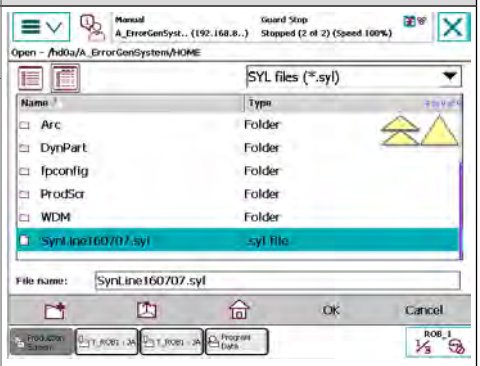
Adjusting the value of a numeric schedule component

	Action	Info/Illustration
1	Select the schedule component that you want to change.	 xx1400001775
2	Tap the plus or minus button to change the value of the selected schedule component.	

Continues on next page

3.1.6 Editing schedule components
Continued

Editing numeric schedule components

	Action	Info/Illustration
1	Select the schedule component that you want to change.	 xx1400001776
2	Tap the **123...** button to open a numerical keypad.	
3	Permitted limit values are shown in the numerical keypad.	 xx1400001777
4	Change the value by entering it in the numerical keypad.	
5	Tap **OK** to set the value.	
6	Tap **Cancel** to cancel.	

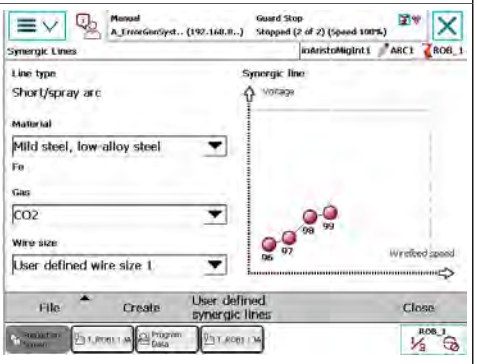
Note

When a new value is given using numerical input, the value may sometimes be adjusted automatically. The value is rounded off to the nearest valid value.

3.2 Manage user defined synergic lines

3.2.1 Open the window for management of user defined synergic lines

Instructions

	Action	Info/Illustration
1	Tap on the Synergic Lines icon to open the window for management of user defined synergic lines.	
2	The window for management of user defined synergic lines is displayed. From here, you can: • Create a user defined synergic line. • Display all user defined synergic lines. • Delete user defined synergic lines. • Open and save user defined synergic lines.	 xx1400001779

3.2.2 Create a user defined synergic line

Instructions

Start with defining working points for your synergic line. These working points are created from the schedule management window.

See *Schedule management on page 19*.

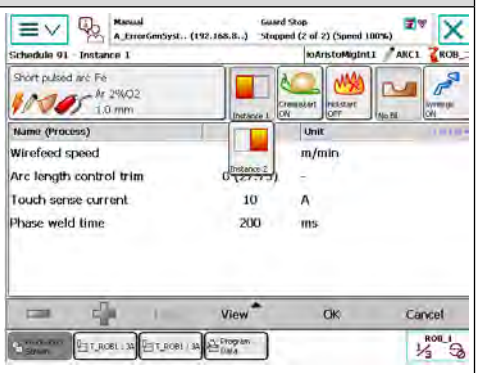
The working points must be stored in schedule 96-99.

Note

See *Synergic data values – a programming aid on page 54*.

The number of working points used is determined by the method:

- For short arc or spray arc, four (4) working points are required (schedule 96-99).
- For short pulse, two (2) working points are required (schedule 96-97).

	Action	Info/Illustration
1	Start from the window for management of user defined synergic lines. Tap the **Create** button.	 xx1400001772
2	A new synergic line is created in the power source.	

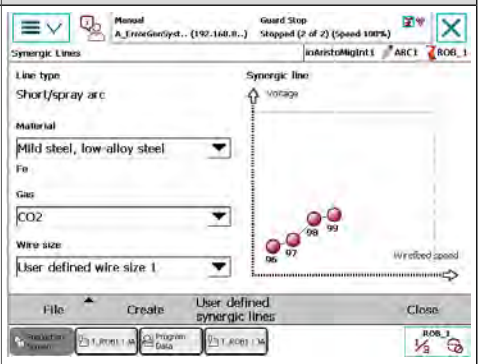
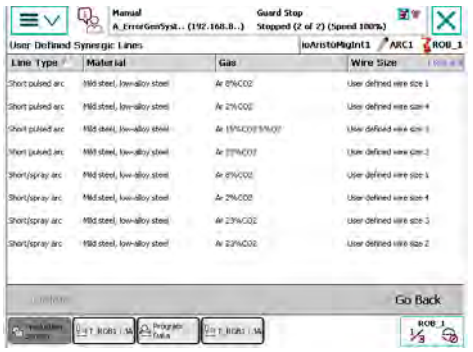
There are also restrictions in the welding parameters, depending on method selected:

Short arc or Spray arc	
Voltage	96 < 97 < 98 < 99
Wire feed speed	96 < 97 < 98 < 99
Regulator type	96 = 97 = 98 = 99

Short pulsed arc	
Arc length	96 < 97
Wire feed speed	96 < 97
Pulse current	96 < 97
Slope	96 = 97
Ka	96 = 97
Ki	96 = 97

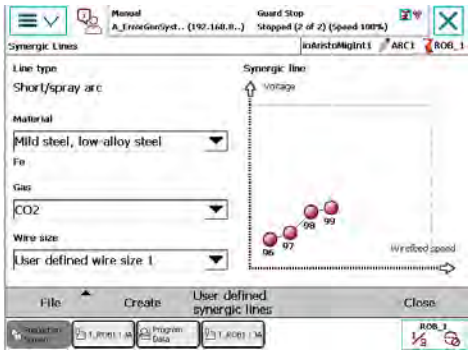
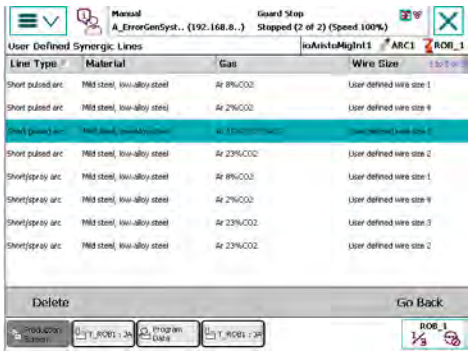
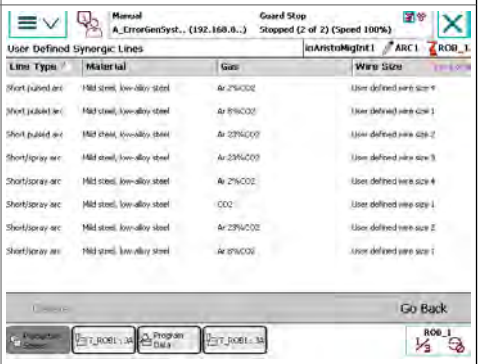
3.2.3 Display all user defined synergic lines

Instructions

	Action	Info/Illustration
1	Start from the window for management of user defined synergic lines. • Tap **User defined synergic lines**.	 xx1400001779
2	All user defined synergic lines are displayed in a list in a new window.	 xx1400001780

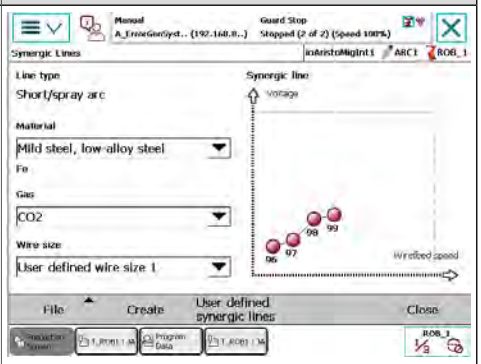
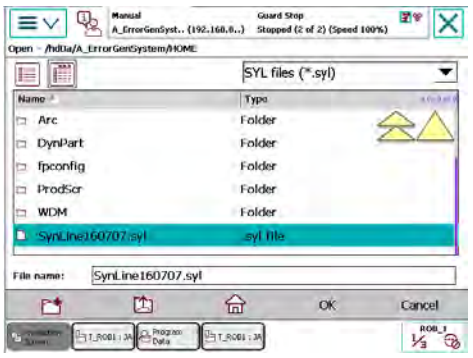
3.2.4 Delete a user defined synergic line

Instructions

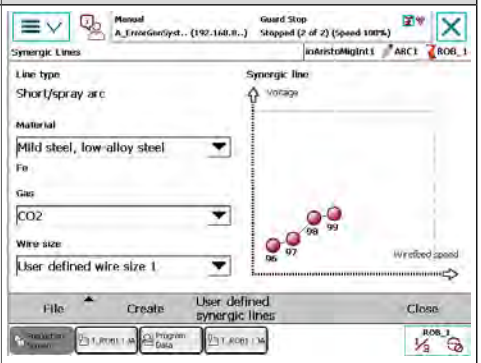
	Action	Info/Illustration
1	Start from the window for management of user defined synergic lines. • Tap **User defined synergic lines**.	 xx1400001779
2	All user defined synergic lines are displayed in a list in a new window. • Select the synergic line to be deleted	 xx1400001781
3	Tap **Delete**.	
4	The user defined synergic line is deleted.	 xx1400001782

3.2.5 Open and save a user defined synergic line

Opening

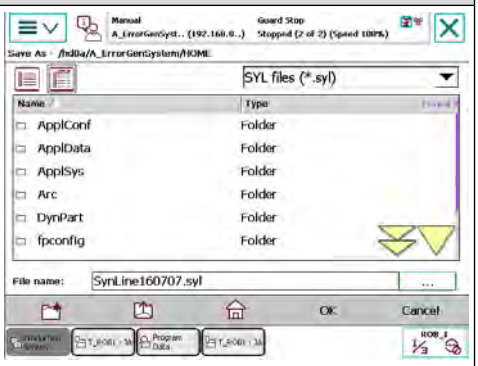
	Action	Info/Illustration
1	Start from the window for management of user defined synergic lines. • Tap on the **File** menu. • Select the **Open** option.	 xx1400001779
2	Select a file.	 xx1400001783
3	Tap **OK** to open the file.	
4	Tap **Cancel** to abort and return to the Synergic Lines window.	

Saving

	Action	Info/Illustration
1	Start from the window for management of user defined synergic lines. • Tap the **File** menu. • Tap **Save**.	 xx1400001779

Continues on next page

3.2.5 Open and save a user defined synergic line
Continued

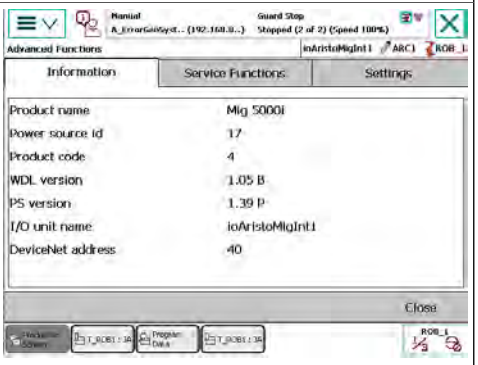
	Action	Info/Illustration
2	A file name is suggested	 xx1400001784
3	If you want to change the filename, tap **ABC....**	
4	Tap **OK** to save the file.	
5	Tap **Cancel** to return to the synergic lines window without saving the file.	

3.3 Advanced functions

3.3.1 Open advanced functions window

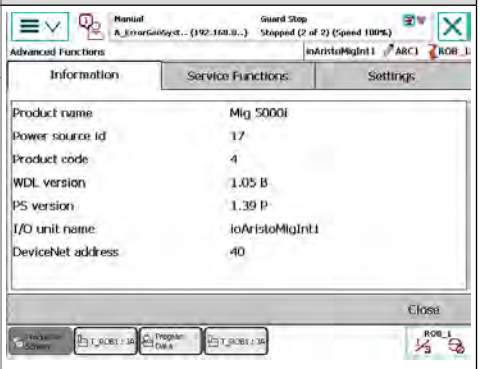
Instructions

To open advanced functions for the power source:

	Action	Info/Illustration
1	Tap on the **Advanced functions** icon to open the Advanced functions window for the power source.	 xx1400001759
2	The window for advanced functions includes the following functions: • Service Information, e.g. version, DeviceNet address, etc. • Service functions, e.g. reset, change of DeviceNet address. • Settings, i.e. customizing the user interface.	 xx1400001785

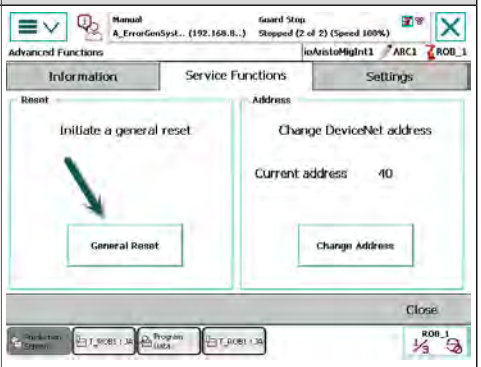
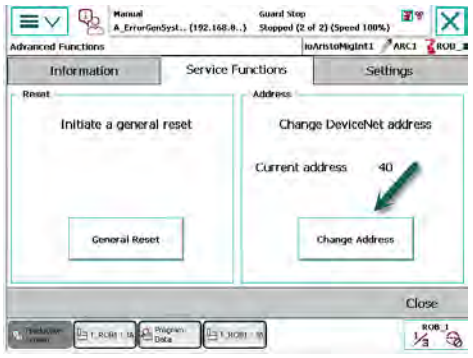
3.3.2 Service information

Instructions

	Action	Info/Illustration
1	In the Advanced functions window, click the **Information** tab.	 xx1400001785
2	The following service information is displayed: • Product name • Power Source id • Product code • Weld data unit software version • Power source software version NOTE! Only applicable to MigRob500 and AristoMig 500 Integrated or similar. • IO unit name • DeviceNet address	

3.3.3 Service functions

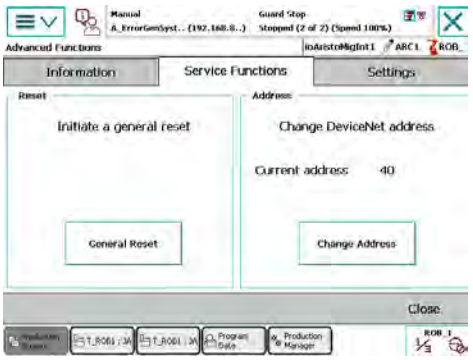
General reset

	Action	Info/Illustration
1	In the **Service** functions window, tap **General reset**.	 xx1400001786
2	Tap **Yes** to confirm resetting of the power source.	 xx1400001787
3	Tap **No** to abort resetting of the power source.	

Note

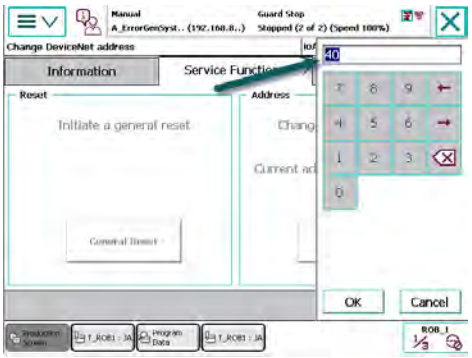
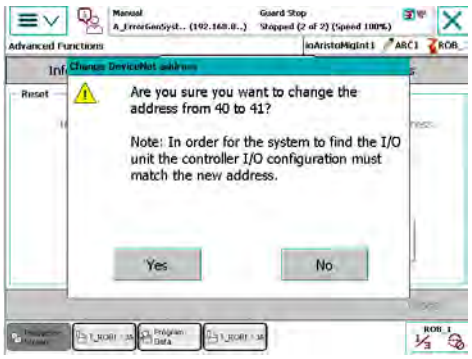
When the power source is reset, the schedule memory is cleared and all user defined synergic lines are deleted!

Changing the DeviceNet address

	Action	Info/Illustration
1	In the **Service** functions window, tap **Change address**.	 xx1400001788

Continues on next page

3.3.3 Service functions
Continued

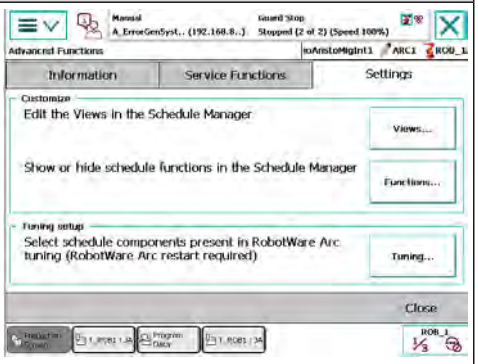
	Action	Info/Illustration
2	Enter the new address in the number field that appears.	 xx1400001789
3	Tap **OK** to continue with the address change.	
4	Tap **Cancel** to abort the address change.	
5	Tap **Yes** to confirm the address change on the power source.	 xx1400001790
6	Tap **No** to abort the address change on the power source.	

Note

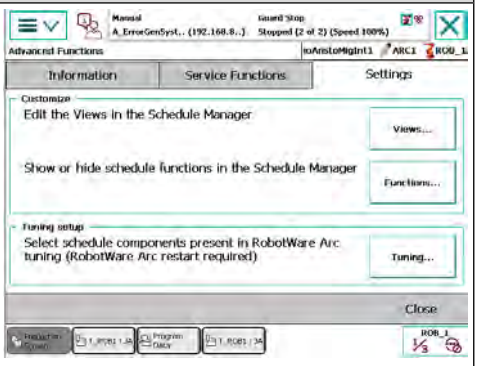
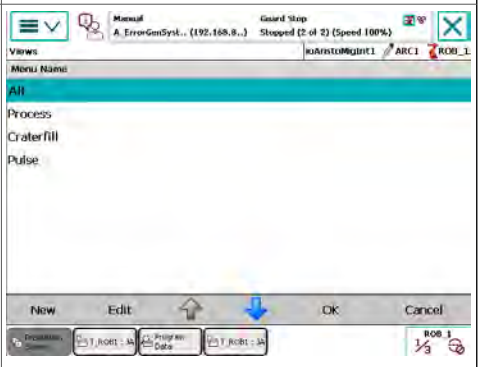
Once the address has been changed, the robot system immediately loses contact with the power source. To enable the robot system to find the power source that has changed address, the I/O configuration in the robot system must be changed.

3.3.4 Settings

Instructions

	Action	Info/Illustration
1	In the Advanced functions window, tap the **Settings** tab.	 xx1400001791
2	You can configure the user interface for the schedule editor here: • Configuring Views. • Hiding/showing certain nonnumeric schedule components (Advanced). • Selecting which schedule components are to be used for on-line tuning in RobotWare Arc (Tuning).	

Customizing views

	Action	Info/Illustration
1	In the **Settings** tab, tap **Views**.	 xx1400001791
2	A new window opens showing all existing views.	 xx1400001792

Continues on next page

3.3.4 Settings
Continued

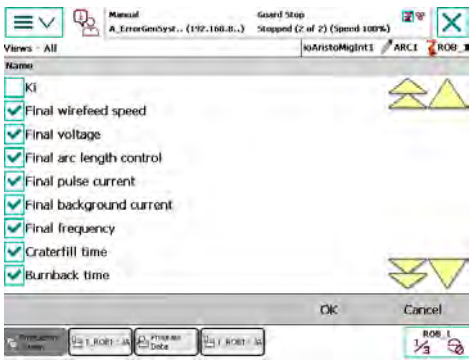
Creating views

	Action	Info/Illustration
1	In the **Settings** tab, tap **New** to add a new view.	 xx1400001792
2	A new window opens. • Enter the name of the view.	 xx1400001793
3	Tap **OK** to save the view.	
4	Tap **Cancel** to cancel creating a new view.	

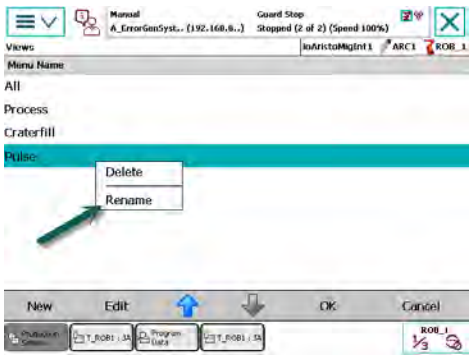
Editing views

	Action	Info/Illustration
1	In the **Settings** tab, select the name of the view.	 xx1400001794
2	Tap **Edit**.	

Continues on next page

	Action	Info/Illustration
3	A new window opens showing the names of all possible schedule components. • Select the schedule components to be included in the view by checking the box beside each schedule component name.	
4	Tap **OK** to save the changes to the view.	
5	Tap **Cancel** to cancel all changes.	

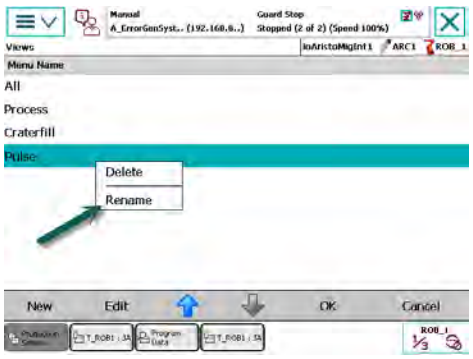
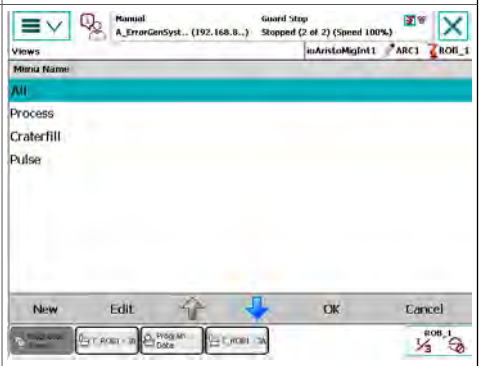
Changing the name of a views

	Action	Info/Illustration
1	In the **Settings** tab, tap and hold on the name of an existing view.	 xx1400001796
2	Select **Rename**.	
3	Enter a new name for the view.	 xx1400001797
4	Tap **OK** to change the name of the view.	
5	Tap **Cancel** to keep the previous name.	

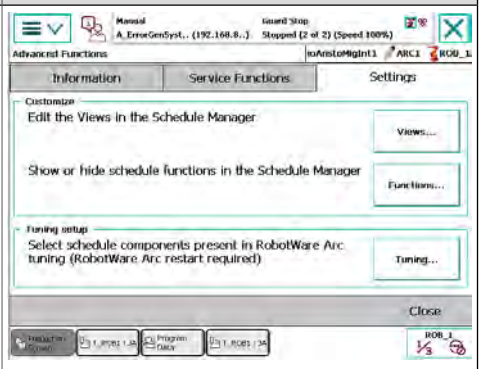
Continues on next page

3.3.4 Settings
Continued

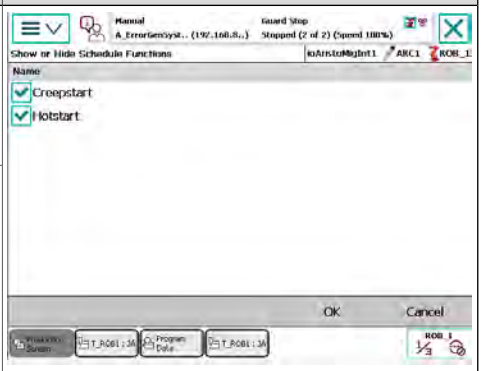
Deleting views

	Action	Info/Illustration
1	In the **Settings** tab, tap and hold the view name.	 xx1400001796
2	Select **Delete**.	
3	The view is deleted.	 xx1400001798

Hiding/showing non-numeric schedule components

	Action	Info/Illustration
1	In the **Settings** tab, tap **Advanced**.	 xx1400001791

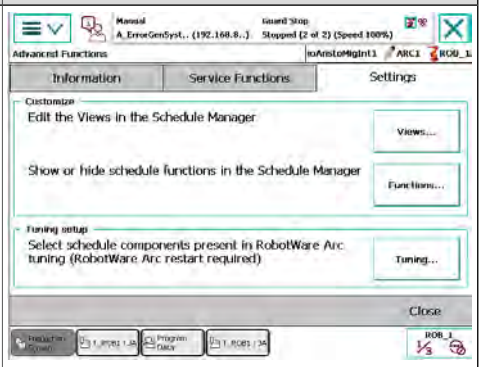
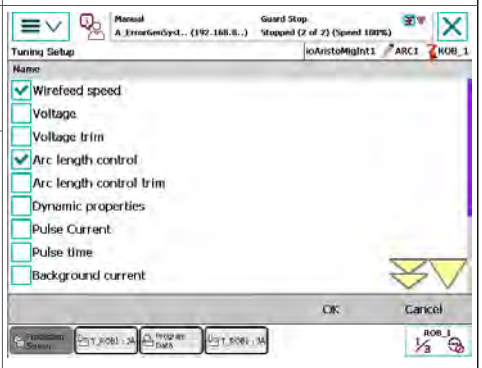
Continues on next page

	Action	Info/Illustration
2	A new window opens showing the configurable non-numeric schedule components. If the box beside the name of the schedule component is selected, the component is visible.	 xx1400001799
3	If the box beside the name of the schedule component is not selected, the component is hidden in the schedule editor.	

Note

If a non-numeric schedule component is hidden, the value of that component will always be set to **OFF** when creating or saving schedules from the **Schedule Management** window.

Changing numeric schedule components for on-line tuning

	Action	Info/Illustration
1	In the **Settings** tab, tap **Tuning**.	 xx1400001791
2	A new window is displayed showing all numeric schedule components that can be configured to be used for on-line tuning in Robotware Arc.	 xx1400001800
3	If the check box beside the schedule component is selected, the component has been selected for online tuning.	

Continues on next page

3.3.4 Settings
Continued

Note

If selected schedule components for on-line tuning have been changed, Robotware Arc must be restarted in order for the changes to take effect.

No power source tuning is allowed when controller is in AUTO mode. The power source tuning components will be hidden in RobotWare Arc tuning window.

3.4 Backup and restore schedules

3.4.1 Open backup and restore window

Instruction

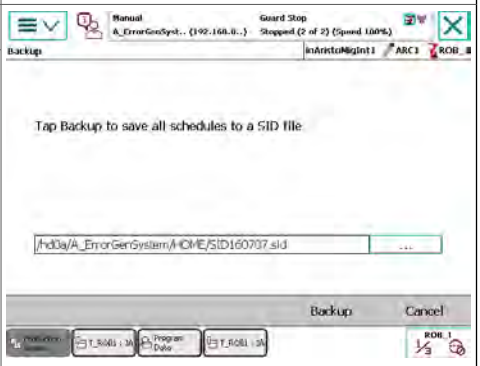
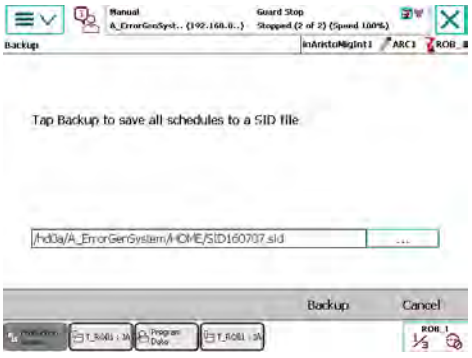
	Action	Info/Illustration
1	Tap **Backup and restore**.	
2	In this window you can select to: Back up the schedule memory. Restore the schedule memory.	 xx1400001827

Note

The only file format supported is SID (*.sid).

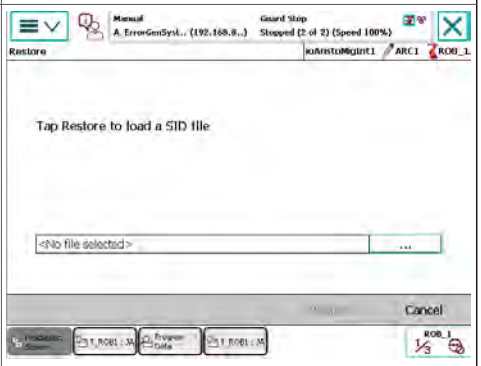
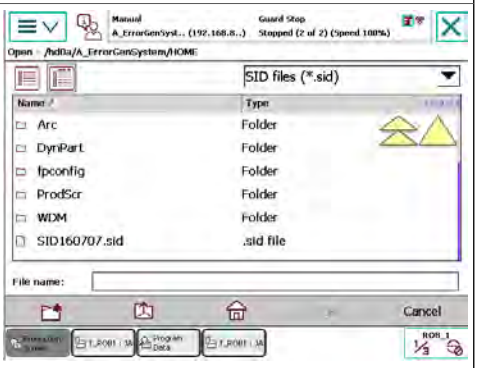
3.4.2 Backup schedules

Instructions

	Action	Info/Illustration
1	Tap **Backup SID file.**	 xx1400001827
2	A default file name is suggested.	 xx1400001801
3	If you want to change search path and file name: Tap the **...** button to change the file name.	
4	Tap **Backup** to save the SID file.	 xx1400001801
5	Tap **Cancel** to cancel the backup.	

3.4.3 Restore schedules

Instructions

	Action	Info/Illustration
1	Tap **Restore SID file.**	 xx1400001827
2	Tap the **...** button to select a file.	 xx1400001802
3	A new window opens where a file can be selected. • Select the file to be opened.	 xx1400001803
4	Tap **OK** to continue.	
5	Tap **Cancel** to cancel.	

Continues on next page

3.4.3 Restore schedules

Continued

	Action	Info/Illustration
6	Tap **Restore**. The SID file will be loaded into the power source.	 xx1400001804

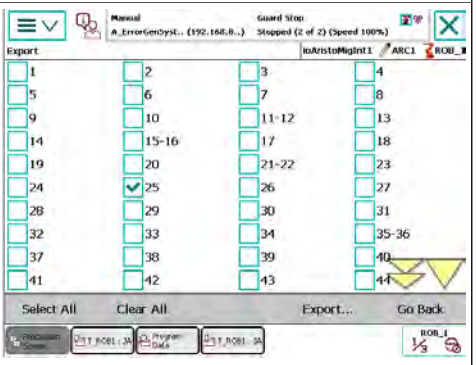
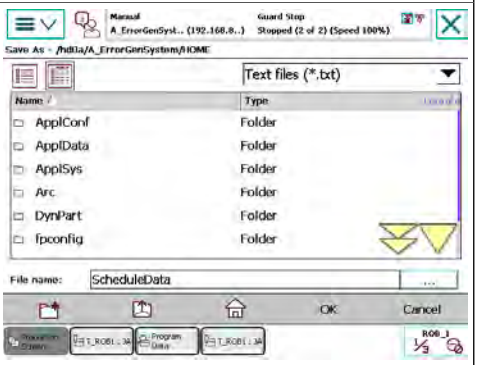
Note

All existing schedules will be deleted and replaced with the schedules stored in the SID file.

3.5 Exporting schedule components

Instructions

Exports all schedule components in one or more schedules to readable form. The exported file may be imported into any word processor or spreadsheet.

	Action	Info/Illustration
1	In the **Backup and Restore** window, tap **Export Schedules**.	 xx1400001805
2	Select the schedules to export.	 xx1400001806
3	Tap **Export**.	
4	Save as a text file (*.txt) or a commaseparated file (*.csv).	 xx1400001807

3.6 Viewing measured welding data

3.6.1 Measured welding data

General

When an arc welding program is executing the Integrated Power Source window showing voltage, current and heat input of process in active arc welding system.

The voltage and current are measured and returned by the power source. These values are accurate values.

The heat input is calculated from the power and the current welding speed. This value should only be seen as an estimation of the real heat input.

Note

The calculated heat input applies under ideal conditions.

4 Programming schedules

4.1 Overview

4.1.1 About schedules

Introduction

A welding schedule is a set of data that is given a task equivalent to RAPID data type. The schedule contains components that control the power source. The schedule is called up from the current `seamdata` or `welddata` used in the arc welding instruction.

Before a welding procedure starts, a schedule is always called up automatically. This schedule, or a sequence from any number of schedules, remains active until the welding operation is complete.

The schedule memory contains 99 available schedules defined by numbers 1 - 99.

Note

All 99 schedules are available, but schedule numbers 96 - 99 are special numbers used when creating user defined synergic lines.

4.2 Synergic data values – a programming aid

4.2.1 Syneric data values

Introduction

There is a synergic function in the power source to simplify the welding program.

This means that:

- There is a pre-programmed relationship between the wire feed speed and all other schedule components in the power source.

  When programming takes place in synergic mode, only the value for wire feed is programmed, after which all other variables are calculated automatically from the synergic line. The synergic line is based on specified values for method (short arc, spray arc or short pulsed arc), material, wire size and gas mixture. A synergic setting also covers other variables that affect the process: Dynamic Properties, etc.
- Synergic settings are often adequate as final settings. However, sometimes you have to view it as an aid for preliminary setting of data values. In certain cases these must be adjusted using non-synergic settings for various types of joint, welding positions, torch angles, electrode projection, surface quality, etc.
- More schedule components are available when welding programming is undertaken in non-synergic mode. The advantage is that the welding operation can be adapted to more specific requirements.
- When switching from synergic to non-synergic mode the system retains the data values set in the synergic mode.
- When switching in the opposite direction, from non-synergic to synergic mode, the data values are changed back to the synergic values.

4.3 Schedule components

4.3.1 Settings

Introduction

Which schedule components that are used is depending on the following settings:

- Mode
- Method
- Material
- Gas
- Wire size

The schedule components displayed in a schedule can vary depending on:

Setting	Description
Mode	The welding mode indicates if the power source uses normal schedule mode or Super pulse. Only applicable to MigRob500 and AristoMig 500 Integrated and similar.
Method	Each method has a specific maximum set of schedule components.
Material	The method determines the available wire materials.
Gas	The method and material determine the available gases.
Wire size	The method, material and gas selected determine the available wire sizes. **Note** There may be more than one option for certain diameters; this is indicated by *high* or *low*. Select the most appropriate with regards to the wirefeed speed.
Hotstart and craterfill	These functions must be accompanied by specific schedule components.
Synergic	In synergic mode, schedule components automatically calculated by the system are hidden.
Conditions	The conditions for the various components are described in section *Method on page 57* and onwards.
Synergic mode	The appropriate combination of method, material, gas and wire size defines a synergic line, which is automatically used by the system in synergic mode.
Non-synergic mode	In non-synergic mode, the process is not affected by the values of the components' material, gas and wire size.

4.3.2 Mode

Introduction

Specifies the welding mode of the power source. Available settings are:

- Normal
- Super pulse

Note

Only applicable to MigRob500 and AristoMig 500 Integrated and similar.

Normal

Welding with the parameters specified in the specific schedule.

Super pulse

The power source pulses between two different schedule settings, called instance 1 and 2.

Note

When Super pulse is activated some of the schedule components can only be used in either one of the instances. These schedule components are related to start and stop/end. The power source always starts with instance 1 settings and stops/ends with instance 2 settings.

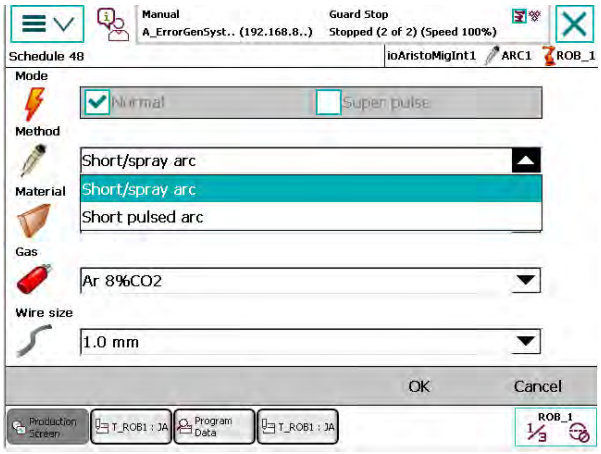
Instance 1	Instance 2
Creepstart	
Hotstart	
	Craterfill
	Burnback time
	Final pulse

4.3.3 Method

Selectable methods

The methods that can be selected are:

- Short arc
- Spray arc
- Short pulsed arc



xx1400001808

Available schedule components

The schedule components available in a schedule depends on the method selected.

If you change method when editing a schedule, the following changes may occur automatically:

- The schedule components available.
- Both numeric and non-numeric values of the remaining components may be changed.
- Synergic will always be ON.

Synergic is ON

If Synergic is ON, the power source calculates the values for components using the current synergic line and the current speed reference for the wire feed. These calculated components are not displayed in the schedule when editing takes place in synergic mode.

Synergic is OFF

If Synergic is OFF, the components and their calculated values are visible in the schedule. There is no difference to the welding process whether Synergic is ON or OFF.

Short arc and spray arc

The following schedule components are available for the short arc and spray arc methods:

- Method

Continues on next page

4.3.3 Method
Continued

- Material
- Gas
- Wire size
- Creepstart
- Hotstart
- Craterfill
- Synergic
- Wirefeed speed
- Voltage
- Hotstart - wire feed speed[I]
- Hotstart voltage[II]
- Hotstart time[I]
- Dynamic properties
- Regulator[III]
- Final wirefeed speed[IV]
- Final voltage[V]
- Craterfill time[IV]
- Burnback time
- Final pulse
- Phase time[VI]

I Available if Hotstart is ON
II Available if Hotstart is ON and Synergic is OFF
III Available if Synergic is OFF
IV Available if Craterfill is Short arc craterfill
V Available if Craterfill is Short arc craterfill and Synergic is OFF
VI Available if welding mode is in Super pulse mode

Short pulsed arc

- Method
- Material
- Gas
- Wire size
- Creepstart
- Hotstart
- Craterfill
- Synergic
- Wirefeed speed
- Arc length
- Hotstart - wire feed speed[I]
- Hotstart - arc length[II]

Continues on next page

- Hotstart time[I]
- Pulse current[III]
- Pulse time[III]
- Background current[III]
- Frequency[III]
- Slope[III]
- Ka[III]
- Ki[III]
- Final wirefeed speed[IV]
- Final arc length[V]
- Final voltage[VI]
- Final pulse current[V]
- Final background current[V]
- Final frequency[V]
- Craterfill time[IV]
- Burnback time
- Phase time[VII]

I Available if Hotstart is ON
II Available if Hotstart is ON and Synergic is OFF
III Available if Synergic is OFF
IV Available if Craterfill is Short pulsed arc craterfill or Short arc craterfill
V Available if Craterfill is Short pulsed arc craterfill and Synergic is OFF
VI Available if Craterfill is Short arc craterfill and Synergic is OFF
VII Available if welding mode is in Super pulse mode

Example of changing method

You can change method within the same welding operation. In this example, welding begins using the spray arc method and continues using short pulsed arc. Assume that `welddata wd5` and `wd6` is created and that `seamdata sm3` is created. `wd5` is using the schedule 5 and `wd6` is using the schedule 6.

Schedule no. 5 Spray arc

Schedule no. 5 using spray arc method:

Mode	Normal
Method	Spray arc
Material	AlSi 5
Gas	Ar
Wire size	1.2 mm
Creepstart	Off
Hotstart	Off

Continues on next page

4.3.3 Method
Continued

Craterfill	Off
Synergic	On
Wirefeed speed	12.00 m/min.
Voltage	0.00 V
Dynamic properties	70%
Burnback time	0.12 sec.

Schedule no. 6 Short pulsed arc

Schedule no. 6 using short pulsed arc method:

Mode	Normal
Method	Short pulsed arc
Material	AlSi 5
Gas	Ar
Wire size	1.2 mm high
Creepstart	Off
Hotstart	Off
Craterfill	Off
Synergic	On
Wirefeed speed	12.00 m/min.
Arc length	0.00
Burnback time	0.12 sec.

Program code

Program code used in this example:

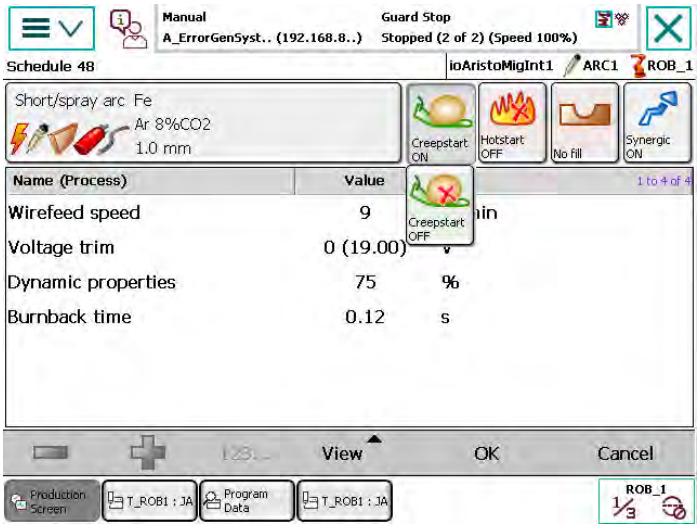
```
ArcLStart *, v600, sm3, wd6, fine, tool;
ArcL *, v600, sm3, wd5, z5, tool;
ArcLEnd *, v600, sm3, wd6, fine, tool;
```

4.3.4 Creepstart

Description

Creepstart is an integrated ignition function used to reduce the wire feed speed until the arc is ignited. The wirefeed speed is reduced to 50% of the speed in the current schedule until the arc is stabilized.

Another way of influencing the conditions until the arc is ignited is to use an ignition schedule in `seamdata`. However, creepstart and ignition schedule should not be used in combination.



xx1400001814

Note

If the method is changed when editing a schedule, the value for creepstart may sometimes change automatically. If so, the new creepstart value becomes the same as the most recently used value in the selected method.

4.3.5 Hotstart

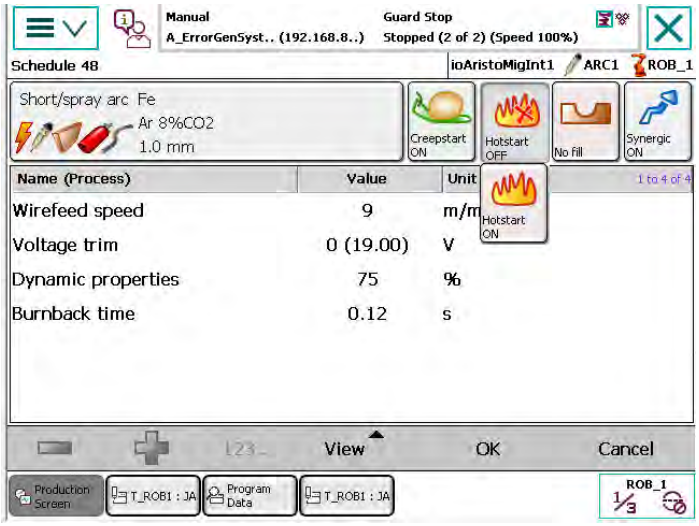
Description

Hotstart is an OFF/ON function that provides increased heat input at the start of welding in order to reduce the risk of defects.

Hotstart is defined in the schedule called up at weld start. The function actuates the process for a specific period defined in Hotstart time, which begins when the arc is ignited.

Hotstart - wirefeed speed functions as a relative value for the wirefeed speed set in the schedule.

In synergic mode, the system automatically selects a higher voltage during the hotstart time. The synergic line is changed temporarily to a slightly higher voltage level. The size of the voltage correction is dependent on the synergic line. The hotstart voltage is not shown in synergic mode.



xx1400001815

Hotstart ON

The following components are available when Hotstart ON is selected:

- Hotstart - wire feed speed (relative value).
- In non-synergic mode: Hotstart voltage or Hotstart arc length dependent on selected method.
- Hotstart time.

> **Note**
>
> Schedule change during hotstart time is not recommended.

Status of hotstart (ON) and the original hotstart time will be retained once they have been initiated regardless of what has been programmed in subsequent schedules that may be called up before the hotstart time is over. In such cases, all new wirefeed and voltage references, basic values as well as offset values, for hotstart will apply on call-up even if these include hotstart OFF. The user must

Continues on next page

therefore check that the components in subsequent schedules have the required values.

Note

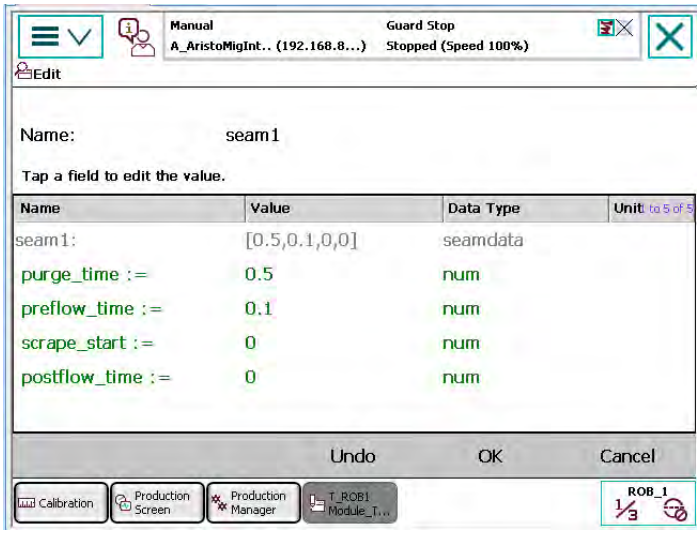
There is also a heating function in `seamdata` (`seamdata Heat`). Using a combination of the components Hotstart and `seamdata Heat` is not recommended. In cases where more schedule components will need to be adjusted it is better to use the Heat function instead.

Example of hotstart

In this example a hotstart is executed as follows:

- Hotstart for two seconds once the arc is ignited.
- The wirefeed speed during the hot start time is 8.00 m/min.

Hotstart is defined in ignition schedule 3 in `seamdata sm3`. See screenshot of `sm3` below.

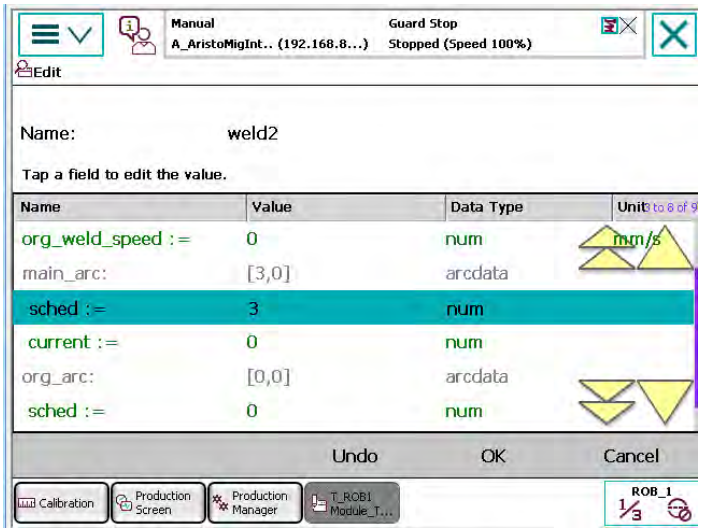


xx1400001816

Continues on next page

4.3.5 Hotstart
Continued

The hotstart function uses the wirefeed speed in the schedule, in `welddata wd3`, which in this case is the same schedule:



xx1400001817

Program code:

```
ArcLStart *, v600, sm3, wd3, fine, tool;
ArcLEnd *, v600, sm3, wd3, fine, tool;
```

Schedule 3 Short arc

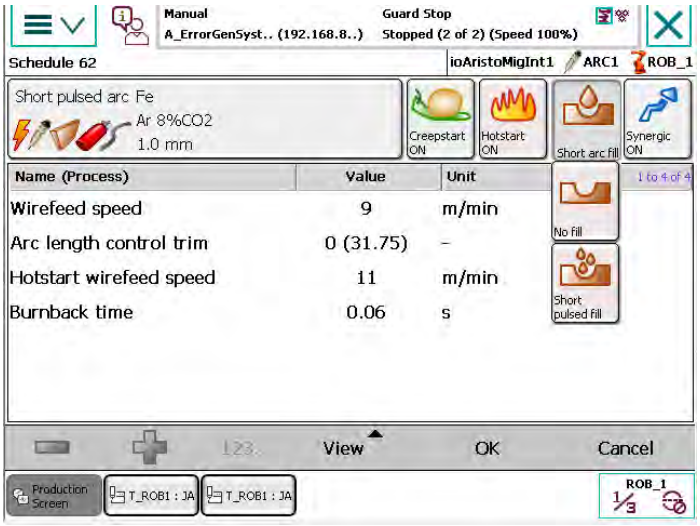
Schedule 3 is defined as:

Mode	Normal
Method	Short arc
Material	Fe
Gas	Ar+8% CO2
Wire size	0.8 mm
Creepstart	Off
Hotstart	On
Craterfill	Off
Synergic	On
Wirefeed speed	6.00 m/min
Voltage	0.00 V
Hotstart - wirefeed speed	2.00 m/min
Hotstart time	2.00 sec
Dynamic properties	85%
Burnback time	0.12 sec

4.3.6 Craterfill

Description

Craterfill is an ON/OFF function. It provides ramped craterfill by means of the welding values decreasing in stationary mode at the end of the welding operation. This is done to reduce the risk of defects in the weld's end crater.



xx1400001818

Variants

There are two variants of craterfill

- Short arc craterfill
- Short pulse craterfill

Both these can be used after a short pulsed arc phase.

Only short arc fill can be used after short arc or spray arc welding.

> **Note**
>
> There is also a filling function in `seamdata`.
>
> The special feature of `seamdata` filling is a cooling process where the arc is temporarily shut off.
>
> After cooling, `seamdata` filling can be performed in the same welding schedule or in a separate filling schedule that is called up.
>
> The user can define either ramped `craterfill`, `seamdata` filling or both.
>
> Ramped `craterfill` can be used before and/or after cooling.

Components in synergic mode

In synergic mode, the following components are available:

- Craterfill time
- Final wirefeed speed

Continues on next page

4.3.6 Craterfill
Continued

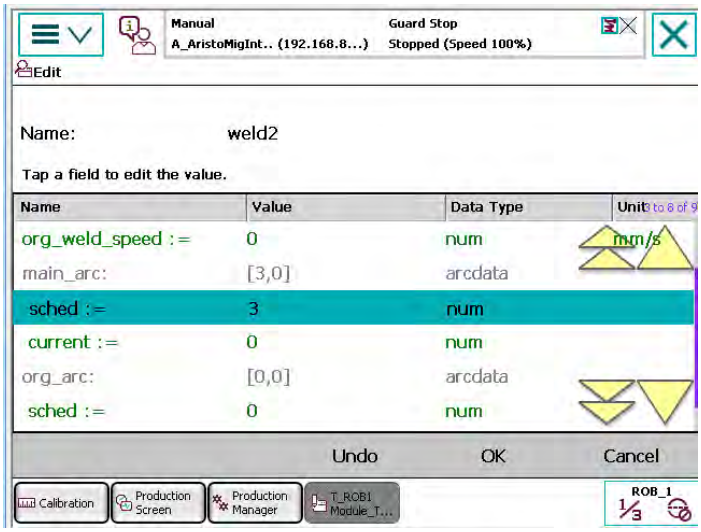
Components in non-synergic mode

In non-synergic mode, the following components are available:

- Craterfill time
- Final wirefeed speed
- Final voltage with short arc fill
- Final arc length with short pulse fill
- Final pulse current with short pulse fill
- Final background current with short pulse fill
- Final frequency with short pulse fill

Craterfill, example 1: Ramped craterfill (no cooling)

Craterfill is defined in the schedule used in ArcWare `welddata`, in this case schedule 3 in `welddata`; `wd3`. See screenshot of `wd3` below.



xx1400001817

If the filling function is available, in this case the filling time must be set to 0 in `seamdata` schedule `sm3`.

Program code

Program code used in this example:

```
ArcLStart *, v600, sm3, wd3, fine, tool;
ArcLEnd *, v600, sm3, wd3, fine, tool;
```

Schedule 3 Short arc

Schedule 3 is defined as:

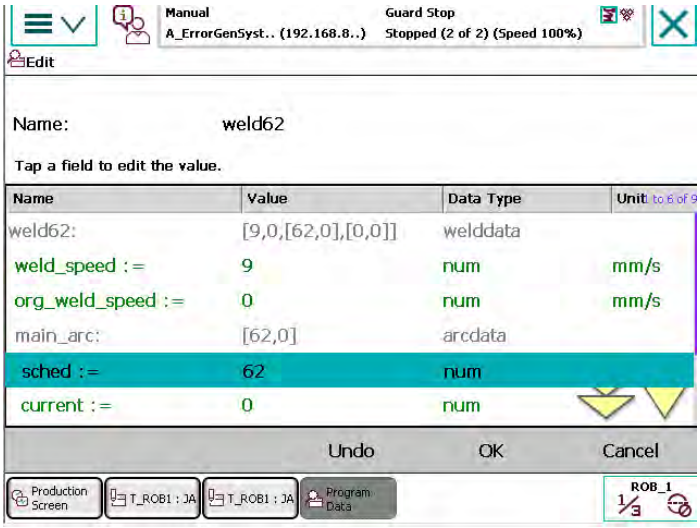
Mode	Normal
Method	Short arc
Material	Fe
Gas	Ar+8% CO2
Wire size	0.8 mm

Continues on next page

Craterfill	Short arc fill
Creepstart	Off
Hotstart	Off
Synergic	On
Voltage	0.00 V
Wirefeed speed	6.00 m/min
Final wirefeed speed	4.00 m/min
Craterfill time	2.50 sec
Burnback time	0.12 sec
Dynamic properties	85%

Craterfill, example 2: Ramped craterfill and filling with cooling

Craterfill is not defined in the schedule used in ArcWare `welddata`, in this case schedule 4 in `welddata`; `wd4`. See the figure below.



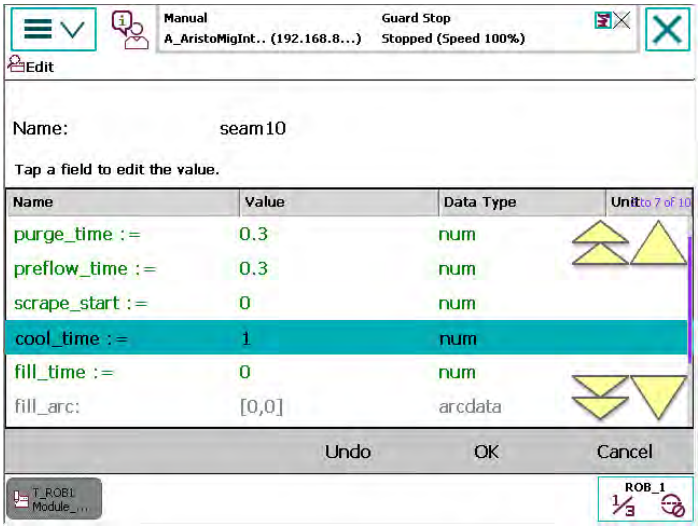
xx1400001819

Craterfill is defined in the filling schedule used in ArcWare `seamdata sm4`. In `sm4`, 0.01 seconds' filling time is used for initiation of craterfill by calling up schedule 3. The cooling time in this example is 1 second.

Continues on next page

4.3.6 Craterfill
Continued

See screenshot of `sm4` below.



xx1400001820

Program code

```
Program code used in this example:
ArcLStart *,v600, sm4, wd4, fine, tool;
ArcLEnd *, v600, sm4, wd4, fine, tool;
```

Schedule 3 Short arc

Schedule 3 is defined as:

Mode	Normal
Method	Short arc
Material	Fe
Gas	Ar+8% CO2
Wire size	0.8 mm
Craterfill	Short arc fill
Creepstart	Off
Hotstart	Off
Synergic	On
Voltage	0.00 V
Wirefeed speed	6.00 m/min
Final wirefeed speed	4.00 m/min
Craterfill time	2.50 sec
Burnback time	0.12 sec
Dynamic properties	85%

Continues on next page

Schedule

Short arc

Schedule 4 is defined as:

Mode	Normal
Method	Short arc
Material	Fe
Gas	Ar+8% CO2
Wire size	0.8 mm
Craterfill	Off
Creepstart	Off
Hotstart	Off
Synergic	On
Voltage	0.00 V
Wirefeed speed	6.00 m/min
Burnback time	0.12 sec
Dynamic properties	85%

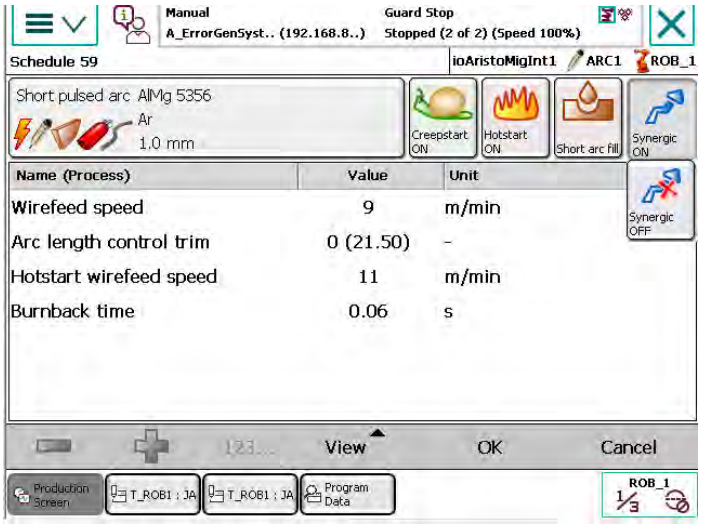
4.3.7 Synergic

Description

The power source can be used in both synergic and non-synergic mode.

Synergic means that certain values used in the process are calculated by the system on the basis of a synergic line once a wire feed speed is selected. This procedure follows the original principle of "one knob control".

The number of components shown in a schedule is dependent on whether synergic or non-synergic mode has been selected. Information on available schedule components can be found in the Method section.



xx1400001821

4.3.8 Wirefeed speed

Description

The wirefeed speed for the welding electrode.

Adjustment range

The adjustment range for the wirefeed speed is dependent on the type of wire feed unit and power source used. The speed range is displayed automatically in the schedules used. The wire feed unit's speed range is specified in the description of the unit in the Welding equipment manual.

Synergic ON

When synergic is ON, changes to the wirefeed speed affect the welding voltage and other variables included in the synergic line calculation.

Synergic OFF

When synergic is OFF, changes to the wirefeed speed do not affect any other components.

References

The wire feed speed range is described in the product manual for the welding equipment.

4.3.9 Voltage

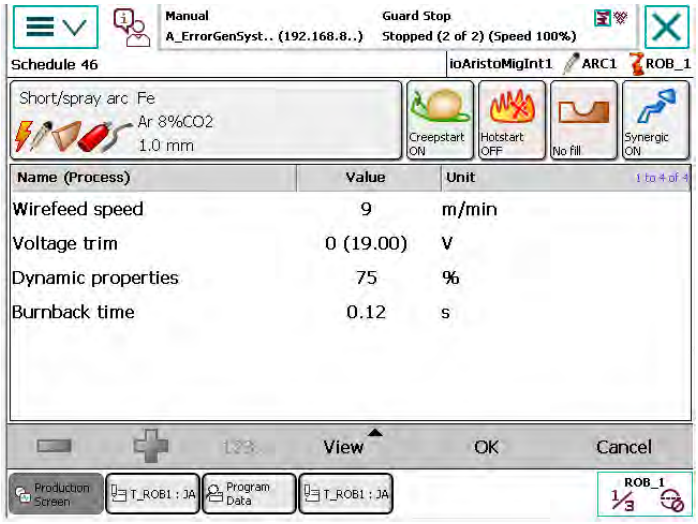
Description

Voltage is available when short arc or spray arc has been selected as method.

Voltage adjustment is used for fine tuning of the arc so that the process remains stable.

One fundamental feature of both methods is that an increased voltage value increases the arc length and heat input, and a reduced voltage value reduces the arc length and heat input.

Control of the welding voltage differs depending on whether synergic or non-synergic mode has been selected.



xx1400001822

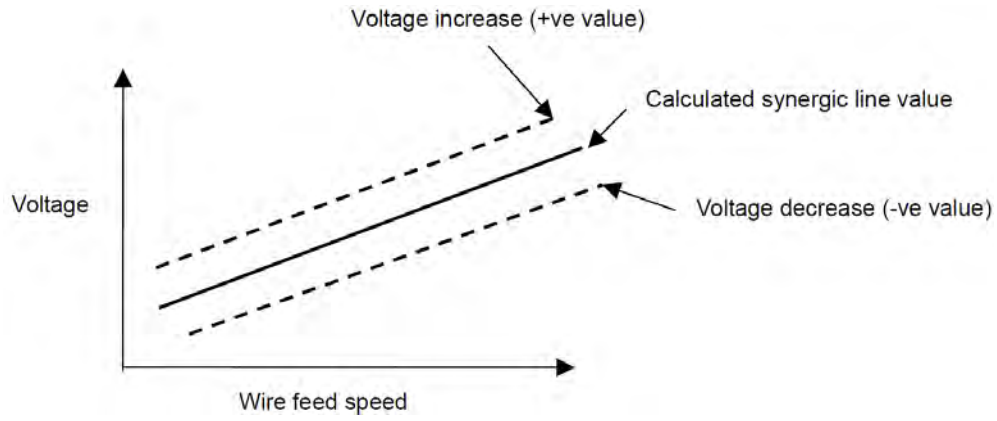
Synergic ON

In synergic mode, the welding voltage is calculated from the synergic line. The welding voltage can be adjusted +/- from the synergic line. The working area is dependent on the values selected for the components' material, gas and wirefeed speed. The absolute value of the voltage is shown in brackets as information.

The relationship between wire feed speed and voltage is shown in graphic form below.

Continues on next page

Voltage



xx1400001823

Synergic OFF

The programmed voltage value is the actual voltage value used (absolute value).

Minimum and maximum for the operation values are determined by all factors in the application, including method, material, gas, wire size and wire feed speed.

Available

Voltage is available when short arc or spray arc are selected.

4.3.10 Arc length

Description

When short pulsing is selected as method, voltage is replaced by a setting for arc length. One fundamental feature is that an increased arc length value increases the arc's length and heat input, and a reduced arc length value reduces the arc's length and heat input. Arc length functions in the same way as voltage with regard to synergic settings and has roughly the same value range as voltage, however, Arc length is not a quantity but a unit.

Available

Arc length is available when short pulsed arc is selected.

4.3.11 Dynamic properties

Description

Dynamic properties is an electronic inductance control that is used to control the current rise during the short circuit phase in the short arc cycle.

It is used to fine-tune short arc welding by regulating the short circuit frequency, heat input and molten pool. It is particularly useful when CO2 is used as shielding gas.

Dynamic properties influences the heat input, depth of penetration and quantity of welding spatter. Low values provide less heat input, and higher values provide greater heat input.

Dynamic properties regulates the size of the globules in short arc welding. With spray arc welding, the process is only influenced during the ignition phase when the wire is shortcircuited against the workpiece.

Available

Dynamic properties is only available with the short arc and spray arc methods.

Adjustment range

The adjustment range is 0 - 100%.

4.3.12 Regulator type

Introduction

There are 12 different types of regulators.

Regulator type 1

Regulator type 1 is designed for Ar and CO2 welding.

Regulator type 1 is suitable for standard short arc welding.

Regulator type 2 - 5

Regulator type 2 - 5 are designed for CO2 welding with various wire sizes and are selected automatically in synergic mode.

- Optional regulator type 2 - 5 can be selected by the user in order to the process.

Regulator type 6

Regulator type 6 is designed for Ar and CO2 welding.

Regulator type 6 produces less heat and is therefore suitable for high-speed welding with short arc.

Regulator type 7 - 12

Regulator type 7 - 12 are experimental versions without a specified purpose.

Regulator type is only available with the short arc and spray arc methods in non-synergic mode.

Note

Changing regulator type is not recommended.

4.3.13 Pulse current

Description

Pulse current is the pulse's amplitude (see *Diagram- short pulsing components on page 81*). In synergic mode the amplitude is dependent on selected values for material, gas and wire size.

A higher pulse current provides greater pinch off current and alters the arc shape. Pulse current and pulse time can be combined in order to alter the shape of the arc from concentrated to broad, which affects weld penetration and weld width. The arc's length is also affected.

Adjustment range

The adjustment range is 100 - 600 A.

Available

Pulse current is only available when short pulsing and synergic OFF are selected.

4.3.14 Pulse time

Description

The pulse time controls the pulse current's duration for short pulsing and includes the slope on one side of the pulse (see *Diagram- short pulsing components on page 81*).

Adjustment range

The adjustment range is 1.7 - 11.0 milliseconds.

Available

Pulse time is only available when short pulsing and synergic OFF are selected.

4.3.15 Background current

Description

Background current is the current level between the pulses (see *on page 63*). The background current maintains the arc between the pulses. The background current affects the arc length and stability.

Adjustment range

The adjustment range is 12 - 300 A.

Available

Background current is only available when short pulsing and synergic OFF are selected.

4.3.16 Frequency

Description

The frequency controls the length of the pulse cycle and directly affects the duration of the background current (see *Diagram- short pulsing components on page 81*). The frequency has a big influence on the arc length and the heat input to the workpiece.

Adjustment range

The adjustment range is 38 - 312 Hz.

Available

Frequency is only available when short pulsing and synergic OFF are selected.

4.3.17 Slope

Description

Slope controls the pulse's up and down ramping time.

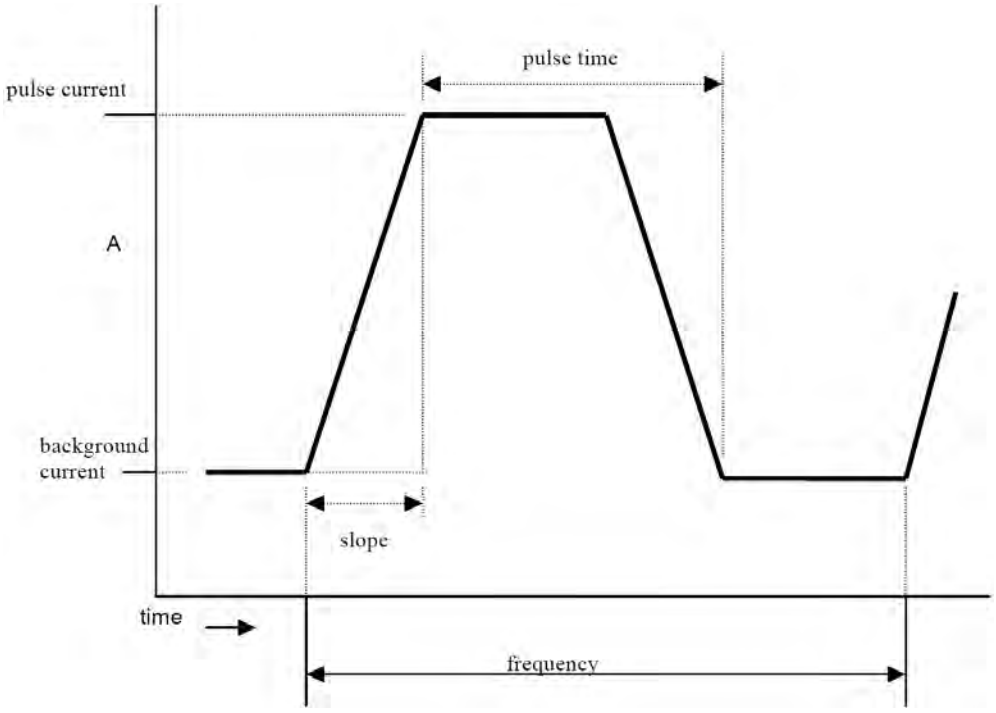
Adjustment range

Slope is defined by a value between 1 and 9 on a proportional scale. The value of 1 equates to the shortest time and the value of 9 equates to the longest time.

Available

Slope is only available when short pulsing and synergic OFF are selected.

Diagram- short pulsing components



xx1400001824

4.3.18 Ka

Description

Ka is a proportional gain factor for control of the arc length. Ka has an individual synergic line. Ka is expressed as a percentage value representing the gain factor.

Adjustment range

The adjustment range is 0 - 100%.

- 0% provides the slowest regulation.
- 100% provides the fastest regulation.

If the process has been set to self-oscillation or is unstable, try reducing Ka to a lower value.

Available

Ka is only available when short pulsing and synergic OFF are selected.

4.3.19 Ki

Description

Ki is the gain factor.

Ki is expressed as a percentage of the maximum permitted value.

Adjustment range

The adjustment range is 0 - 100%.

- 0% provides the slowest integration.
- 100% provides the fastest integration.

The standard value can probably be used for all applications, and so Ki does not normally need to be adjusted.

Available

Ki is only available when short pulsing and synergic OFF are selected.

4.3.20 Final wirefeed speed

Description

Final wirefeed speed is the wire feed speed at the end of the craterfill time.

Adjustment range

If this value is lower than the set value for wire feed speed in the current schedule, the system will ramp down the speed during the crater filling time.

Final wirefeed speed cannot be given a higher value than that for wire feed speed in the current schedule.

Available

Final wirefeed speed is only available when craterfill has been defined.

4.3.21 Final voltage

Description

Final voltage is the final voltage value at the end of the craterfill time.

Adjustment range

The adjustment range for voltage is approximately 8 - 50 V.

Available

Final voltage is only available when short arc fill and synergic OFF are selected.

4.3.22 Final arc length

Description

Final arc length is the final arc length value at the end of the craterfill time.

Adjustment range

The adjustment range for arc length is approximately 8 - 50.

Available

Final arc length is only available when short pulse fill and synergic OFF are selected.

4.3.23 Final pulse current

Description

Final pulse current is the pulse current value at the end of the craterfill time.

Adjustment range

The adjustment range is 100 - 600 A.

If this value is lower than the set value for cutting pulse current in the current schedule, the system will ramp down the pulse current during the craterfill time.

Final pulse current cannot be given a higher value than that for the pulse current in the current schedule.

Available

The schedule component is only used when short pulse fill and synergic OFF are selected.

4.3.24 Final background current

Description

Final background current is the background current at the end of the craterfill time.

Adjustment range

The adjustment range is 12 - 300 A.

If this value is lower than the set value for background current in the current schedule, the system will ramp down the current during the craterfill time.

Final background current cannot be given a higher value than that for background current in the current schedule.

Available

Final background current is only available when short pulse fill and synergic OFF are selected.

4.3.25 Final frequency

Description

Final frequency is the frequency at the end of the craterfill time.

Adjustment range

The adjustment range is 38 - 312 Hz.

If this value is lower than the set value for frequency in the current schedule, the system will ramp down the frequency during the craterfill time.

Final frequency cannot be given a higher value than that for frequency in the current schedule.

Available

Final frequency is only available when short pulse fill and synergic OFF are selected.

4.3.26 Craterfill time

Description

The craterfill time is the down ramping time at the end of the weld when the robot has stopped at the end position.

Adjustment range

The adjustment range is 0 - 10 seconds.

Available

Craterfill time is only available with short arc fill or short pulse fill.

4.3.27 Burnback time

Description

Burnback time is used to prevent the electrode getting stuck in the cooling molten pool once the welding process is complete.

The burnback time is the time the welding current remains on once the wire feeding has stopped.

Adjustment range

The adjustment range is 0 - 1 seconds

Suggested values:	
Aluminium	0.05 sec
Steel	0.05 - 0.13 sec

4.3.28 Final pulse

Description

Final pulse controls the amplitude of the ”pinch off” at the end of the process after the backburn time.

The high current cuts off the final globule from the wire and forces it into the still liquid molten pool so that the wire is cleaned ready for the next welding operation.

The value is a percentage value of an internally calculated value based on current and wire type.

Adjustment range

The adjustment range is 10 - 120%.

For thin sheet, a low value must be considered. A high value applies high pressure on the molten pool.

Available

Final pulse is only available when the short arc or spray arc method and synergic OFF are selected.

4.3.29 Touch sense current

Description

The current that must flow between the wire and the material before the power source signals that it has contact.

See ESAB manual for current setting range.

Note

Only applicable to MigRob500 and AristoMig 500 Integrated and similar

4.3.30 Phase time

Description

Phase time is the time that the power source welds with the individual schedule during Super pulse welding.

Setting range

The setting range is 1 - 25 ms.

Available

The phase time is available only if Super pulse is selected as the welding mode.

5 Predefined synergic lines

5.1 Introduction

Description

There are predefined synergic lines for the power source. The purpose of the synergic lines is to help the user set up a functional welding process.

This chapter contains:

- A description of the geometric welding process that ABB used for development of the synergic lines.

Note

A synergic line is based on data developed in an established laboratory procedure. The welding result from this kind of procedure is not optimised precisely for all actual arc welding applications. If it provides stable, if not yet fully optimised conditions in the initial development stages of the welding process.

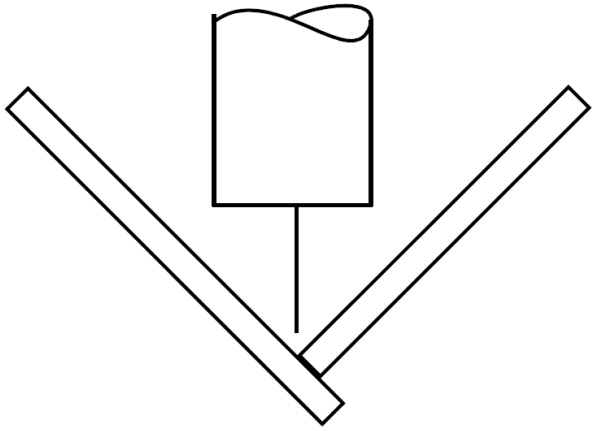
If necessary, the user can switch to non-synergic mode to further optimise required schedule components.

5.2 Setting the welding process

Introduction

The geometric conditions used for the settings are:

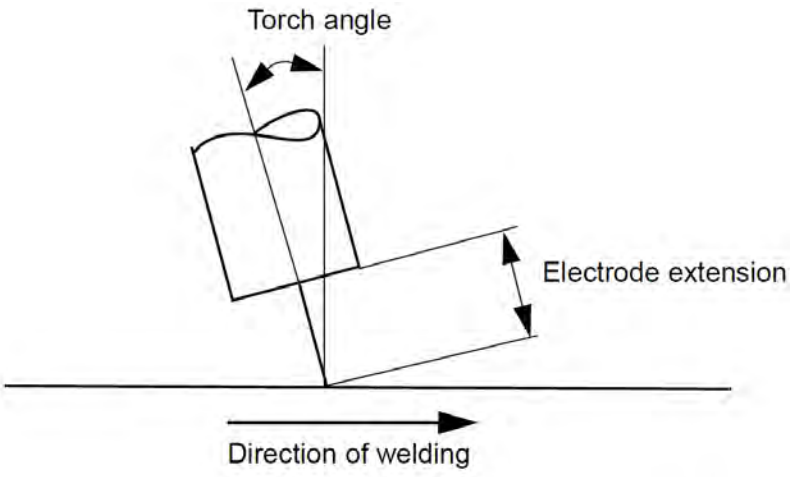
Cutaway view of the workpiece and welding torch



xx1400001825

90 degree fillet weld in horizontal position. The welding torch is positioned vertically.

Sectional view of the weld path and the welding torch's position



xx1400001826

Sectional view of the weld path and the position of the welding torch.

Settings

Process description	Torch angle in degrees	Electrode extension in mm
Spray arc	15	20
Short arc	15	15
RAPID PROCESS[i]	40	25

Continues on next page

Process description	Torch angle in degrees	Electrode extension in mm
Short-pulsed arc (short pulsing)	15	15

i RAPID PROCESS™ is a trademark owned by Aga Gas AB. Within the framework of the RAPID PROCESS concept, a method using a short-circuiting arc can be employed for very high welding speeds. The synergic lines for short arc welding are extended for the RAPID PROCESS field.

This page is intentionally left blank

6 Rapid command *Load

6.1 Load the .sid file

Introduction

The RAPID command `*Load` is used to load the .sid file from a storage medium to the memory in the power source.

Note

* is valid for

- Arci (Arcitec IRC5)
- MigRob (MigRob 500)
- AristoMig (AristoMig 500 Integrated)

Example

```
*Load "HOME:/AWdata.sid" \UnitName:="B_AW_PROC_40";
```

All the schedules in the file AWdata.sid in the HOME directory are loaded in to the schedule memory on the power source with the I/O unit name `B_AW_PROC_40`.

Argument

```
*Load FileName \UnitName
```

`FileName`

Data type: `string`

The file name.

`UnitName`

Data type: `string`

The unit name. The standard name is specified in `PROC` in CFG.

Example

Use `*Load` at the beginning of procedures to load the .sid file.

```
MODULE WELD
  PROC main
    part1;
    part2;
  ENDPROC
  PROC part1
    ! Loading the schedule from the part1.sid file
    *Load "HOME:/part1.sid" \UnitName:="B_AW_PROC_40";
    ...
  ENDPROC
  PROC part2
    ! Loading the schedule from the part2.sid file
    *Load "HOME:/part1.sid" \UnitName:="B_AW_PROC_40";
    ...
```

Continues on next page

6.1 Load the .sid file

Continued

```
  ENDPROC
ENDMODULE
```

Syntax

```
*Load
  [ FileName ':=' ] < phrase (IN) for string > ';'
  [ \UnitName ':=' ] < phrase (IN) for string > ';'
```

Reference document

	Described in:
Saving the .sid file	Instructions - MigRobStore
Setting numeric parameters	Instructions - MigRobTune
Restoring	See *Restore schedules on page 49*

7 Rapid command *Store

Note

* is valid for

- Arci (Arcitec IRC5)
- MigRob (MigRob 500)
- AristoMig (AristoMig 500 Integrated)

Continues on next page

7.1 Saving the .sid file

Introduction

The rapid command *Store is used to save all schedules in the MigRob memory to a storage medium.

Example

```
*Store "HOME:/AWdata.sid" \UnitName:="B_AW_PROC_40";
```

All schedules in the power source with the I/O unit name B_AW_PROC_40 are saved to the AWdata.sid file in the HOME directory. The file extension should be .sid.

Argument

```
*Store FileName \UnitName
```

FileName

Data type: string

The file name.

UnitName

Data type: string

The unit name. The standard name is specified in PROC in CFG.

Example

Use *Store at the end of procedures to save the .sid file.

```
MODULE WELD
  PROC main
    part1;
    part2;
  ENDPROC
  PROC part1
    ! Saving the schedule to the part1.sid file
    *Store "HOME:/part1.sid" \UnitName:="B_AW_PROC_40";
    ...
  ENDPROC
  PROC part2
    ! Saving the schedule to the part2.sid file
    ArciStore "HOME:/part2.sid"
    \UnitName:="B_AW_PROC_41";
    ...
  ENDPROC
ENDMODULE
```

Syntax

```
*Store
  [ FileName ':=' ] < phrase (IN) for string > ';'
  [ \UnitName ':=' ] < phrase (IN) for string > ';'
```

Continues on next page

Reference document

	Described in:
Loading the .sid file	*Rapid command *Load on page 99*
Setting numeric parameters	Instructions - MigRobTune
Manual backup	See *Backup schedules on page 48*

This page is intentionally left blank

8 Rapid command *Tune

Note

* is valid for

- Arci (Arcitec IRC5)
- MigRob (MigRob 500)
- AristoMig (AristoMig 500 Integrated)

Continues on next page

8.1 Setting Numeric Schedule Components

Introduction

The rapid command *Tune is used to set the numeric schedule parameters in the power source.

Example

```
VAR num parid;
...
parid := 20;
*Tune\Offset, parid, 0.5;
```

The parameter with the identity of 20 is increased by 0.5.

Argument

```
*Tune [\Offset] | [\Write] ParId Value
```

[\Offset]

Data type: switch

The argument \Offset is used when an increment is to be added in a numeric parameter.

[\Write]

Data type: switch

The argument \Write is used when a numeric parameter is to be given a new value.

ParId

Data type: num

Parameter identity.

Value

Data type: num

If the switch argument \Offset is active, the Value argument is an increment added to the existing value of the numeric parameter defined by the ParId argument. The increment can be positive or negative.

If the switch argument \Write is active, the Value argument is the new value of the numeric parameter defined by the ParId argument.

UnitName

Data type: string

The unit name. The standard name is specified in PROC in CFG.

Example

Use two programmable buttons for the settings (one to increase and one to reduce parameter values). You can configure which signals and buttons you want to link up on the FlexPendant control panel under programmable buttons.

```
MODULE WELD
  !Global parameter declaration num parid;
```

Continues on next page

```
  PROC main
    ! Method for determining parameter identity
    SetUpParId(parid);
    ! Connecting two Trap drivers (simulated) to digital
    inputs
    ! actuated by the programmable buttons.
    CONNECT intno1 WITH IncPar;
    ISignalDI, 1, intno1;
    CONNECT intno2 WITH DecrPar;
    ISignalDI, 1, intno2;
    ! Main sequence
    ...
    ! Switching off the Trap drivers
    IDelete intno1;
    IDelete intno2;
  ENDPROC
  ! Trap driver for increasing the value in steps of 0.5
  TRAP IncPar
    *Tune\Offset, parid, 0.5;
  ENDTRAP
  ! Trap driver for reducing the value in steps of 0.5
  TRAP IncPar
    *Tune\Offset, parid, -0.5;
  ENDTRAP
ENDMODULE
```

Syntax

```
*Tune
  [ '\'Offset',' ] | [ '\'Write',' ]
  [ ParId ':=' ] < phrase (IN) for num > ','
  [ Value ':=' ] < phrase (IN) for num > ';'
  [ '\'UnitName ':=' ] < phrase (IN) for string> ';'
```

Reference document

	Described in:
Saving the .sid file	*Rapid command *Store on page 101*
Loading the .sid file	*Rapid command *Load on page 99*

This page is intentionally left blank

Index

Contact us

ABB AB
Discrete Automation and Motion
Robotics
S-721 68 VÄSTERÅS, Sweden
Telephone +46 (0) 21 344 400

ABB AS, Robotics
Discrete Automation and Motion
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 51489000

ABB Engineering (Shanghai) Ltd.
No. 4528 Kangxin Highway
PuDong District
SHANGHAI 201319, China
Telephone: +86 21 6105 6666

www.abb.com/robotics

3HAC050972-001, Rev A, en