# Advanced operation (key-operator mode)

This chapter gives an overview of functions for the advanced user:

- Overview of key-operator functions
- Quality Control
- Preventive maintenance schedule
- Cleaning the exterior
- Cleaning the print head
- Troubleshooting checklist

3

# **Overview of key-operator functions**

The key-operator menus make it possible to use the Drystar 5302 advanced functions.

These functions are described in detail in the Drystar 5302 Reference manual.

For general information on the key functions of the Drystar 5302, refer to 'The NOTAPPROVE user interface' on page 20.

#### Overview

The Drystar 5302 features the following functions on the main menu level of the key-operator mode:

Menu item	Function	Page (Ref. Man.)
Show settings	To consult the current settings of the printer.	50
Change settings	To change the current settings of the printer.	56
Print image	To print one of the Drystar 5302 test images. To load and print images from an external CF-card.	86
Save configuration	<b>ave configuration</b> To make a backup of the printer settings.	
Restore configuration	To restore the backup of the printer settings.	92
Calibration	To calibrate the printer.	97
Service actions	ions To view error, repair and maintenance data.	
Quality Control	To perform the QC procedure.	(User Manual) 47
Installation	To install or update the Drystar 5302 software.	118



Refer to the indicated page of the Drystar 5302 Reference manual for an explanation of the function and the appropriate procedures.

# **Quality Control**

In order to establish and maintain consistent image quality, a regular evaluation of image quality is advised.

The Drystar 5302 contains an automatic QC feature that has been designed to comply with the grayscale reproduction constancy test, according to the international standard IEC 1223-2-4.

The Drystar 5302 QC procedure consists of two main steps: • Before initial use

- Before initial use, establishing a number of reference values that will be used for further follow-up and verifying initial image quality.
- After establishing these values, performing regular daily, weekly and annual quality tests.

The results of these tests are recorded on Quality Control Charts.

The QC image (Refer to 'QC test image' on page 52) has several additional fields where the QC data can be filled in. This image should be filed as part of the QC procedure.

For more information, please refer to 'Quality Control Charts' on page 75.

#### Establishing the reference values and verifying image quality

After installation of a new Drystar 5302 and before initial use you must establish Quality Control aim values. These values will be used as the base line for comparison when daily Quality Control is done. These values should be determined again after major service, repair or software update.

The following Quality Control aim values must be determined:

- The daily operating density levels. Refer to 'Establishing the daily operating reference density levels' on page 49.
- Drystar 5302 image geometry. Refer to *Establishing the image geometry reference values*' on page 52.

Once Quality Control aim values are established you must evaluate the Spatial Resolution, the Artifact Levels and the Low Contrast Visibility to determine if the image quality is acceptable. Refer to *'Verifying Acceptable Spatial Resolution, Artifact Levels and Low Contrast Visibility'* on page 54.

The Quality Control aim values, the Spatial Resolution and Artifact Levels and the Image Geometry values are all recorded on the Quality Control charts. Refer to '*Quality Control Charts*' on page 75.

On these charts, the following test conditions are also recorded:

- The type and serial number of the Drystar 5302.
- The type and emulsion number of the film used to determine the reference values.
- The time (day, month, year) that the values were established.



Before you can establish the daily operating levels, the Drystar 5302 must be switched on for at least 15 minutes and it must be calibrated as well.

Refer to 'Switching on the Drystar 5302' on page 30 and 'Performing the calibration procedures' on page 97 of the Drystar 5302 Reference manual.

Establishing the daily operating reference density levels

This procedure enables you to establish the base line values for:

- Low density
- Mid density
- High density



The densitometer of the Drystar 5302 is calibrated at installation. Authorized service personnel should recalibrate the densitometer annually or after major service or repair.

To establish the daily operating levels, proceed as follows:

- 1 Press the Key-operator key 📋 to enter the Key-operator mode.
- 2 Press the down key seven times, followed by the **ok** key to select 'QC'.

1 Show settings 2 Change settings 3 Brint imago	Key-operator main menu
4 Save configuration 5 Restore configuration 6 Calibration	<ul> <li>♥ quit</li> <li>♥ ok</li> <li>■ ■ select</li> </ul>
7 Installation	
8 QC	

The 'QC' screen appears:

Chard	QC	Key-operator QC	
to pe d	printing test image arform: aily / weekly nd yearly control	⊠ quit I ok	

**3** Press the ok key to continue.

The Drystar 5302 will automatically print the QC Test image.

4 After the image is printed, the system will display the optical density values:

readings	Key-operator QC
:0.26 :1.35 :1.89 hart)	✓ ok
	readings :0.26 :1.35 :1.89 hart)

The displayed values represent the following steps on the test film:

- Low density: the density of the Low density step. Target: 0.4.
- Mid density: the density value of the Mid density step. Target: 1.2.
- High density: the density value of the High density step. Target: 2.0.



If the mid density value does not meet or exceeds the recommended values, the reason must be found and the problem solved before any further clinical films can be printed.

Refer to '*Preventive maintenance schedule*' on page 59 and '*Maintaining image quality and resolving image quality problems*' on page 173 of the Drystar 5302 Reference manual, or call your local Agfa service organization.

- **5** Record the density levels on the Drystar 5302 Chart 1 ('Determination of the operating levels'). Refer to '*Quality Control Charts*' on page 75.
- **6** Press the ok key. The following screen is displayed:

QC	Key-operator QC
dure as stated in the User man- ual	▼ ok

- Press the ok key to return to the main menu. 7
- Repeat 1 steps through 7 once a day for five consecutive days, as indicated on 8 the Drystar 5302 Chart 1.
- Calculate the average value of the densities from the five images. These values 9 represent operating levels, or aim values, for each density.
- **10** Record the respective aim (average) values as the 'Operating levels' on the Drystar 5302 Charts 2a and 2b ('daily Drystar 5302 control chart'). Refer to TAPPROVED 'Quality Control Charts' on page 75.

The calculated 'Operating levels' shou	ld be as following:	
--	---------------------	--

Operating Level	Value (according IEC 1223-2-4 or beter)
Low density	$0.4 \pm 0.05$
Mid density	1.2 ± 0.15
High density	2.0 ± 0.2

**11** These charts will be used for the daily quality test. For more information, refer to 'Performing the daily QC test' on page 55.

Establishing the image geometry reference values

 Print the QC test image or use the previously printed test image. You should obtain an image looking like this (without the dimensions A and B): QC test image



**2** To determine the reference values for geometry, measure the dimensions A and B of the geometric square on the test image.



Make sure to measure distance A from the left edge of the left line to the right edge of the right line and distance B from the upper edge of the upper line to the lower edge of the lower line.

We strongly recommend using a 30 cm (12-inch) machinist scale with 0.5 mm divisions (1/64 inch).

**3** Record these values as reference dimensions A ref and B ref on the Drystar 5302 Chart 4 ('Drystar 5302 Geometric Consistency Control Chart'). Refer to '*Quality Control Charts*' on page 75.

These charts will be used for the annual quality test. For more information, refer to *'Performing the Annual QC tests'* on page 58.

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4 Save this film for future reference.

Verifying Acceptable Spatial Resolution, Artifact Levels and Low Contrast Visibility



Good viewing conditions are important for the correct interpretation of both diagnostic and test images. Make sure that the lightbox intensity (luminance) is between 2000 and 4000 cd/m<sup>2</sup> (4500 and 6500 °K). Use a magnifying glass and use shutters to collimate. Make sure the ambient light is low.

- 1 Print the QC Test image or use the previously printed QC Test image used to establish the daily operating density levels.
- 2 Visually check the QC test image for artifacts: no significant disturbing artifacts should be visible.
- 3 Check the spatial resolution in each of the three ovals. Within each oval there are three groups, each having five dots. All five dots of each group must be visible with a magnifying glass. The smallest cluster of 5 dots are only visible if the viewing conditions are good.
- 4 Record these values at the top of the Drystar 5302 Chart 3 (Drystar 5302 Artifacts and Spatial Resolution Control Chart). Refer to '*Quality Control Charts*' on page 75.
- 5 Check the Low Contrast Visibility at both the high (100 / 95%) and low end (0 / 5%) of the density scale. You should be able to see the circle in the square (refer to item 1 on the '*QC test image*' on page 52) and the upper circle (refer to item 2 on the '*QC test image*' on page 52).
- 6 These charts will be used for the weekly quality test. For more information, refer to *'Performing the Weekly QC tests'* on page 57.



In case of significant artifacts or insufficient spatial resolution, the reason must be found and the problem solved before any further clinical films can be printed.

Refer to '*Preventive maintenance schedule*' on page 59 and '*Maintaining image quality and resolving image quality problems*' on page 173 of the Drystar 5302 Reference manual, or call your local Agfa service organization.

## Performing quality control (QC) tests

The following procedures must be performed daily, weekly or annually as indicated.

The reason for performing quality control tests is to determine if any significant image quality variation or deterioration has occurred which may require corrective action. Comparing the results of the tests with the reference values previously established does this.

This procedure allows the operator to take the necessary preventive actions TAPPROVED before any image quality loss can take place.

Performing the daily QC test



This test must be performed every day before any clinical film can be processed.

- 1 Turn on the Drystar 5302 and wait at least for 15 minutes. Refer to 'Switching on the Drystar 5302' on page 30.
- Press the Key-operator key to enter the Key-operator mode. 2
- 3 Press the down key seven times, followed by the ok key to select 'QC'.

1 Show settings 2 Change settings	Key-operator main menu
4 Save configuration 5 Restore configuration 6 Calibration	<ul> <li>♀ quit</li> <li>♀ ok</li> <li>■ select</li> </ul>
8 QC	

The 'QC' screen appears:



4 Press the ok key to continue.

The Drystar 5302 will automatically print the QC Test image.

After the image is printed, the system will display the optical density values:

QC Internal Density r	eadings	Key-operator QC
Low density Mid density High density: (copy on control o	:0.19 :1.25 1.78 chart)	🔽 ok
<		

- 5 Record the density values on the Drystar 5302 Charts 2A and 2B (Drystar 5302 Daily Density Control Chart'). Also record the date and time of the test on the charts and on the QC test images. Refer to 'Quality Control Charts' on page 75.
- 6 Press the ok key. The following screen is displayed: OT AP

QC	Key-operator QC
Proceed with the QC proce- dure as stated in the User man- ual	<b>⊘</b> ok

7 Press the ok key to return to the main menu.



In case the measure results are not within the aim values, the reason for the unacceptable density variations must be identified and resolved before any further clinical films can be processed. This may include repeating the film calibration procedure.

For possible causes of non-compliance and the respective actions, refer to *Preventive maintenance schedule'* on page 59 and *Maintaining image quality* and resolving image quality problems' on page 173 of the Drystar 5302 Reference manual.

Performing the Weekly QC tests

Spatial Resolution, Artifact Test and Low Contrast Visibility

To identify artifacts and verify spatial resolution you must perform the following test weekly or as needed for troubleshooting image quality problems.



Good viewing conditions are important for the correct interpretation of both diagnostic and test images. Make sure that the lightbox intensity (luminance) is between 2000 and 4000 cd/m<sup>2</sup> (4500 and 6500 °K). Use a magnifying glass and use shutters to collimate. Make sure the ambient light is low.

- 1 Check the QC test image visually for artifacts: no significant disturbing artifacts should be visible.
- 2 Check the spatial resolution.

The test film also shows three squares which each contains an oval. These 3 ovals contain 3 groups, each having 5 dots. All five dots of each group must be visible with a magnifying glass. The smallest cluster of 5 dots are only visible if the viewing conditions are good.

- **3** Check the Low Contrast Visibility at both the high (100 / 95%) and low end (0 / 5%) of the density scale. You should be able to see the circle in the square (refer to item 1 on the '*QC test image*' on page 52) and the upper circle (refer to item 2 on the '*QC test image*' on page 52).
- **4** Record these values on the Drystar 5302 Chart 3 (Drystar 5302 Artifacts and Spatial Resolution Control Chart).



In case of significant artifacts, insufficient spatial resolution or failure of any other recommended QC tests, the cause of the problem must be identified, and corrective action must be taken before the Drystar 5302 can be used for any further clinical imaging.

Refer to *Preventive maintenance schedule*' on page 59 and *Maintaining image quality and resolving image quality problems*' on page 173 of the Drystar 5302 Reference manual, or call your local Agfa service organization for assistance.

#### Performing the Annual QC tests

Geometric Consistency Test

To be able to notice fluctuations in image size and aspect ratio, you must perform this procedure once a year.

- **1** First, perform the daily test.
- 2 Use the QC test image of the weekly test and measure the dimensions A and B of the geometric square. Refer to *Establishing the image geometry reference values*' on page 52.



Make sure to measure distance A from the left edge of the left line to the right edge of the right line and distance B from the upper edge of the upper line to the lower edge of the lower line.

We strongly recommend using a 30 cm (12-inch) machinist scale with 0.5 mm divisions (1/64 inch).

- **3** Record these values as measured dimensions A and B on Chart 4 ('Drystar 5302 Geometric Consistency Control Chart').
- 4 Compare the measured A and B dimensions with the reference dimension values, A ref and B ref on the Drystar 5302 Chart 4 ('Drystar 5302 Geometric Consistency Control Chart').

The differences between measured dimensions of A and B and the reference values A ref and B ref should be less than or equal to 1.0%.

- **5** Check for image distortion.
- 6 Calculate the aspect ratio by dividing A by B. The result must be 1 +/- 0.01



If the image size or distortion values are outside of limits, contact Agfa service to resolve the problem.

# Preventive maintenance schedule

The Drystar 5302 is designed for trouble-free service. Maintenance and cleaning involve only some minor user tasks. Refer to the following pages for the appropriate cleaning procedure.

Interval	What to do?	Page
Ad hoc	'Cleaning the exterior'	60
When image quality tends to degrade. An appropriate warning message is displayed.	Cleaning the princhead'	61

#### Safety guidelines



To prevent damage to the printer while performing maintenance, observe the following safety precautions:

- Do not lubricate the printer.
- Do not attempt to disassemble the printer.
- Do not touch the resistor line of the print head.
- Always switch off the Drystar 5302 and disconnect the power cord from the outlet before carrying out any maintenance work inside the printer.



Film jam removal or cleaning the printer head can be done without switching the power off. Nevertheless, care should be taken and the 'Safety precautions' on page 9 should be respected.

# Cleaning the exterior

- 1 Switch off the Drystar 5302 by following the procedure as described in *'Switching off the Drystar 5302'* on page 32.
- **2** Remove the power plug from the socket.
- Wipe the exterior of the printer with a clean, soft, damp cloth.Use a mild soap or detergent if required but never use an ammonia-based cleaner. Be careful not to get any liquid in the power cord port.
- careful not to get any liquid in the power cord port.
  Plug in the printer and switch it on by following the procedure as described in *Switching on the Drystar 5302* on page 30.

# Cleaning the print head



Print head cleaning must be done when image quality problems occur.

#### To clean the print head:

- 1 Press the Key-operator key to enter the key-operator mode.
- 2 On the key-operator main menu, press the Down key five times, followed by the Confirm key to select 'Calibration'.



**3** On the Calibration menu, press the Down key, followed by the Confirm key to select 'Therm. Head clean.'.



**4** The 'Thermal head cleaning' screen will give step by step instructions on what to do:



#### **5** Open the top cover.



6 As soon as the top cover is opened, the 'Thermal head cleaning' screen continues giving the following instructions:



7 Open the hold-down bracket.



**8** Open the print head unit.



**9** Locate and check on sight the print head resistor line.





Be careful not to touch the print head resistor line with your fingers.

**10** Clean the print head resistor line.



Gently pass over the resistor line a few times with a lint free cloth, slightly moistened with Isopropyl alcohol or Ethanol. **Do this only in one direction, i.e. from left to right, without lifting the cloth**.



Do not apply any pressure on the print head because this pressure may cause damage on the interconnections underneath the print head.

11 Close the print head unit, the hold-down bracket and finally the top cover.

After you have cleaned the print head resistor line and you have closed the top cover, the printer will restart automatically.



If residue dust is present as part of the cleaning procedure it will disappear after a few prints.

# Troubleshooting checklist

The table below lists some general problems which can occur when working with the Drystar 5302.



Refer to the appropriate pages of the Drystar 5302 Reference manual.

• The Drystar 5302 does not print.

Action	Refer to	Page (Ref. Man.)
	'Checking the status indicator LED'	157
Check the Drystar 5302	'Checking the connections'	158
	'Checking the print queue'	160
	'Film input tray jams'	162
Remove a jammed film	'Film transport jams (clearing from the top)'	165
	'Unauthorized opening of the printer'	167
Resolve error messages	'Checking error messages'	159
Handle CF-card errors	'Checking CF-card error messages'	159
Resolve film identification problems	'The Film Identification tag is not readable'	168

• The quality of the printed images is bad (printing remains possible).

Action	Refer to	Page (Ref. Man.)
Resolve film quality problems	'Persistent white dots or lines appear in the transport direction'	175
Resolve warning messages	'Maintenance messages'	177

Have electrical or mechanical defects repaired by skilled personnel only!





# Equipment information sheet

# **Specifications**

Product description	
Type of product	Printer
Commercial name	Drystar 5302
Original seller/manufacturer	Agfa-Gevaert N.V.
Labelling	PROVED
TÜV-, cULus-Certification Mark, CE-marking	NOTAP
CCC Mark	
Dimensions	
Dimensions (approx. values in cm)	<ul> <li>Unpacked: width tbd, length tbd, height tbd</li> <li>Packed: width tbd_length tbd</li> </ul>
	height tbd
Weight	• Unpacked: approx. 90 kg
Weight	• Packed: approx. 120 kg
RAM memory	512 Mb
Mass storage media (internal/external)	Compact Flash Type II
Electrical connection	
Operating voltage	100-127 V; 220-240 V AC
No external mains fuses	
Mains frequency	50/60 Hz

Network connectivity			
Ethernet / connectors	RJ45 twisted pair for 10/100Base-TX; Serial RS232 connection		
Network protocols (TCP/IP services)	FTP, Telnet, HTTP, SMTP		
Image formats	DICOM (Default) TIFF		
Postscript	Not available		
Power consumption - heat dissipation	PROVED		
During operation	250 W - 900 kJ/h		
In standby	70 W - 252 kJ/h		
Peak power (absolute max. rating)	530 W - 1908 kJ/h		
Protection against			
Electrical shocks	Class 1 (grounded)		
Ingress of water	IPXØ		
Environmental conditions (operation)			
Room temperature	Between +15°C and +30°C		
Relative humidity	Between 20% and 75%		
	Note: Films may not become wet!		
Atmospheric pressure	70 kPa - 106 kPa		
Environmental storage conditions			
Climate conditions for storage are in accordance with EN60721-3-1-class 1K4.			
Room temperature	Between -25°C and 55°C (storage)		
Relative humidity	Between 10% and 100%		
Absolute humidity	Between 0.1 g/m <sup>3</sup> and 35 g/m <sup>3</sup>		
Rate of change of temperature	1°C/min		
Atmospheric pressure	70 kPa - 106 kPa		

Environmental transport conditions			
Climate conditions for transport EN60721-3-2-class 2K4.	are in accordance with		
Temperature	Between -40°C and 70°C (transport)		
Relative humidity not combined with rapid temperature changes	95% at +45°C		
Noise emission (method of measureme part 19)	ent in accordance with DIN 45635		
During operation	Max. 64 dBA		
In standby	Max. 54 dBA		
Consumables			
Drystar DT 2B and Drystar DT 2C	8x10", 10x12", 11x14", 14x14" and 14x17"film sizes		
Print technology			
Direct thermal printing			
Reliability			
Estimated product life (if regularly serviced and maintained according to Agfa instructions)	> 5 years and > 125,000 films		
Service interventions	Max. 2 interventions / 3 years		
Earthquake (standard)	Meets the CA requirements		

Imaging Array - Diagnostic area					
Film size 8x10"	8" dimensions in pixels	8" dimensions in mm	10" dimensions in pixels	10" dimensions in mm	
Diagnostic area	2375.76	188.64	3072.24	243.94	
Film size 10x12"	10" dimensions in pixels	10" dimensions in mm	12" dimensions in pixels	12" dimensions in mm	
Diagnostic area	3072.24	243.94	3652.84	290.04	
Film size 11x14"	11" dimensions in pixels	11" dimensions in mm	14" dimensions in pixels	14" dimensions in mm	
Diagnostic area	3348.06	265.84	4358.13	346.04	
Film size 14x14"	14" dimensions in pixels	14" dimensions in mm	14" dimensions in pixels	14" dimensions in mm	
Diagnostic area	4358.13	346.04	4302.72	341.64	
Film size 14x17"	14" dimensions in pixels	14" dimensions in mm	17" dimensions in pixels	17" dimensions in mm	
Diagnostic area	4358.13	346.04	5232.19	415.44	

# Viewing the System info area on a film

On the top right corner of each film, a "System info" area will be printed.

This info can only be read using a magnifying glass.



The System info area contains info about:

- Printer: (serial number, densitometer info, film counts, software version, etc.),
- Controller (image source, date, time, etc.).

For more detailed information, refer to the Drystar 5302 Service documentation.

# **Options and accessories**

#### Mobile / Earthquake provisions

#### Hardware

The OPTIONAL mobile/earthquake installation kit allows you to use the Drystar 5302 in a van, or to use it in unstable environment.

It contains the necessary equipment to fix the printer onto a table and has provisions for easy service access.

The mobile/earthquake installation kit is delivered with the necessary mounting instructions.

Software

No additional software for mobile/earthquake use is required.

ABC code

ABC code: tbd

# Connectivity

#### Connectivity with Agfa equipment

- Connected via VIPS or CR QS
  - ADC Compact
  - ADC Compact Plus
  - ADC Solo
  - CR 25.0
  - CR 75.0
- ADR Thorax
- Impax
- MG3000
- Paxport
- MULTIFLEX

For more information, contact your Agfa representative.

#### Connectivity with non-Agfa equipment

Drystar 5302 is a Dicom printer and can therefore be connected to all modalities supporting Dicom. Although, to ensure optimal operation and image quality, Agfa has made the effort to test and release the Drystar 5302 with most of modalities on the market. For the complete list or if you want to check on a specific modality, contact your Agfa representative.

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Appendix

# Quality Control Charts

Chart	1
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# Drystar 5302: Determination of Operating Levels

Imager Type:	Serial #:	Date
Film Type:	Emulsion #:	
Densitometer	Internal:(	default selection)
	External: Type S	Serial #:

**Step 1:** Print QC Test images on five consecutive days. Record the optical densities measurements in the tables below. After five days, average the values to determine the operating (aim) levels for each of the parameters.

	Day 1	Day 2	Day 3	Day 4	Day 5
Month					
Day					
Initials					
-					
Low Donaity					

Low Density					
A	verage of 5 Values	= operating (aim)	level "Low Density	r"	

Mid Density					
A	verage of 5 Values	= operating (aim)	level "Mid Density"	"	

High Density				
Avera	ge of 5 Values = o	perating (aim) leve	el "High Density"	

Step 2: Copy the operating (aim) levels to Charts 2A/B ('Daily Density Control Chart')

Chart 2A



# Drystar 5302 Daily Density Control Chart

	Druster 530	P Daily Donsi	Chart 2B
	Conti	ol Chart	ly
	Cond		
Imager Type:	_ Serial #:	_ Film Type:	Emul #:
Densitometer	Internal:	(default sel	ection)
	External: Type	Serial #:	
Upper Control limit =			
+0.20			
		High Density	

\_

High Density Aim

Lower Control Limit =

-0.20

Chart 3

## Drystar 5302 Artifacts and Spatial Resolution Control Chart

Drystar 5302 Serial #

F									
	Initial Reference Test Date								
	Initial Reference Artifacts								
	Initial Reference Dot Visibility								
-	Initial Reference Low Contrast								
L									
Month									
Day									
Artifacts									
Visibility of all Dots									
Low Contrast Visibility									
· · ·									
Month									
Day									
Artifacts									
Visibility of all Dots									
Low Contrast Visibility									
Month									
Day									
Artifacts									
Visibility of all Dots									
Low Contrast Visibility									
Month									
Day									
Artifacts									
Visibility of all Dots									
Low Contrast Visibility									
Month									
Day									
Artifacts									
Visibility of all Dots									
Low Contrast Visibility									

Test Frequency:

Weekly



# Drystar 5302 Geometric Consistency Control Chart

Test Frequency: Annually or as required

Drystar 5302 Serial #\_\_\_\_\_

Reference Dimensions Date:		Measured Dimensions Date:		Consistency		Aspect Ratio	
A <sub>ref</sub>		A:		A/A <sub>ref</sub>		A/B	
B <sub>ref</sub>		B:		B/B <sub>ref</sub>			

Reference Dimensions Date:		Measured Dimensions Date:		Consistency		Aspect Ratio	
A <sub>ref</sub>		A:		A/A <sub>ref</sub>		A/B	
B <sub>ref</sub>		В:		B/B <sub>ref</sub>			

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