

ROBOTICS

Product specification

Robot stopping distances according to ISO 10218-1



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> Document ID: 3HAC048645-001 Revision: AC

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Original instructions.

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Inc	lex		885	

Overview of this specification

About this specification

This specification contains stopping distances and times for category 0 and category 1 stops, as required by EN ISO 10218-1 Annex B.

Usage

This specification should be used when calculating the safe distance in applying safeguarding devices.

Who should read this manual?

This specification is intended for:

· Personnel working with planning of robot systems

References

Documentation referred to in the manual, is listed in the table below.

Document name	Document ID
Safety manual for robot - Manipulator and IRC5 or OmniCore controller	3HAC031045-001
Product specifications for the respective robots	
Standard: EN ISO 10218-1, Annex B	
i This manual contains all safety instructions from the product manuals for t	he manipulators and the

This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

Revisions

Revision	Description	
-	First edition. Release 13.2.	
A	Release 14.1. The following robots are added: • IRB 120 • IRB 140 • IRB 6700 • IRB 260 • IRB 460 • IRB 660 • IRB 760	
В	 Release 15.1. The following robots are added: IRB 6700 variants IRB 1200 IRB 1520 IRB 1600 Descriptions about the data and measurements are updated. 	
С	Release 15.2. The following robots are added: • IRB 2400	

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Revision	Description		
	• IRB 4400		
	• IRB 8700		
	Note		
	Category 0 values are missing for IRB 7600 2.80 m 340 kg.		
D	Release 16.1.		
	The following robots are added: New variants for IRB 1600ID 		
	 This revision includes the following additions and/or changes: A description of how to measure the stopping distance and time for your installation is added, see <i>Measuring stopping distance and time on page 17</i>. 		
E	Release 16.1. Rename of the new variant IRB 1600ID - 6/1.55 to IRB 1660ID - 6/1.55. 		
	 Re-inserted IRB 1600ID-4/1.5 that was missing in the previous revision. 		
F	Release 16.2. Improved measurements for 4-axis articulated robots. 		
	 Improved measurements for 4-axis articulated robots. Category 0 values are added for IRB 7600 340/2.80. 		
G	Release 17.2.		
u	 Updated data for all previously published robots. 		
	Added information about naming conventions, see Naming of		
	product variants in this document on page 15.		
	The following robots are added: IRB 360		
	Note Note		
	For stop category 0, the robot may hit the mechanical stops before the speed is reduced to 0.		
	- IRB 6700Inv		
н	Release 19A.		
	The following robots are added: • IBB 6790		
	IRBP K, IRBP L, IRB R		
	Note		
	Note		
	Data for IRBP C will be added in a later release.		
J	The following robots are added: • IRB 910SC		
к	The following robots are added: • IRBP A, IRBP B, IRBP D		
	 Orrected names in tables for IRBP R. 		
L	The following robots are added:		
	• IRB 910INV		
	IRB 1100 IRBP C		
м			
М	Added back IRB 2600, that was accidentally removed from revision L.		

Continues on next page

Revision	Description	
Ν	Added correct graphics for IRB 2600. The graphics used in revisions J to M are not correct.	
Ρ	Release 20C. The category 0 stop data for all IRBP is updated with graphics. The following robots are added: • IRB 1300	
Q	Release 20C. The following robots are added: • IRB 760, 445 kg variant The description about measurement and calculation is updated.	
R	Release 21A. The following robots are added: • IRB 390	
S	Release 21B. The following robots are added: • CRB 1100 • CRB 15000	
Т	Release 21C. The following robots are added: • IRB 920 The graphs for IRB 1660ID are corrected.	
U	 Release 22A. The following robots are added: IRB 1300-12/1.4 IRB 5710 IRB 5720 The robot IRB 260 is removed as it is phased out from the official produc offer. 	
V	Release 22B. The following robots are added: • IRB 365	
W	Release 22C. The following robots are added: • IRB 1010 • IRB 920, new variants	
x	Release 22D. The following robots are added: • CRB 1300	
Y	 Release 23A. IRB 365, new variants The robot IRB 140 is removed as it is phased out from the official product offer. The robot IRB 6640 is removed as it is phased out from the official product offer. 	
Z	 Release 23B. The data for the CRB 15000 and IRB 5710/5720 robots is moved to their respective product specification. All documents are avail able on <u>www.abb.com/robotics</u>. The data for new robots is included in their respective product specification. 	

Revision	Description	
	Removed duplicated pages for IRB 1010.	
AA	Release 23C.	
	The following robots are added: • IRB 1510	
	The data for the CRB 1100, CRB 1300, IRB 1010, IRB 1100, IRB 1300, IRB 910INV, and IRB 920 robots is moved to their respective product specification. All documents are available on <u>www.abb.com/robotics</u> .	
	The data for new robots is included in their respective product specific- ation.	
AB	 Release 24A. Corrected the category 0 stop data for IRB 1600. IRB 120 is phased out from the product offer. 	
AC	 Release 24B. IRB 1410 is phased out from the product offer. IRB 910SC is phased out from the product offer. The stopping data for IRB 1200 OmniCore robots is moved to <i>Product specification - IRB 1200, 3HAC081417-001.</i> 	

1 About the data

Robot stopping distances and times

For articulated and SCARA robots, all measurements and calculations of stopping distances and times are done according to ISO 10218-1, with single axis motion on axes 1, 2, and 3. If more than one axis is used for the movement, then the stopping distance and time can be longer. Normal delays of the hardware and software are taken into account.

For delta robots (parallel arm) the values are based on movement by all axes, as these axes always move together. Only stopping times are presented.

For positioners the values are based on single axis movement.

The stop categories 0 and 1 are according to IEC 60204-1.

Category 0 stops

The stopping distance and time for category 0 stops are simulated using maximum speed, maximum payload, and the arm stretched out to the maximum reach.



Note

For SCARA robots without brakes on axis 1 and 2, the stopping distances for category 0 stops in actual applications can be longer than those stated in this document because without brakes, it is the friction that will stop the robot (on axes without brakes).

Category 1 stops

The stop category 1 data are based on calculations in simulation of worst case scenarios. The data for stop category 1 are verified by measurements.

The simulations and verifications are done with the default value (100%) for the system parameter AccSet. Changing this value will affect the stopping distances and times (only for robots running on versions prior to RobotWare 6.01).



Note

The stop category 1 is a controlled stop and will therefore have less deviation from the programmed path compared with a stop category 0.

Robots

For robots the stopping distance and time for category 1 stop is provided for three arm extensions and three payloads. These variables are 100%, 66%, and 33% of the maximum values for the robot.

The speed and zone data in the simulations are based on TCP0.

Positioners

For positioners the stopping distance and time is provided for three payloads. No extension zones are applicable. The payloads are 100%, 66%, and 33% of the maximum values for the positioner.

1 About the data

Continued

Positioners with more than one station are presented with only one station data as the stations are identical.

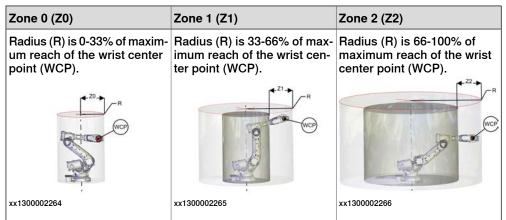
Loads

The used loads represent the rated load, with rated inertia in the load diagram, maximum cog z, and zero cog x and cog y. No arm load is used. The load diagrams are available in the respective product specification.

At 66% load and 33% load, the mass and inertia are reduced to 66% and 33% but cog z is the same as for 100% load.

Extension zones for articulated robots

The extension zone for the stop category 1 is based on the wrist center point (WCP). The extension zone limits describe the size of the respective zones. Radius R is measured from the axis-1 center.



Speed

For robots the TCP0 speed is measured in meters per second when the stop is triggered.

For positioners the speed is the angular speed in radians per second.

Stopping distances

The stopping distance is measured in degrees.



The stopping distances are presented as angles. Large angles with TCP0 close to the rotation center do not necessarily correspond to a long stopping distance. Therefore a large stop angle can represent a short TCP stop distance.



Note

The stopping distance for delta robots is measured in meters.

Stopping times

The stopping time is measured in seconds.

Limitations

The stopping distance can vary depending on additional loads on the robot.

The stopping distance for category 0 stops can vary depending on the individual brakes and their friction.

This document includes the robot variants that are part of the official product offer at the time of the release of this revision.

Naming of product variants in this document

The product variants presented in this document are named according to their reach and capacity. This corresponds to their official variant name but there are a few exceptions where the the names do not match due to different data sources. For example, IRB 6650S 125/3.5 is listed as IRB 6650S 3.45 m 125 kg.

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2 Measuring stopping distance and time

Preparations before measuring

For measurement and calculation of overall system stopping performance, see ISO 13855:2010.

The measurement shall be done for the selected stop category. The emergency stop button on the robot controller is configured for stop category 0 on delivery. A risk assessment can conclude the need for another stop category. The stop category can be changed through the system parameter Function (topic Controller, type Safety Run Chain). In case of deviations of the default configuration of stop category 0, then this is detailed in the product specification for the respective manipulator.



CAUTION

The measurement and calculation of overall stopping performance for a robot must be tested with its correct load, speed, and tools, in its actual environment, before the robot is taken into production.

All load and tool data must be correctly defined (weight, CoG, moment of inertia). The load identification service routine can be used to identify the data.



Follow the safety instructions in the respective product manual for the robot.

Measuring with TuneMaster

The software TuneMaster can be used to measure stopping distances and times for ABB robots. The TuneMaster software contains documentation on how to use it.

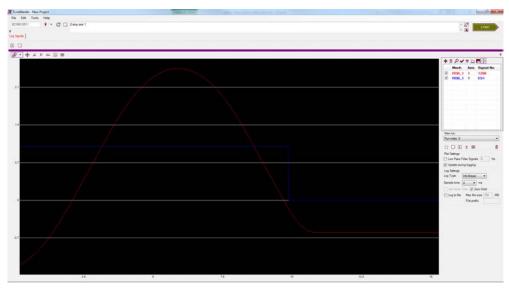
- 1 Download TuneMaster from www.abb.com/robotics, section RobotStudio -Downloads - RobotWare Tools and Utilities.
- 2 Install TuneMaster on a computer. Start the TuneMaster app and select Log Signals.
- 3 Connect to the robot controller.
- 4 Define the I/O stop signal to use for measurement, for example, ES1 for emergency stop.
- 5 Define the signal number to use for measurement, 1298 for axis position. The value is given in radians.
- 6 Start the logging in TuneMaster.
- 7 Start the test program on the controller.
- 8 When the axis has reached maximum speed, press the emergency stop button.
- 9 In TuneMaster, measure the stopping distance and time.
- 10 Repeat for all installed emergency stop buttons until the identified hazards due to stopping distance and time for axes have been verified.

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2 Measuring stopping distance and time

Continued

Example from TuneMaster



xx1600000386

3 IRB 1200

3.1 IRB 1200 0.7 m 7 kg



This data is applicable for the IRC5 robot. For OmniCore robots, see *Product specification - IRB 1200, 3HAC081417-001*.

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

Axis	Distance (degrees)	Stop time (s)
1	32.7	0.14
2	37.2	0.22
3	37.6	0.16

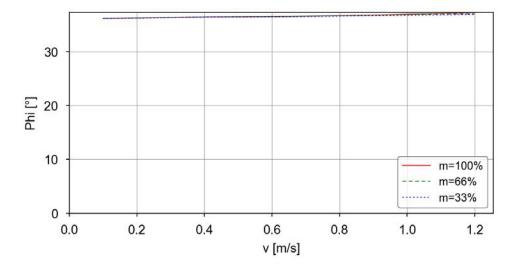
Category 1, extension zones

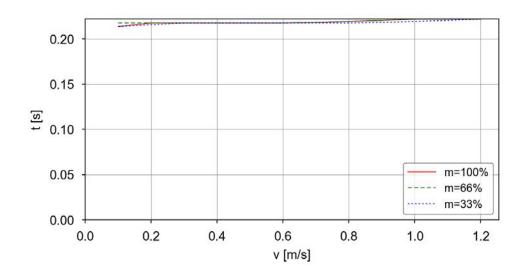
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.235
1	0.235	0.469
2	0.469	max reach

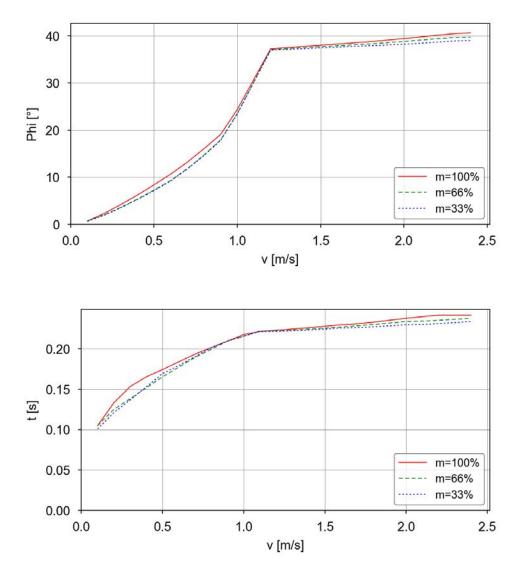
Category 1, Axis 1

Extension zone 0, stopping distance and stopping time

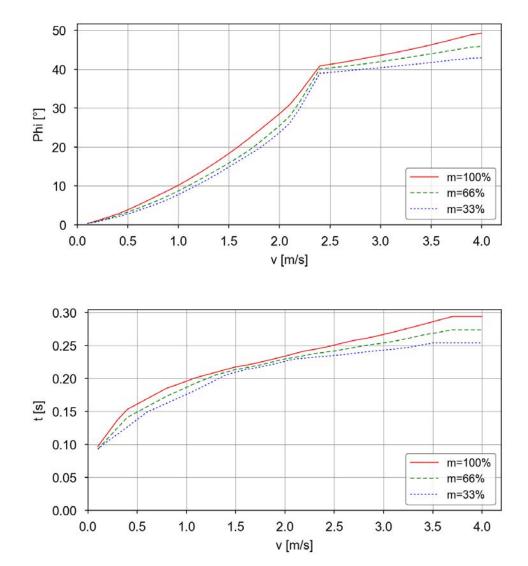




Extension zone 1, stopping distance and stopping time



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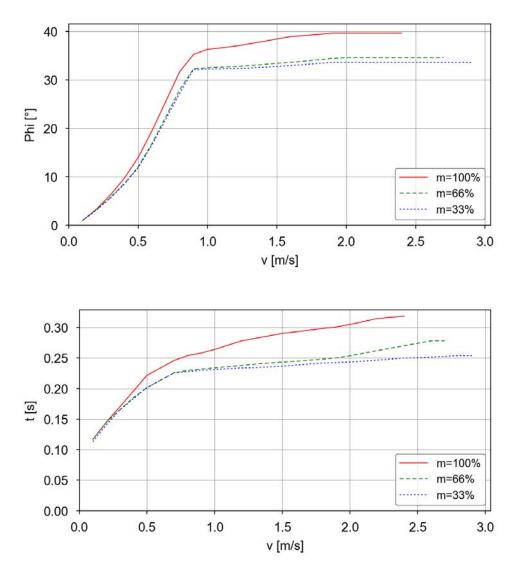
Extension zone 2, stopping distance and stopping time

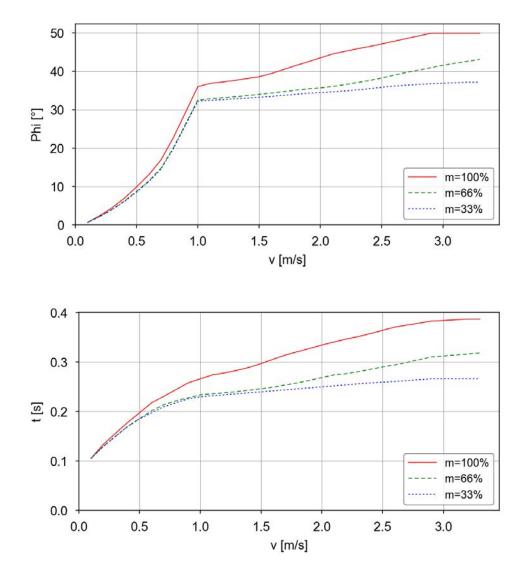
3 IRB 1200

3.1 IRB 1200 0.7 m 7 kg *Continued*

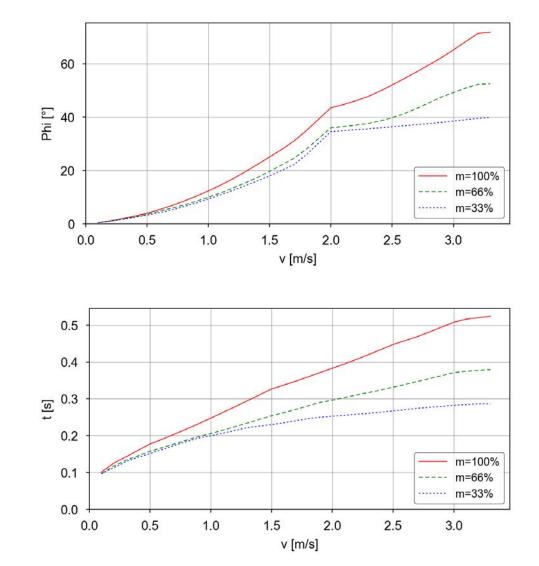
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time





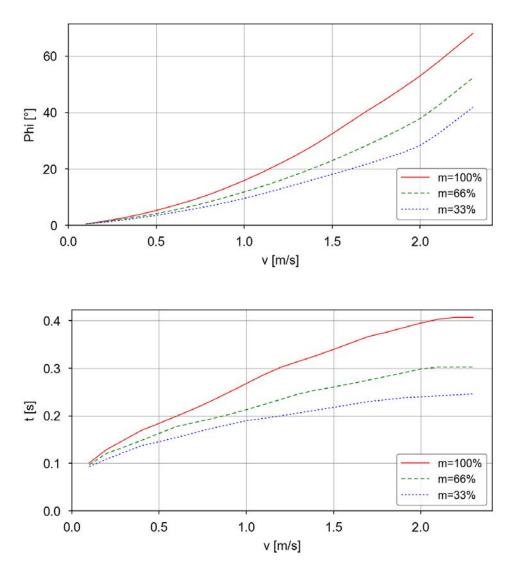
Extension zone 1, stopping distance and stopping time



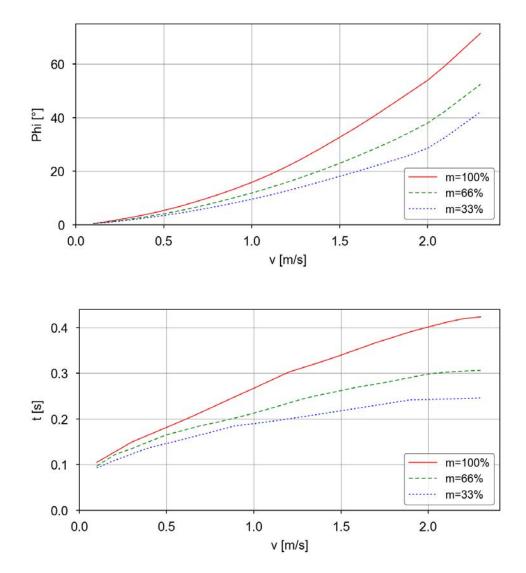
Extension zone 2, stopping distance and stopping time

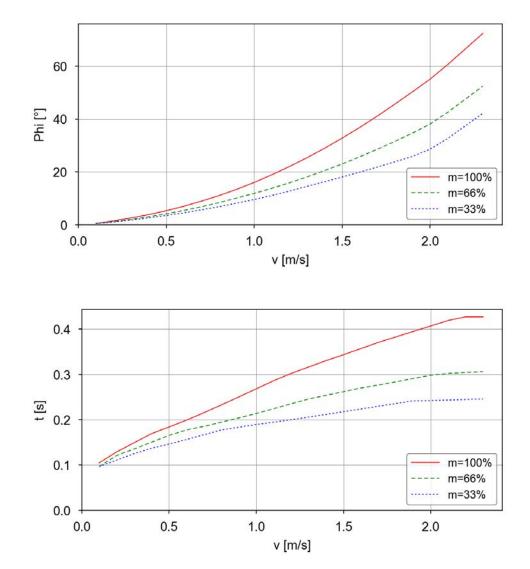
Category 1, Axis 3

Extension zone 0, stopping distance and stopping time



Extension zone 1, stopping distance and stopping time





Extension zone 2, stopping distance and stopping time

3.2 IRB 1200 0.7 m 7 kg

Note

This data is applicable for the IRC5 robot. For OmniCore robots, see *Product specification - IRB 1200, 3HAC081417-001.*

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

Axis	Distance (degrees)	Stop time (s)
1	32.7	0.14
2	37.1	0.22
3	37.6	0.16

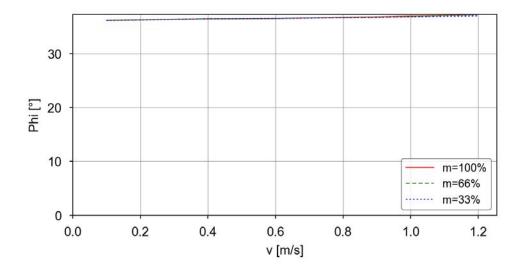
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.235
1	0.235	0.469
2	0.469	max reach

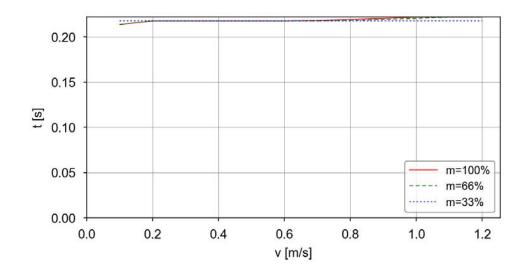
Category 1, Axis 1

Extension zone 0, stopping distance and stopping time

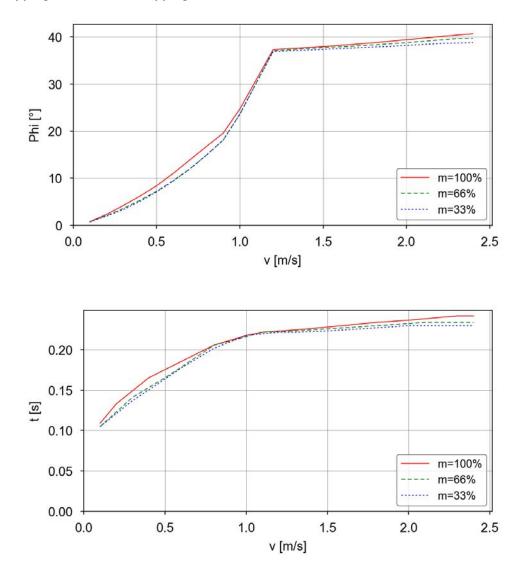


3 IRB 1200

3.2 IRB 1200 0.7 m 7 kg Continued



Extension zone 1, stopping distance and stopping time



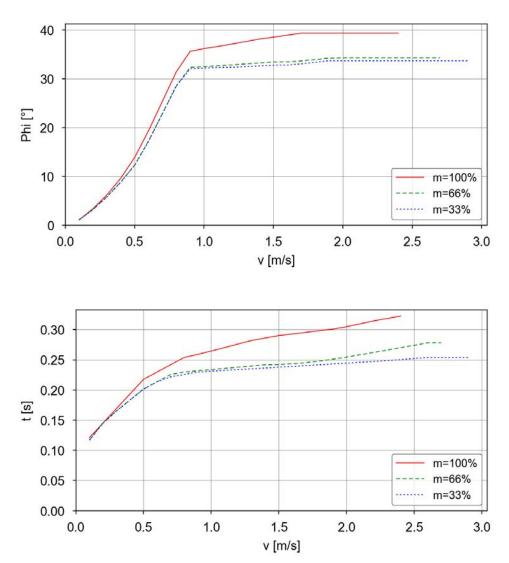
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> 50 -----40 30 Phi [°] 20 m=100% 10 --m=66% m=33% 0 1.0 1.5 2.5 0.0 0.5 2.0 3.0 3.5 4.0 v [m/s] 0.30 0.25 10000 ADDDDD 0.20 <u>چ</u> 0.15 1.... 0.10 m=100% 0.05 m=66% --m=33% 0.00 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 v [m/s]

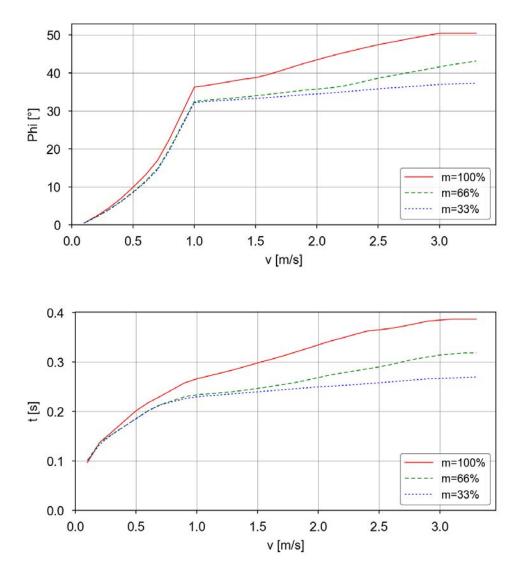
Extension zone 2, stopping distance and stopping time

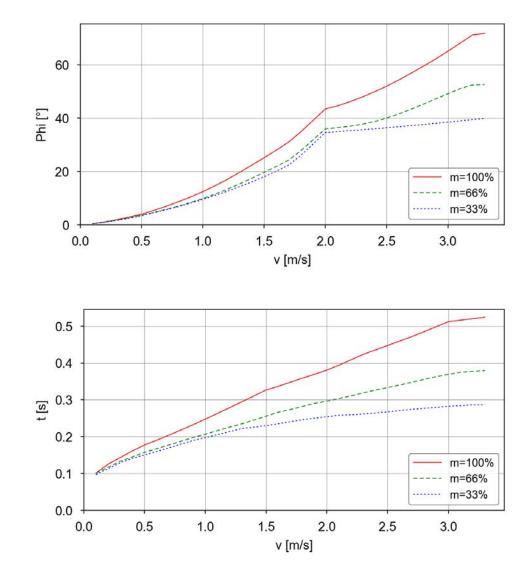
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time



Extension zone 1, stopping distance and stopping time





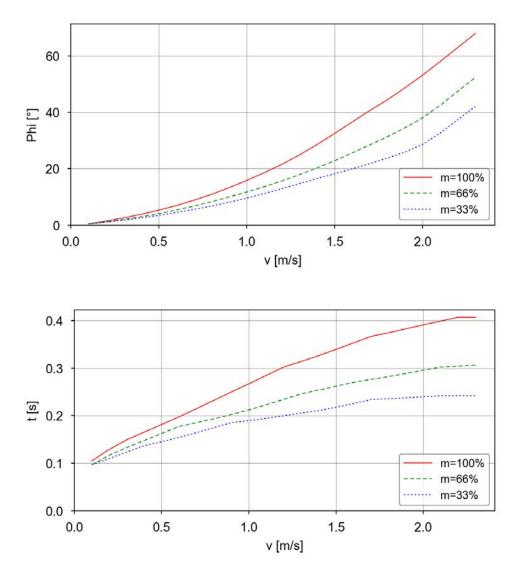
Extension zone 2, stopping distance and stopping time

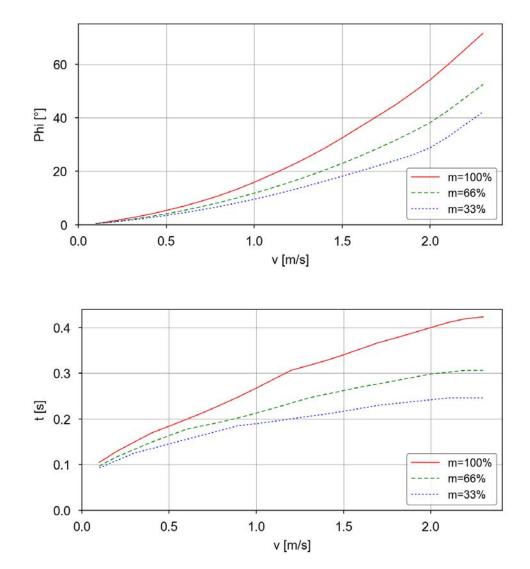
3 IRB 1200

3.2 IRB 1200 0.7 m 7 kg *Continued*

Category 1, Axis 3

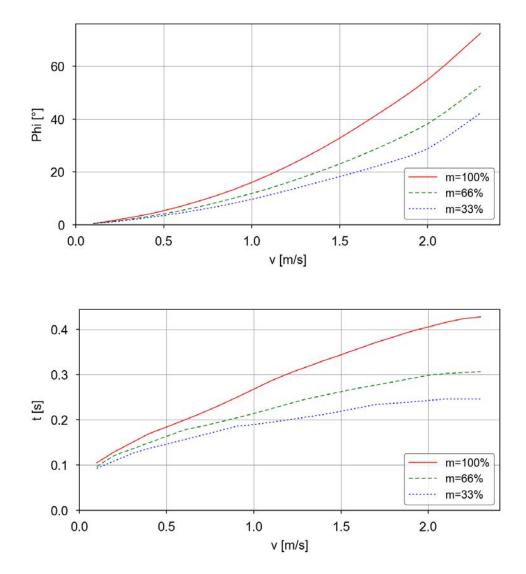
Extension zone 0, stopping distance and stopping time





Extension zone 1, stopping distance and stopping time

Extension zone 2, stopping distance and stopping time



3.3 IRB 1200 0.9 m 5 kg

Note

This data is applicable for the IRC5 robot. For OmniCore robots, see *Product specification - IRB 1200, 3HAC081417-001*.

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

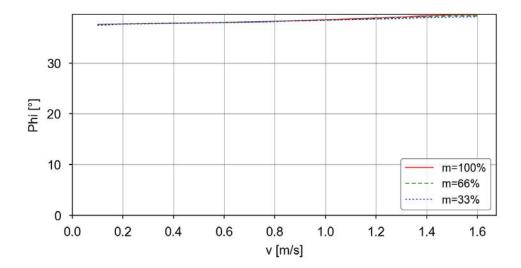
Axis	Distance (degrees)	Stop time (s)
1	39.1	0.19
2	45.8	0.29
3	42.1	0.2

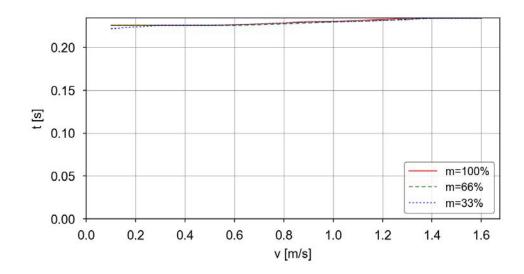
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

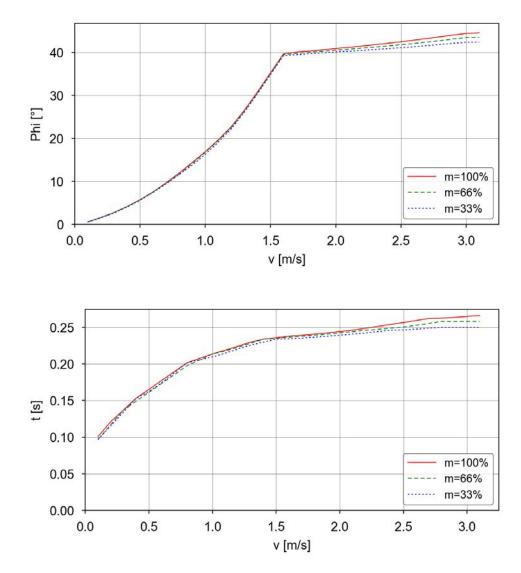
Zone	wcp min (m)	wcp max (m)
0	0	0.3
1	0.3	0.601
2	0.601	max reach

Category 1, Axis 1

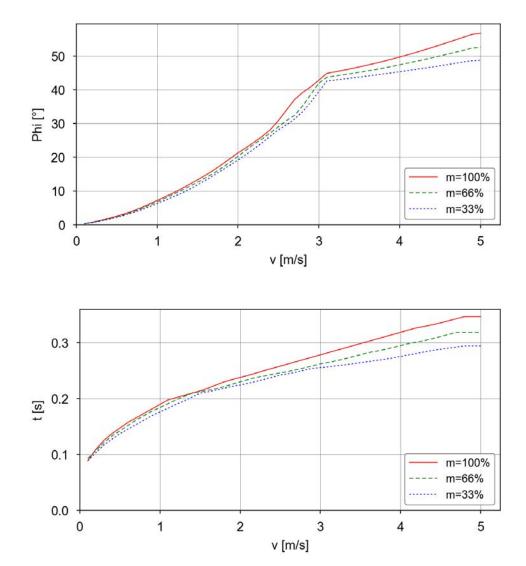




Extension zone 1, stopping distance and stopping time



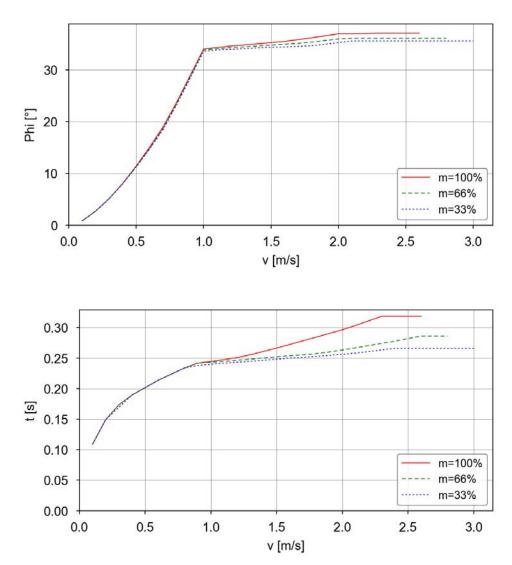
Continues on next page



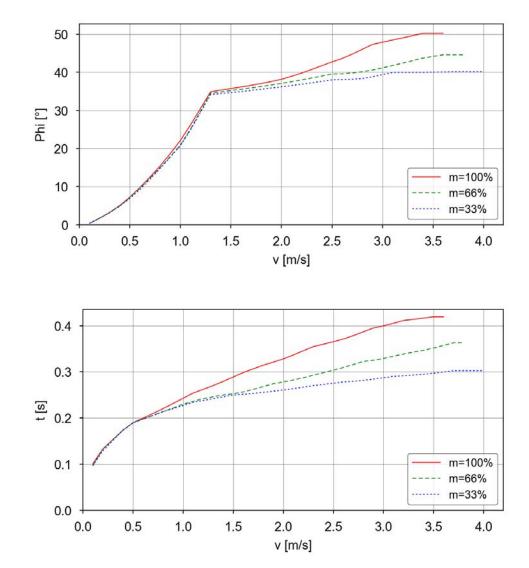
3.3 IRB 1200 0.9 m 5 kg *Continued*

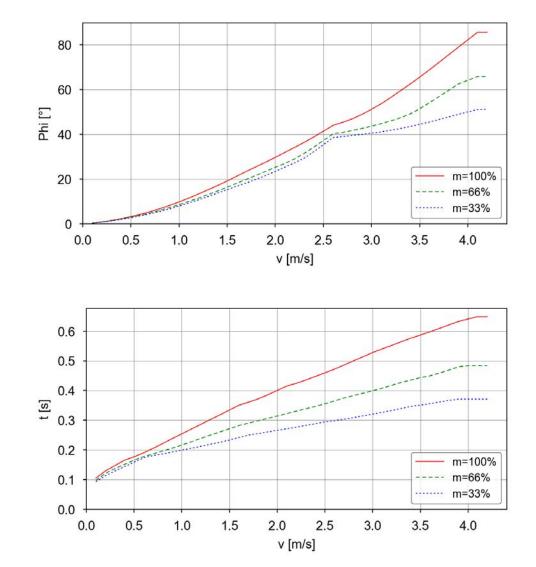
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time

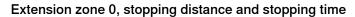


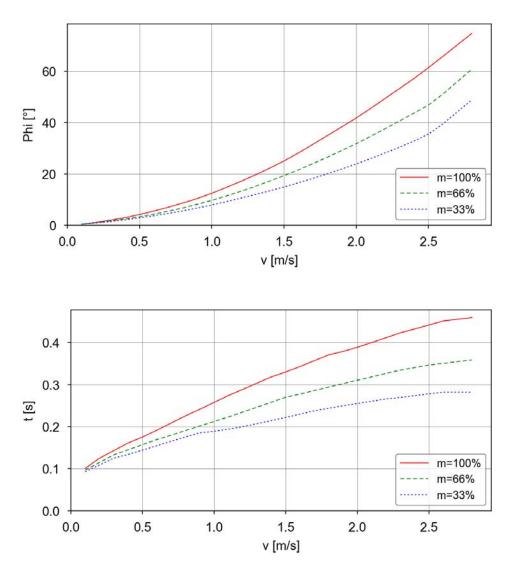
Continues on next page

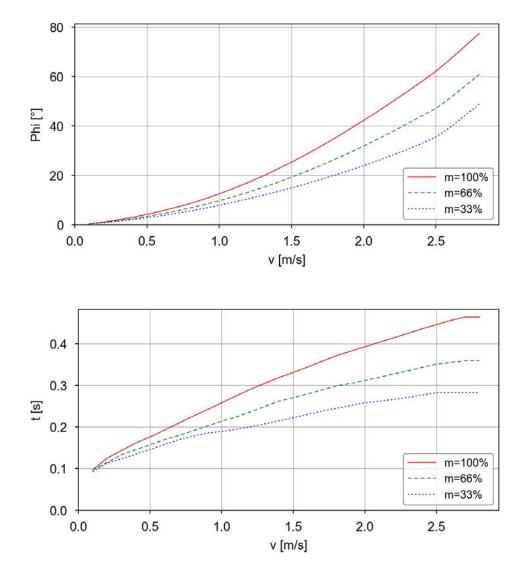


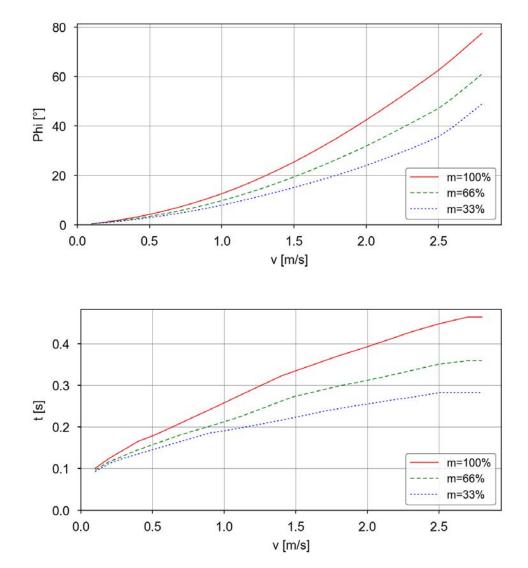


Category 1, Axis 3









Extension zone 2, stopping distance and stopping time

3.4 IRB 1200 0.9 m 5 kg

Note

This data is applicable for the IRC5 robot. For OmniCore robots, see *Product specification - IRB 1200, 3HAC081417-001.*

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

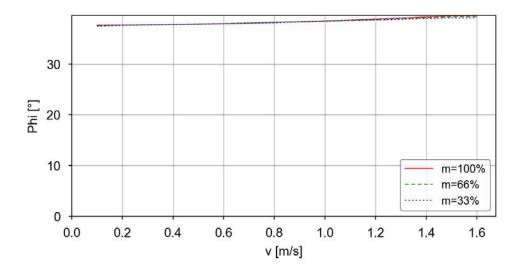
Axis	Distance (degrees)	Stop time (s)
1	39.1	0.19
2	45.6	0.29
3	41.9	0.2

Category 1, extension zones

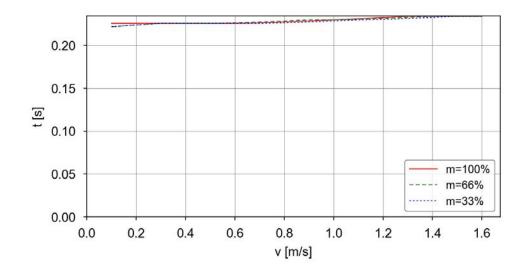
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.3
1	0.3	0.601
2	0.601	max reach

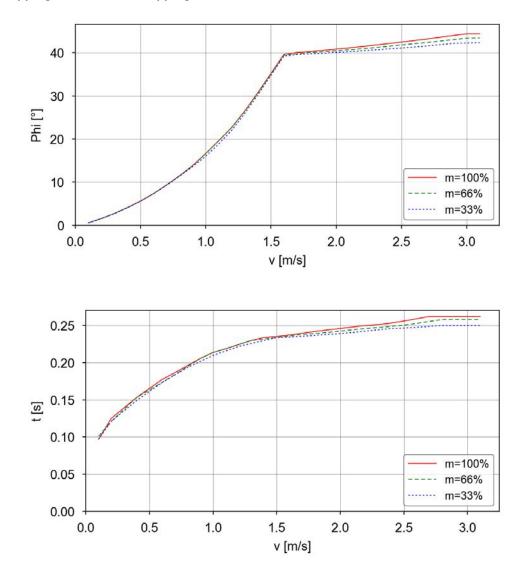
Category 1, Axis 1



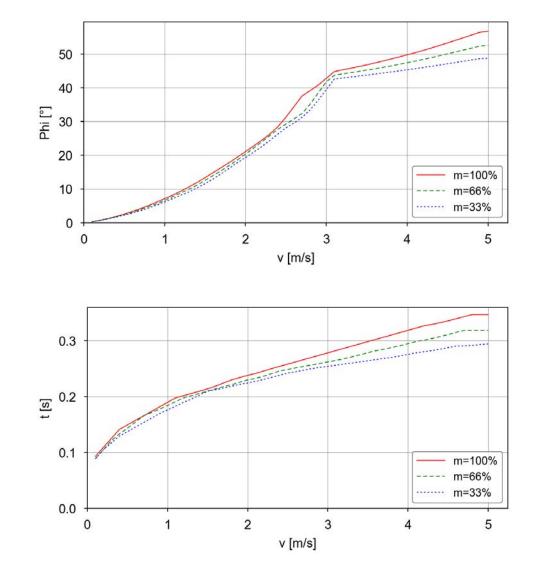
3.4 IRB 1200 0.9 m 5 kg Continued



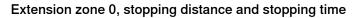
Extension zone 1, stopping distance and stopping time

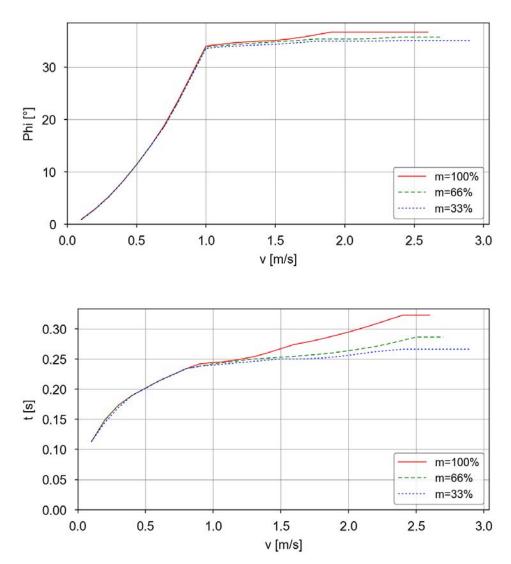


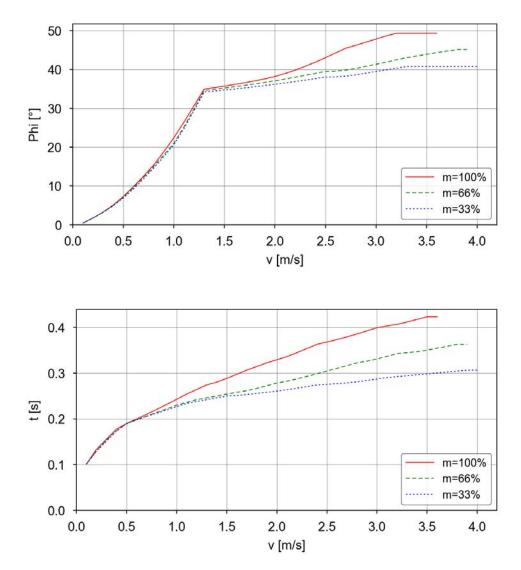
Continues on next page

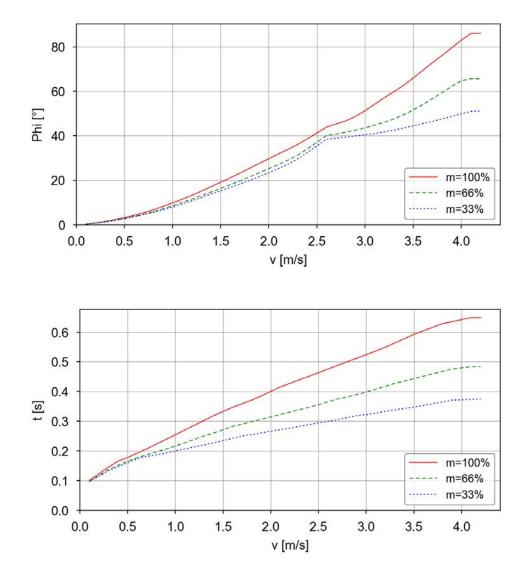


Category 1, Axis 2



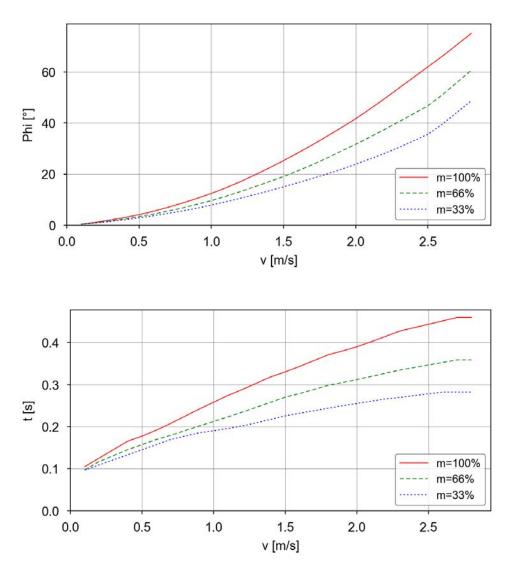


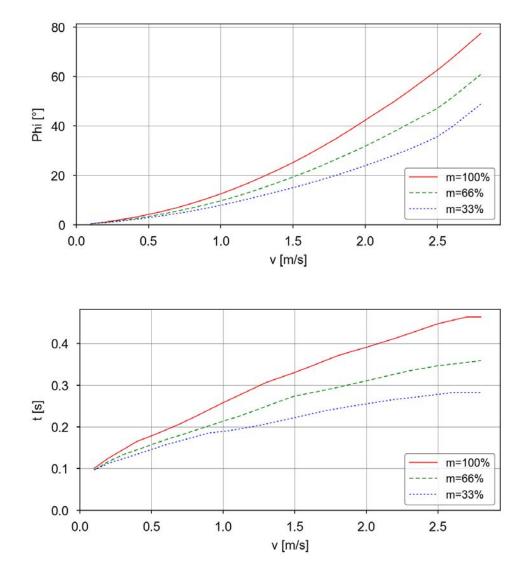


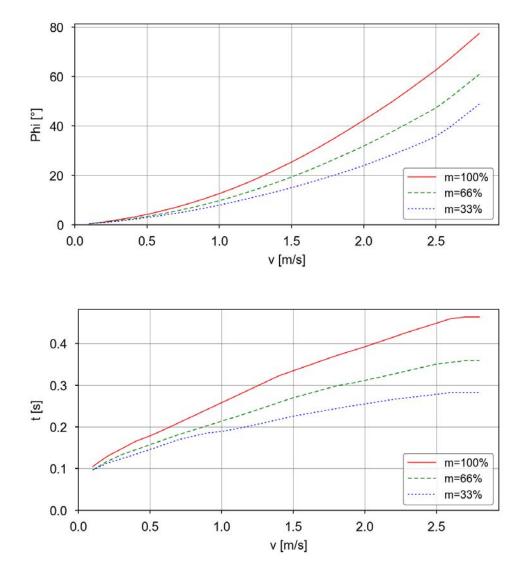


3.4 IRB 1200 0.9 m 5 kg *Continued*

Category 1, Axis 3







4.1 IRB 1510ID 1.5 m 4 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

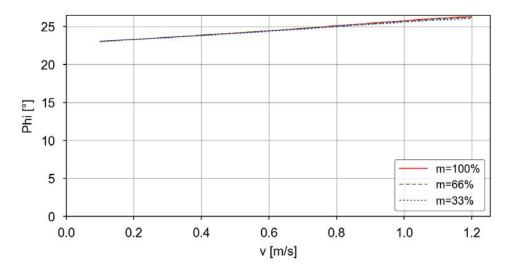
Axis	Distance (degrees)	Stop time (s)
1	20.2	0.22
2	18.5	0.17
3	15.0	0.12

Category 1, extension zones

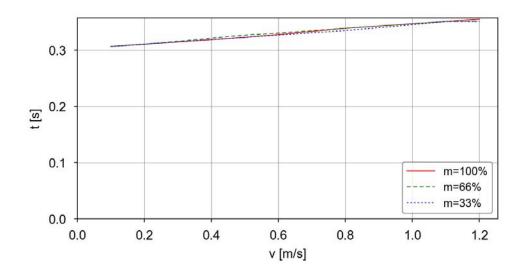
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.5
1	0.5	1.0
2	1.0	max reach

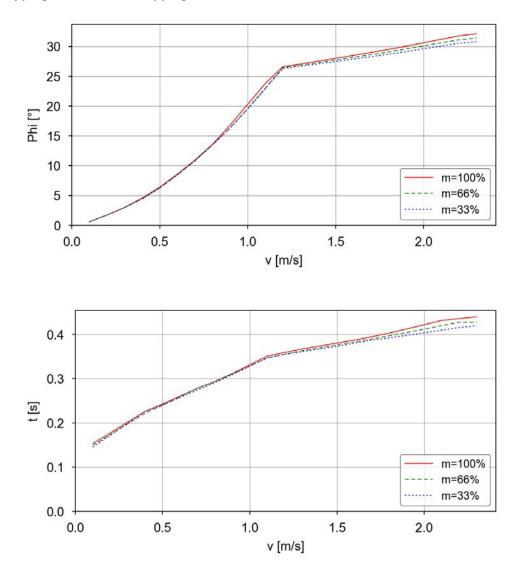
Category 1, Axis 1



4.1 IRB 1510ID 1.5 m 4 kg Continued

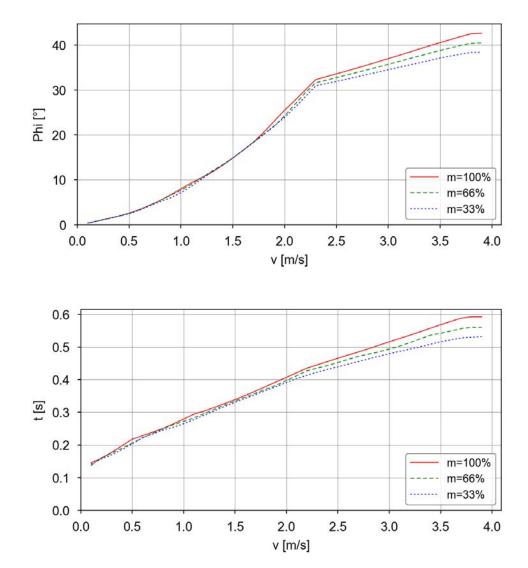


Extension zone 1, stopping distance and stopping time



Continues on next page

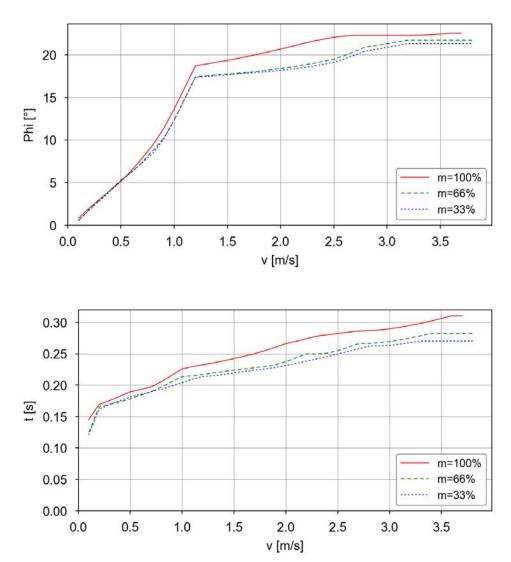
4.1 IRB 1510ID 1.5 m 4 kg Continued



4.1 IRB 1510ID 1.5 m 4 kg Continued

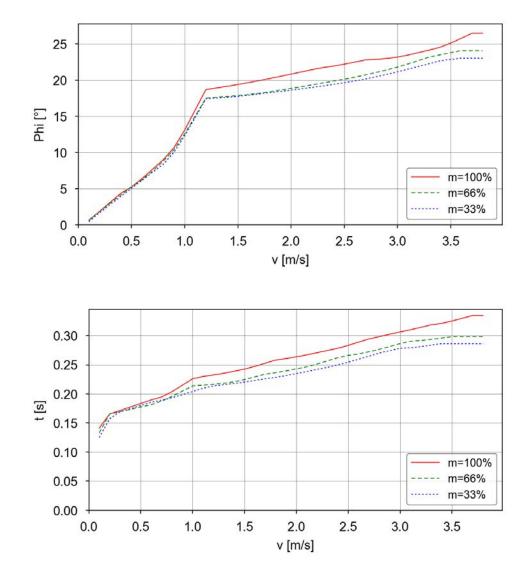
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time

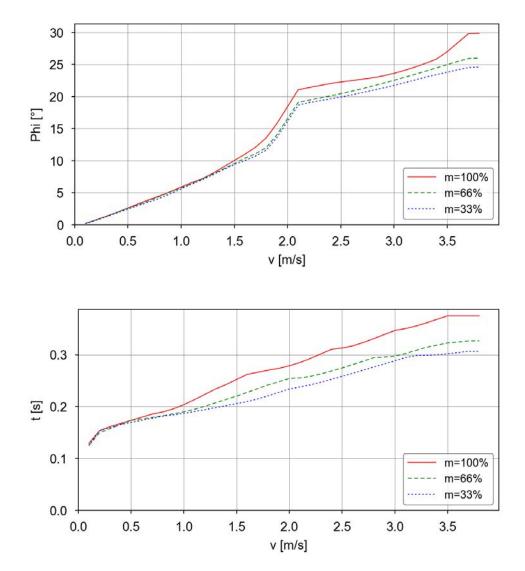


Continues on next page

4.1 IRB 1510ID 1.5 m 4 kg Continued

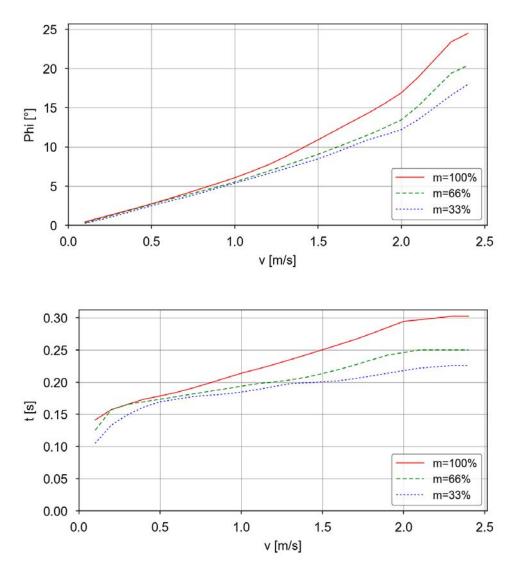


4.1 IRB 1510ID 1.5 m 4 kg Continued

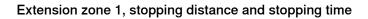


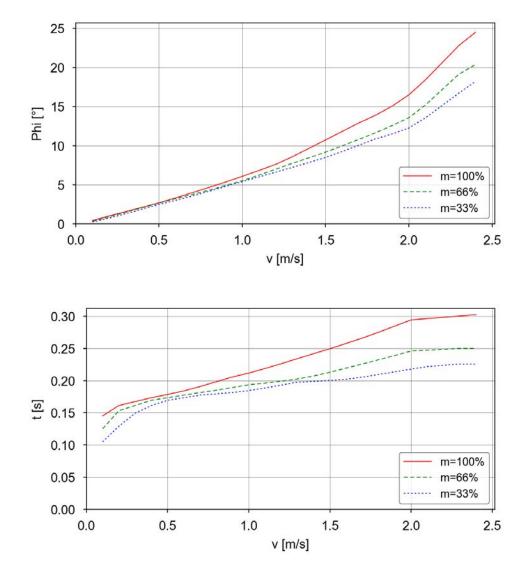
4.1 IRB 1510ID 1.5 m 4 kg Continued

Category 1, Axis 3

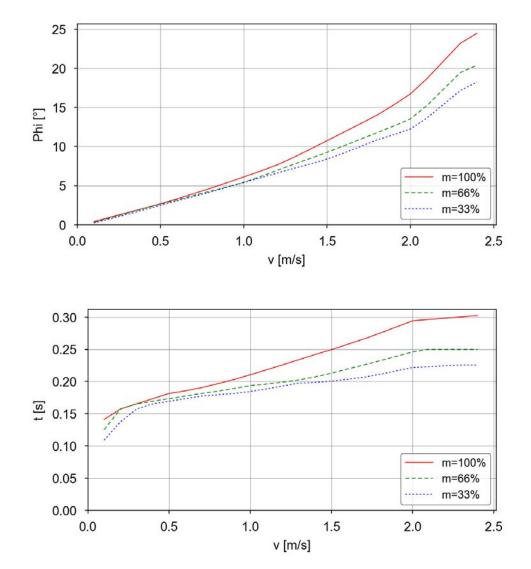


4.1 IRB 1510ID 1.5 m 4 kg Continued





4.1 IRB 1510ID 1.5 m 4 kg Continued



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5.1 IRB 1520ID 1.5 m 4 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

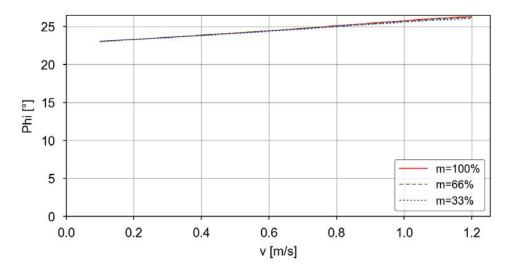
Axis	Distance (degrees)	Stop time (s)
1	20.2	0.22
2	18.5	0.17
3	15.0	0.12

Category 1, extension zones

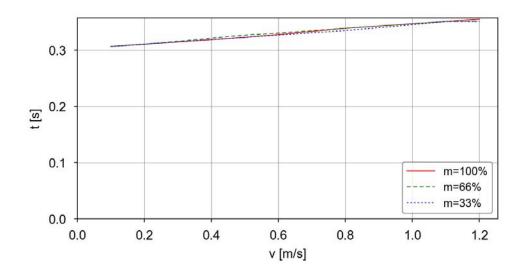
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.5
1	0.5	1.0
2	1.0	max reach

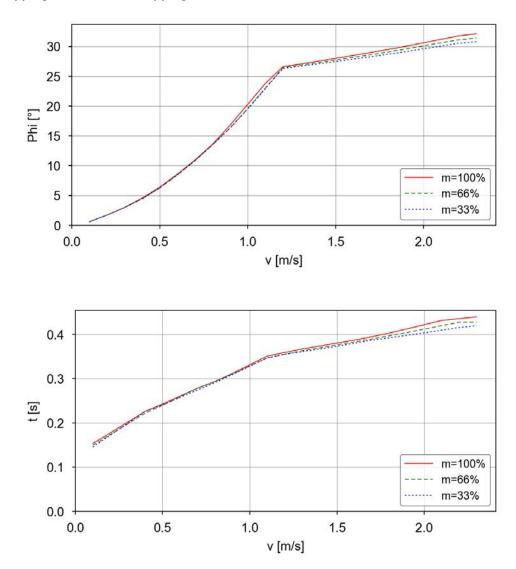
Category 1, Axis 1



5.1 IRB 1520ID 1.5 m 4 kg Continued

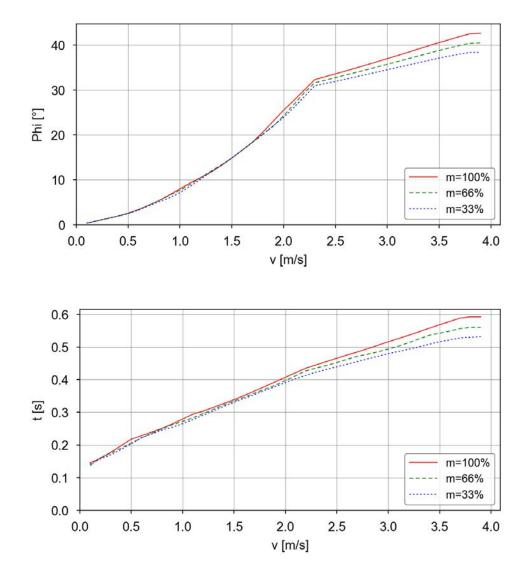


Extension zone 1, stopping distance and stopping time



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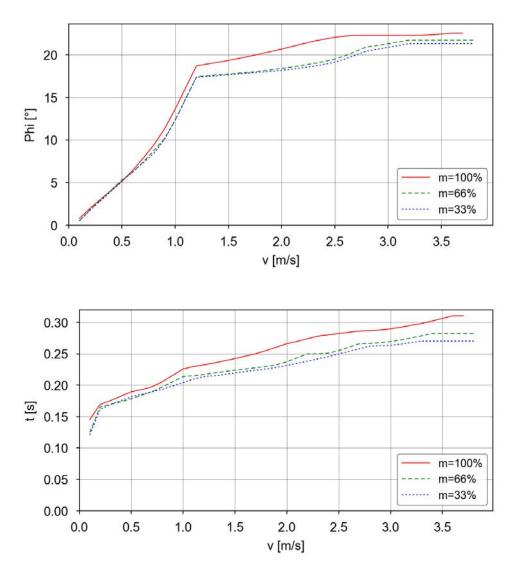
5.1 IRB 1520ID 1.5 m 4 kg Continued



5.1 IRB 1520ID 1.5 m 4 kg Continued

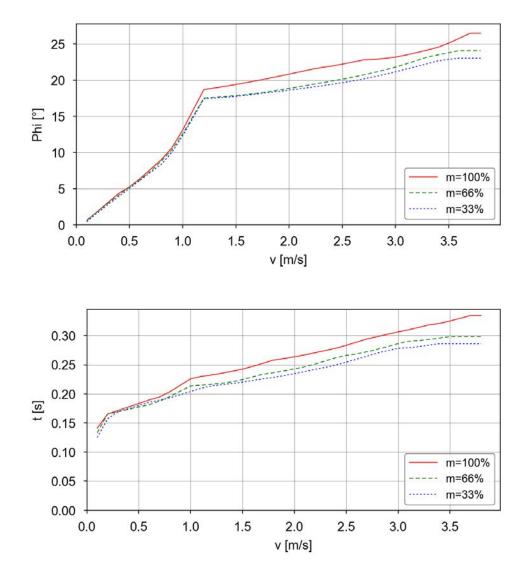
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time

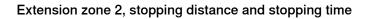


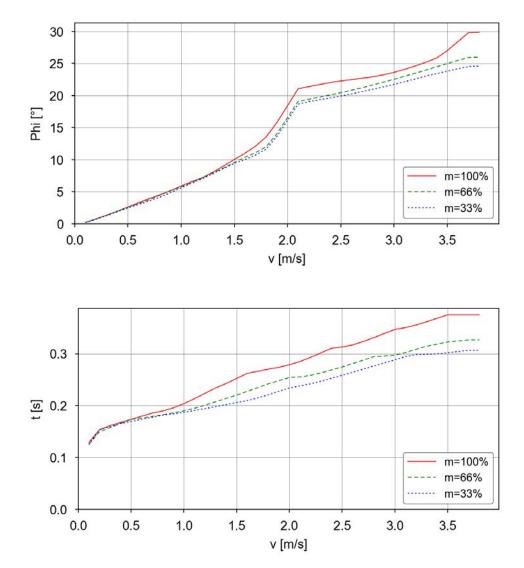
Continues on next page

5.1 IRB 1520ID 1.5 m 4 kg Continued



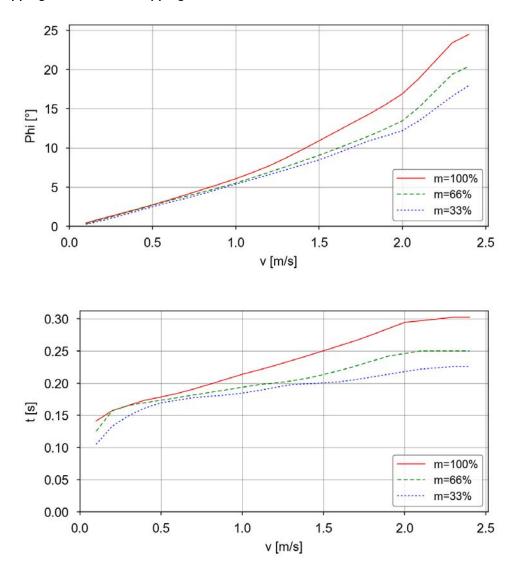
5.1 IRB 1520ID 1.5 m 4 kg Continued



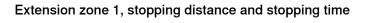


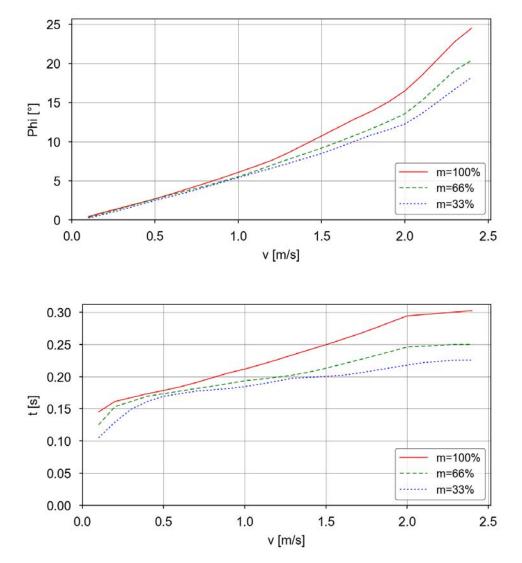
5.1 IRB 1520ID 1.5 m 4 kg Continued

Category 1, Axis 3

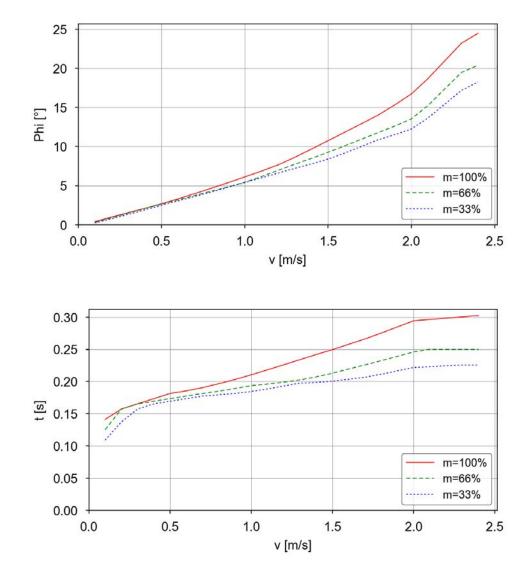


5.1 IRB 1520ID 1.5 m 4 kg Continued





5.1 IRB 1520ID 1.5 m 4 kg Continued



Extension zone 2, stopping distance and stopping time

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6 IRB 1600

6.1 IRB 1600 1.2 m 6 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

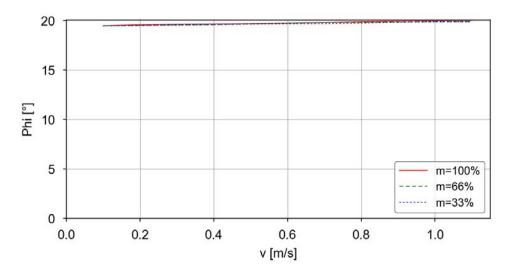
Axis	Distance (degrees)	Stop time (s)
1	19.7	0.17
2	16.8	0.12
3	16.1	0.1

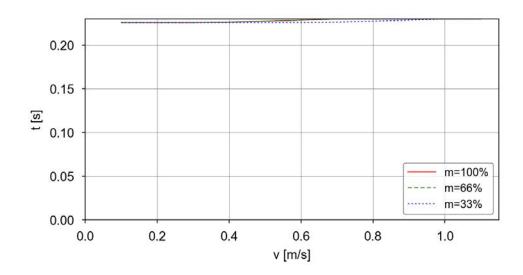
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

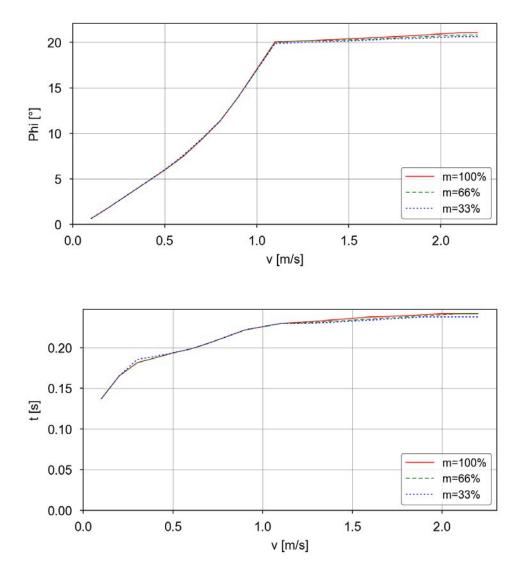
Zone	wcp min (m)	wcp max (m)
0	0	0.408
1	0.408	0.817
2	0.817	max reach

Category 1, Axis 1

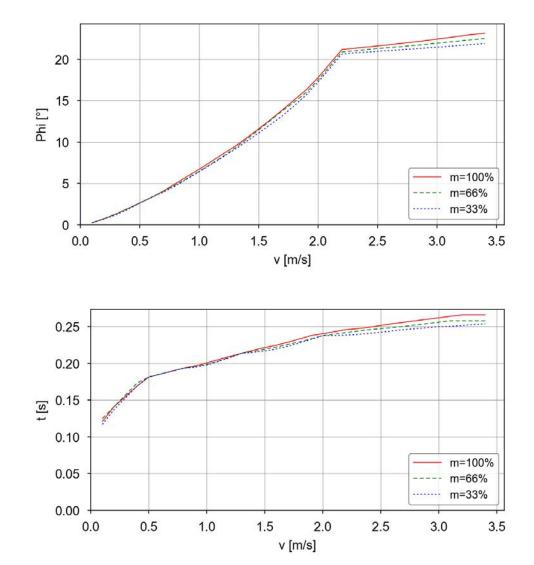




Extension zone 1, stopping distance and stopping time



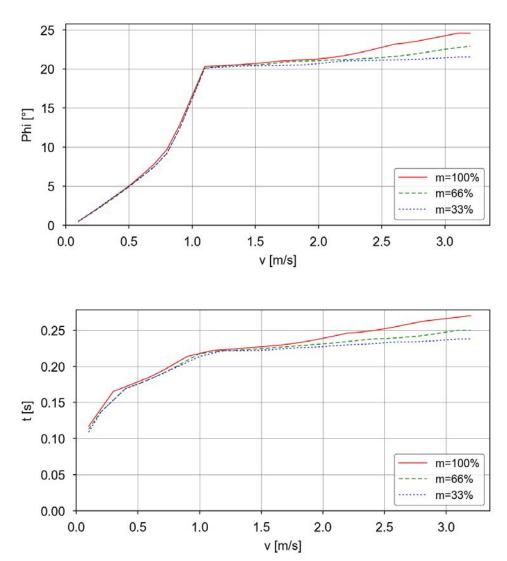
Continues on next page

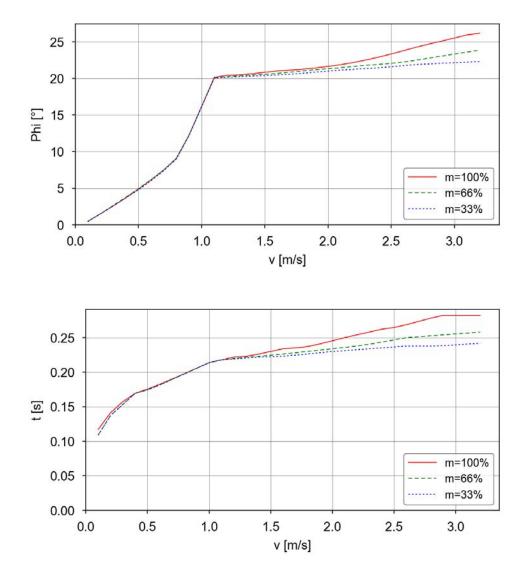


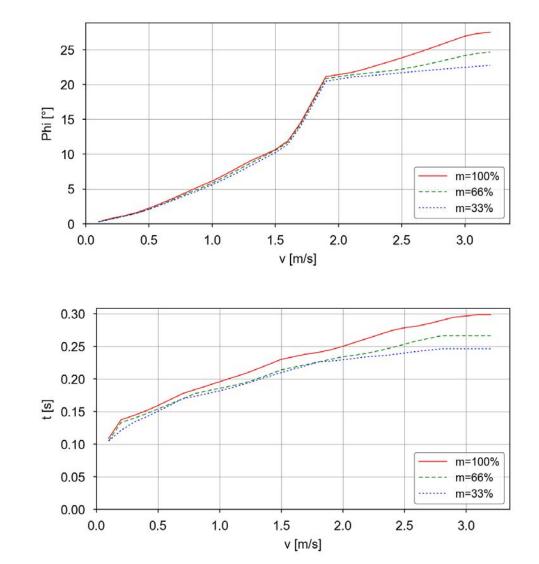
6 IRB 1600

6.1 IRB 1600 1.2 m 6 kg *Continued*

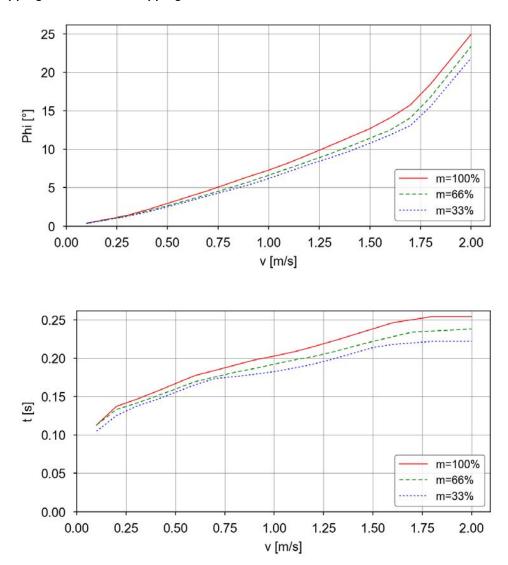
Category 1, Axis 2

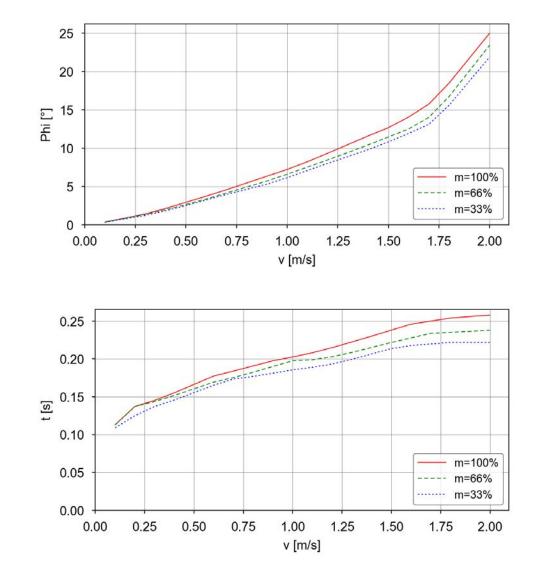


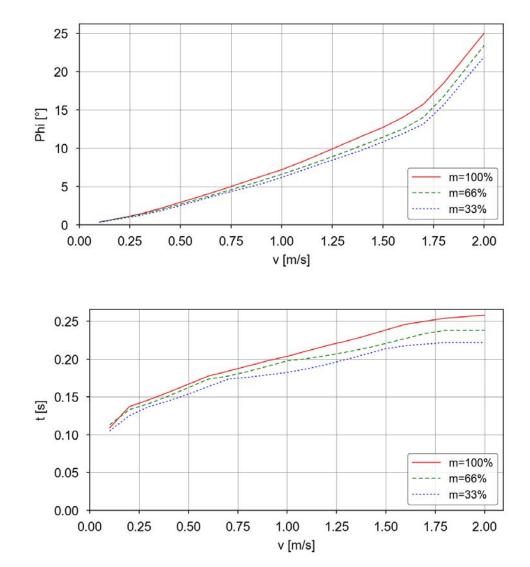




Category 1, Axis 3







6.2 IRB 1600 1.2 m 10 kg

6.2 IRB 1600 1.2 m 10 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

Axis	Distance (degrees)	Stop time (s)
1	22.7	0.17
2	26.1	0.2
3	22.3	0.15

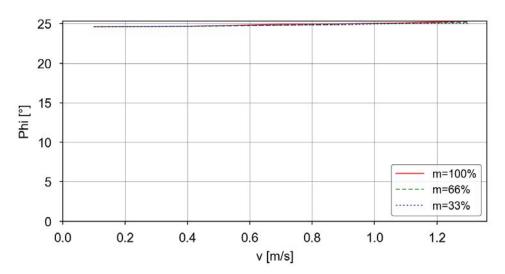
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.408
1	0.408	0.817
2	0.817	max reach

Category 1, Axis 1

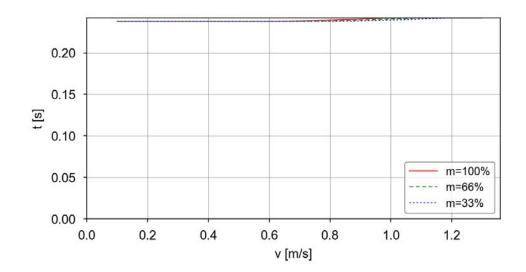
Extension zone 0, stopping distance and stopping time



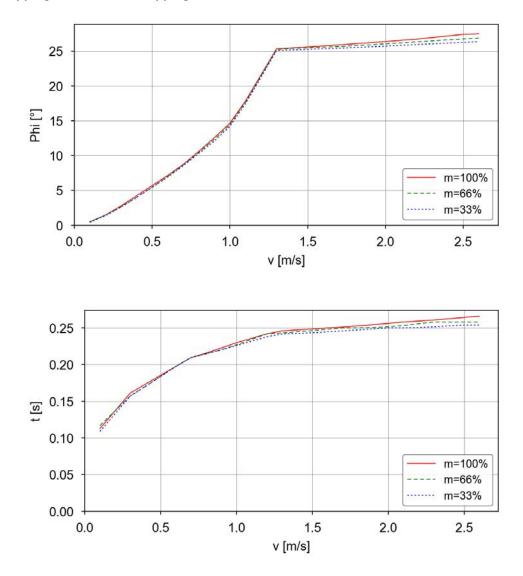
84

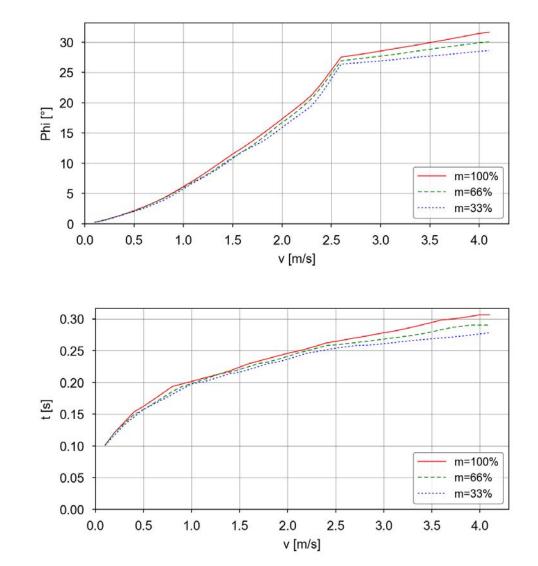
6 IRB 1600

6.2 IRB 1600 1.2 m 10 kg *Continued*

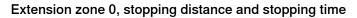


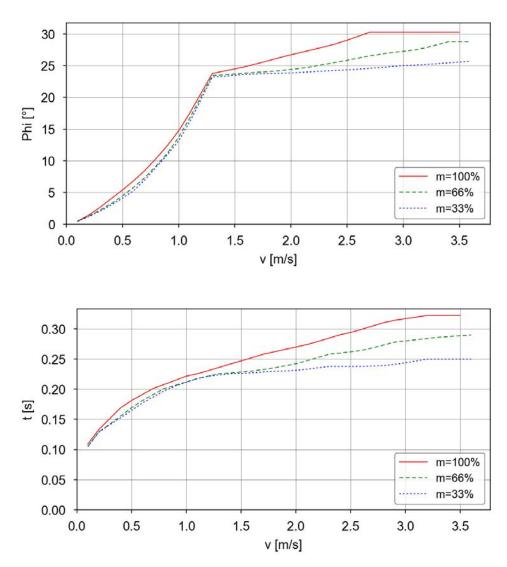
Extension zone 1, stopping distance and stopping time

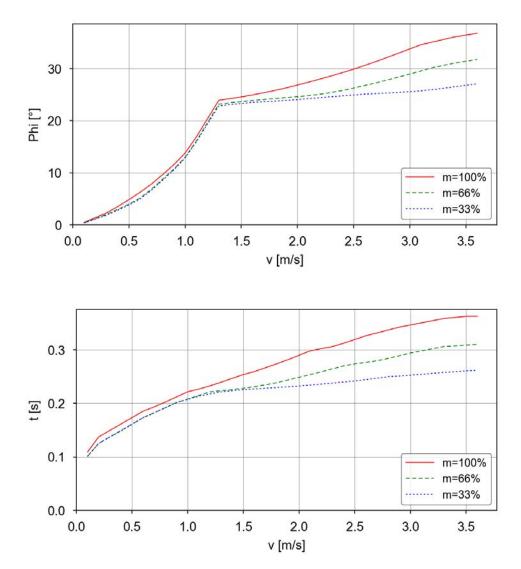


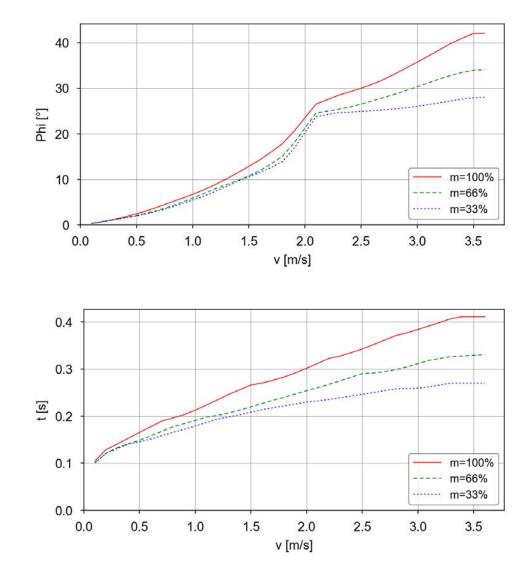


Category 1, Axis 2





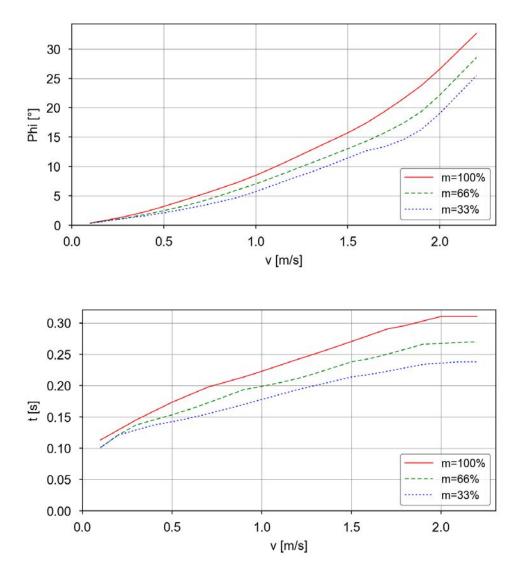


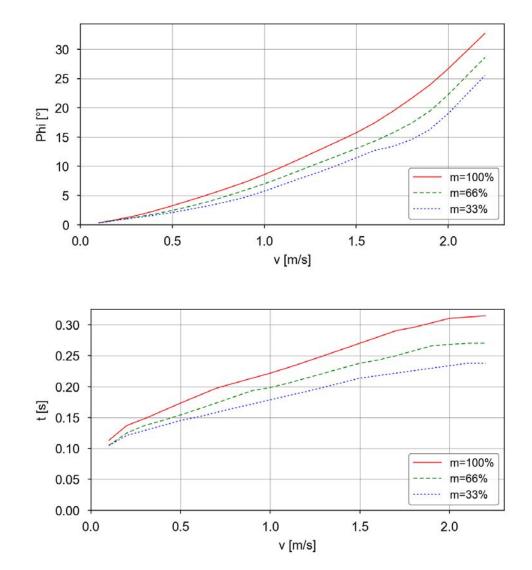


6 IRB 1600

6.2 IRB 1600 1.2 m 10 kg Continued

Category 1, Axis 3





Extension zone 1, stopping distance and stopping time

> 30 25 [] ²⁰ iud 15 20 10 m=100% 5 m=66% m=33% 0 1.0 1.5 0.0 0.5 2.0 v [m/s] 0.30 0.25 0.20 t [s] 0.15 -----0.10 m=100% 0.05 m=66% m=33% 0.00 0.5 0.0 1.0 1.5 2.0 v [m/s]

6.3 IRB 1600 1.45 m 6 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

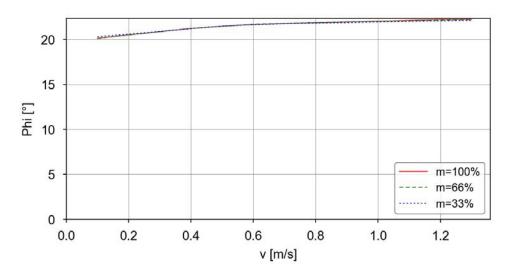
Axis	Distance (degrees)	Stop time (s)
1	23.4	0.2
2	22.0	0.17
3	15.8	0.1

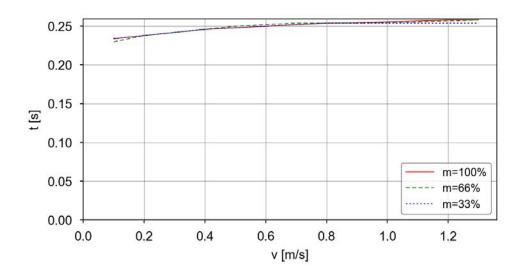
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

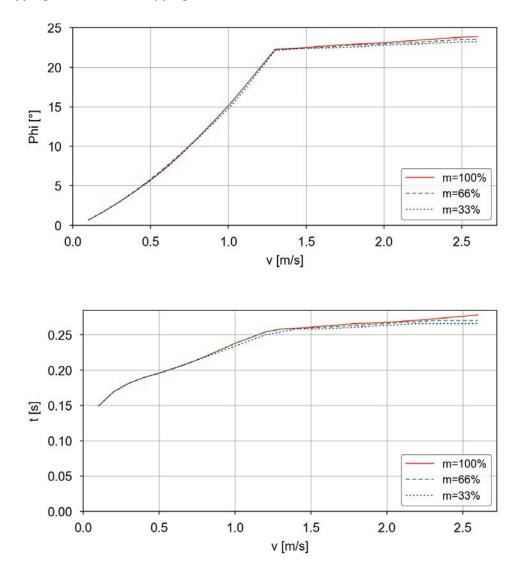
Zone	wcp min (m)	wcp max (m)
0	0	0.483
1	0.483	0.967
2	0.967	max reach

Category 1, Axis 1

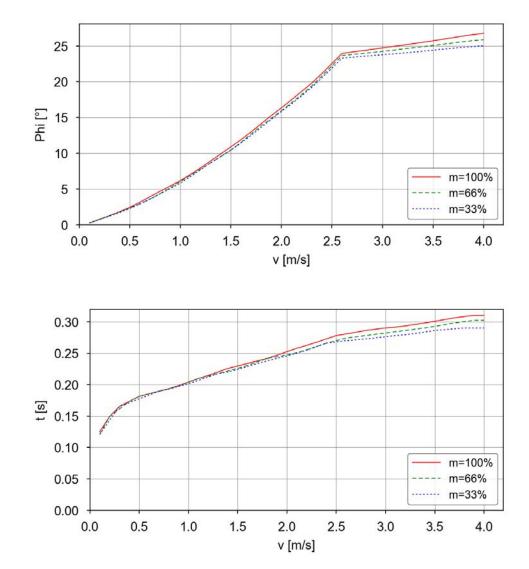




Extension zone 1, stopping distance and stopping time



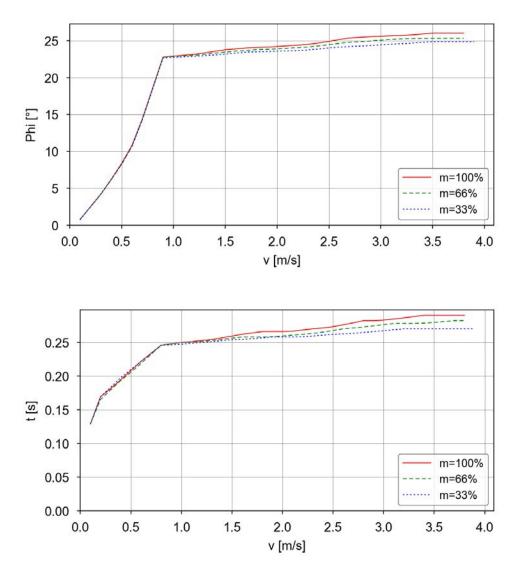
Continues on next page

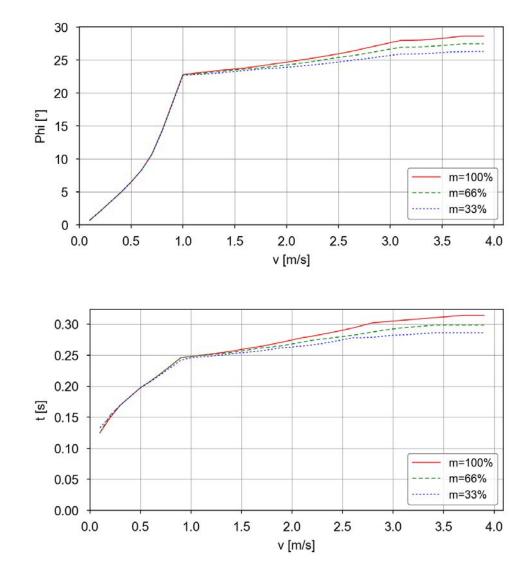


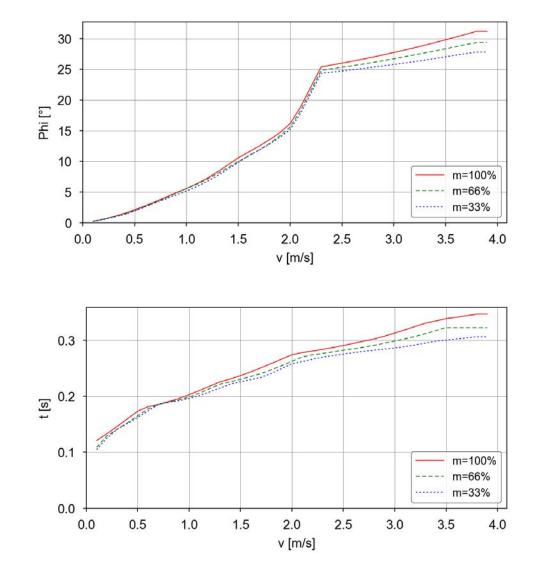
6 IRB 1600

6.3 IRB 1600 1.45 m 6 kg *Continued*

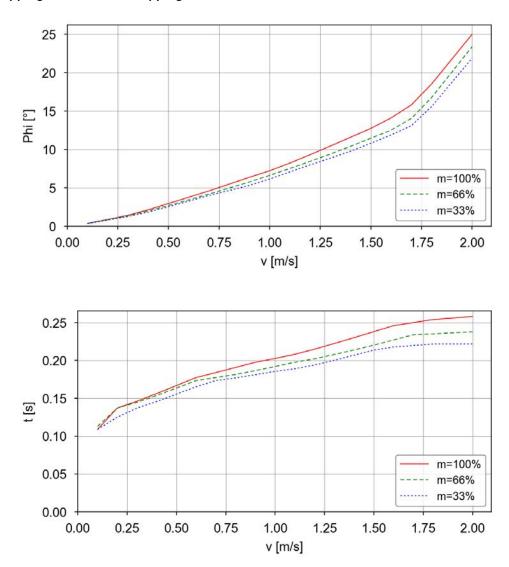
Category 1, Axis 2

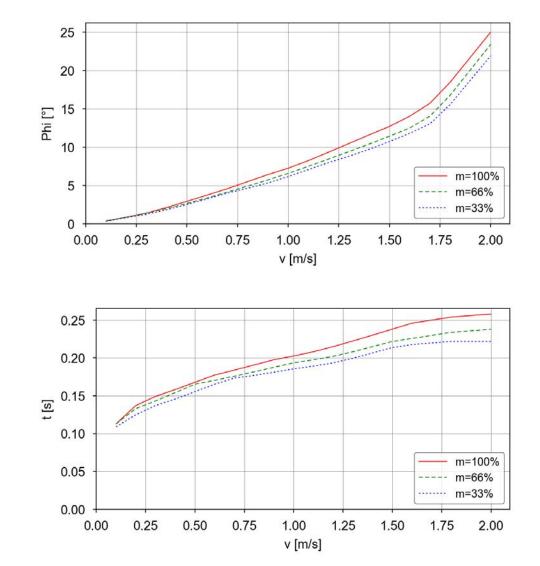


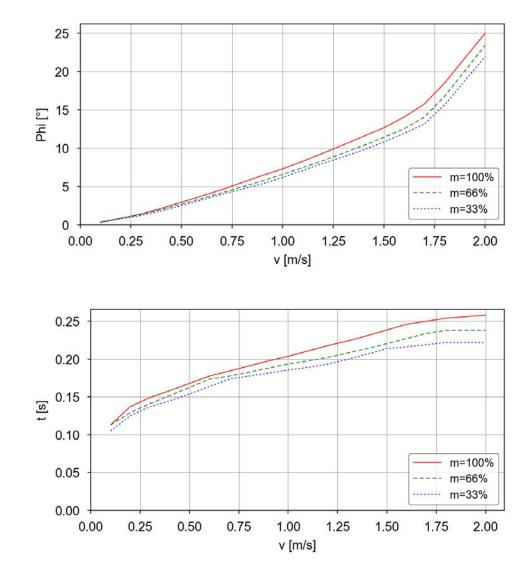




Category 1, Axis 3







6.4 IRB 1600 1.45 m 10 kg

6.4 IRB 1600 1.45 m 10 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

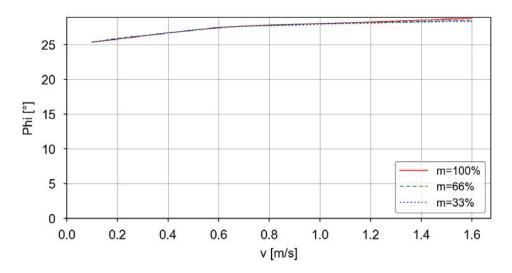
Axis	Distance (degrees)	Stop time (s)
1	33.1	0.28
2	38.5	0.34
3	29.4	0.22

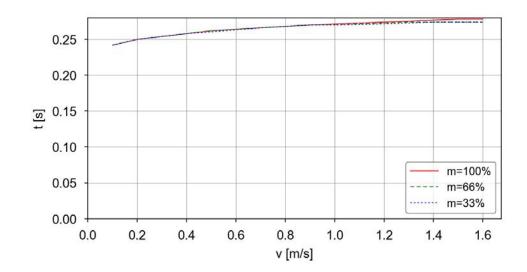
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

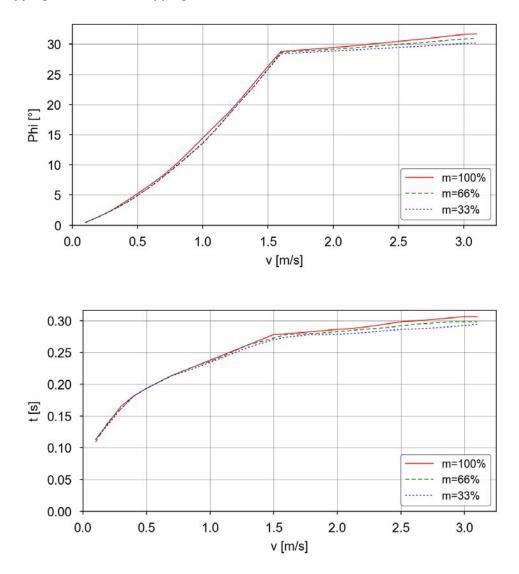
Zone	wcp min (m)	wcp max (m)
0	0	0.483
1	0.483	0.967
2	0.967	max reach

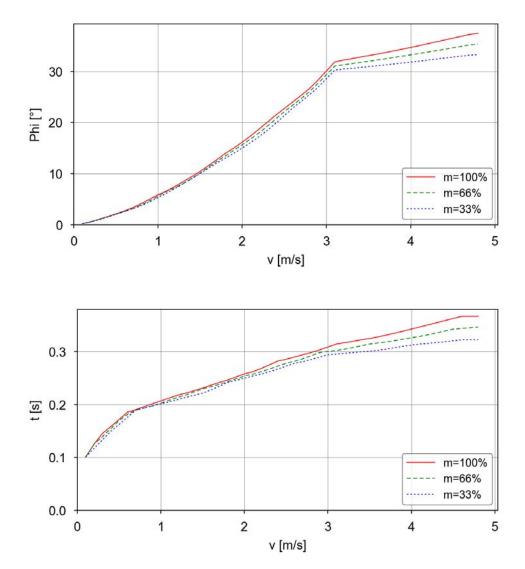
Category 1, Axis 1



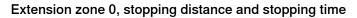


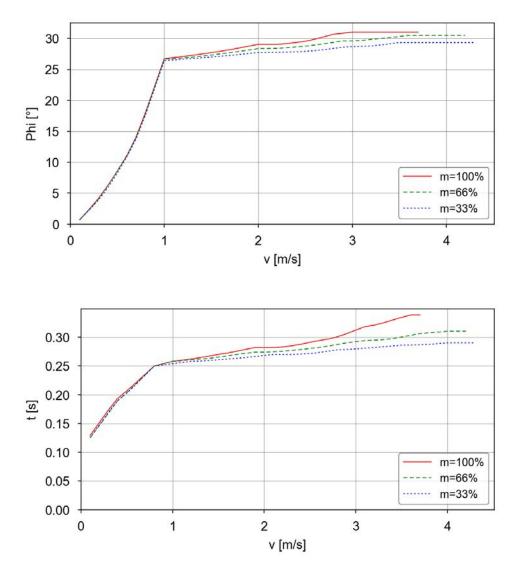
Extension zone 1, stopping distance and stopping time





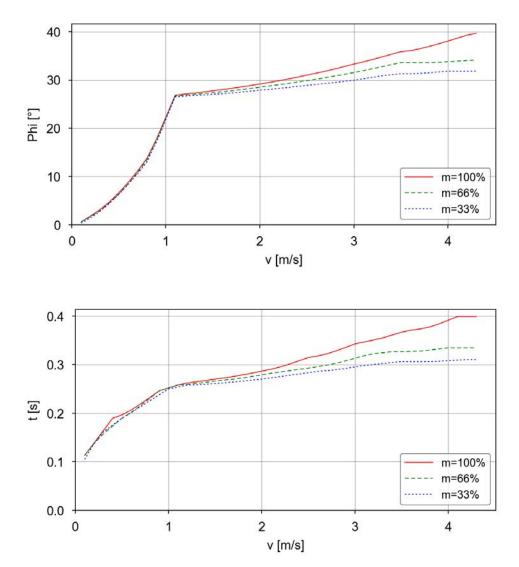
Category 1, Axis 2

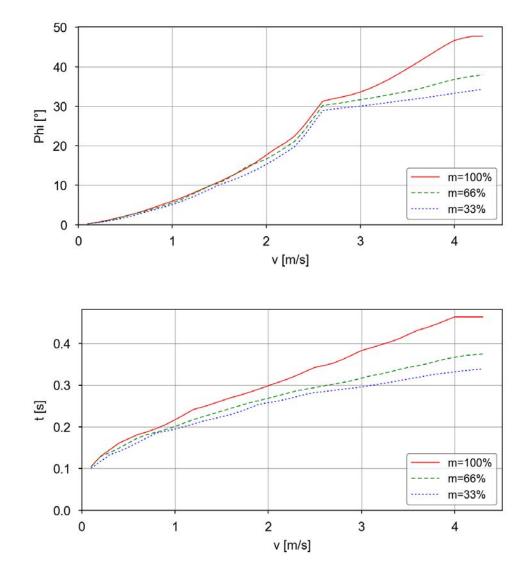




6 IRB 1600

6.4 IRB 1600 1.45 m 10 kg Continued

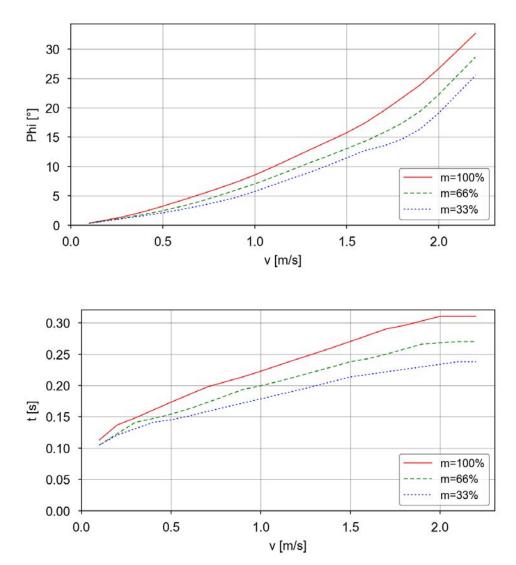




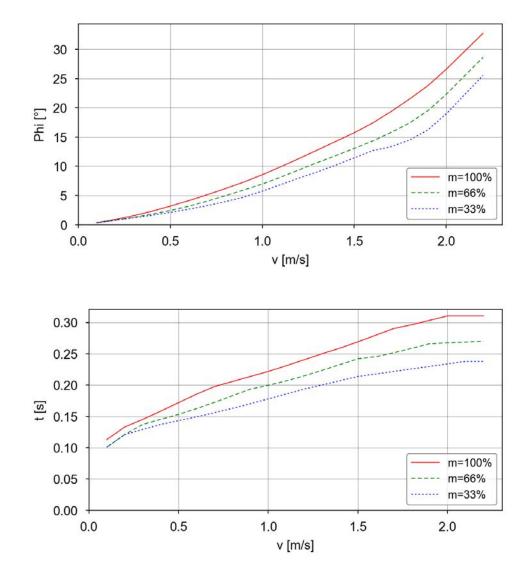
6 IRB 1600

6.4 IRB 1600 1.45 m 10 kg *Continued*

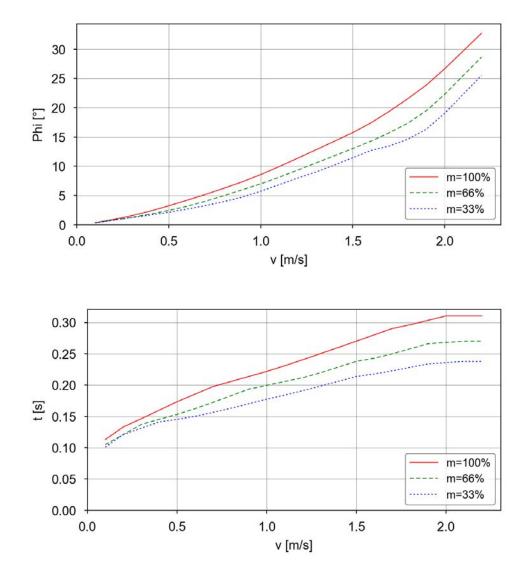
Category 1, Axis 3



6.4 IRB 1600 1.45 m 10 kg Continued



6.4 IRB 1600 1.45 m 10 kg *Continued*



6.5 IRB 1600ID 1.5 m 4 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

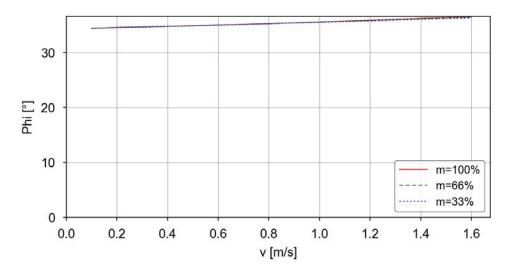
Axis	Distance (degrees)	Stop time (s)
1	32.2	0.25
2	29.1	0.22
3	21.5	0.15

Category 1, extension zones

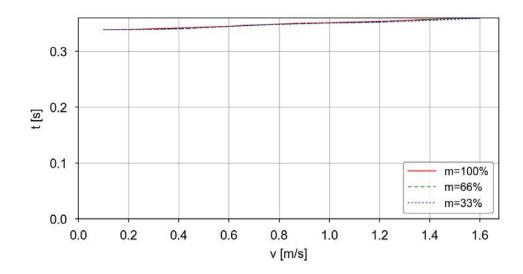
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.5
1	0.5	1.0
2	1.0	max reach

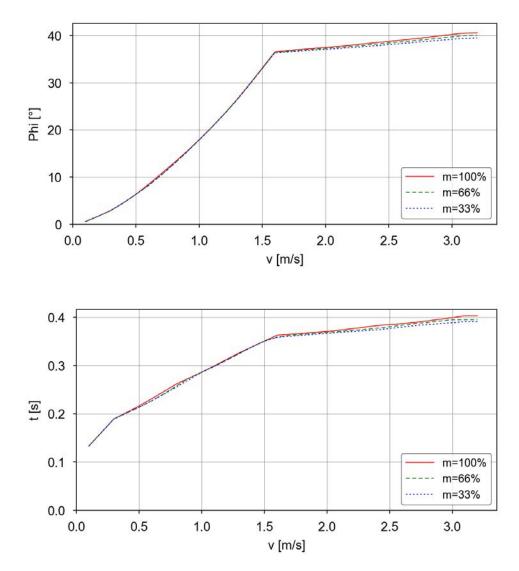
Category 1, Axis 1



6.5 IRB 1600ID 1.5 m 4 kg *Continued*

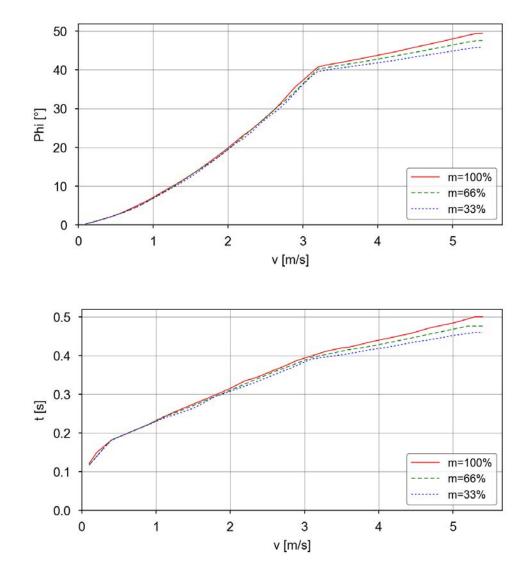


Extension zone 1, stopping distance and stopping time



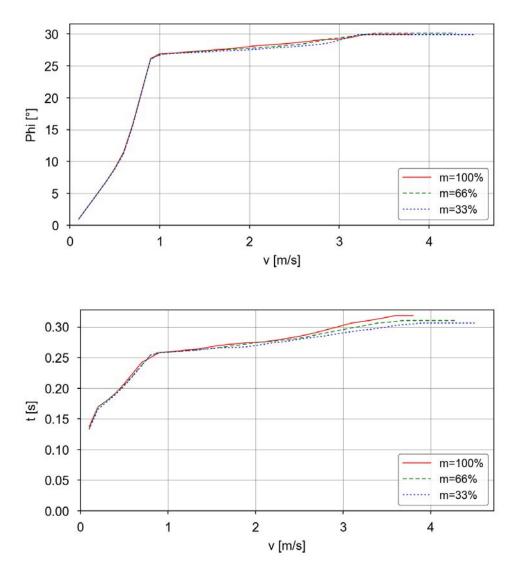
Continues on next page

6.5 IRB 1600ID 1.5 m 4 kg Continued

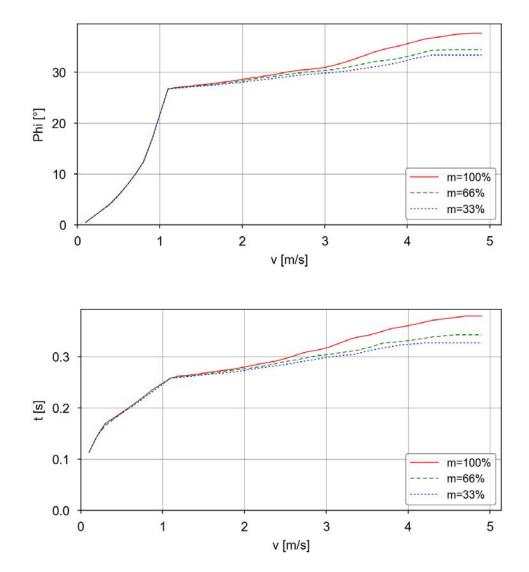


6.5 IRB 1600ID 1.5 m 4 kg *Continued*

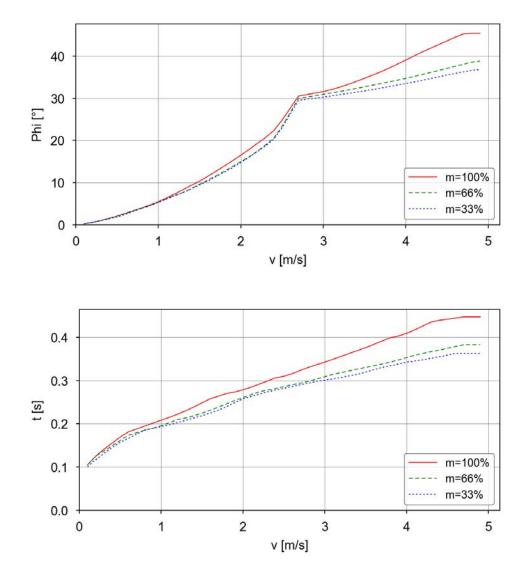
Category 1, Axis 2



6.5 IRB 1600ID 1.5 m 4 kg Continued

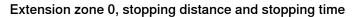


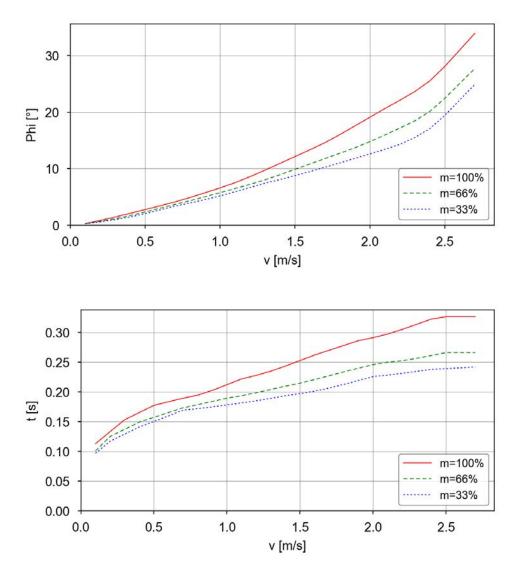
6.5 IRB 1600ID 1.5 m 4 kg Continued



6.5 IRB 1600ID 1.5 m 4 kg Continued

Category 1, Axis 3

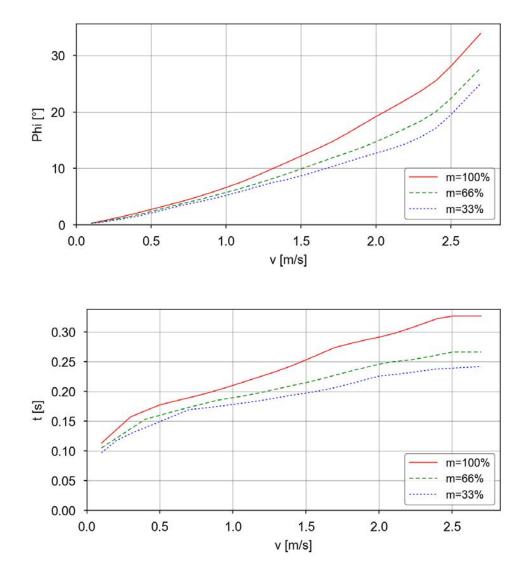




6.5 IRB 1600ID 1.5 m 4 kg Continued

> 30 Phi [°] 20 10 -----m=100% m=66% ATT THE T m=33% 0 1.0 1.5 2.0 0.0 0.5 2.5 v [m/s] 0.30 0.25 0.20 t [s] 17.7.7.7 11.1.1 0.15 0.10 m=100% m=66% 0.05 m=33% 0.00 0.0 0.5 1.0 1.5 2.0 2.5 v [m/s]

6.5 IRB 1600ID 1.5 m 4 kg Continued



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7.1 IRB 1660ID 1.55 m 4 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

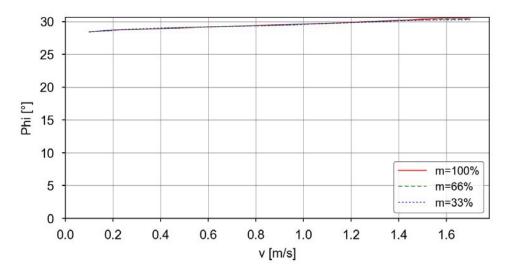
Axis	Distance (degrees)	Stop time (s)
1	29.6	0.22
2	40.2	0.34
3	26.8	0.2

Category 1, extension zones

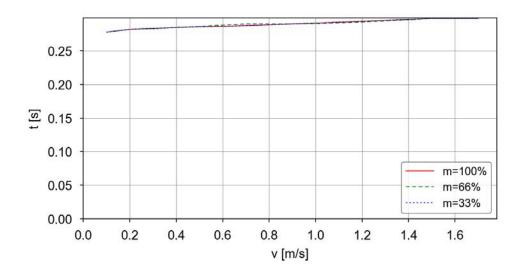
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

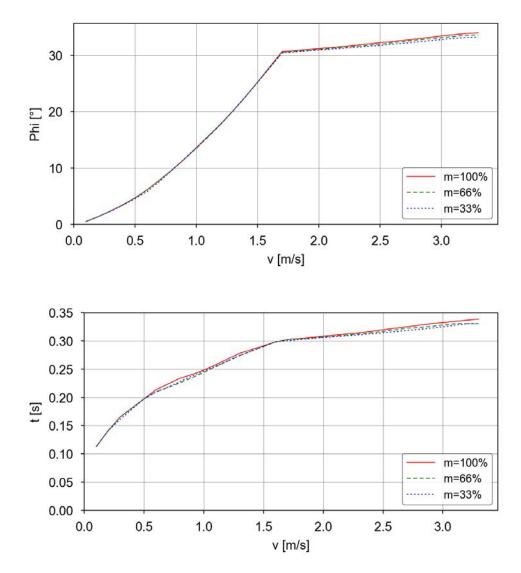
Category 1, Axis 1



7.1 IRB 1660ID 1.55 m 4 kg Continued

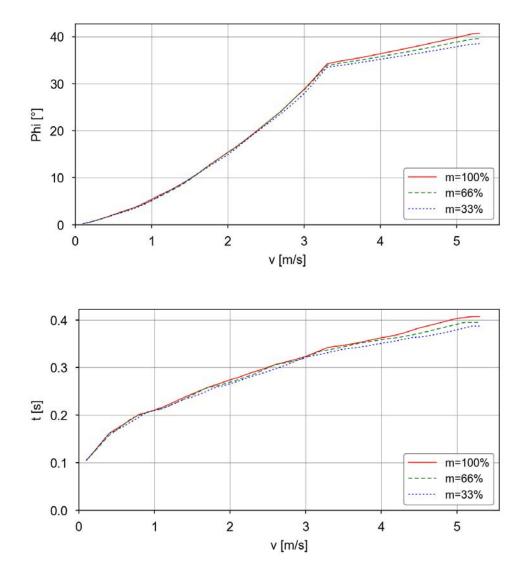


Extension zone 1, stopping distance and stopping time



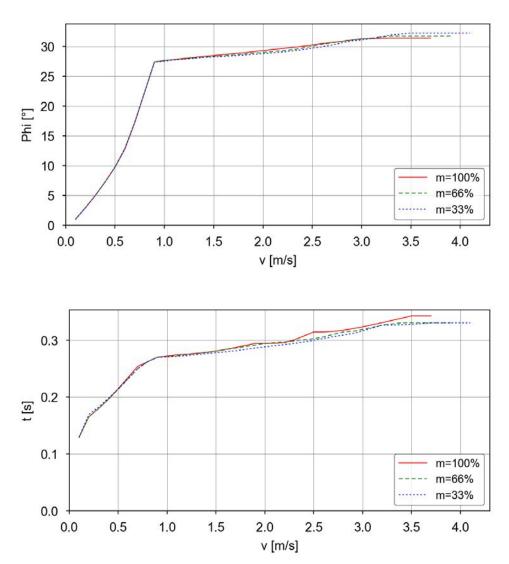
Continues on next page

7.1 IRB 1660ID 1.55 m 4 kg Continued

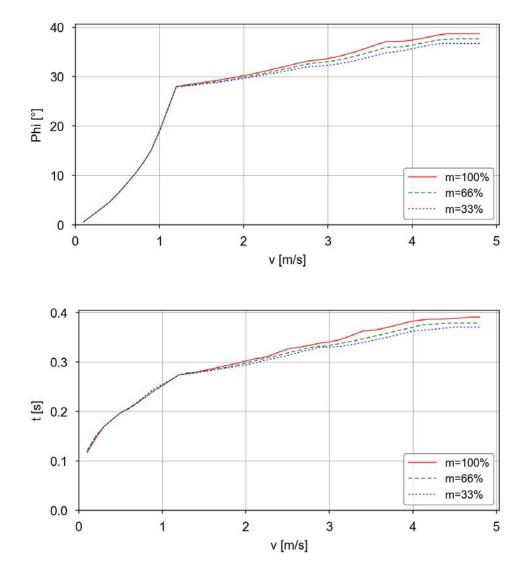


7.1 IRB 1660ID 1.55 m 4 kg Continued

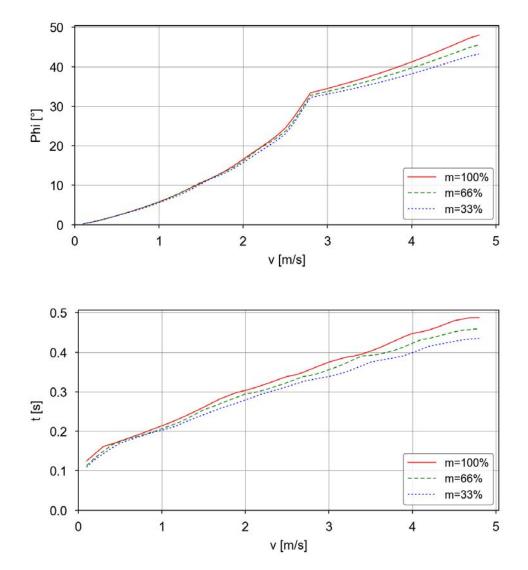
Category 1, Axis 2



7.1 IRB 1660ID 1.55 m 4 kg Continued

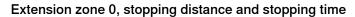


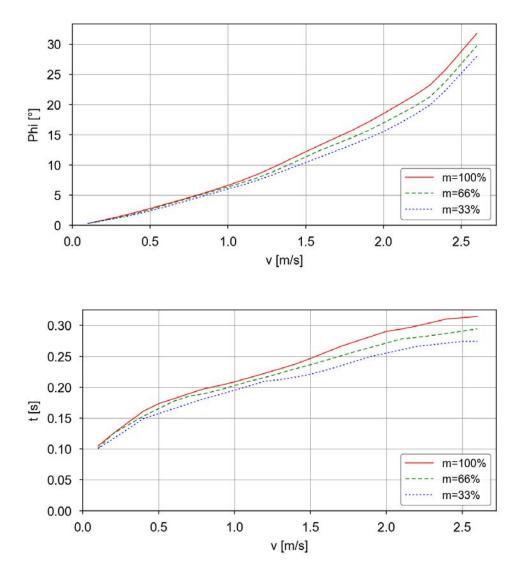
7.1 IRB 1660ID 1.55 m 4 kg Continued



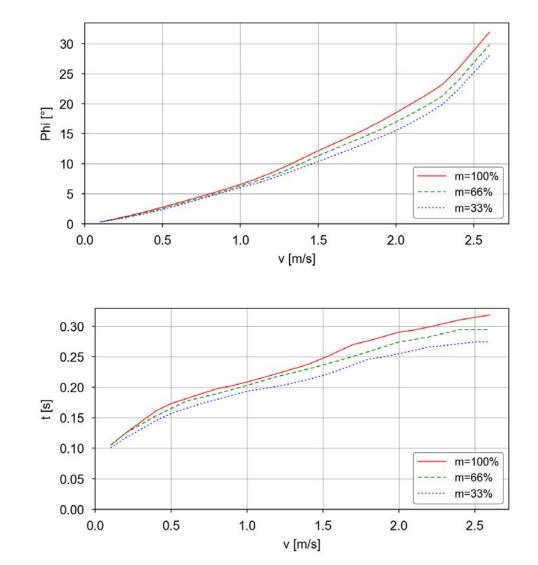
7.1 IRB 1660ID 1.55 m 4 kg Continued

Category 1, Axis 3

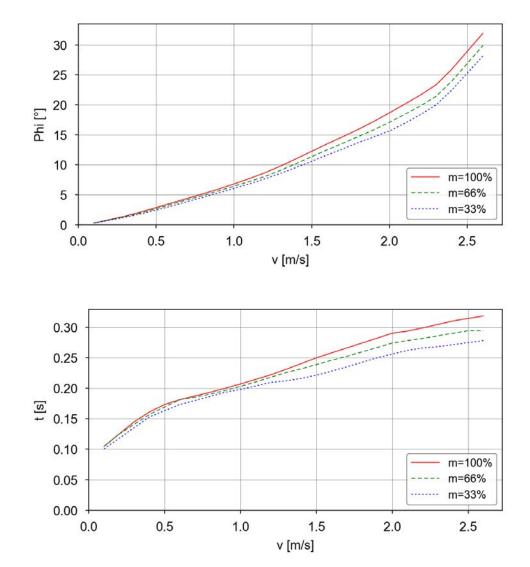




7.1 IRB 1660ID 1.55 m 4 kg Continued



7.1 IRB 1660ID 1.55 m 4 kg Continued



7.2 IRB 1660ID 1.55 m 6 kg

7.2 IRB 1660ID 1.55 m 6 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

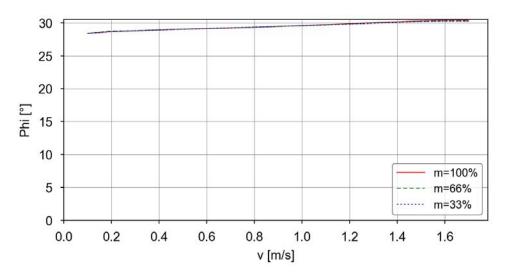
Axis	Distance (degrees)	Stop time (s)
1	29.5	0.22
2	39.5	0.32
3	26.6	0.2

Category 1, extension zones

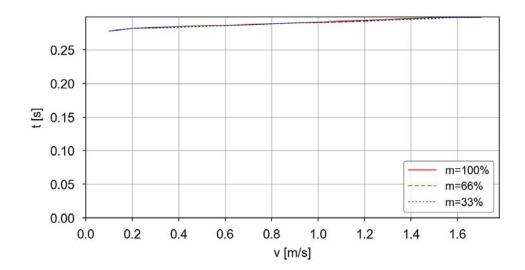
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

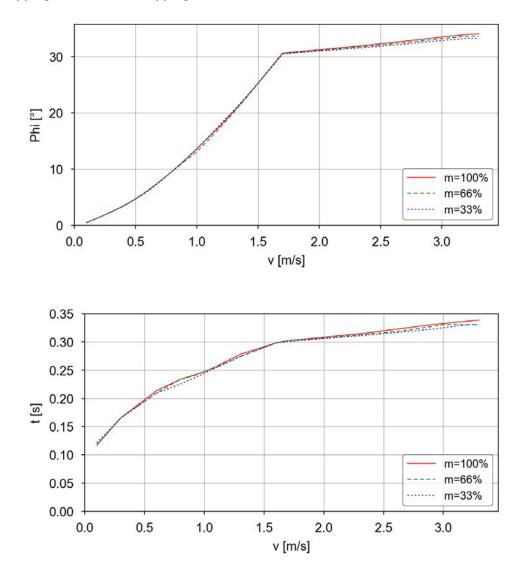
Category 1, Axis 1



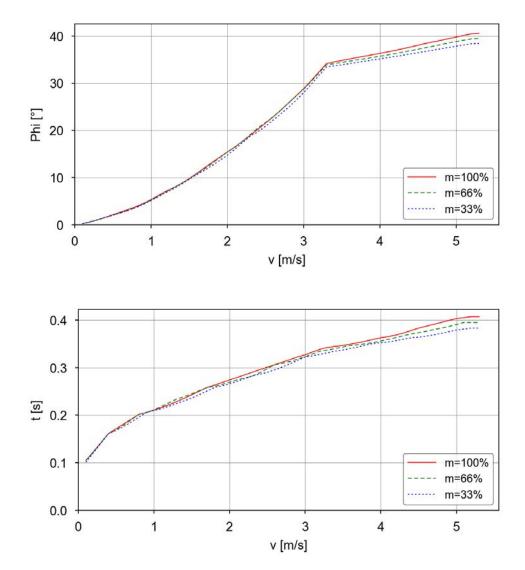
7.2 IRB 1660ID 1.55 m 6 kg Continued



Extension zone 1, stopping distance and stopping time

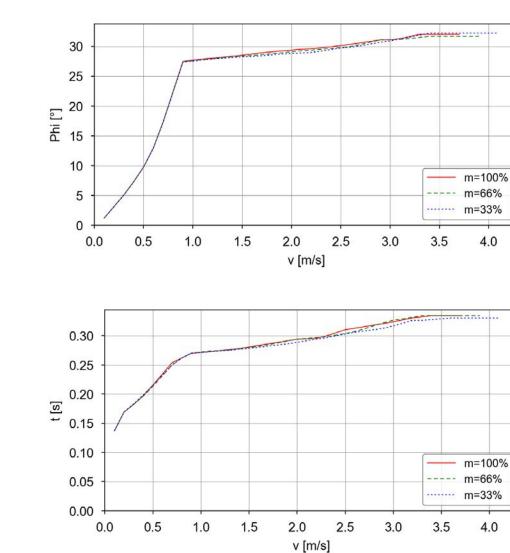


7.2 IRB 1660ID 1.55 m 6 kg Continued

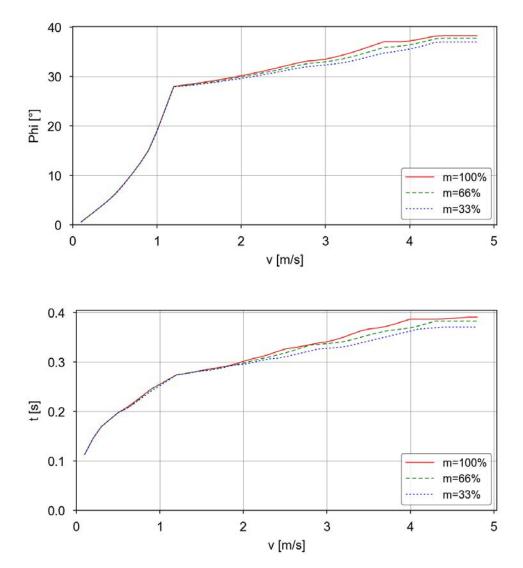


7.2 IRB 1660ID 1.55 m 6 kg Continued

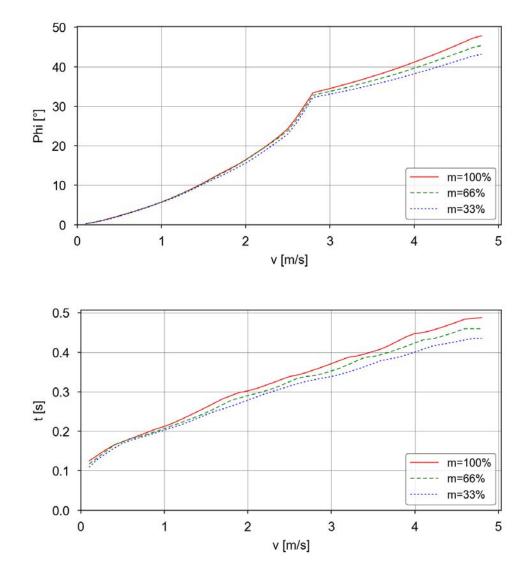
Category 1, Axis 2



7.2 IRB 1660ID 1.55 m 6 kg *Continued*



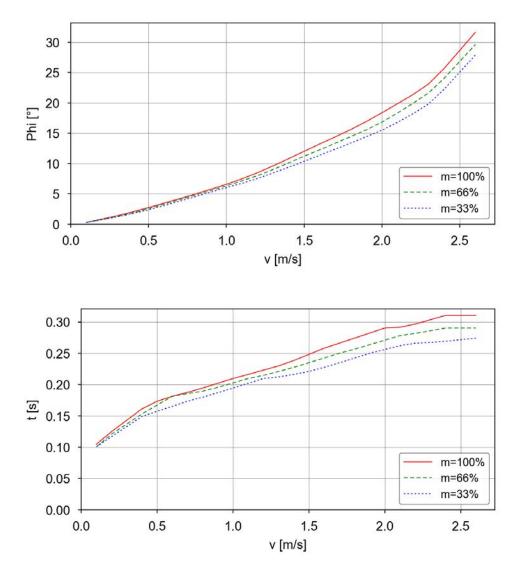
7.2 IRB 1660ID 1.55 m 6 kg Continued



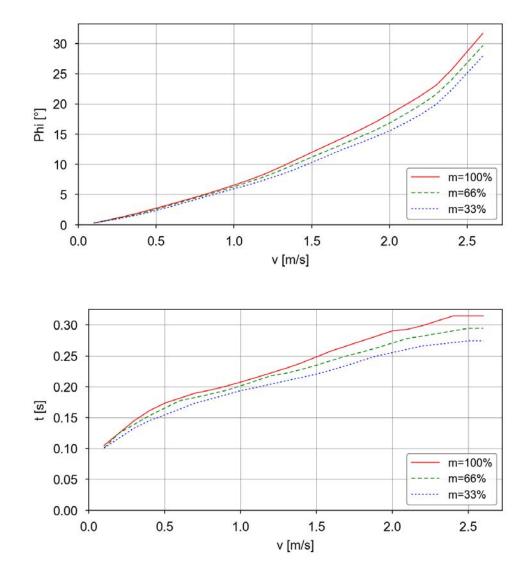
Extension zone 2, stopping distance and stopping time

7.2 IRB 1660ID 1.55 m 6 kg *Continued*

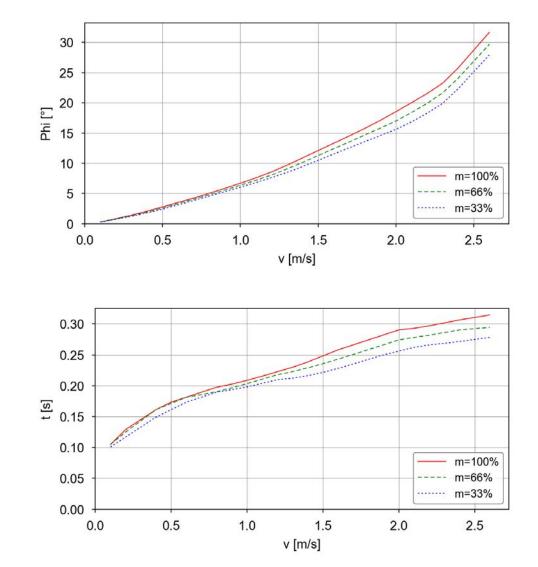
Category 1, Axis 3



7.2 IRB 1660ID 1.55 m 6 kg Continued



7.2 IRB 1660ID 1.55 m 6 kg *Continued*



8.1 IRB 2400 1.5 m 10 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

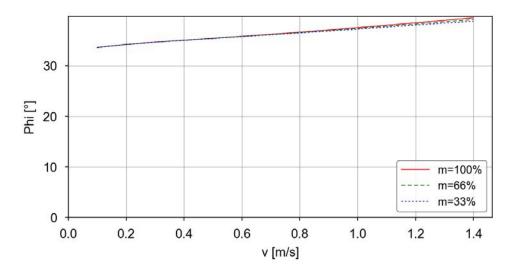
Axis	Distance (degrees)	Stop time (s)
1	46.9	0.51
2	36.4	0.32
3	22.8	0.2

Category 1, extension zones

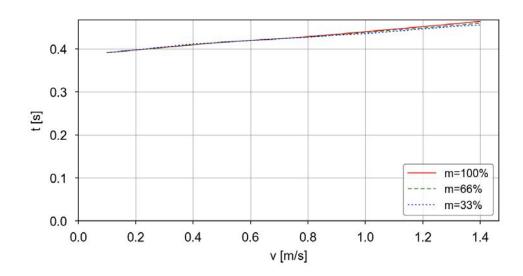
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.524
1	0.524	1.048
2	1.048	max reach

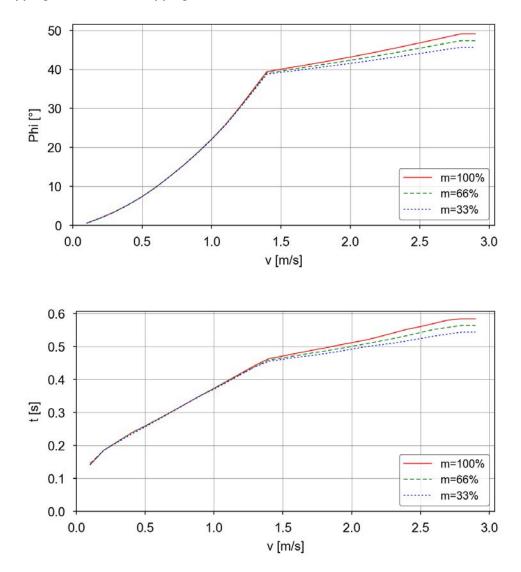
Category 1, Axis 1



8.1 IRB 2400 1.5 m 10 kg *Continued*

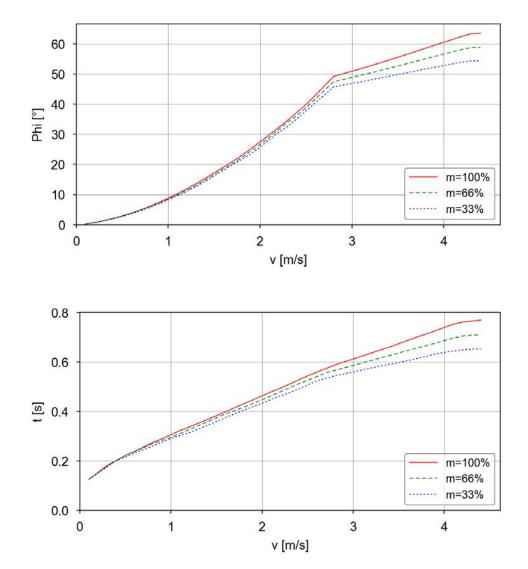


Extension zone 1, stopping distance and stopping time



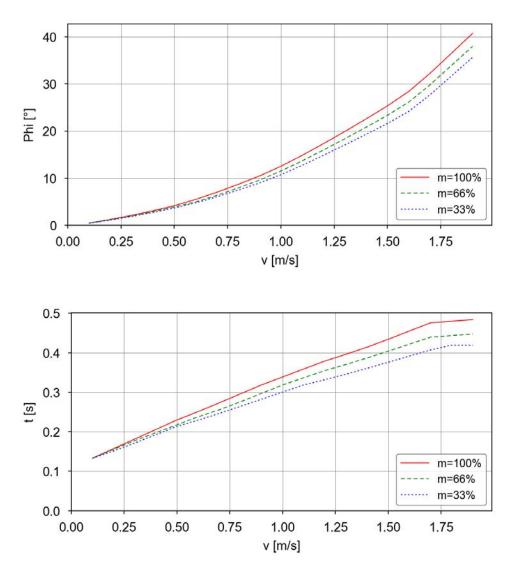
Continues on next page

8.1 IRB 2400 1.5 m 10 kg Continued

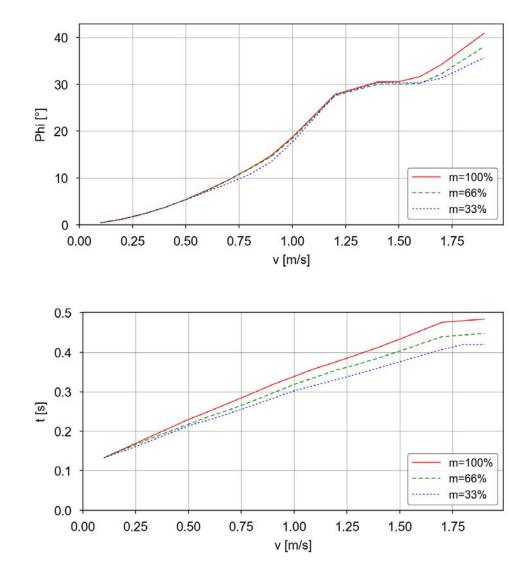


8.1 IRB 2400 1.5 m 10 kg *Continued*

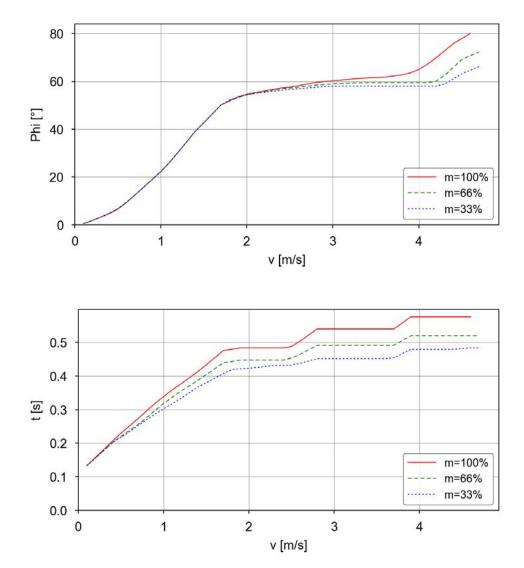
Category 1, Axis 2



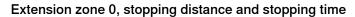
8.1 IRB 2400 1.5 m 10 kg *Continued*

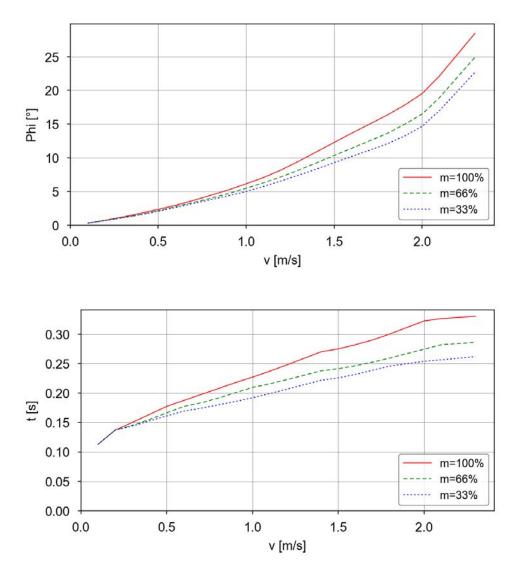


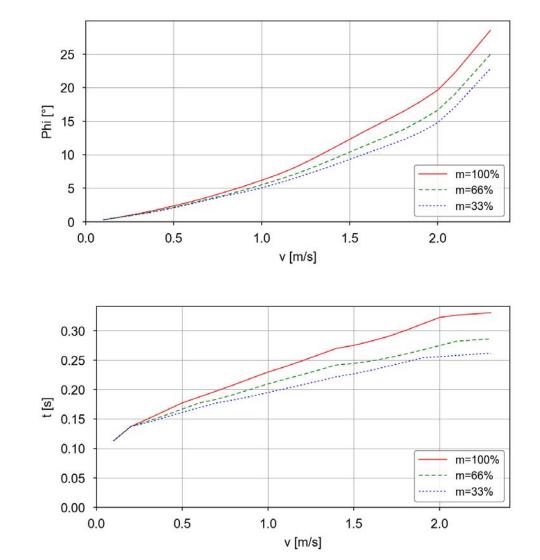
8.1 IRB 2400 1.5 m 10 kg *Continued*

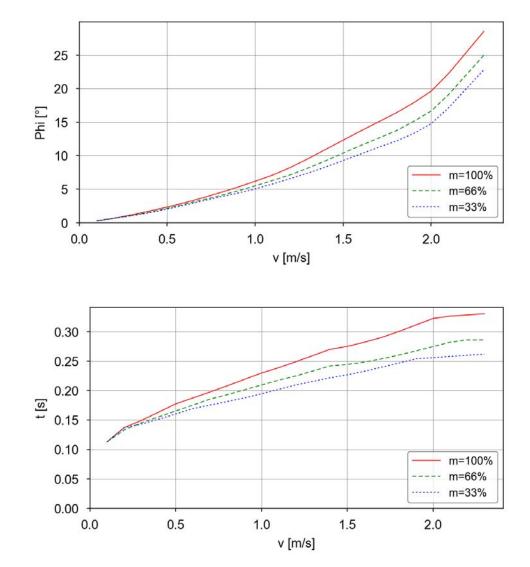


Category 1, Axis 3









8.2 IRB 2400 1.5 m 16 kg

8.2 IRB 2400 1.5 m 16 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

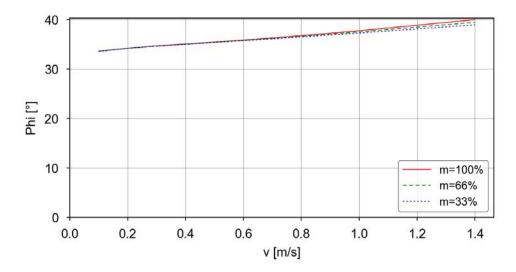
Axis	Distance (degrees)	Stop time (s)
1	53.2	0.61
2	36.1	0.32
3	29.1	0.27

Category 1, extension zones

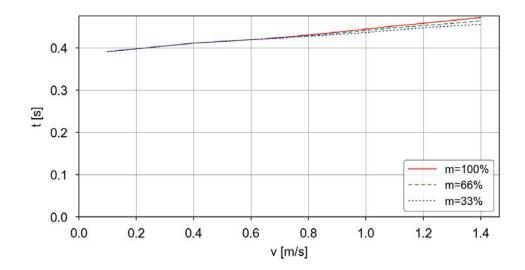
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.524
1	0.524	1.048
2	1.048	max reach

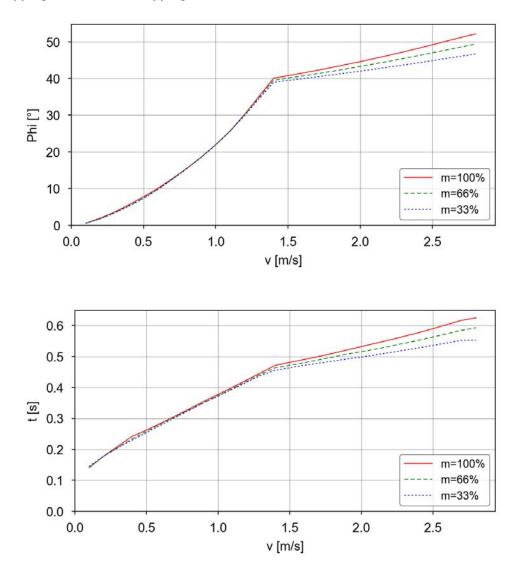
Category 1, Axis 1



8.2 IRB 2400 1.5 m 16 kg Continued



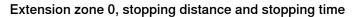
Extension zone 1, stopping distance and stopping time

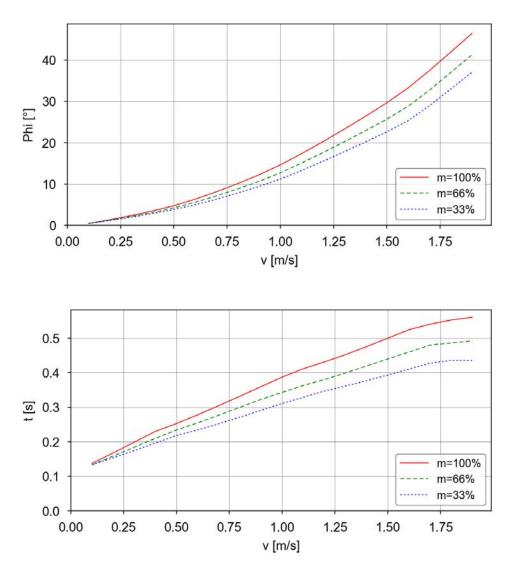


Continues on next page

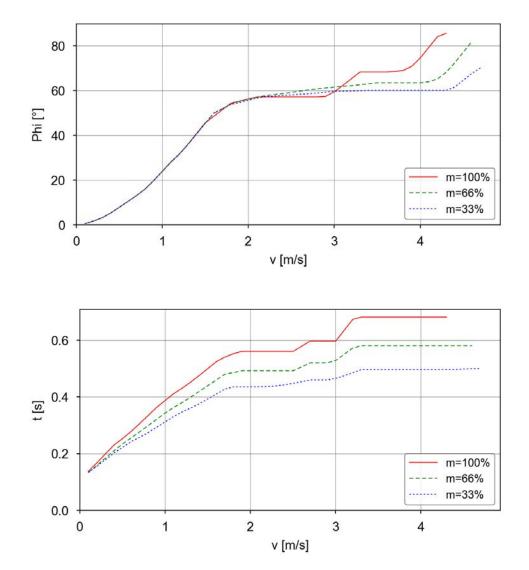
> 60 Phi [°] 40 P.C. C. C. 20 m=100% 1 m=66% m=33% 0 2 3 0 1 4 v [m/s] 0.8 0.6 t [s] 0.4 -----R. R. R. m=100% 0.2 - m=66% m=33% 0.0 2 1 3 0 4 v [m/s]

Category 1, Axis 2



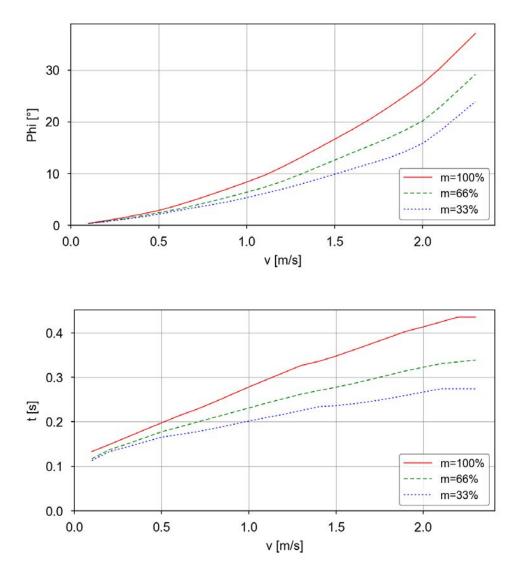


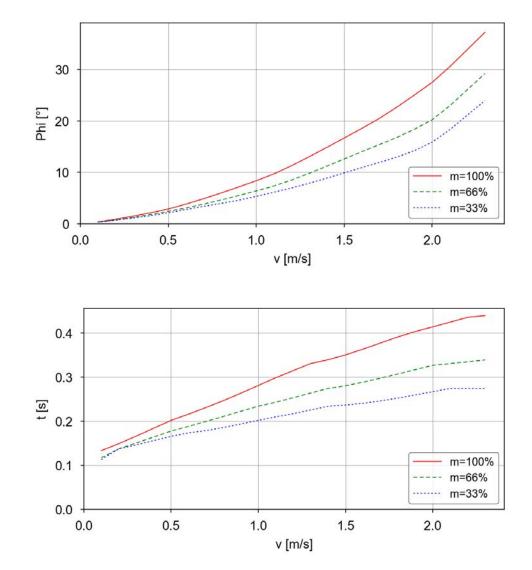
> 40 30 Phi [°] 20 m=100% 10 m=66% m=33% 0 0.5 1.0 2.0 2.5 0.0 1.5 3.0 3.5 4.0 v [m/s] 0.5 0.4 <u>ت</u> 0.3 0.2 m=100% 0.1 m=66% m=33% 0.0 1.5 0.0 0.5 1.0 2.0 2.5 3.0 3.5 4.0 v [m/s]

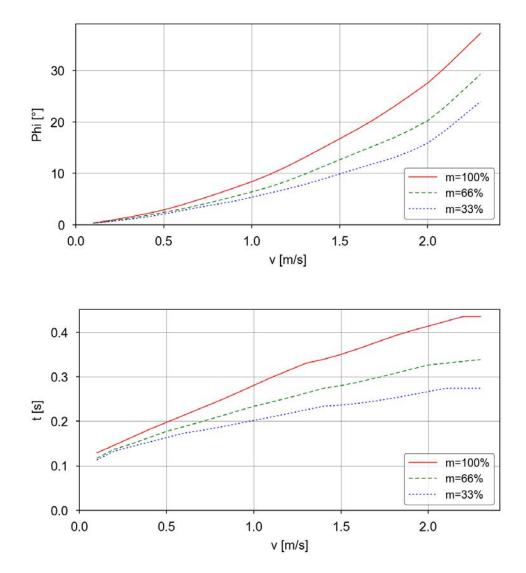


8.2 IRB 2400 1.5 m 16 kg Continued

Category 1, Axis 3







9.1 IRB 2600 1.65 m 12 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

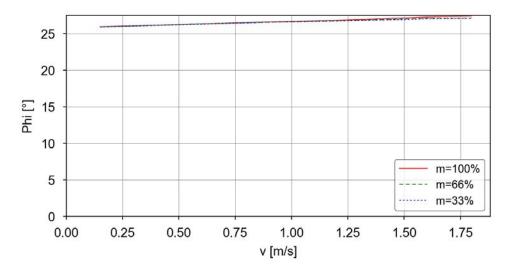
Axis	Distance (degrees)	Stop time (s)
1	26.6	0.2
2	26.9	0.2
3	18.2	0.12

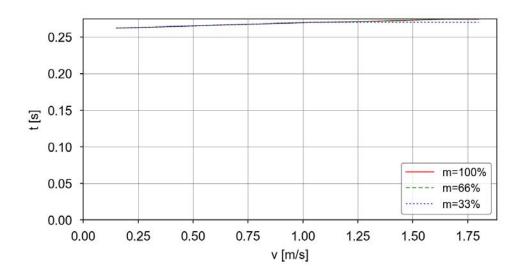
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

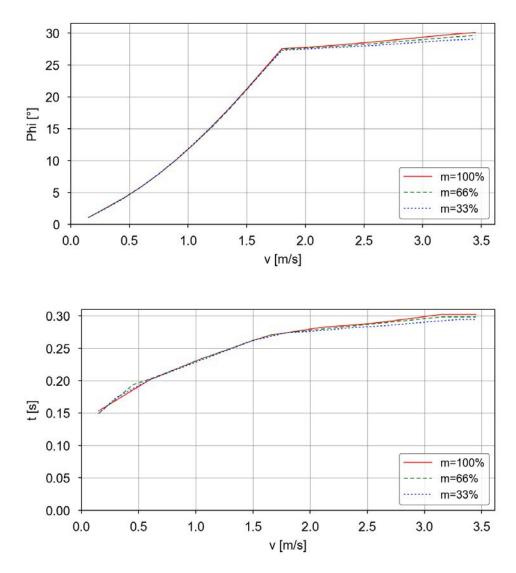
Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

Category 1, Axis 1

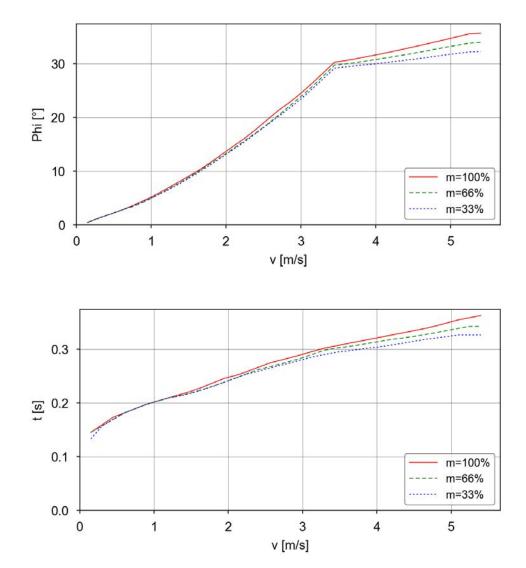




Extension zone 1, stopping distance and stopping time



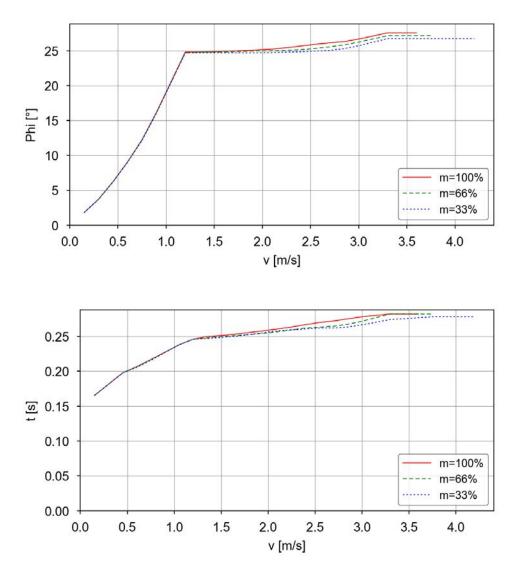
Continues on next page

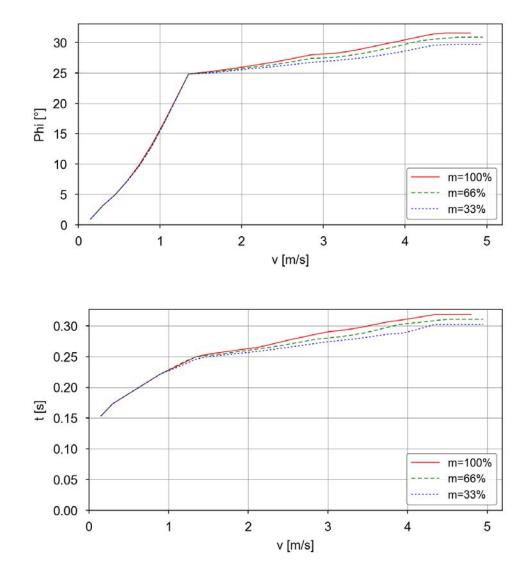


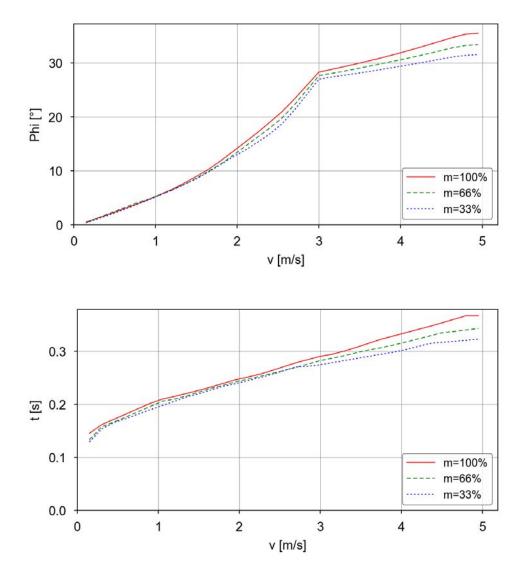
Extension zone 2, stopping distance and stopping time

9.1 IRB 2600 1.65 m 12 kg Continued

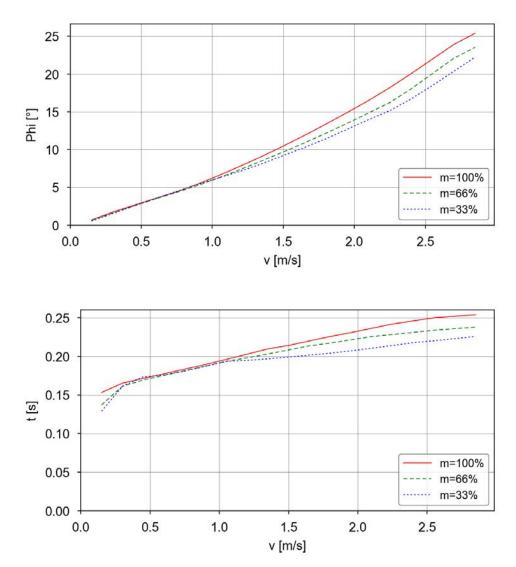
Category 1, Axis 2



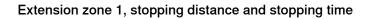


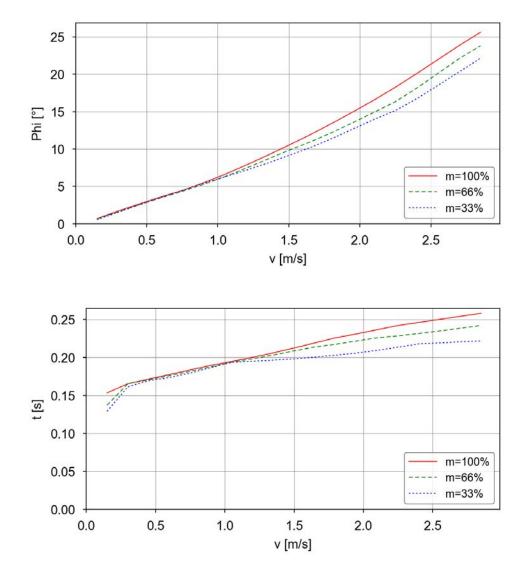


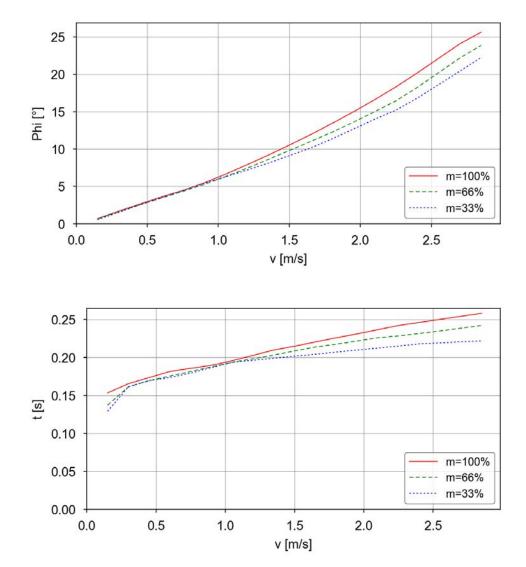
Category 1, Axis 3



9.1 IRB 2600 1.65 m 12 kg Continued







9.2 IRB 2600 1.65 m 20 kg

9.2 IRB 2600 1.65 m 20 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

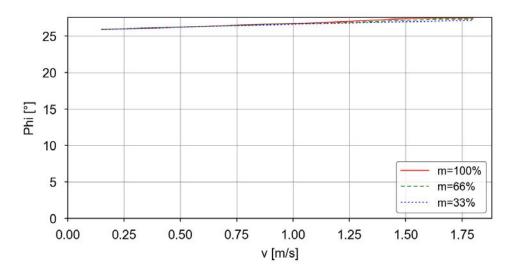
Axis	Distance (degrees)	Stop time (s)
1	28.7	0.22
2	30.5	0.25
3	22.4	0.17

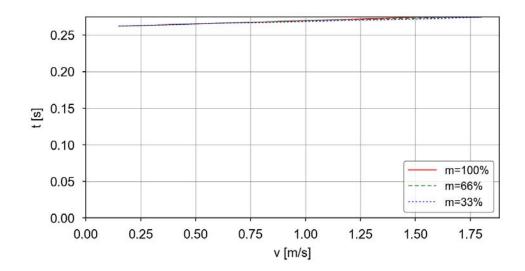
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

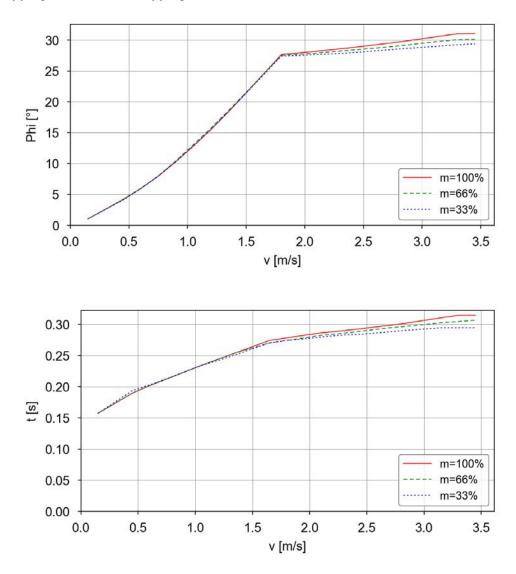
Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

Category 1, Axis 1

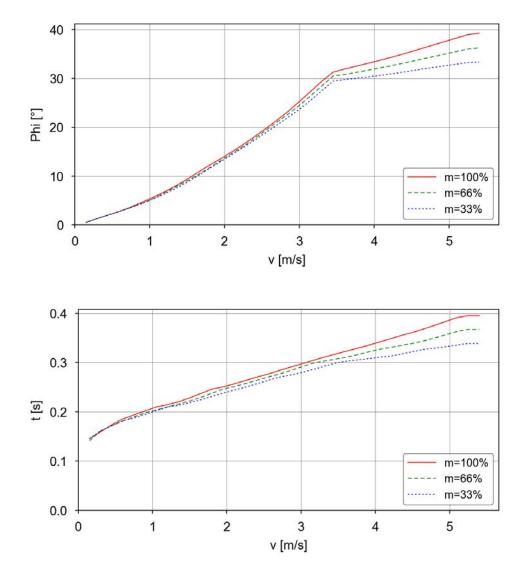




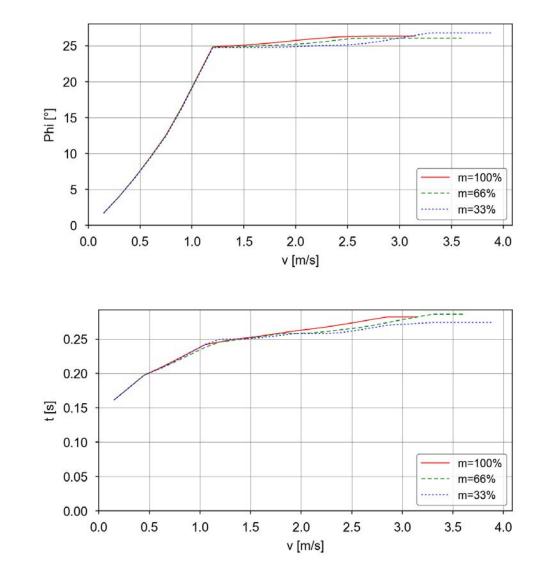
Extension zone 1, stopping distance and stopping time



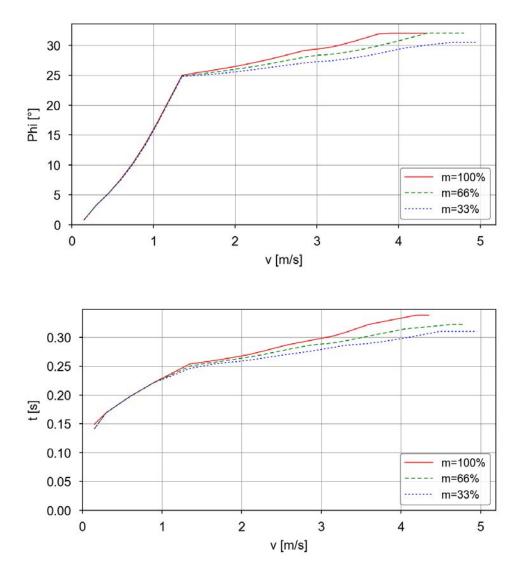
9.2 IRB 2600 1.65 m 20 kg *Continued*

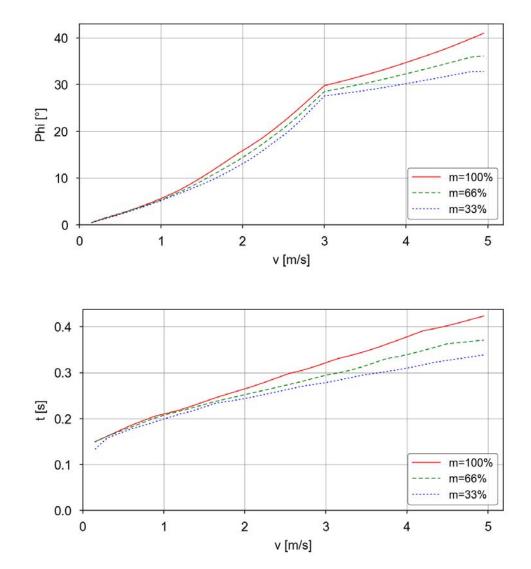


Category 1, Axis 2



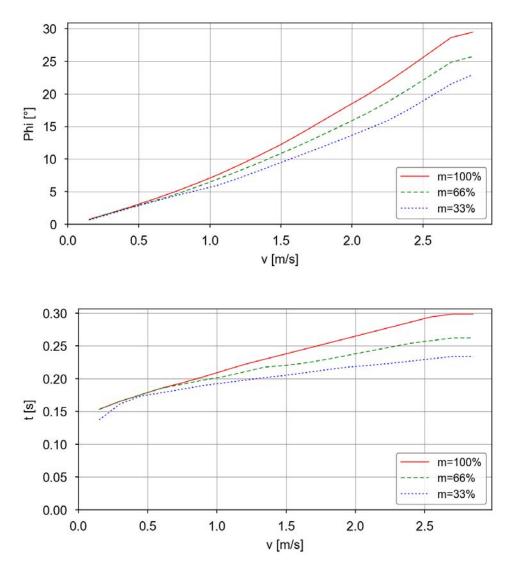
9.2 IRB 2600 1.65 m 20 kg *Continued*

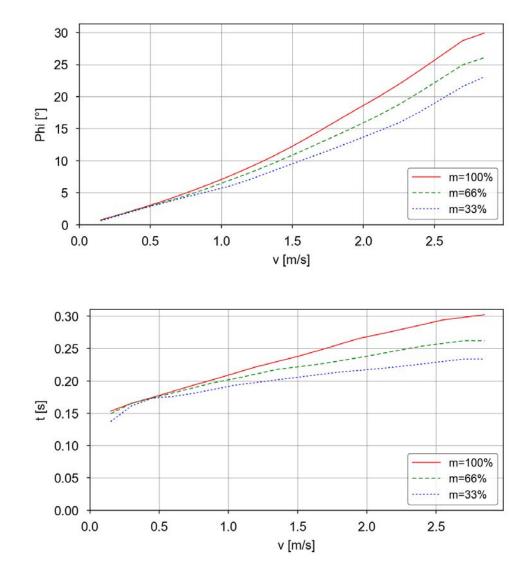




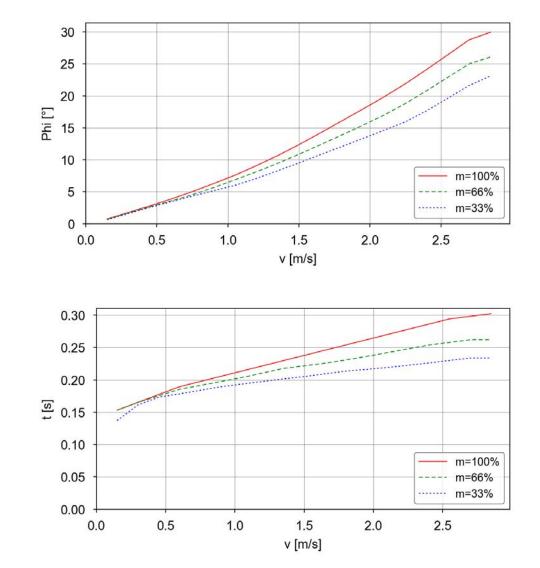
9.2 IRB 2600 1.65 m 20 kg *Continued*

Category 1, Axis 3





9.2 IRB 2600 1.65 m 20 kg *Continued*



9.3 IRB 2600 1.85 m 12 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

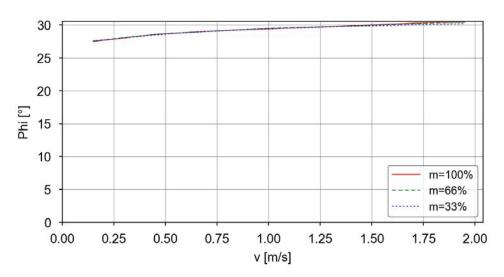
Axis	Distance (degrees)	Stop time (s)
1	30.3	0.25
2	30.9	0.25
3	17.8	0.12

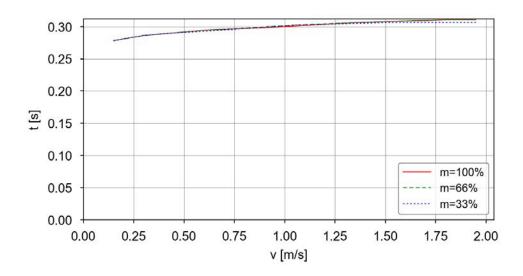
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

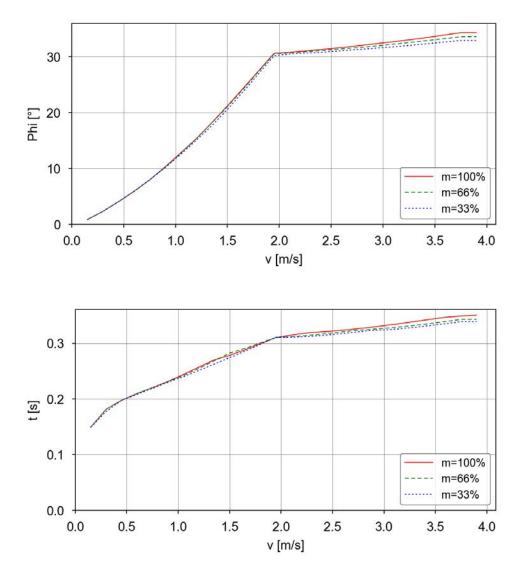
Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

Category 1, Axis 1

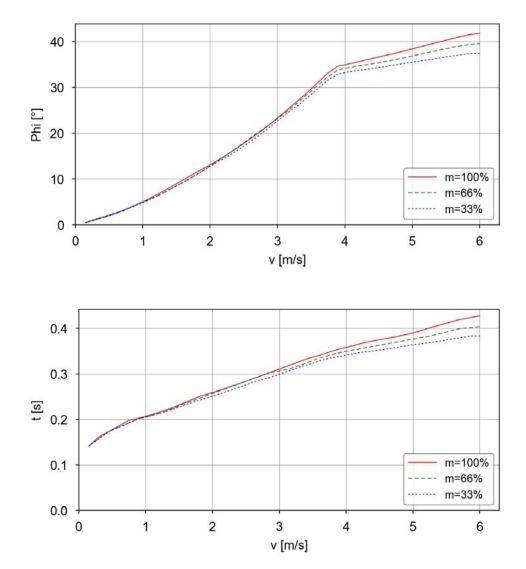




Extension zone 1, stopping distance and stopping time

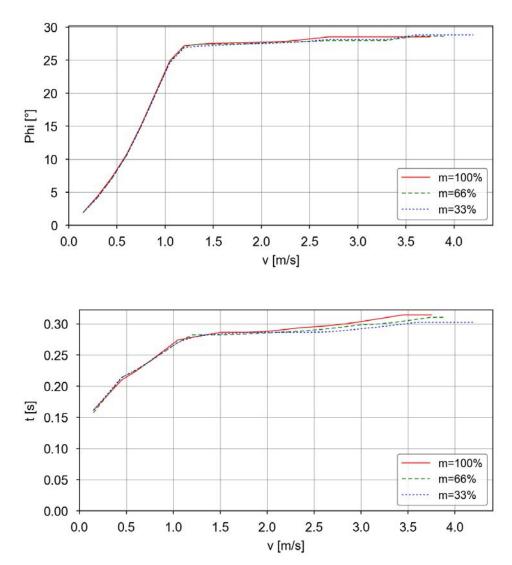


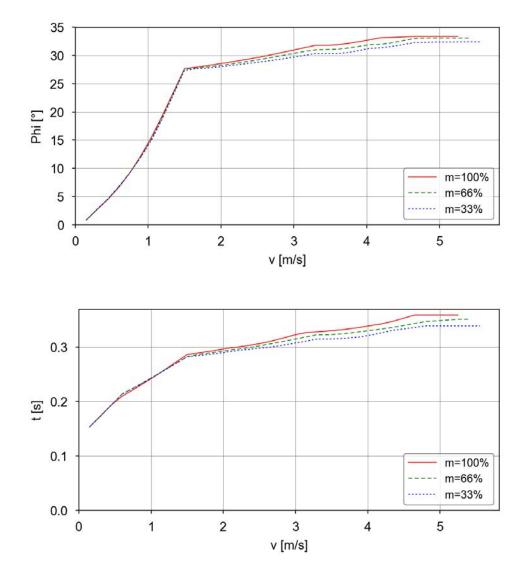
Continues on next page



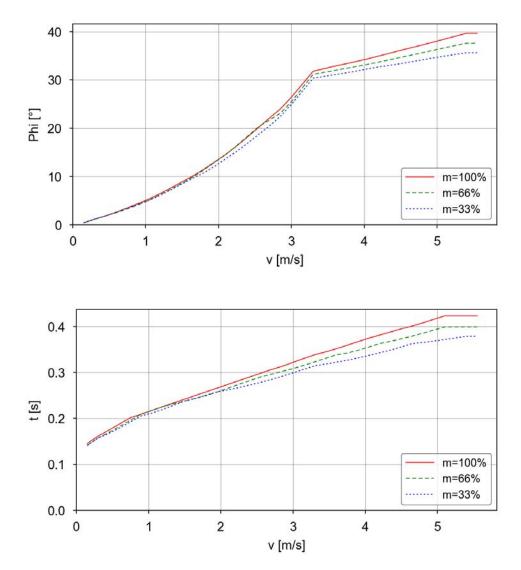
9.3 IRB 2600 1.85 m 12 kg Continued

Category 1, Axis 2



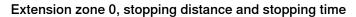


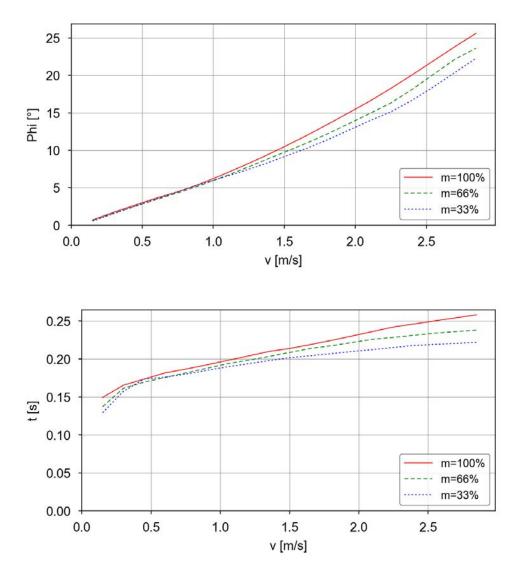
9.3 IRB 2600 1.85 m 12 kg *Continued*



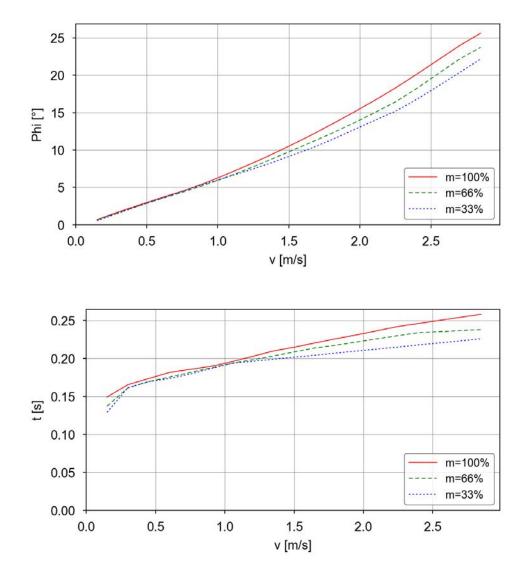
9.3 IRB 2600 1.85 m 12 kg Continued

Category 1, Axis 3

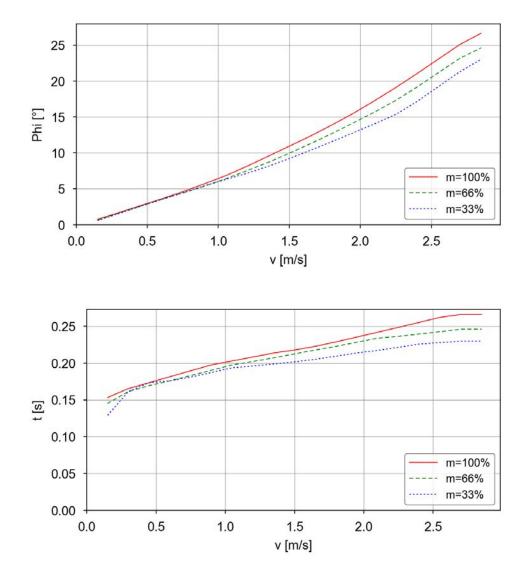




9.3 IRB 2600 1.85 m 12 kg Continued



9.3 IRB 2600 1.85 m 12 kg Continued



Extension zone 2, stopping distance and stopping time

9.4 IRB 2600ID 1.85 m 15 kg

9.4 IRB 2600ID 1.85 m 15 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

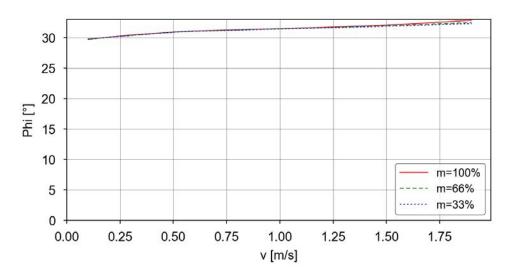
Axis	Distance (degrees)	Stop time (s)
1	33.1	0.27
2	34.4	0.27
3	20.7	0.15

Category 1, extension zones

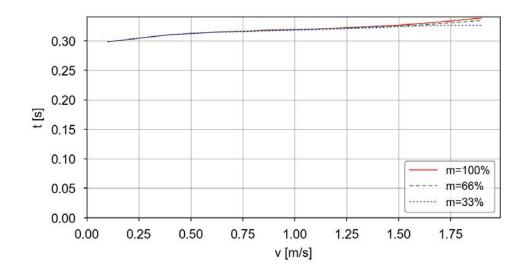
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.617
1	0.617	1.233
2	1.233	max reach

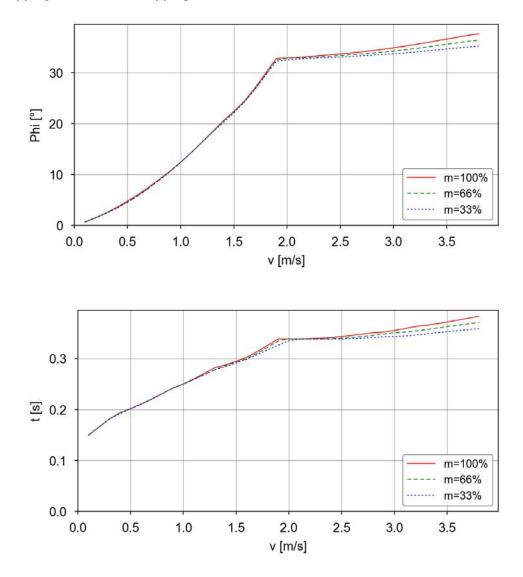
Category 1, Axis 1



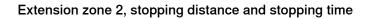
9.4 IRB 2600ID 1.85 m 15 kg Continued

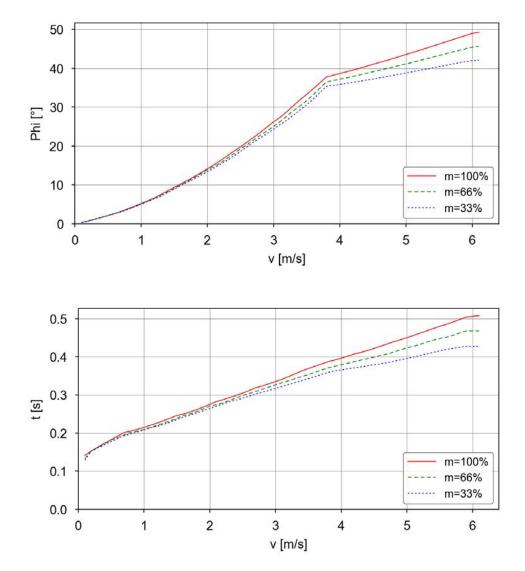


Extension zone 1, stopping distance and stopping time



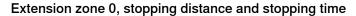
9.4 IRB 2600ID 1.85 m 15 kg *Continued*

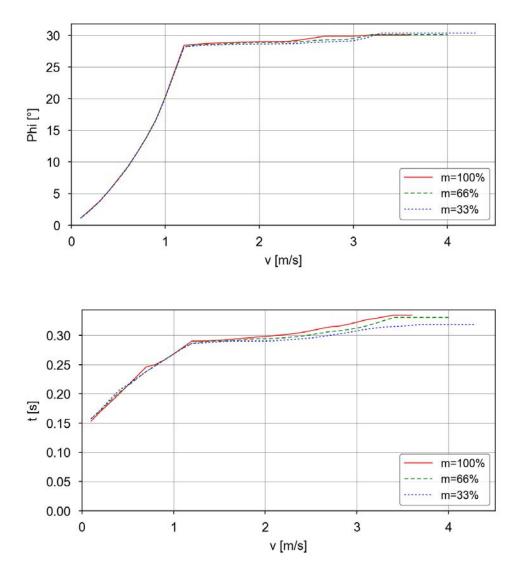




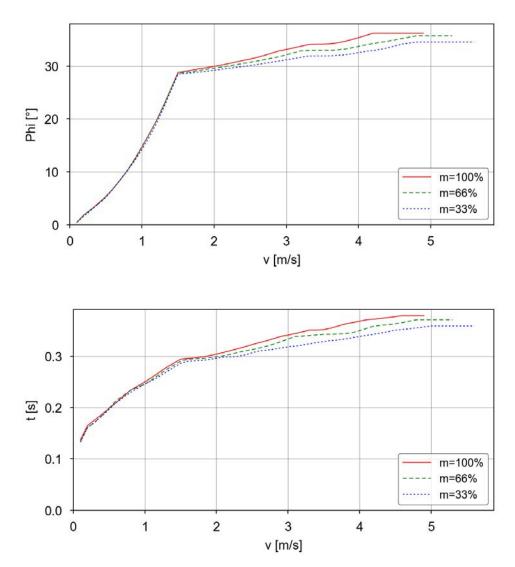
9.4 IRB 2600ID 1.85 m 15 kg Continued

Category 1, Axis 2

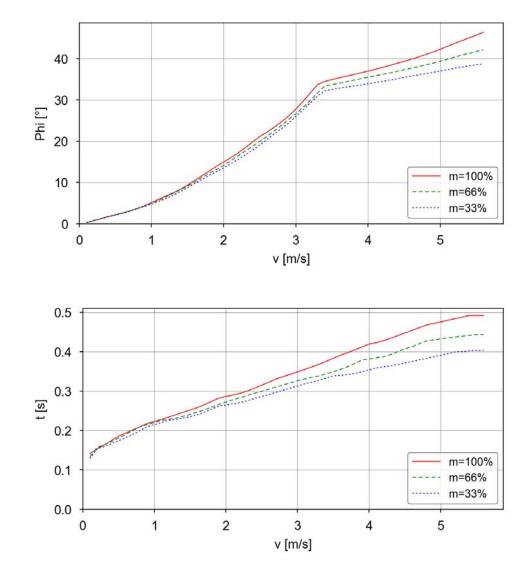




9.4 IRB 2600ID 1.85 m 15 kg *Continued*



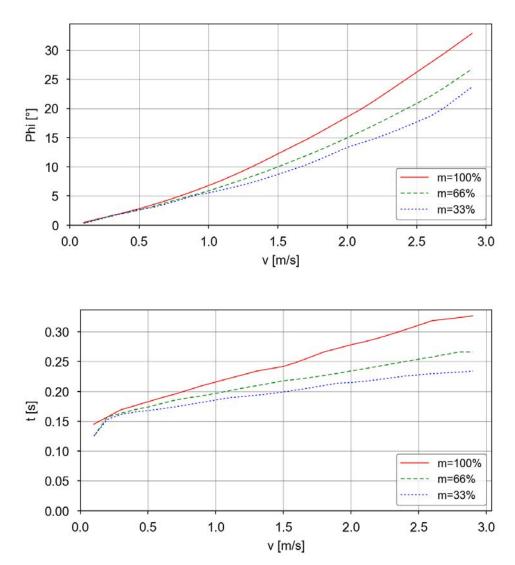
9.4 IRB 2600ID 1.85 m 15 kg Continued



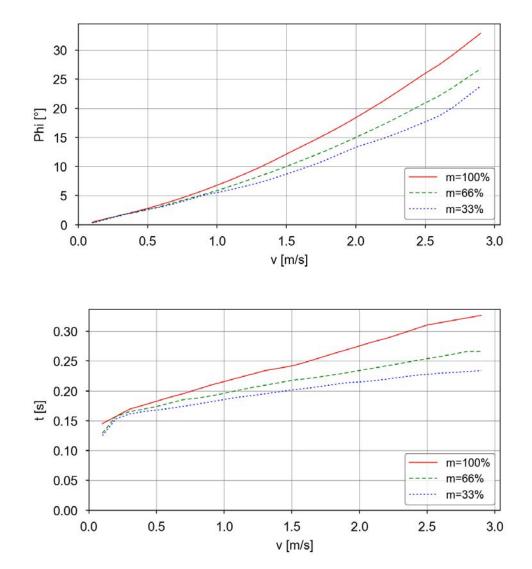
Extension zone 2, stopping distance and stopping time

9.4 IRB 2600ID 1.85 m 15 kg *Continued*

Category 1, Axis 3



9.4 IRB 2600ID 1.85 m 15 kg Continued



9.4 IRB 2600ID 1.85 m 15 kg *Continued*

> 30 25 Phi [°] 20 15 10 m=100% 5 m=66% m=33% 0 1.0 0.5 1.5 2.0 3.0 0.0 2.5 v [m/s] 0.30 0.25 0.20 t [s] 0.15 11 0.10 m=100% m=66% 0.05 m=33% 0.00 1.5 0.0 0.5 1.0 2.0 3.0 2.5 v [m/s]

9.5 IRB 2600ID 2.00 m 8 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

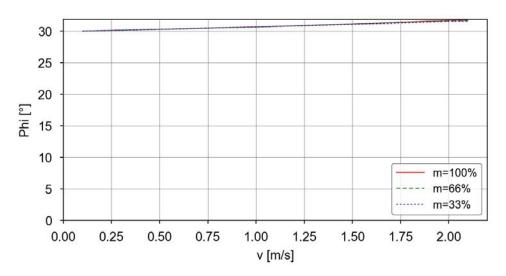
Axis	Distance (degrees)	Stop time (s)
1	31.8	0.27
2	33.7	0.29
3	23.0	0.17

Category 1, extension zones

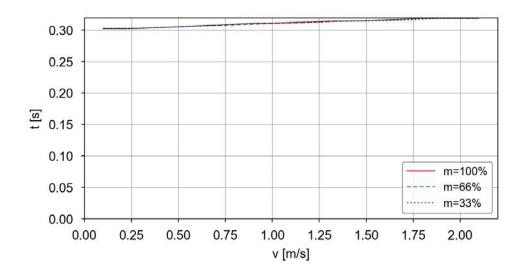
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.667
1	0.667	1.333
2	1.333	max reach

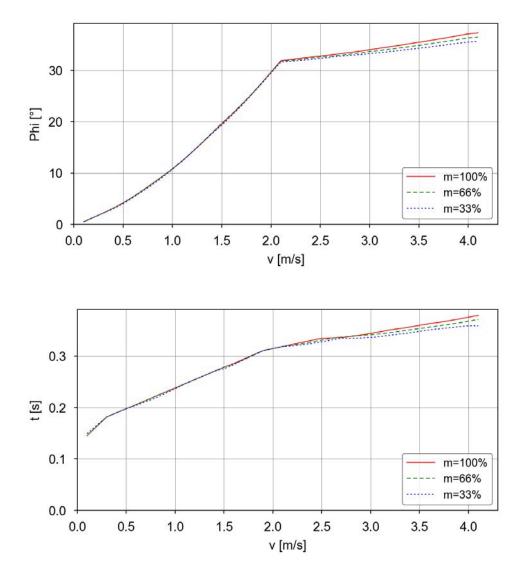
Category 1, Axis 1



9.5 IRB 2600ID 2.00 m 8 kg Continued

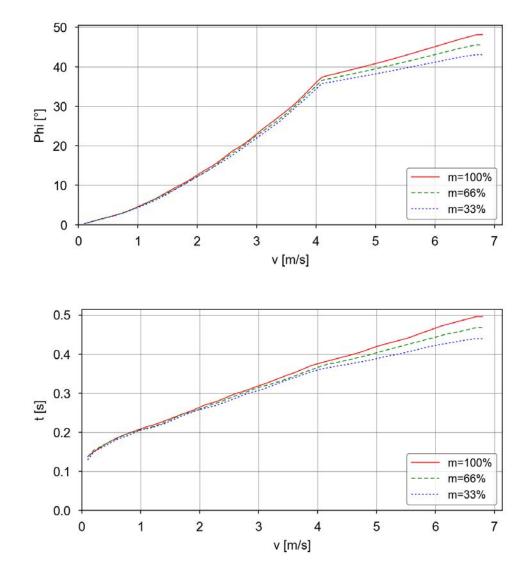


Extension zone 1, stopping distance and stopping time



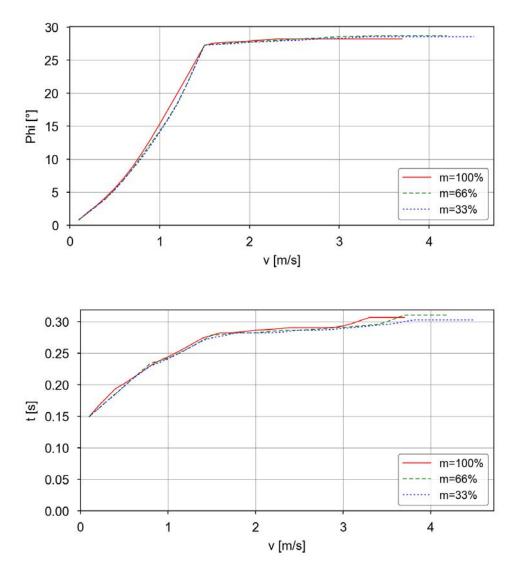
Continues on next page

9.5 IRB 2600ID 2.00 m 8 kg Continued

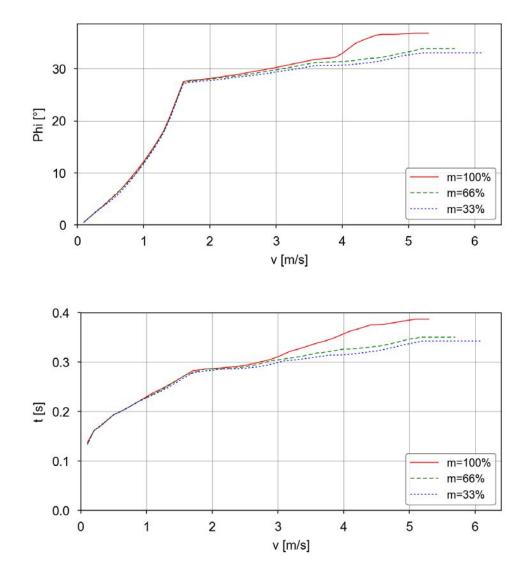


9.5 IRB 2600ID 2.00 m 8 kg Continued

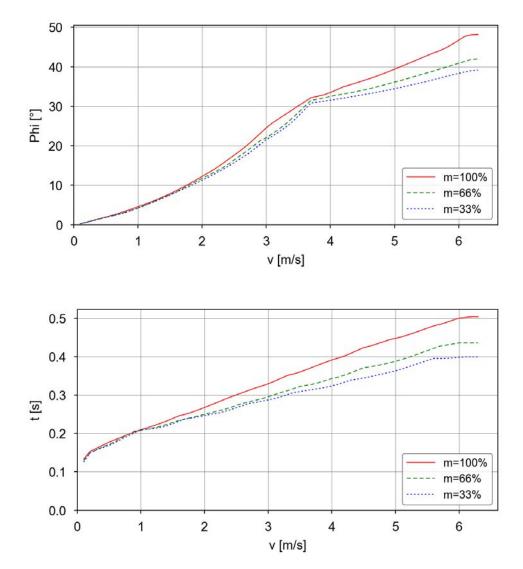
Category 1, Axis 2



9.5 IRB 2600ID 2.00 m 8 kg Continued

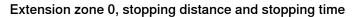


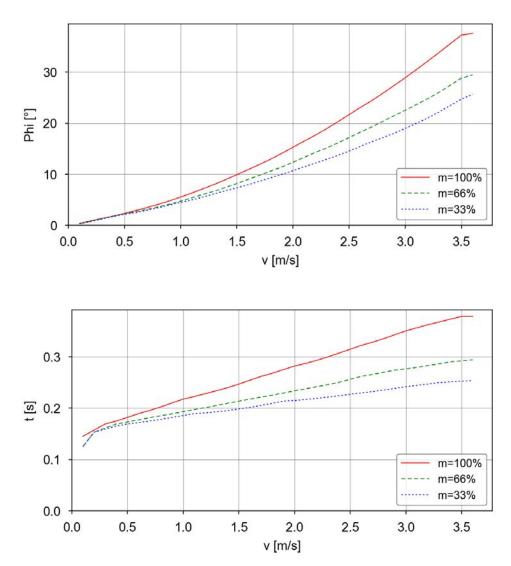
9.5 IRB 2600ID 2.00 m 8 kg *Continued*



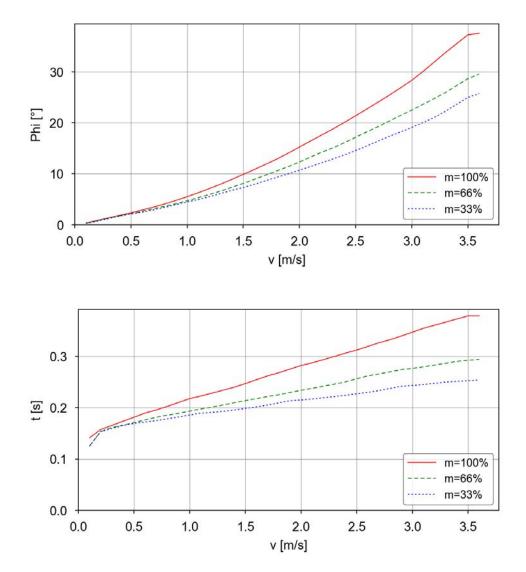
9.5 IRB 2600ID 2.00 m 8 kg Continued

Category 1, Axis 3

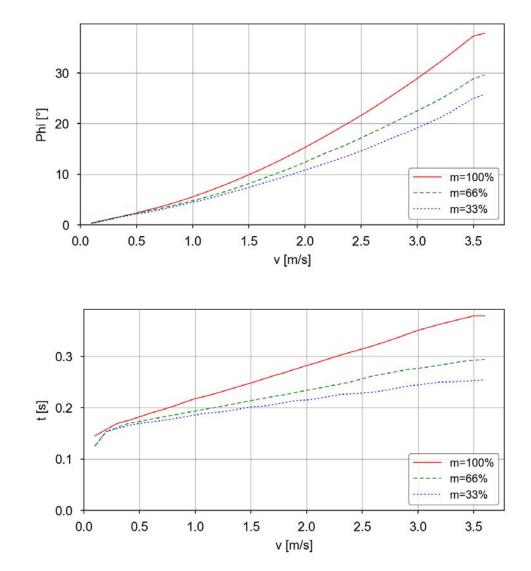




9.5 IRB 2600ID 2.00 m 8 kg *Continued*



9.5 IRB 2600ID 2.00 m 8 kg Continued



Extension zone 2, stopping distance and stopping time

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10.1 IRB 4400 1.95 m 45 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

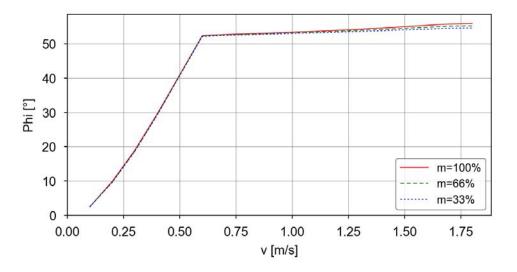
Axis	Distance (degrees)	Stop time (s)
1	67.8	0.8
2	18.8	0.22
3	18.2	0.22

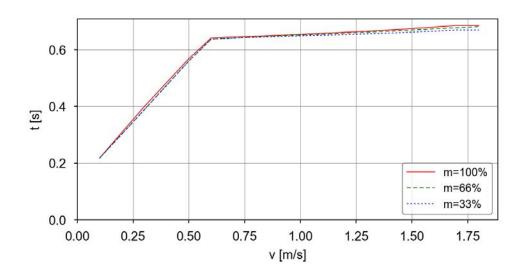
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

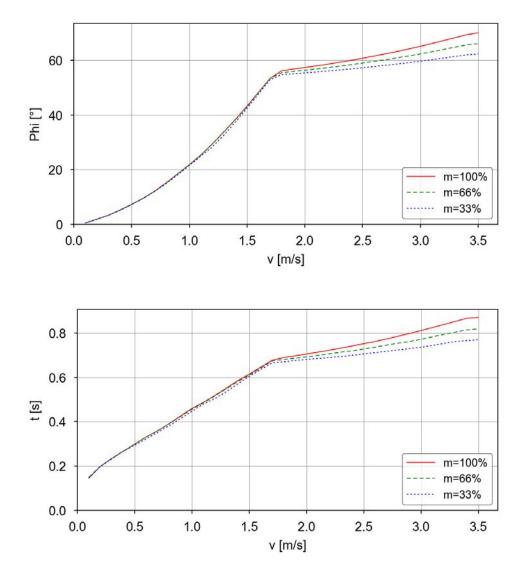
Zone	wcp min (m)	wcp max (m)
0	0	0.661
1	0.661	1.322
2	1.322	max reach

Category 1, Axis 1

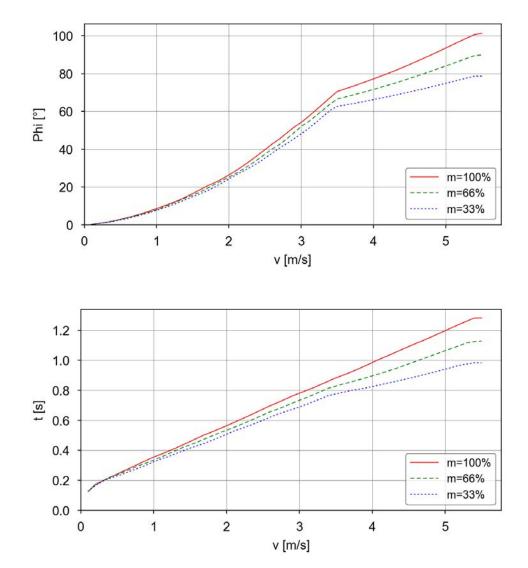




Extension zone 1, stopping distance and stopping time

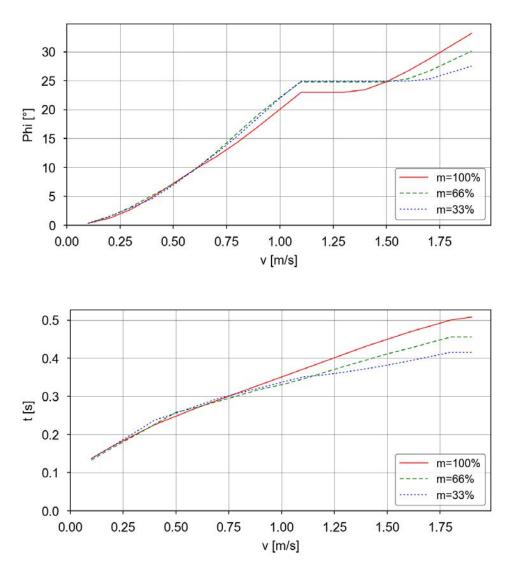


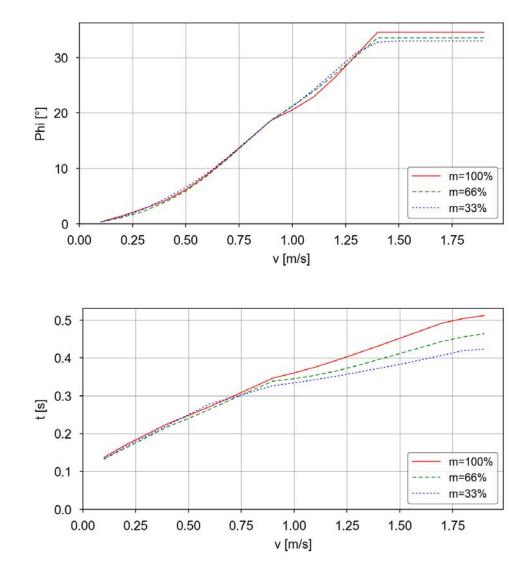
Continues on next page 204

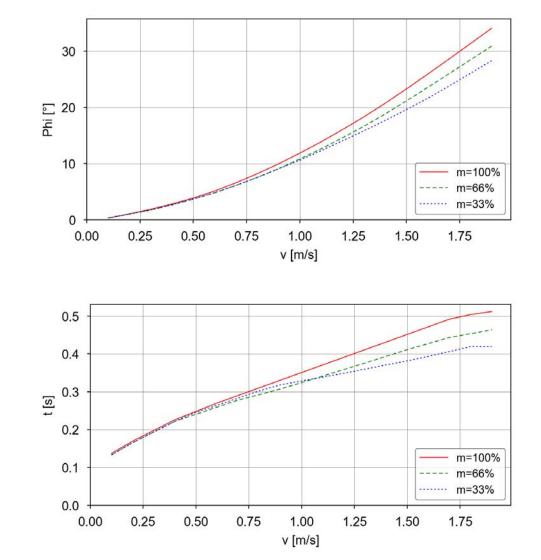


10.1 IRB 4400 1.95 m 45 kg *Continued*

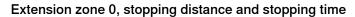
Category 1, Axis 2

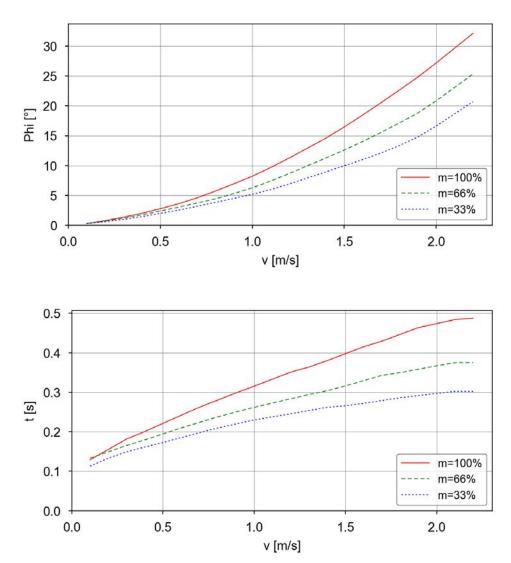






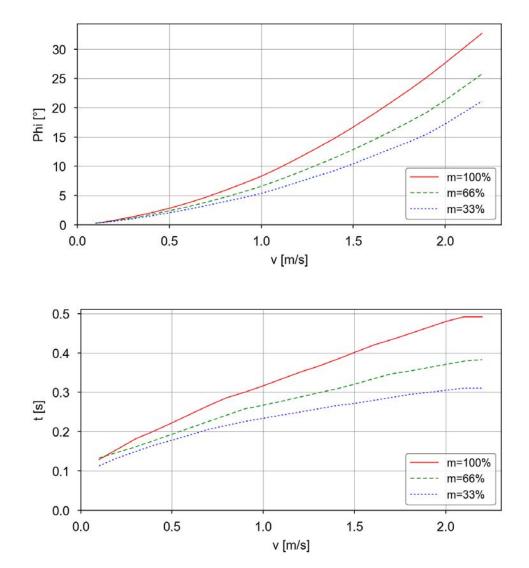
Category 1, Axis 3





10.1 IRB 4400 1.95 m 45 kg Continued

> 30 25 20 Phi [°] 15 10 m=100% m=66% 5 m=33% 0 1.0 1.5 0.5 2.0 0.0 v [m/s] 0.5 0.4 0.3 t [s] 0.2 m=100% 0.1 m=66% m=33% 0.0 0.0 0.5 1.0 1.5 2.0 v [m/s]



10.2 IRB 4400 1.95 m 60 kg

10.2 IRB 4400 1.95 m 60 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

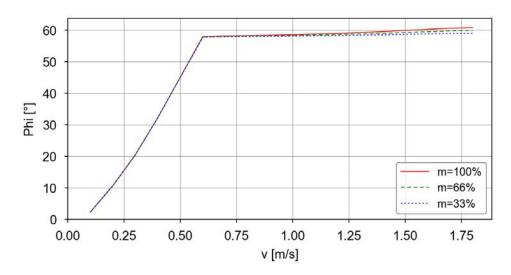
Axis	Distance (degrees)	Stop time (s)
1	75.1	0.9
2	20.2	0.25
3	20.6	0.27

Category 1, extension zones

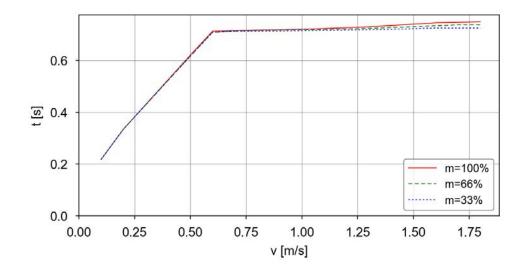
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.661
1	0.661	1.322
2	1.322	max reach

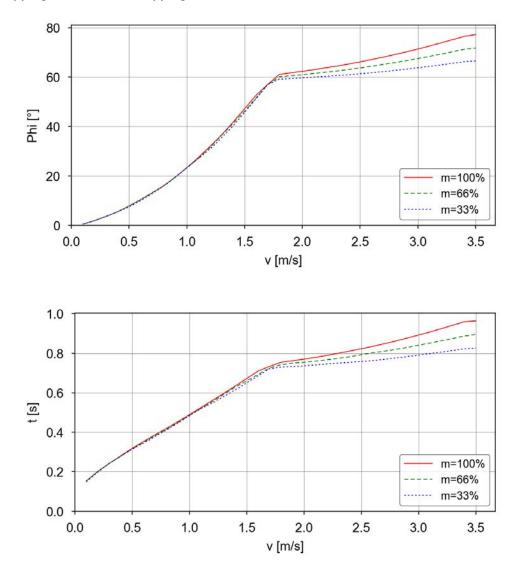
Category 1, Axis 1



10.2 IRB 4400 1.95 m 60 kg Continued



Extension zone 1, stopping distance and stopping time

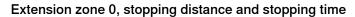


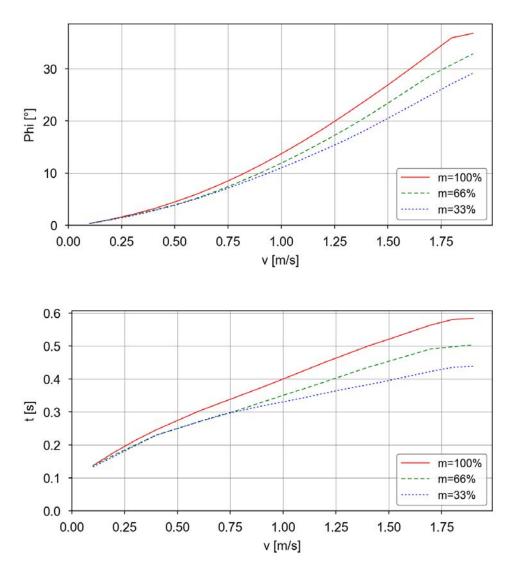
Continues on next page

10.2 IRB 4400 1.95 m 60 kg Continued

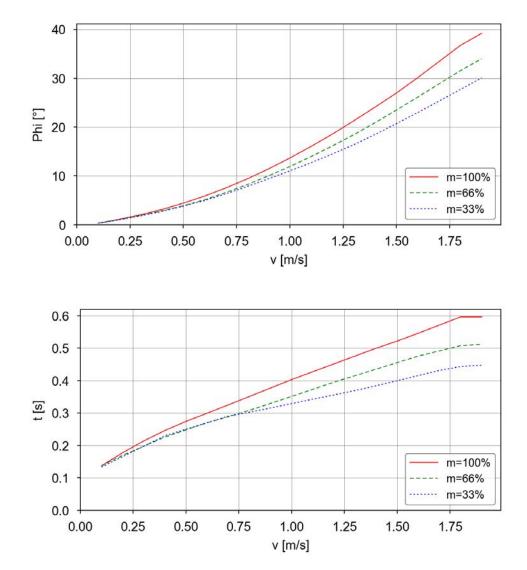
> 120 100 80 Phi [°] 60 40 m=100% 20 m=66% m=33% 0 2 5 3 4 0 1 v [m/s] 1.50 1.25 1.00 t [s] 0.75 0.50 m=100% 0.25 m=66% m=33% 0.00 2 3 1 4 5 0 v [m/s]

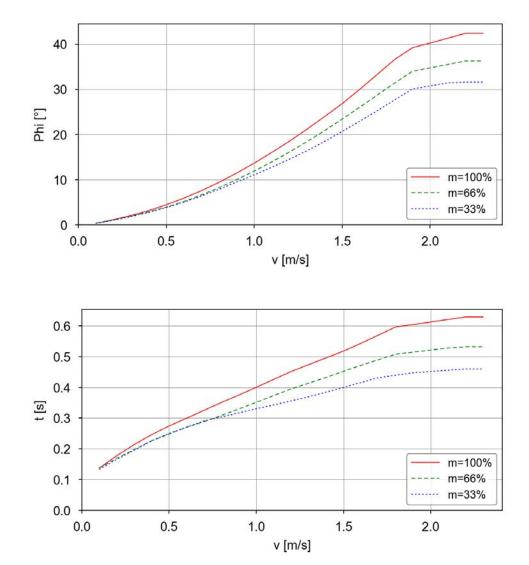
Category 1, Axis 2





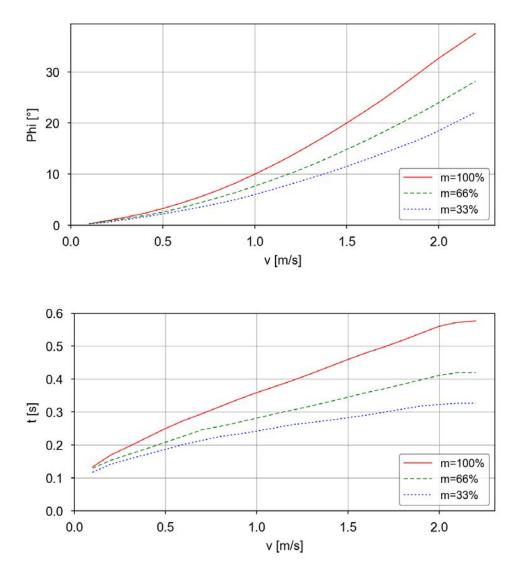
10.2 IRB 4400 1.95 m 60 kg Continued

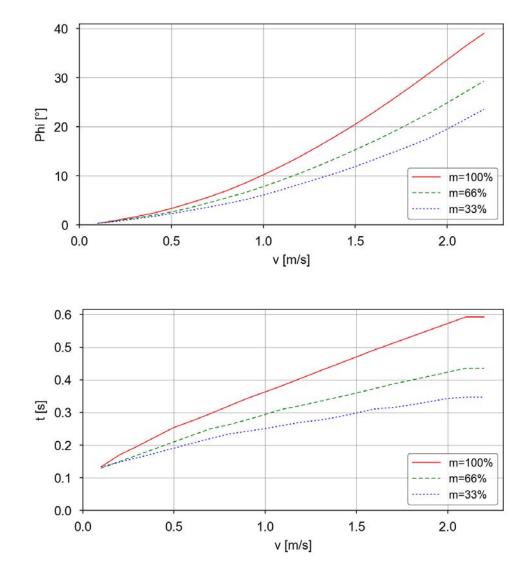




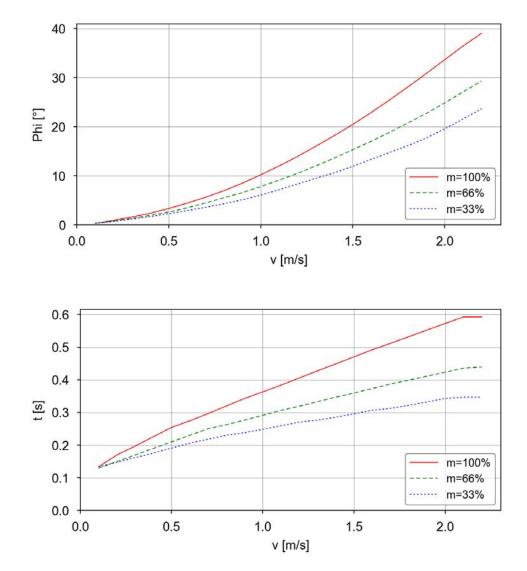
10.2 IRB 4400 1.95 m 60 kg Continued

Category 1, Axis 3





10.2 IRB 4400 1.95 m 60 kg Continued



10.3 IRB 4400 2.6 m 10 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

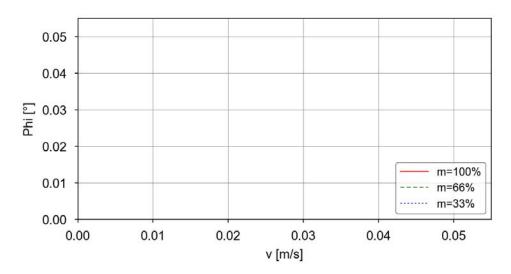
Axis	Distance (degrees)	Stop time (s)
1	51.3	0.58
2	21.1	0.2
3	19.0	0.17

Category 1, extension zones

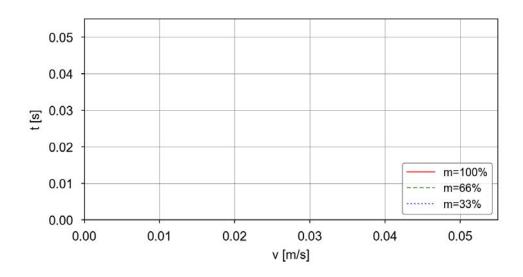
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.0
1	0.0	0.0
2	0.0	max reach

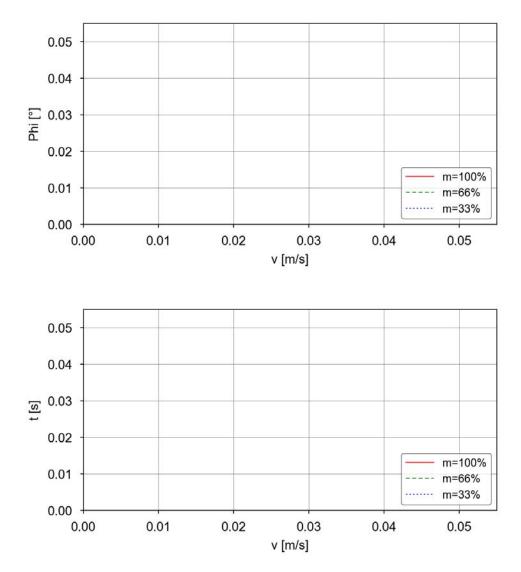
Category 1, Axis 1



10.3 IRB 4400 2.6 m 10 kg *Continued*

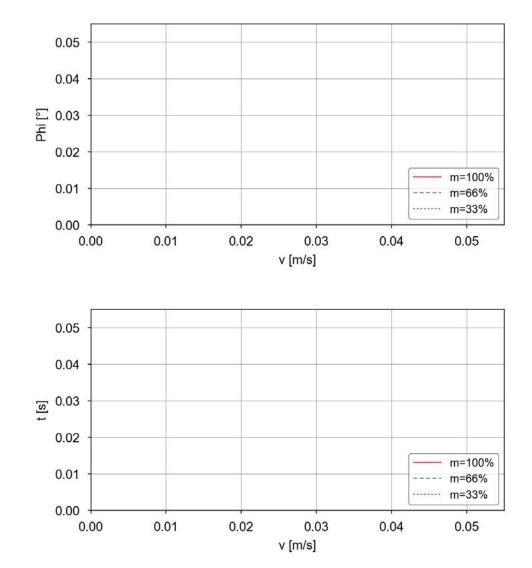


Extension zone 1, stopping distance and stopping time



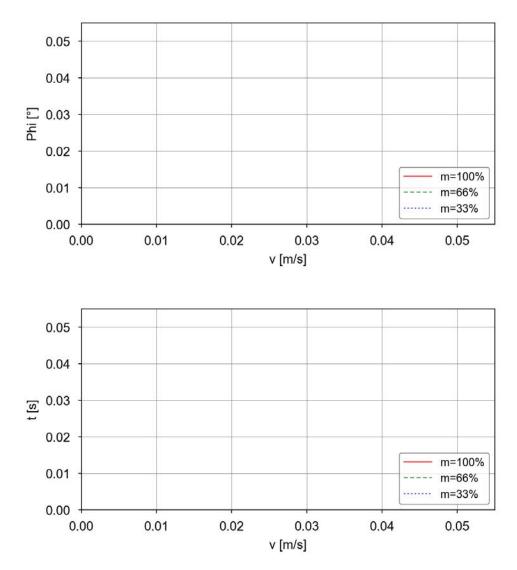
Continues on next page

10.3 IRB 4400 2.6 m 10 kg Continued

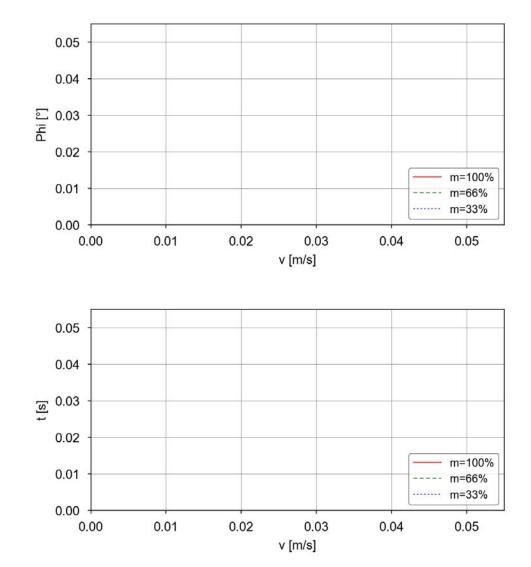


10.3 IRB 4400 2.6 m 10 kg Continued

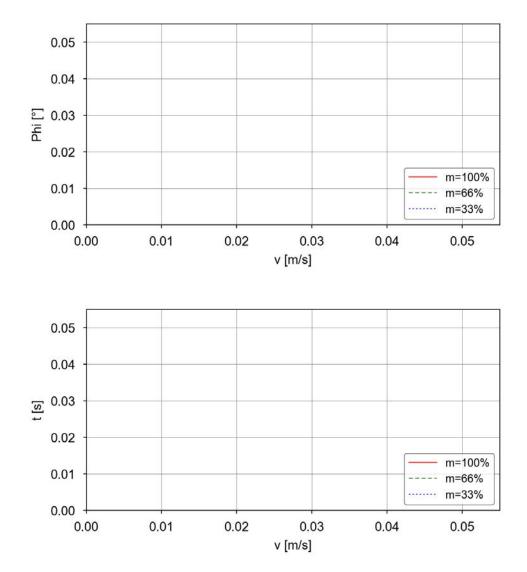
Category 1, Axis 2



10.3 IRB 4400 2.6 m 10 kg Continued

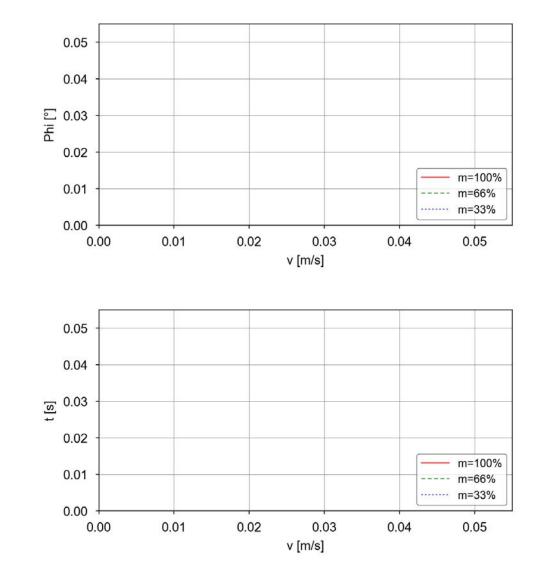


10.3 IRB 4400 2.6 m 10 kg Continued

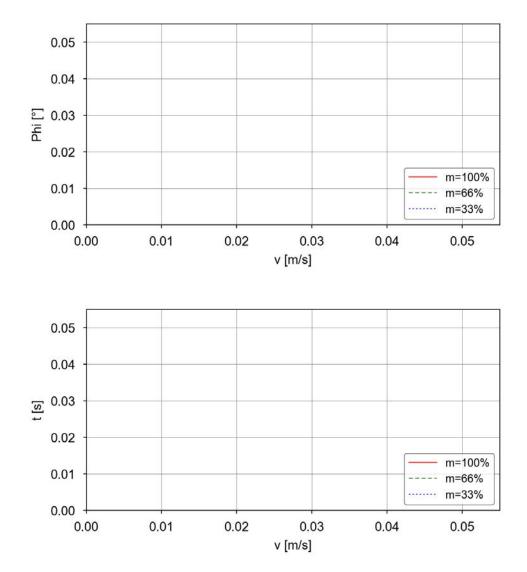


10.3 IRB 4400 2.6 m 10 kg Continued

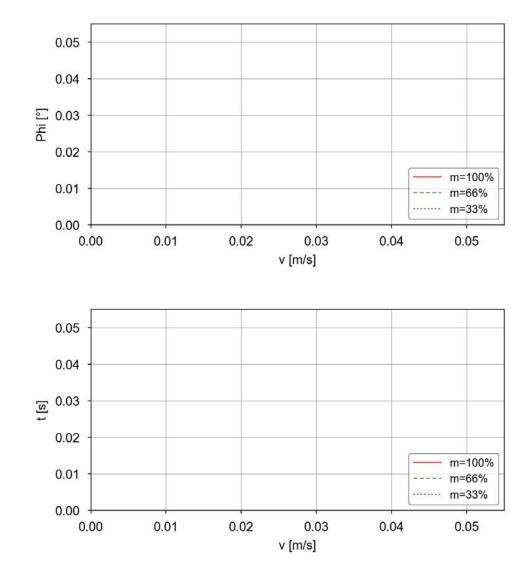
Category 1, Axis 3



10.3 IRB 4400 2.6 m 10 kg *Continued*



10.3 IRB 4400 2.6 m 10 kg Continued



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11.1 IRB 4600 2.05 m 45 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

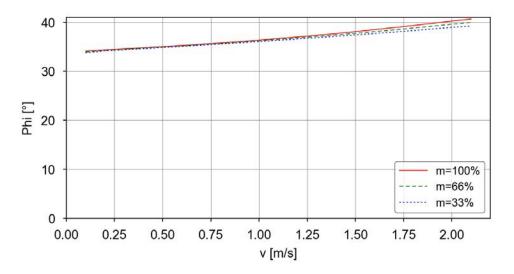
Axis	Distance (degrees)	Stop time (s)
1	60.5	0.58
2	37.1	0.32
3	25.3	0.2

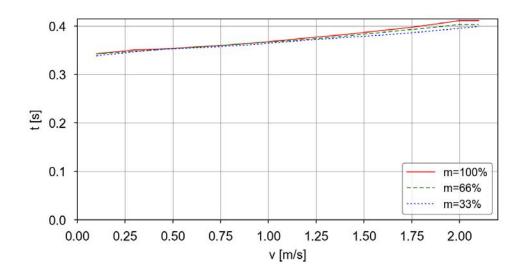
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

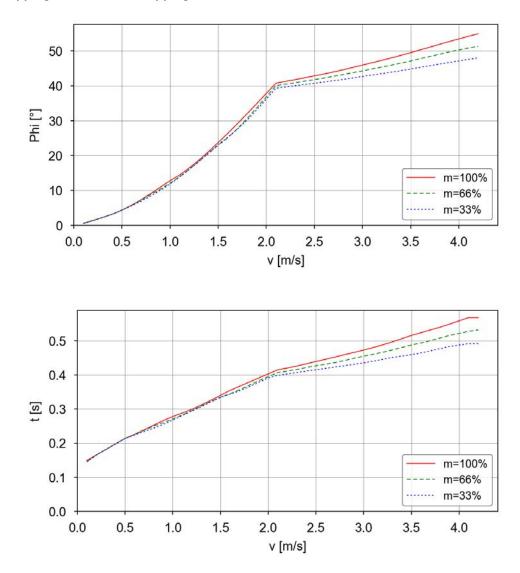
Zone	wcp min (m)	wcp max (m)
0	0	0.684
1	0.684	1.367
2	1.367	max reach

Category 1, Axis 1



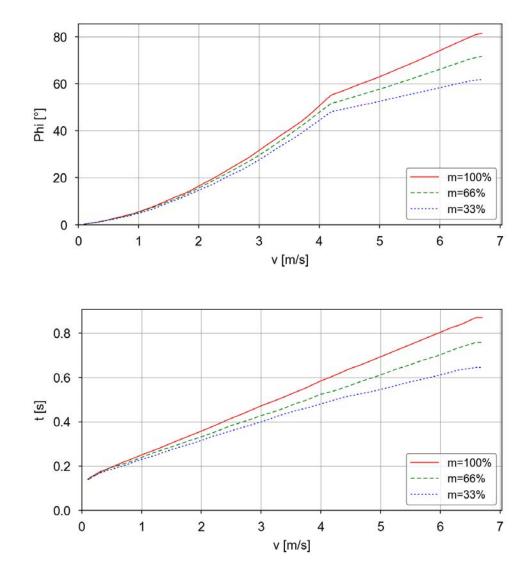


Extension zone 1, stopping distance and stopping time



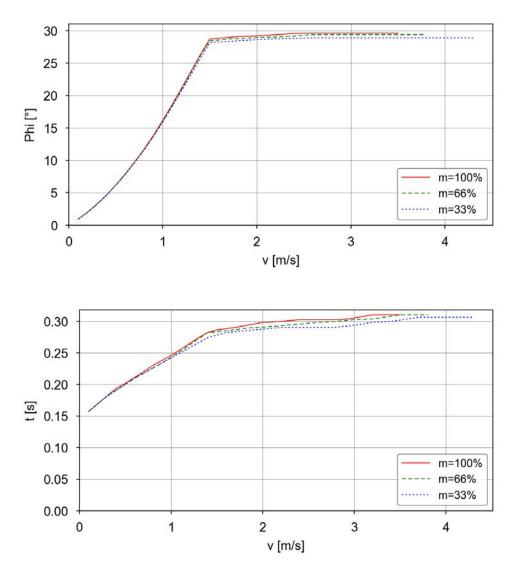
Continues on next page

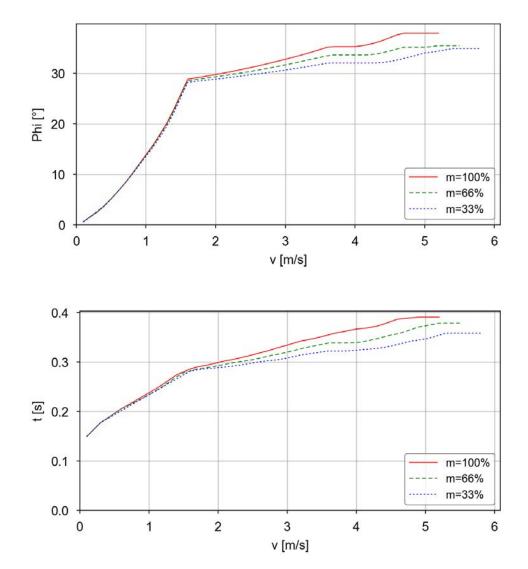
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC



11.1 IRB 4600 2.05 m 45 kg Continued

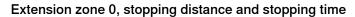
Category 1, Axis 2

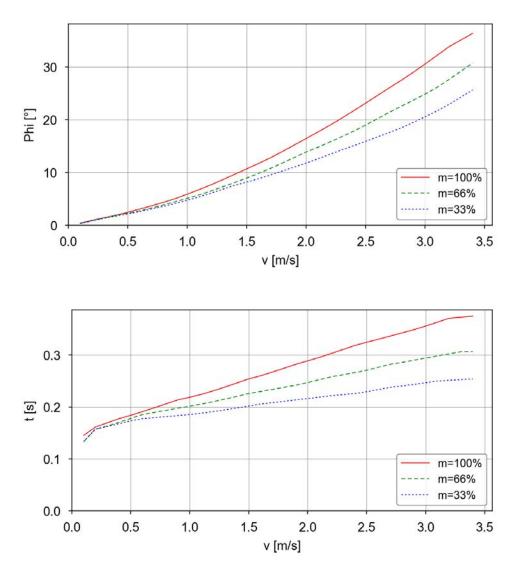




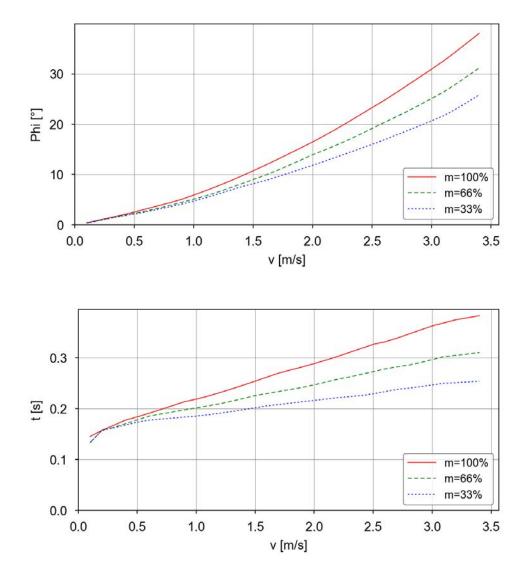
> 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 2 3 4 5 6 0 1 v [m/s] 0.5 0.4 -----<u>ت</u> 0.3 0.2 m=100% 0.1 m=66% m=33% 0.0 2 3 4 5 0 1 6 v [m/s]

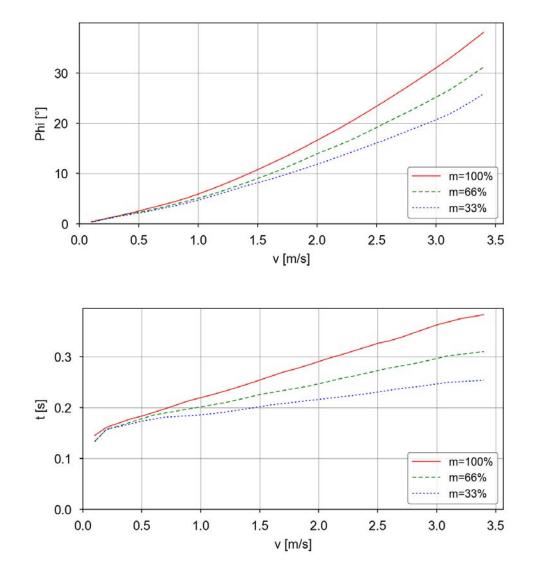
Category 1, Axis 3





11.1 IRB 4600 2.05 m 45 kg Continued





Extension zone 2, stopping distance and stopping time

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11.2 IRB 4600 2.05 m 60 kg

11.2 IRB 4600 2.05 m 60 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

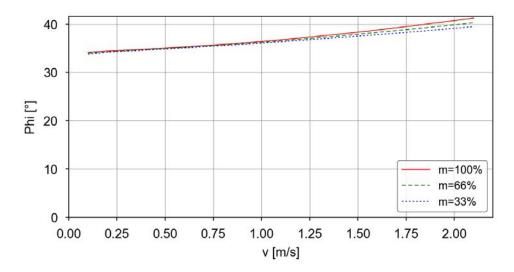
Axis	Distance (degrees)	Stop time (s)
1	62.9	0.66
2	40.3	0.37
3	32.8	0.27

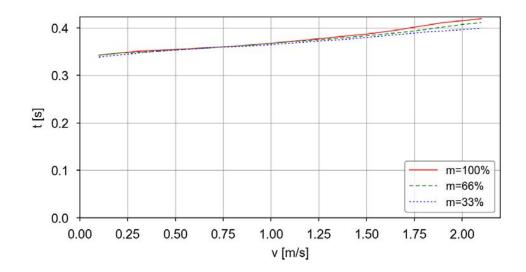
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

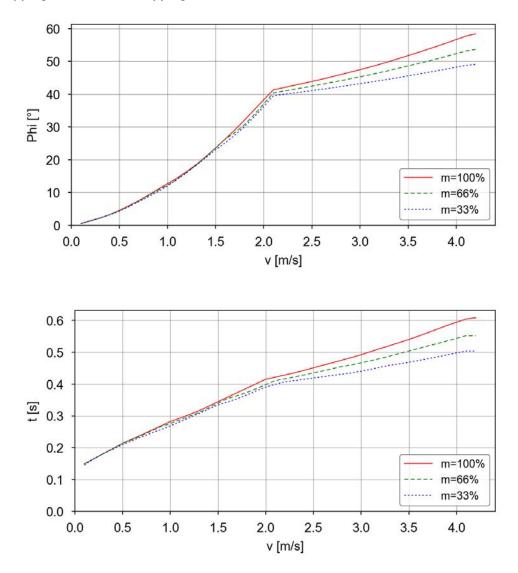
Zone	wcp min (m)	wcp max (m)
0	0	0.684
1	0.684	1.367
2	1.367	max reach

Category 1, Axis 1





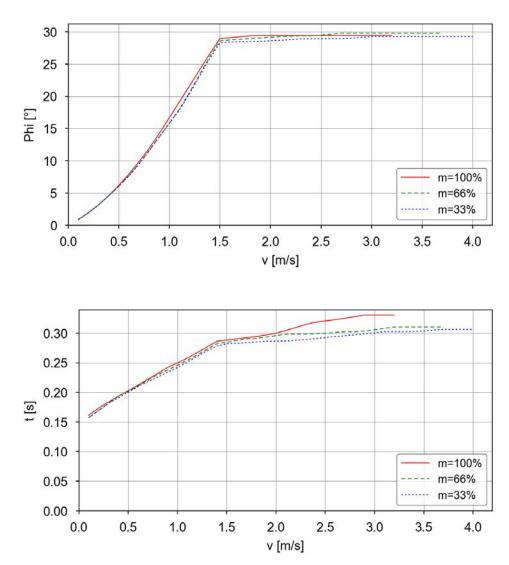
Extension zone 1, stopping distance and stopping time



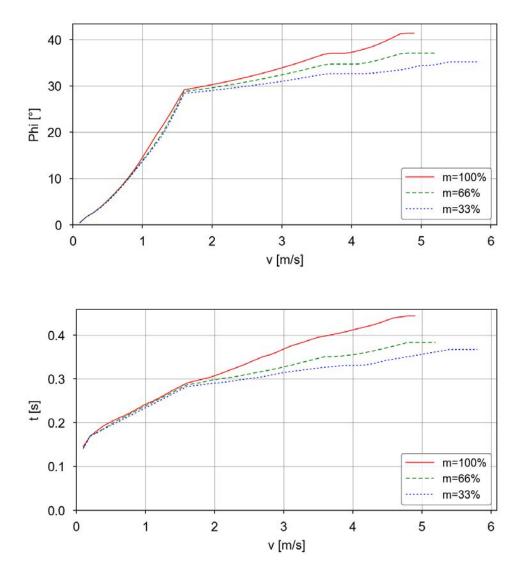
Continues on next page

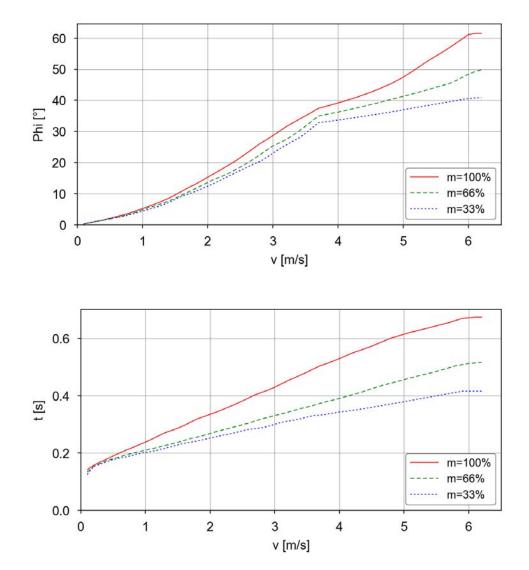
> 80 60 []. 141 40 m=100% 20 m=66% m=33% 0 2 3 5 7 0 4 6 1 v [m/s] 0.8 0.6 t [s] 0.4 and the state m=100% 0.2 m=66% m=33% 0.0 2 3 4 5 0 1 6 7 v [m/s]

Category 1, Axis 2



11.2 IRB 4600 2.05 m 60 kg Continued

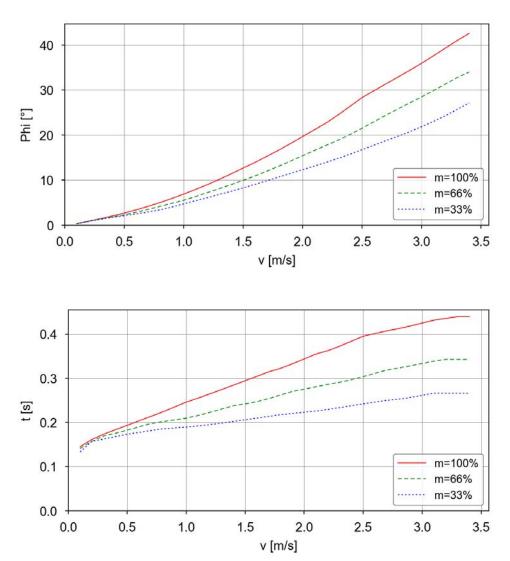


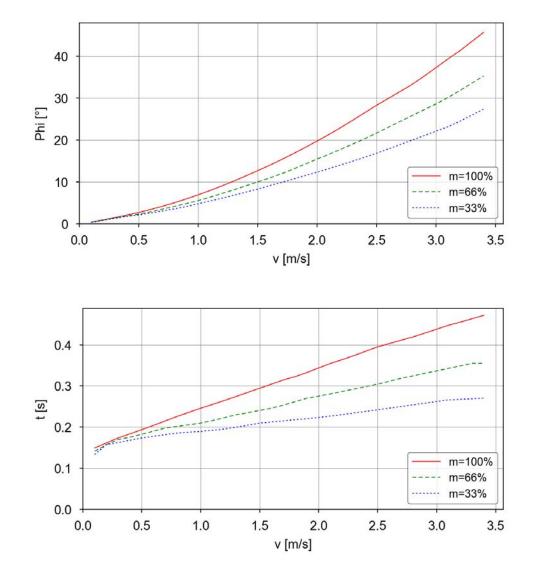


Extension zone 2, stopping distance and stopping time

11.2 IRB 4600 2.05 m 60 kg Continued

Category 1, Axis 3





11.2 IRB 4600 2.05 m 60 kg Continued

> 40 30 Phi [°] 20 m=100% 10 - m=66% m=33% 0 1.0 1.5 2.0 0.0 0.5 2.5 3.0 3.5 v [m/s] 0.4 0.3 t [s] 0.2 T.C. M. T. T. T. m=100% 0.1 m=66% - m=33% 0.0 1.5 0.0 0.5 1.0 2.0 2.5 3.5 3.0 v [m/s]

11.3 IRB 4600 2.50 m 20 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

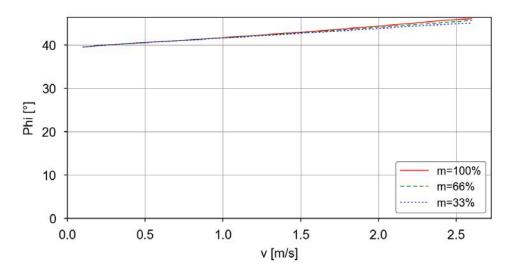
Axis	Distance (degrees)	Stop time (s)
1	53.9	0.51
2	33.9	0.29
3	22.2	0.17

Category 1, extension zones

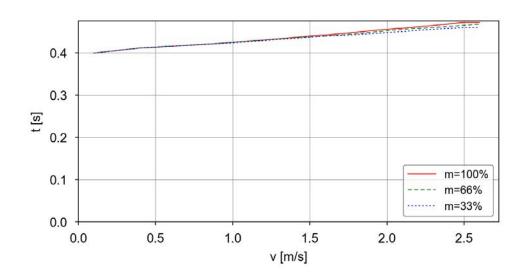
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.838
1	0.838	1.675
2	1.675	max reach

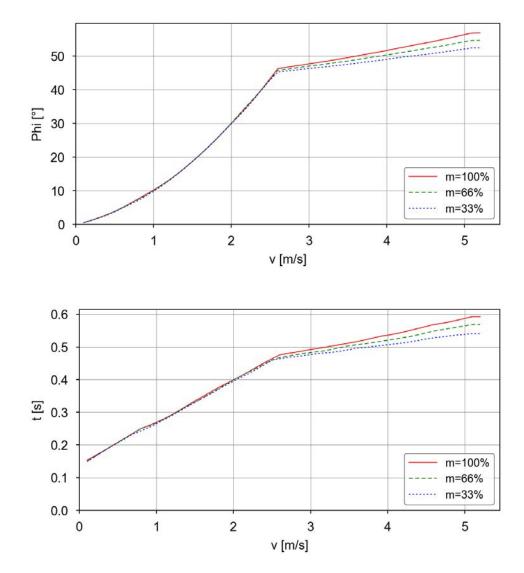
Category 1, Axis 1



11.3 IRB 4600 2.50 m 20 kg Continued

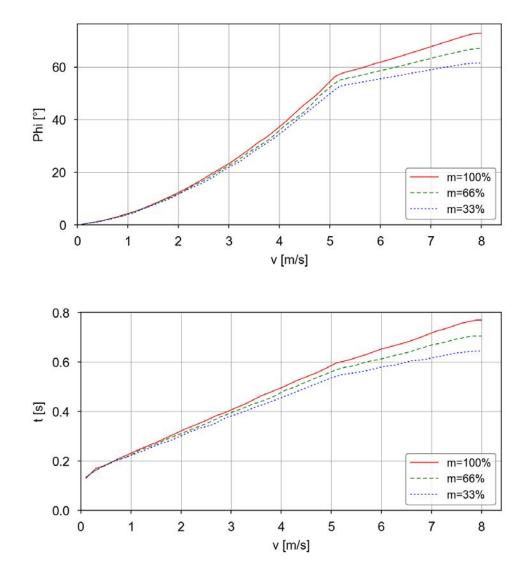


Extension zone 1, stopping distance and stopping time



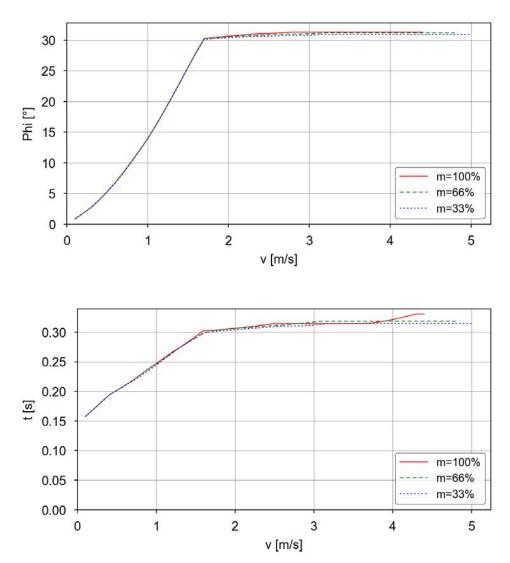
Continues on next page 250

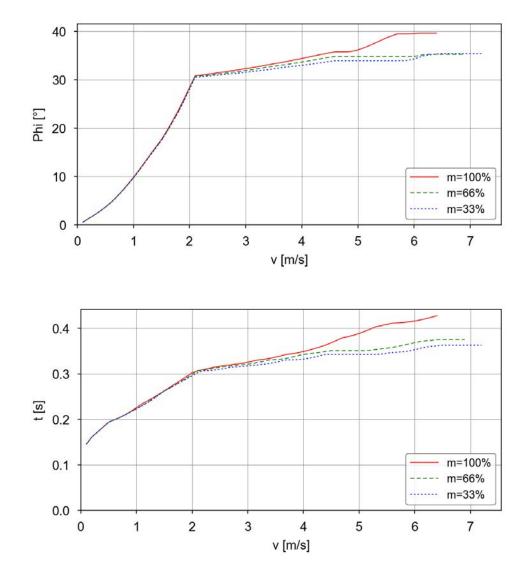
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

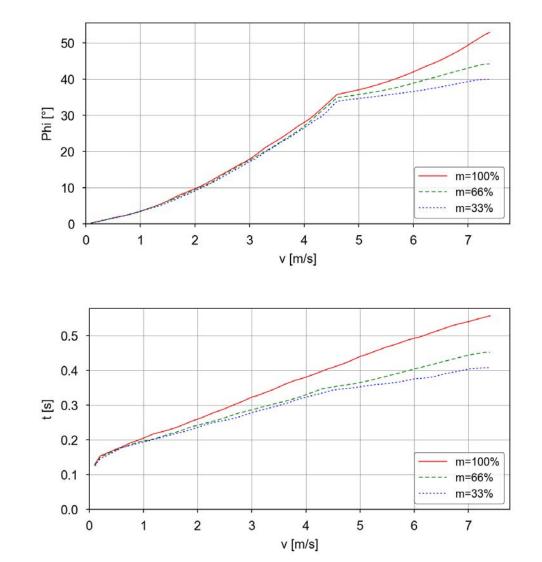


11.3 IRB 4600 2.50 m 20 kg Continued

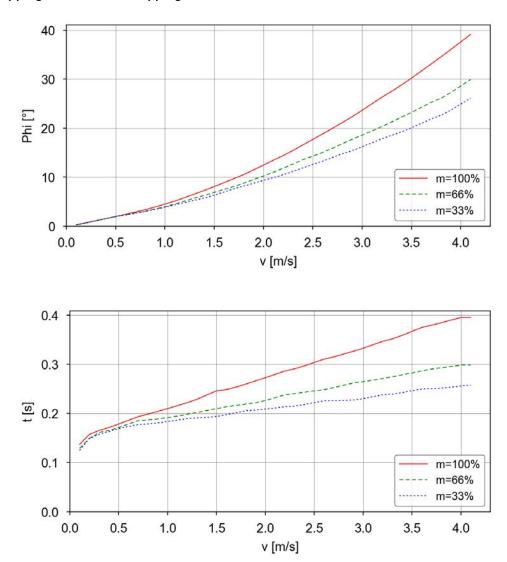
Category 1, Axis 2



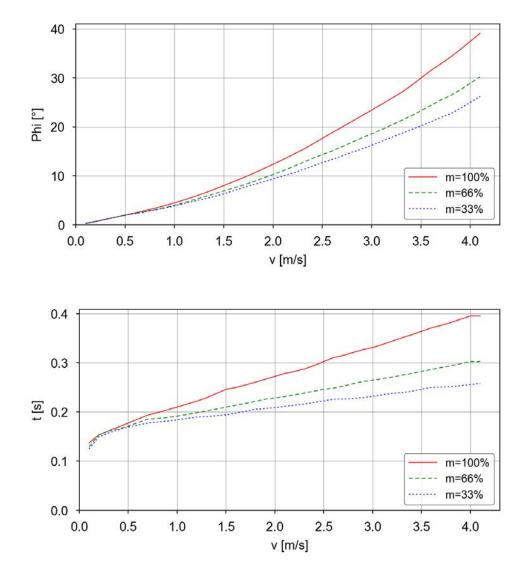


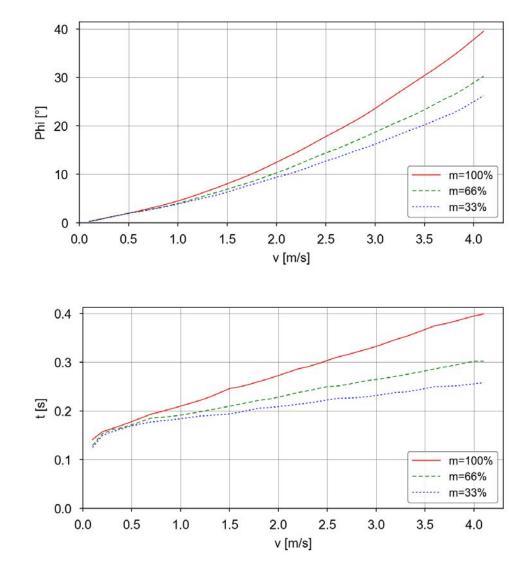


Category 1, Axis 3



11.3 IRB 4600 2.50 m 20 kg Continued





Extension zone 2, stopping distance and stopping time

11.4 IRB 4600 2.55 m 40 kg

11.4 IRB 4600 2.55 m 40 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

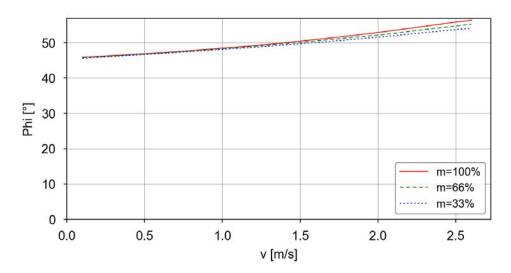
Axis	Distance (degrees)	Stop time (s)
1	61.7	0.71
2	41.9	0.37
3	30.2	0.25

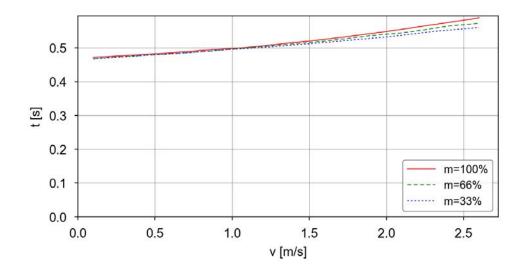
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

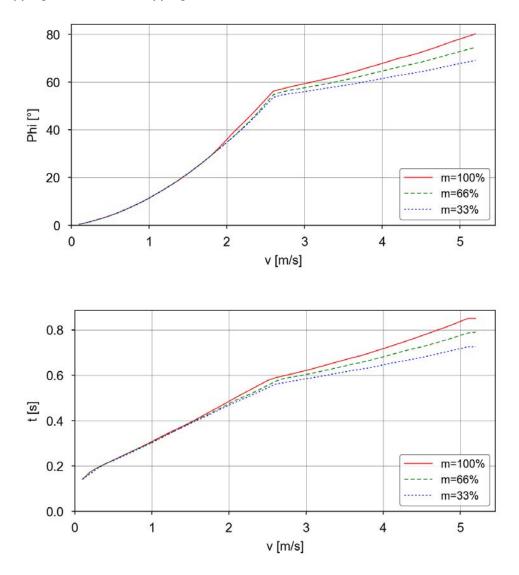
Zone	wcp min (m)	wcp max (m)
0	0	0.851
1	0.851	1.701
2	1.701	max reach

Category 1, Axis 1





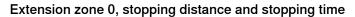
Extension zone 1, stopping distance and stopping time

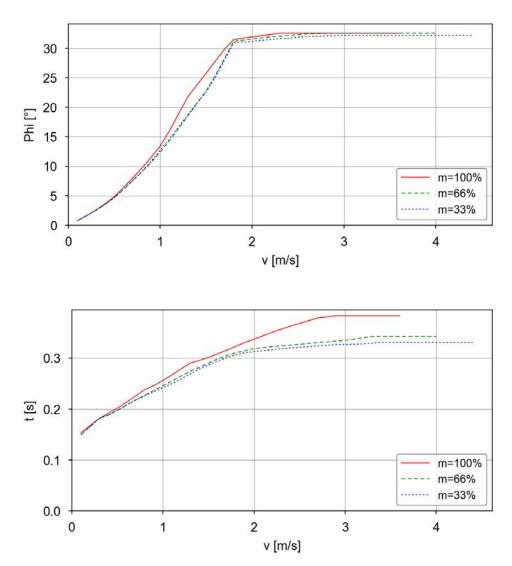


Continues on next page

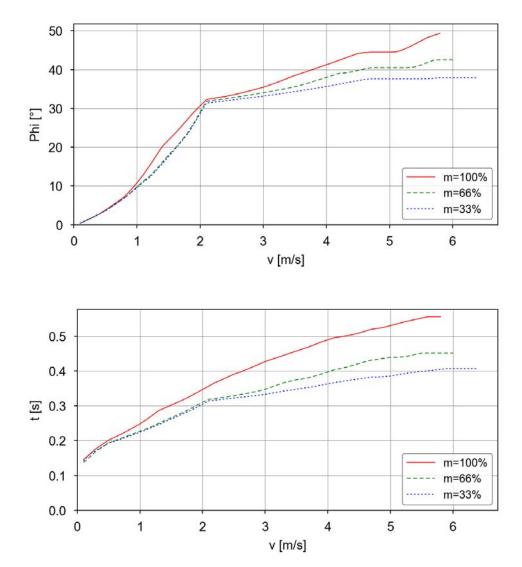
> 80 60 Phi [°] 40 m=100% 20 m=66% m=33% 0 2 3 5 6 7 8 0 4 1 v [m/s] 1.2 1.0 0.8 t [s] 0.6 0.4 anan an m=100% 0.2 m=66% m=33% 0.0 2 3 5 4 6 7 8 0 1 v [m/s]

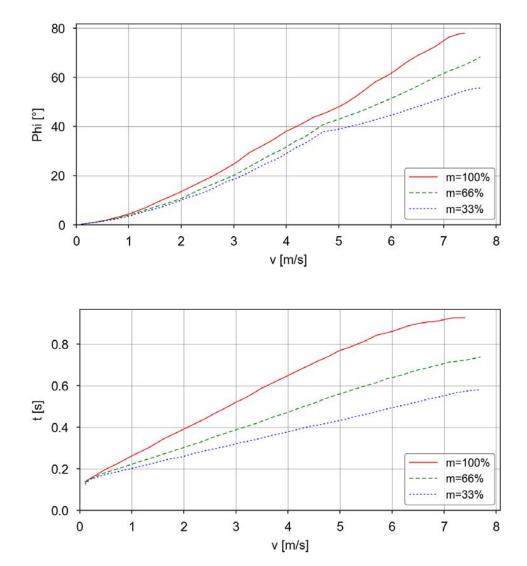
Category 1, Axis 2





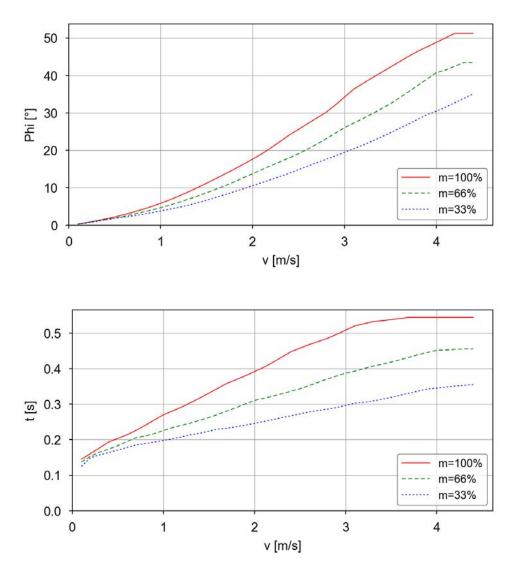
11.4 IRB 4600 2.55 m 40 kg Continued

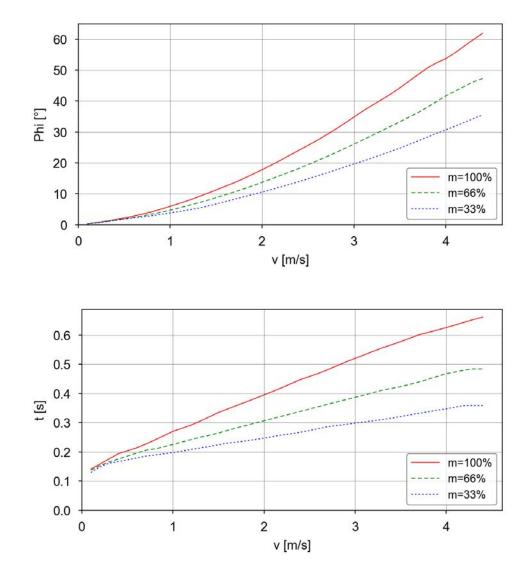




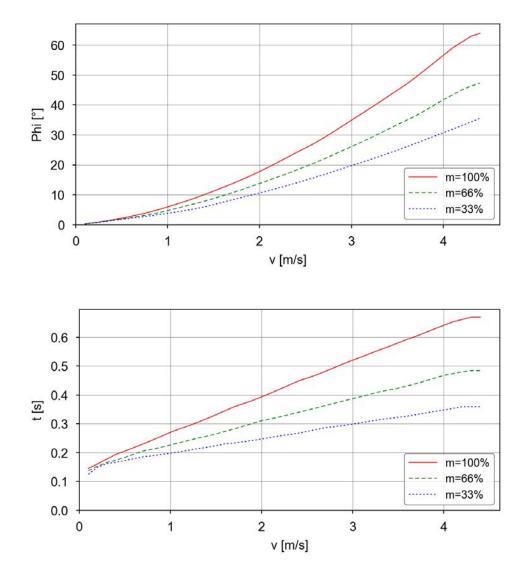
11.4 IRB 4600 2.55 m 40 kg Continued

Category 1, Axis 3





11.4 IRB 4600 2.55 m 40 kg Continued



12.1 IRB 6620 2.20 m 150 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

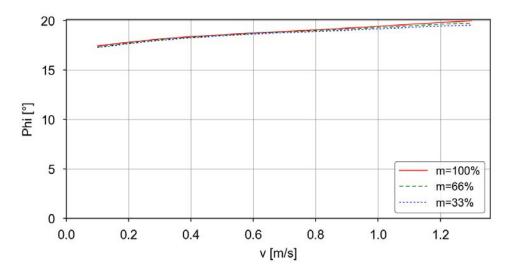
Axis	Distance (degrees)	Stop time (s)
1	29.1	0.49
2	25.2	0.44
3	19.0	0.29

Category 1, extension zones

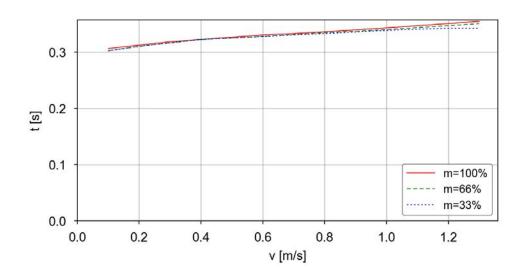
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.735
1	0.735	1.47
2	1.47	max reach

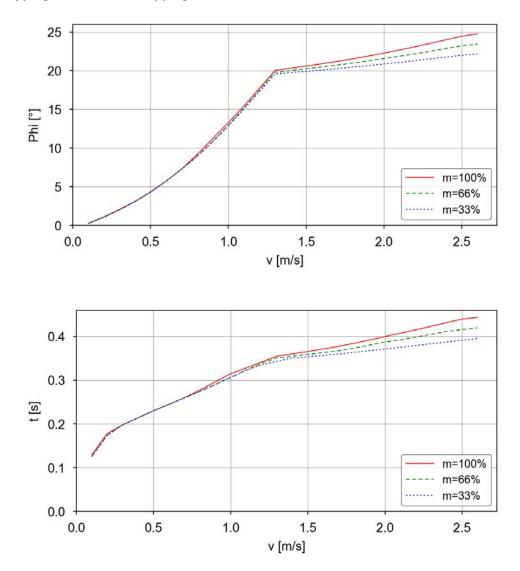
Category 1, Axis 1



12.1 IRB 6620 2.20 m 150 kg Continued



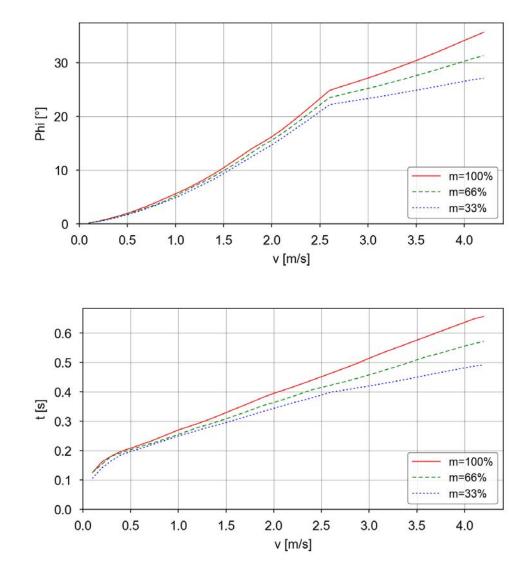
Extension zone 1, stopping distance and stopping time



Continues on next page 268

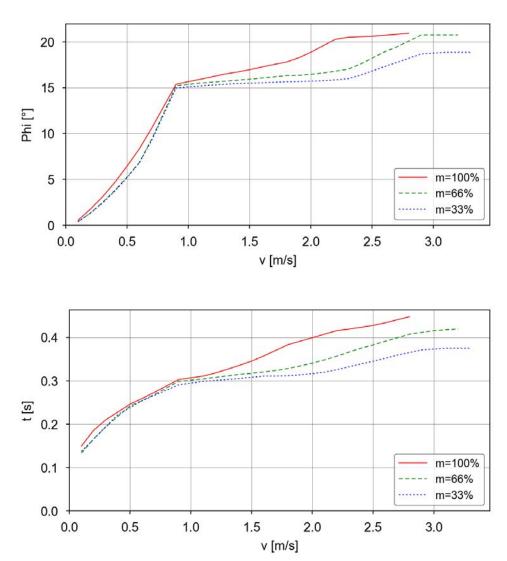
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

12.1 IRB 6620 2.20 m 150 kg Continued

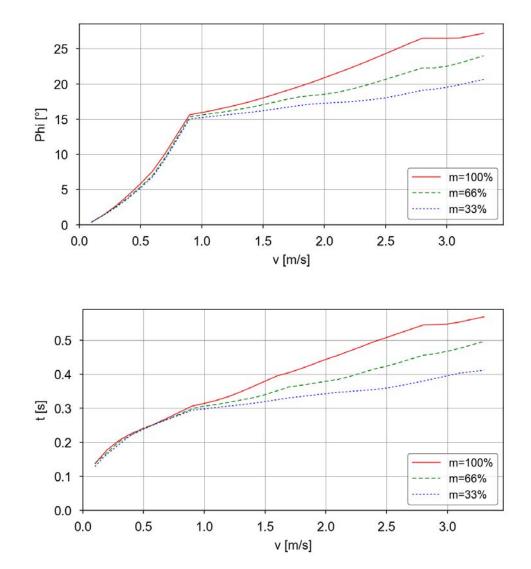


12.1 IRB 6620 2.20 m 150 kg Continued

Category 1, Axis 2



12.1 IRB 6620 2.20 m 150 kg Continued

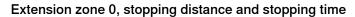


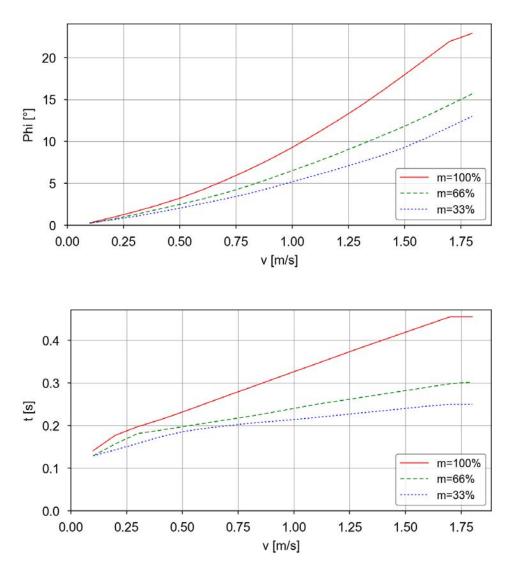
12.1 IRB 6620 2.20 m 150 kg Continued

> 30 Phi [°] 20 10 m=100% _ _ m=66% m=33% 0 1.5 0.5 1.0 2.0 2.5 3.0 0.0 v [m/s] 0.8 0.6 t 4.0 ک 0.2 m=100% -- m=66% m=33% 0.0 0.5 1.0 1.5 2.0 2.5 0.0 3.0 v [m/s]

12.1 IRB 6620 2.20 m 150 kg Continued

Category 1, Axis 3

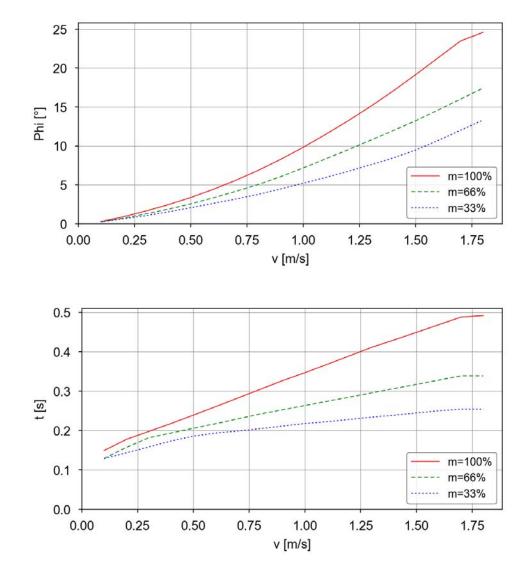




12.1 IRB 6620 2.20 m 150 kg Continued

> 20 15 Phi [°] 10 m=100% 5 m=66% m=33% 10000000 0 0.00 0.50 0.75 1.00 0.25 1.25 1.50 1.75 v [m/s] 0.4 0.3 t [s] 0.2 and the m=100% 0.1 m=66% m=33% 0.0 1.25 0.00 0.25 0.50 0.75 1.00 1.50 1.75 v [m/s]

12.1 IRB 6620 2.20 m 150 kg Continued



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13.1 IRB 6650S 3.00 m 200 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

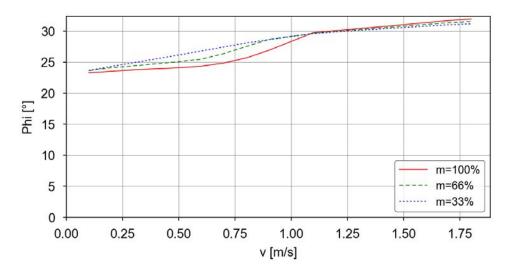
Axis	Distance (degrees)	Stop time (s)
1	51.5	0.95
2	34.5	0.63
3	20.0	0.32

Category 1, extension zones

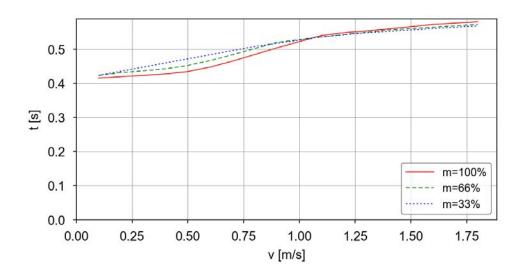
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.013
1	1.013	2.026
2	2.026	max reach

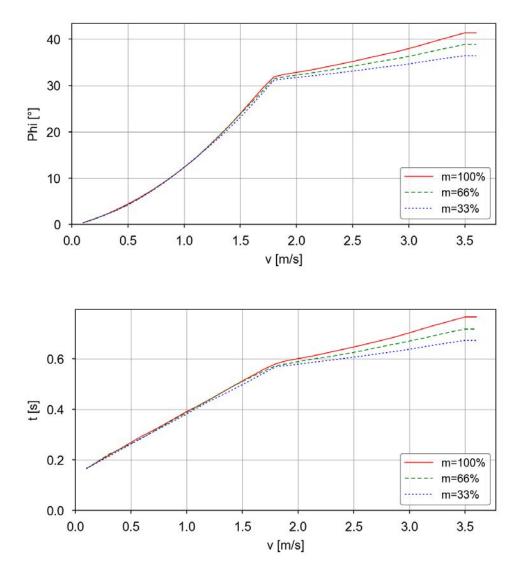
Category 1, Axis 1



13.1 IRB 6650S 3.00 m 200 kg Continued



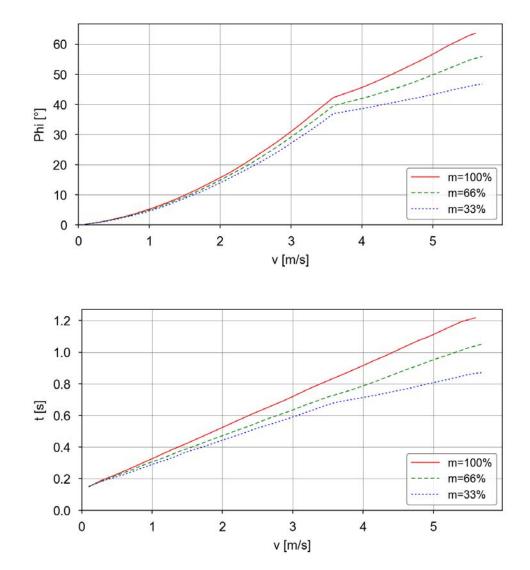
Extension zone 1, stopping distance and stopping time



Continues on next page

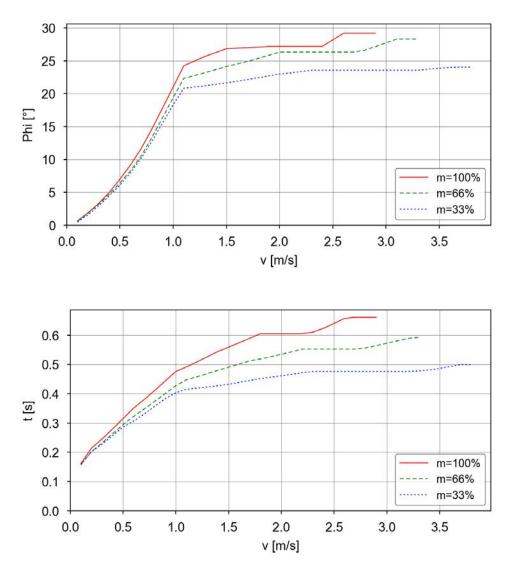
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

13.1 IRB 6650S 3.00 m 200 kg Continued

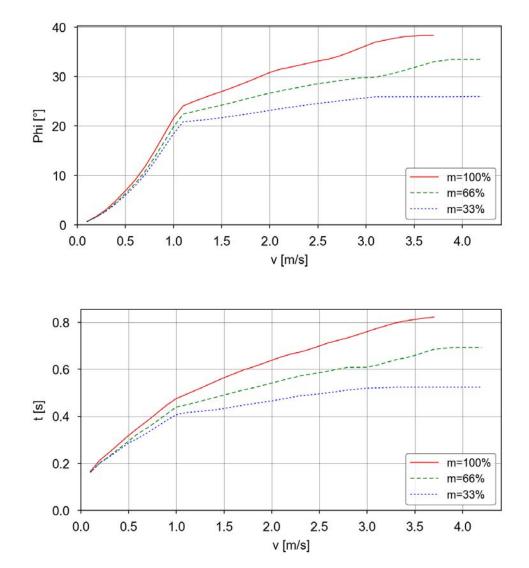


13.1 IRB 6650S 3.00 m 200 kg Continued

Category 1, Axis 2



13.1 IRB 6650S 3.00 m 200 kg Continued

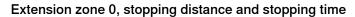


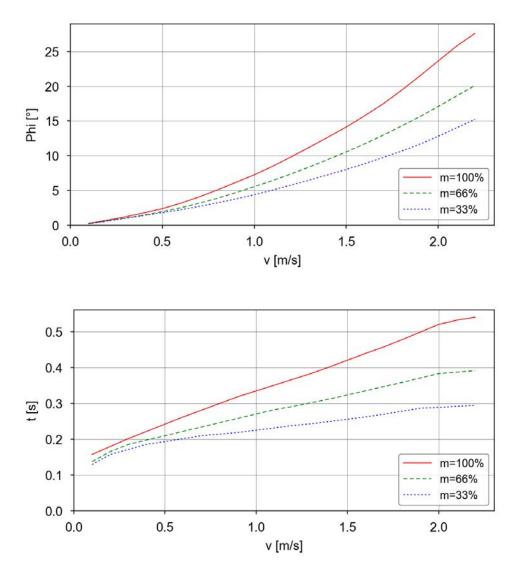
13.1 IRB 6650S 3.00 m 200 kg Continued

> 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 1.0 2.5 0.5 1.5 2.0 0.0 3.0 3.5 4.0 v [m/s] 1.2 1.0 0.8 t [s] 0.6 0.4 m=100% ---0.2 m=66% m=33% 0.0 1.5 0.5 1.0 2.0 2.5 3.0 0.0 3.5 4.0 v [m/s]

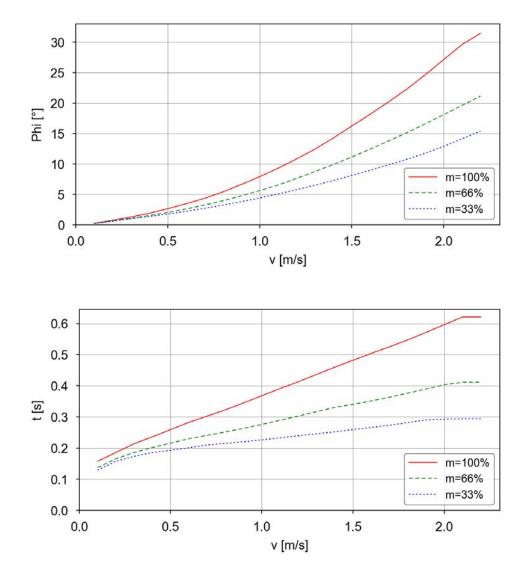
13.1 IRB 6650S 3.00 m 200 kg Continued

Category 1, Axis 3

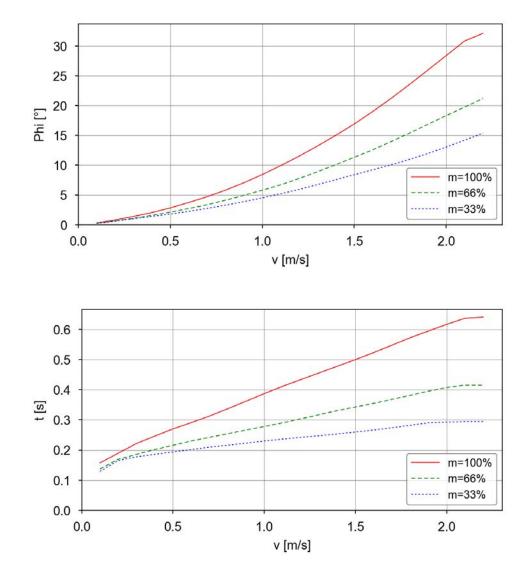




13.1 IRB 6650S 3.00 m 200 kg Continued



13.1 IRB 6650S 3.00 m 200 kg Continued



Extension zone 2, stopping distance and stopping time

13.2 IRB 6650S 3.45 m 125 kg

13.2 IRB 6650S 3.45 m 125 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

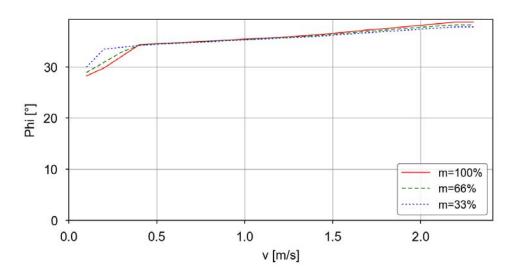
Axis	Distance (degrees)	Stop time (s)
1	52.8	0.95
2	33.4	0.61
3	20.3	0.32

Category 1, extension zones

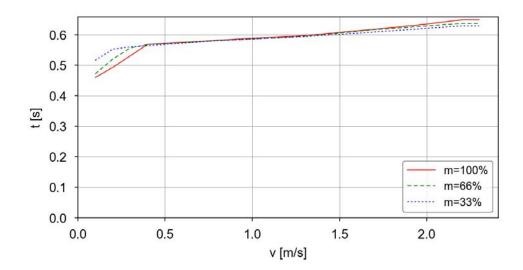
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.161
1	1.161	2.323
2	2.323	max reach

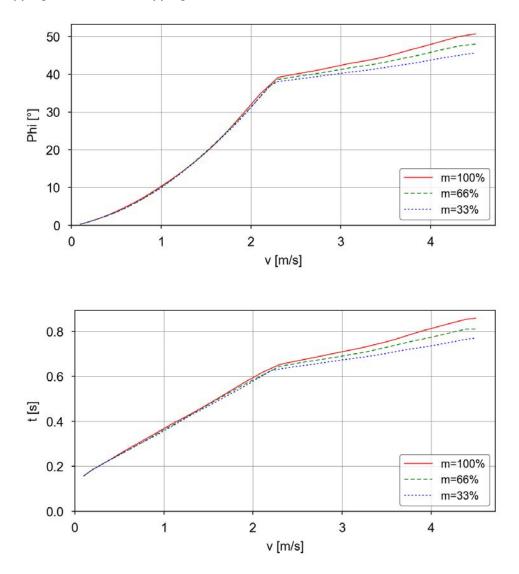
Category 1, Axis 1



13.2 IRB 6650S 3.45 m 125 kg Continued

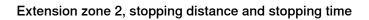


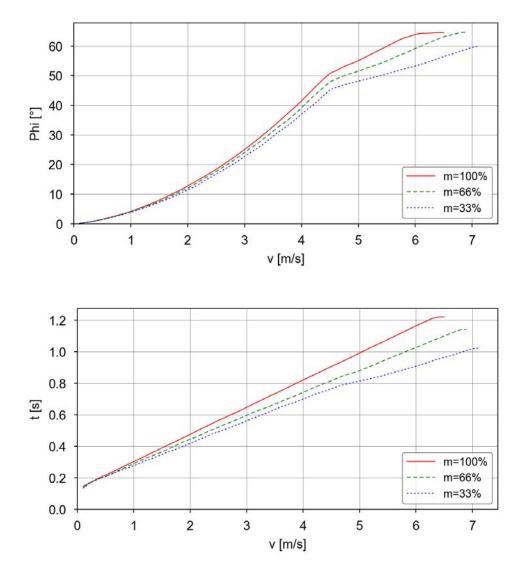
Extension zone 1, stopping distance and stopping time



Continues on next page

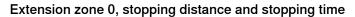
13.2 IRB 6650S 3.45 m 125 kg Continued

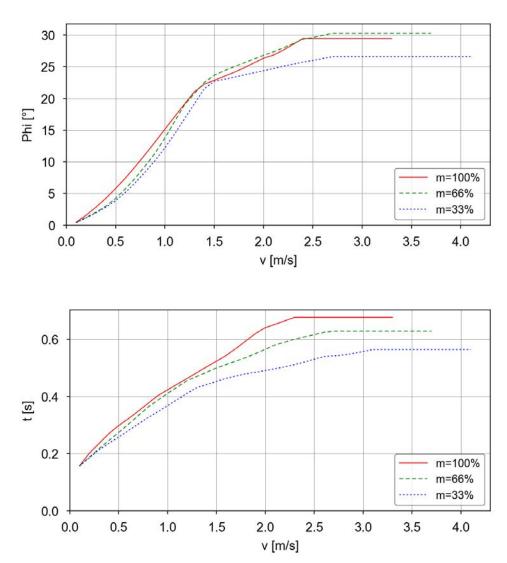




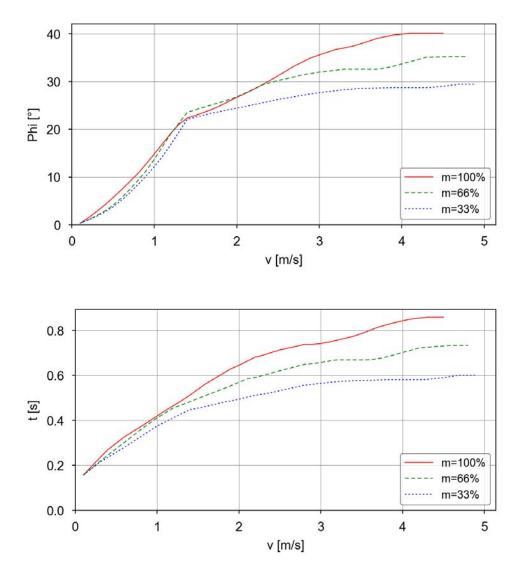
13.2 IRB 6650S 3.45 m 125 kg Continued

Category 1, Axis 2

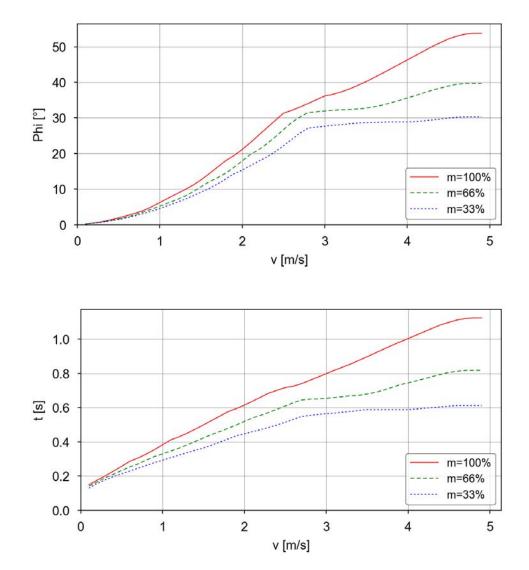




13.2 IRB 6650S 3.45 m 125 kg Continued

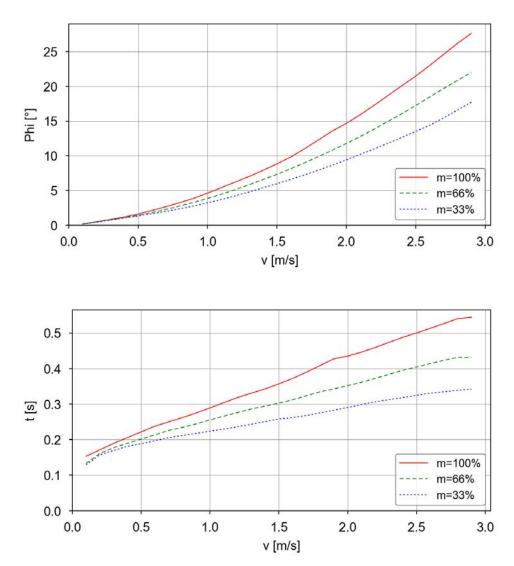


13.2 IRB 6650S 3.45 m 125 kg Continued

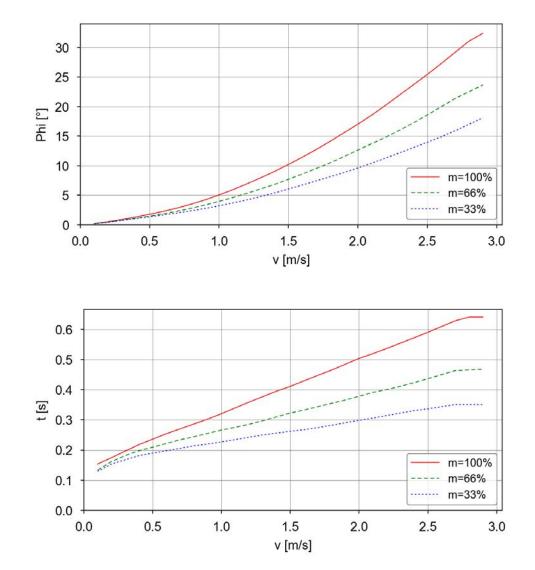


13.2 IRB 6650S 3.45 m 125 kg Continued

Category 1, Axis 3



13.2 IRB 6650S 3.45 m 125 kg Continued



13.2 IRB 6650S 3.45 m 125 kg Continued

> 30 25 [] ²⁰ iud 15 20 10 m=100% 5 m=66% m=33% 0 1.0 1.5 2.0 0.0 0.5 3.0 2.5 v [m/s] 0.6 0.5 0.4 t [s] 0.3 0.2 T.T.T.T.T.T. m=100% m=66% 0.1 m=33% 0.0 0.5 1.5 0.0 1.0 2.0 3.0 2.5 v [m/s]

13.3 IRB 6650S 3.90 m 90 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

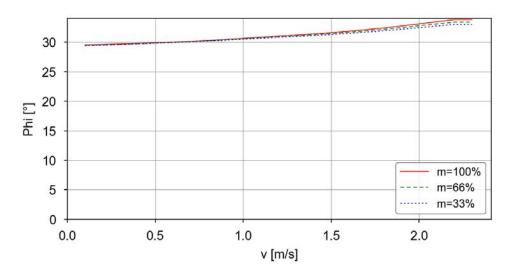
Axis	Distance (degrees)	Stop time (s)
1	51.2	0.97
2	37.0	0.68
3	23.9	0.39

Category 1, extension zones

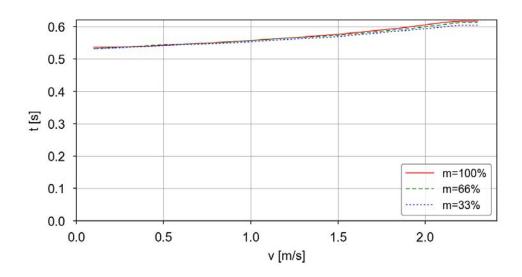
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.311
1	1.311	2.621
2	2.621	max reach

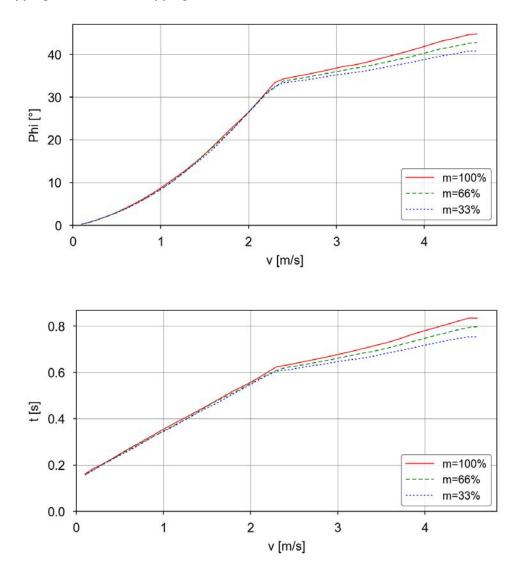
Category 1, Axis 1



13.3 IRB 6650S 3.90 m 90 kg Continued



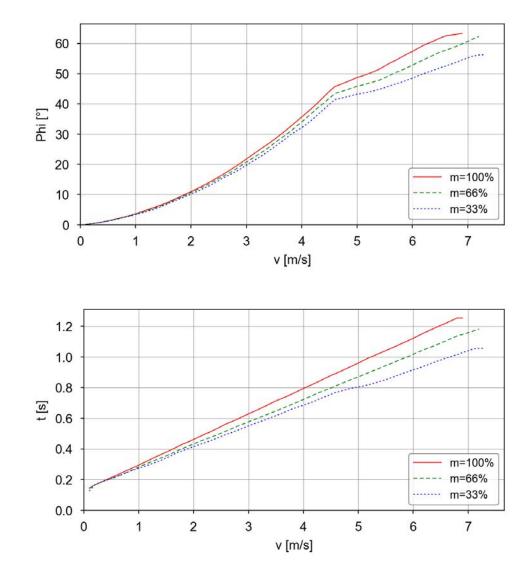
Extension zone 1, stopping distance and stopping time



Continues on next page 296

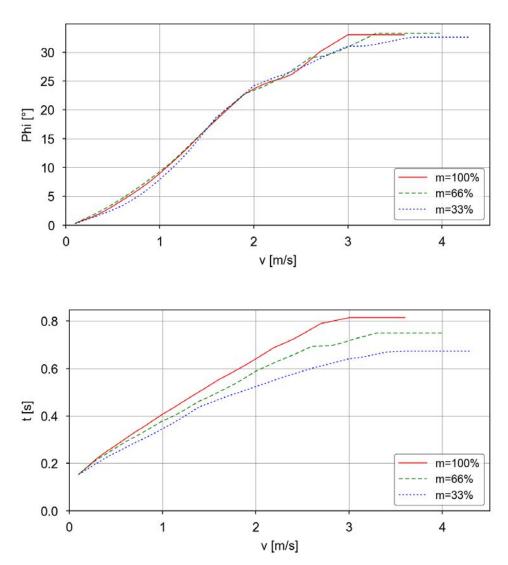
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

13.3 IRB 6650S 3.90 m 90 kg Continued

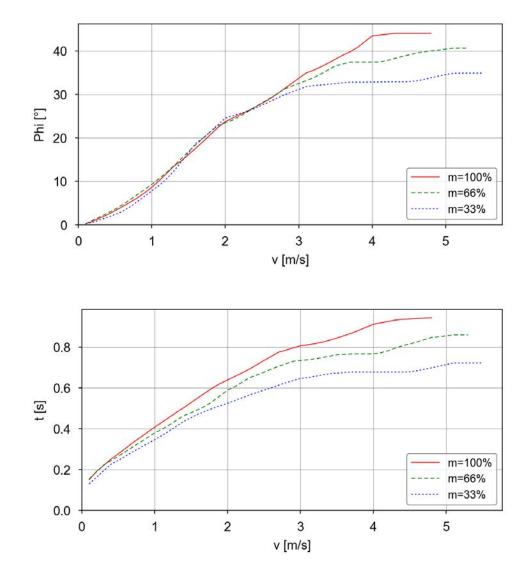


13.3 IRB 6650S 3.90 m 90 kg Continued

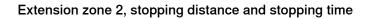
Category 1, Axis 2

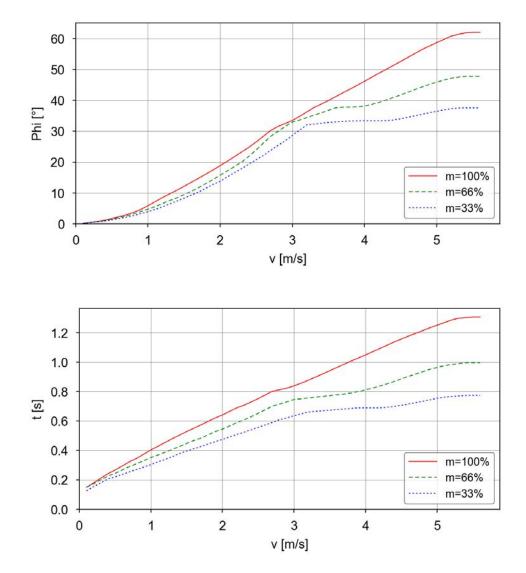


13.3 IRB 6650S 3.90 m 90 kg Continued



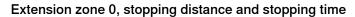
13.3 IRB 6650S 3.90 m 90 kg Continued

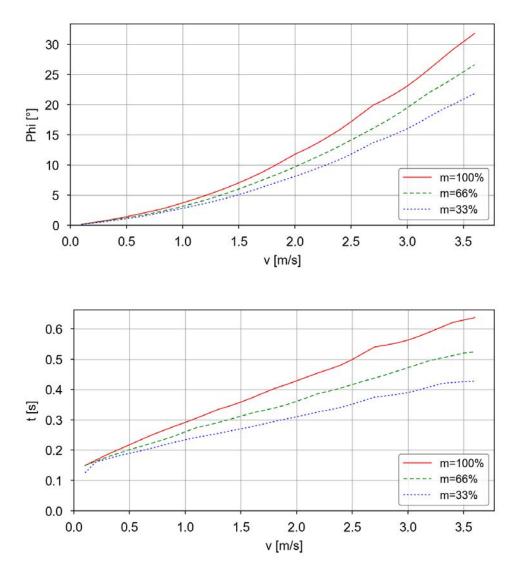




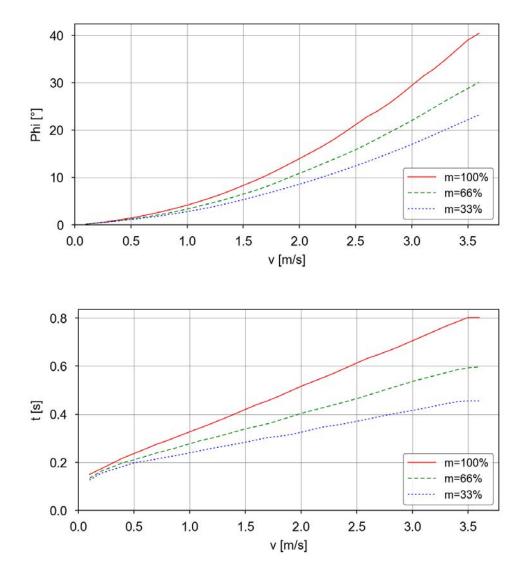
13.3 IRB 6650S 3.90 m 90 kg Continued

Category 1, Axis 3

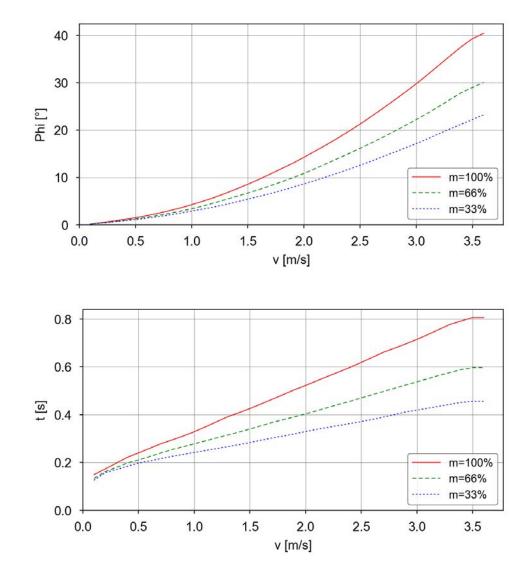




13.3 IRB 6650S 3.90 m 90 kg Continued



13.3 IRB 6650S 3.90 m 90 kg Continued



13.4 IRB 6650SLeanID 3.0 m 190 kg

13.4 IRB 6650SLeanID 3.0 m 190 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

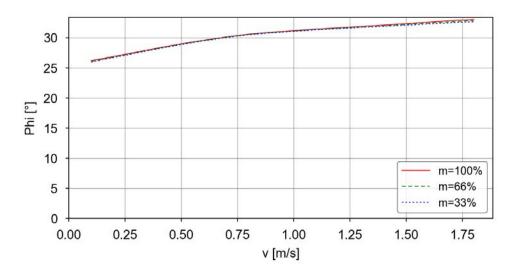
Axis	Distance (degrees)	Stop time (s)
1	45.7	0.83
2	26.2	0.46
3	13.8	0.22

Category 1, extension zones

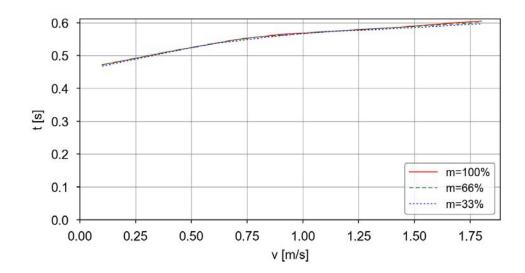
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.013
1	1.013	2.027
2	2.027	max reach

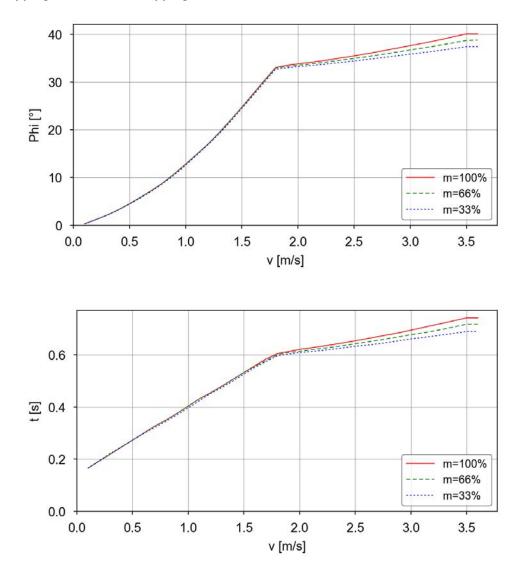
Category 1, Axis 1



13.4 IRB 6650SLeanID 3.0 m 190 kg Continued

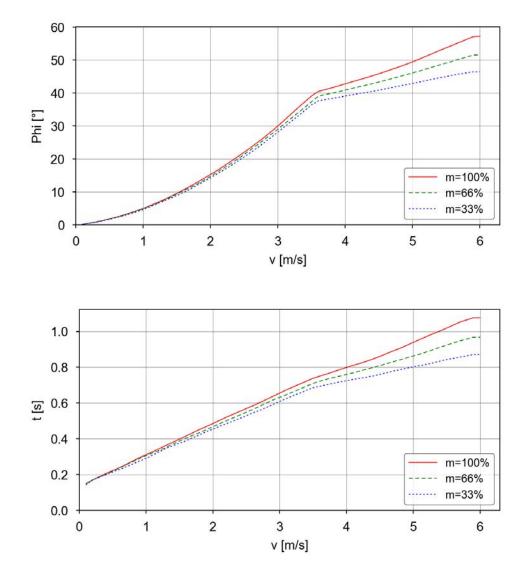


Extension zone 1, stopping distance and stopping time



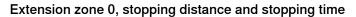
Continues on next page

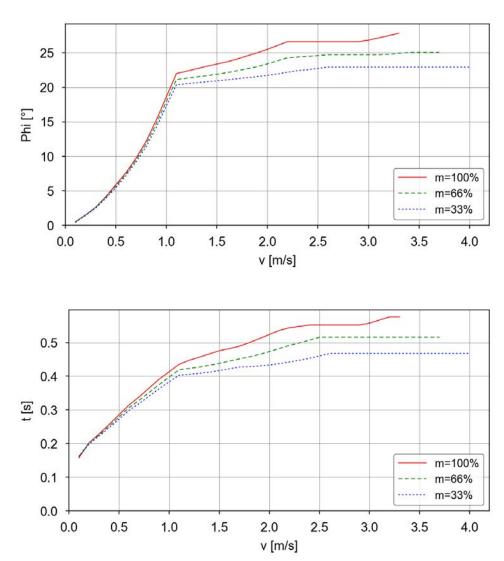
13.4 IRB 6650SLeanID 3.0 m 190 kg Continued



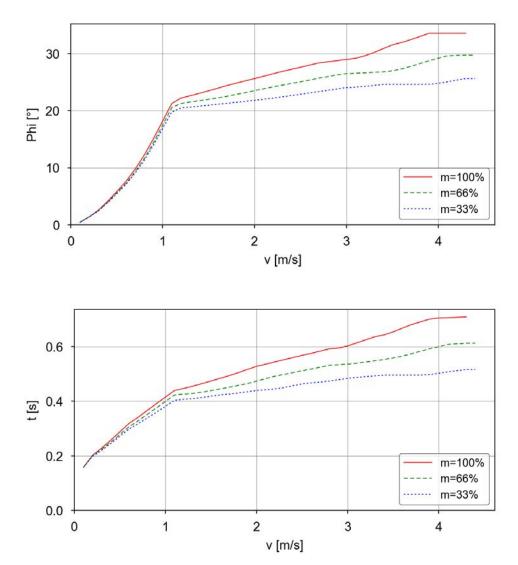
13.4 IRB 6650SLeanID 3.0 m 190 kg Continued

Category 1, Axis 2

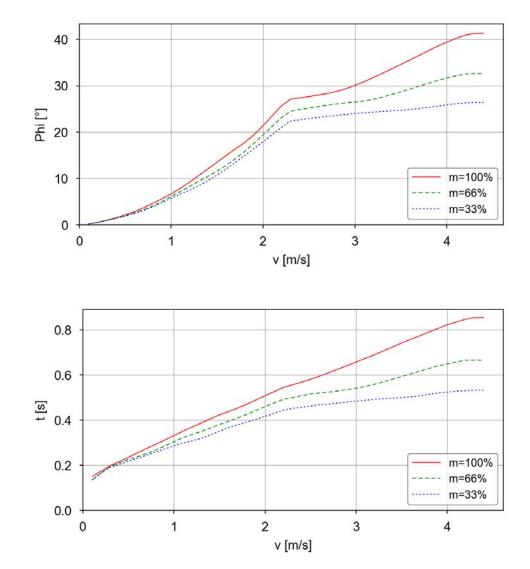




13.4 IRB 6650SLeanID 3.0 m 190 kg Continued

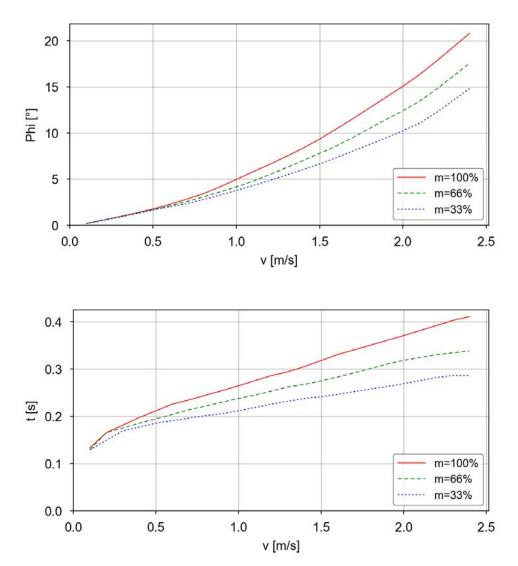


13.4 IRB 6650SLeanID 3.0 m 190 kg Continued

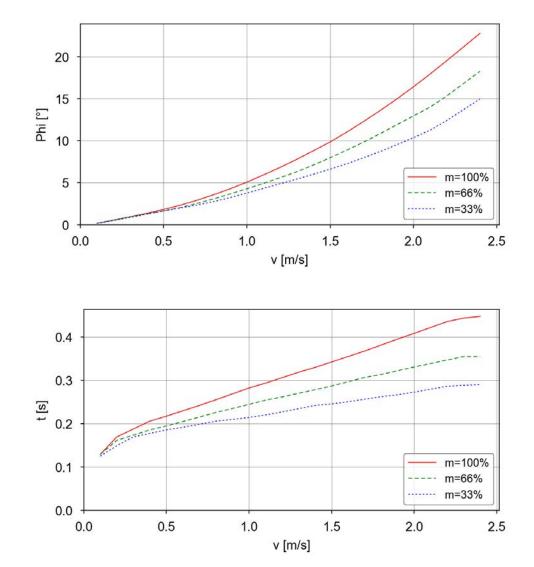


13.4 IRB 6650SLeanID 3.0 m 190 kg Continued

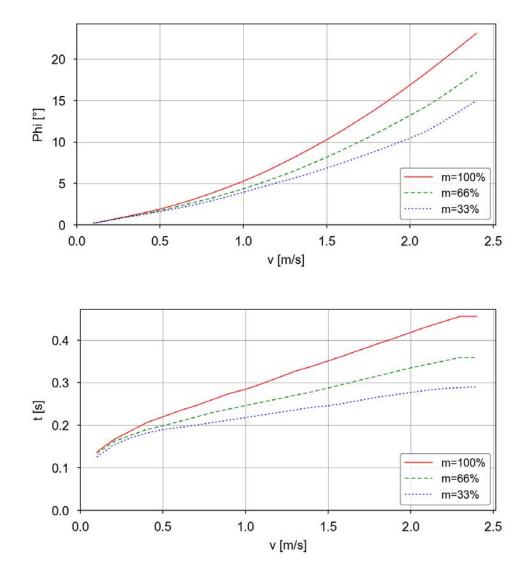
Category 1, Axis 3



13.4 IRB 6650SLeanID 3.0 m 190 kg Continued



13.4 IRB 6650SLeanID 3.0 m 190 kg Continued



13.5 IRB 6650SLeanID 3.5 m 100 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

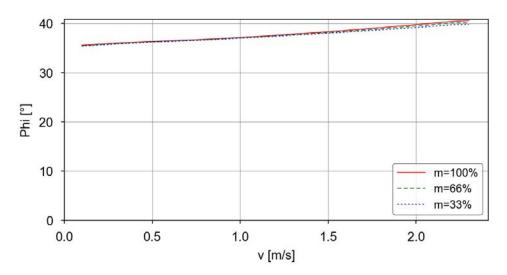
Axis	Distance (degrees)	Stop time (s)
1	50.6	0.9
2	34.9	0.66
3	20.5	0.34

Category 1, extension zones

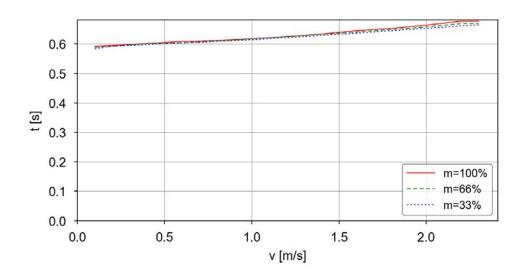
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.162
1	1.162	2.323
2	2.323	max reach

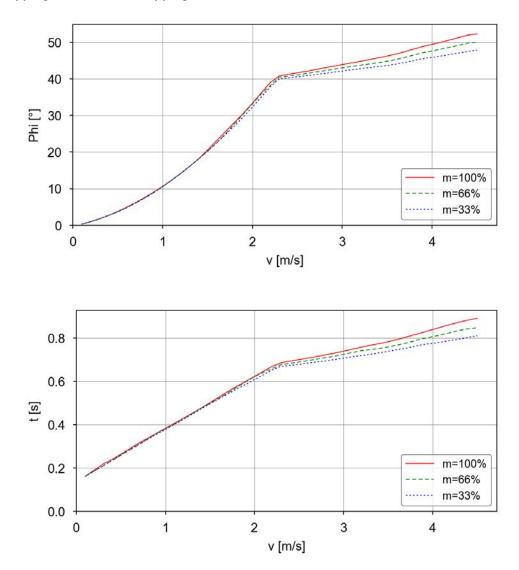
Category 1, Axis 1



13.5 IRB 6650SLeanID 3.5 m 100 kg Continued



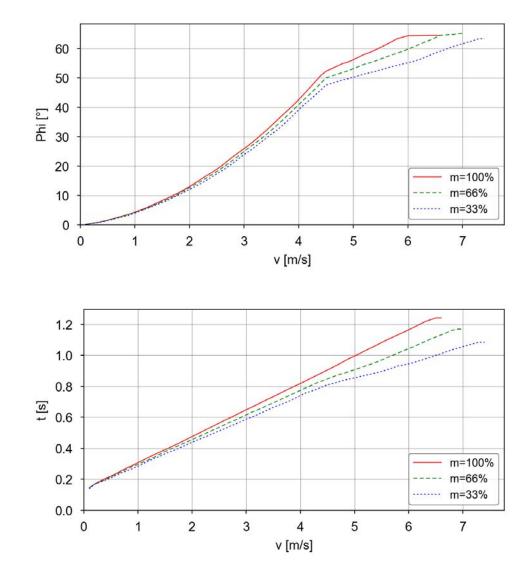
Extension zone 1, stopping distance and stopping time



Continues on next page

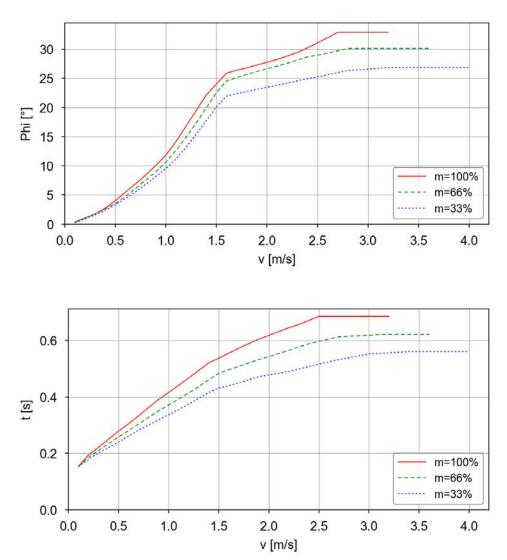
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

13.5 IRB 6650SLeanID 3.5 m 100 kg Continued

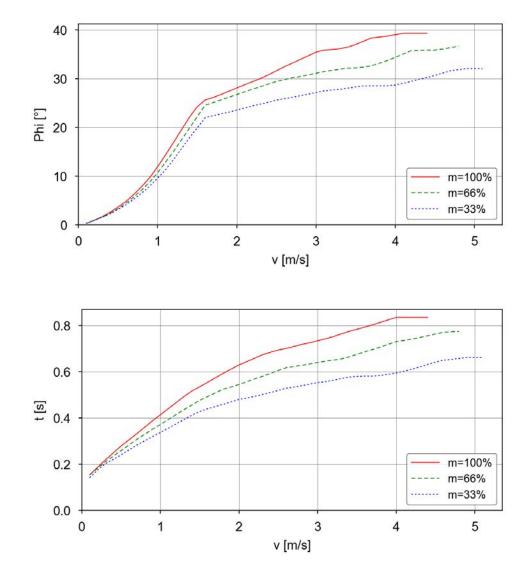


13.5 IRB 6650SLeanID 3.5 m 100 kg Continued

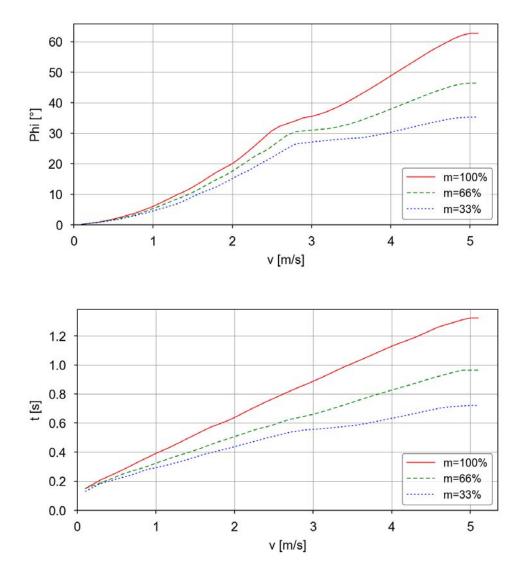
Category 1, Axis 2



13.5 IRB 6650SLeanID 3.5 m 100 kg Continued

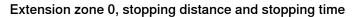


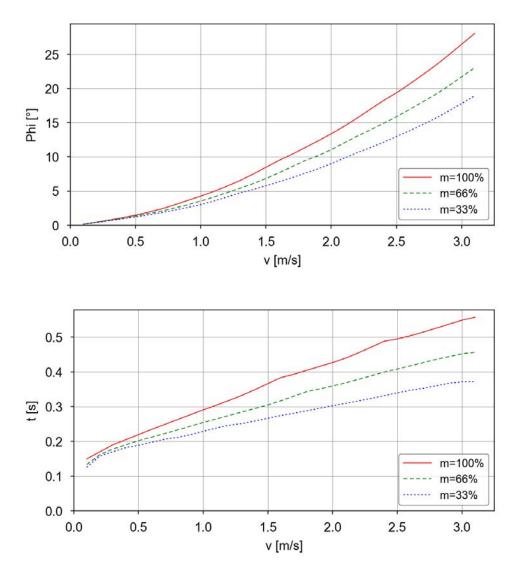
13.5 IRB 6650SLeanID 3.5 m 100 kg Continued



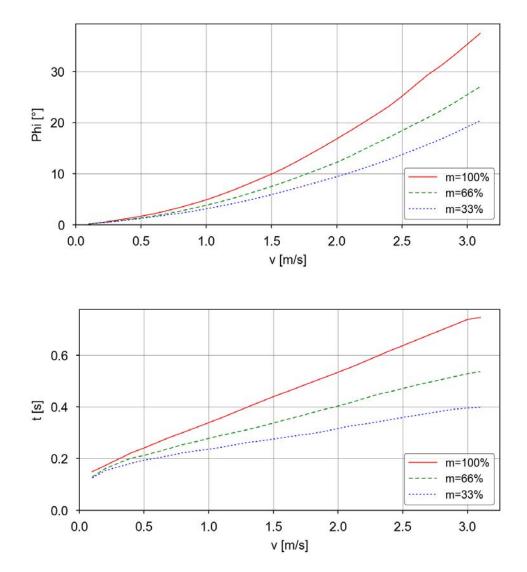
13.5 IRB 6650SLeanID 3.5 m 100 kg Continued

Category 1, Axis 3

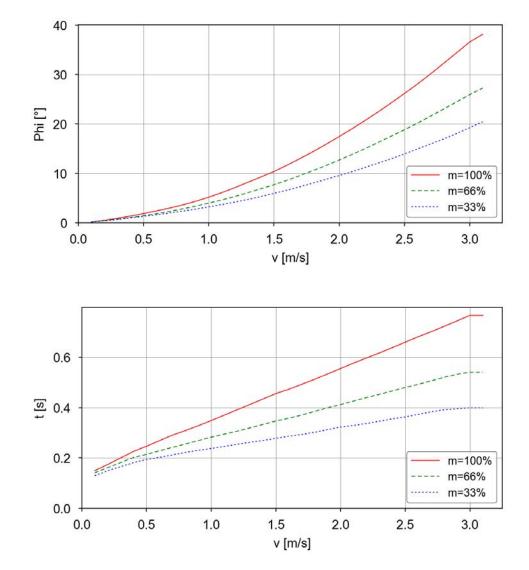




13.5 IRB 6650SLeanID 3.5 m 100 kg Continued



13.5 IRB 6650SLeanID 3.5 m 100 kg Continued



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14.1 IRB 6660 1.90 m 205 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

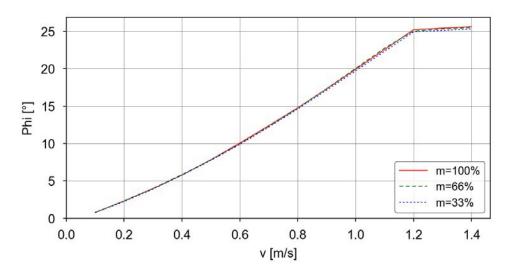
Axis	Distance (degrees)	Stop time (s)
1	21.1	0.32
2	15.1	0.15
3	19.6	0.27

Category 1, extension zones

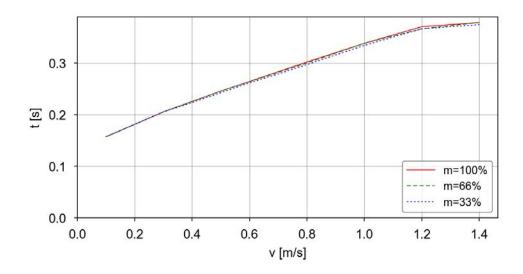
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.644
1	0.644	1.289
2	1.289	max reach

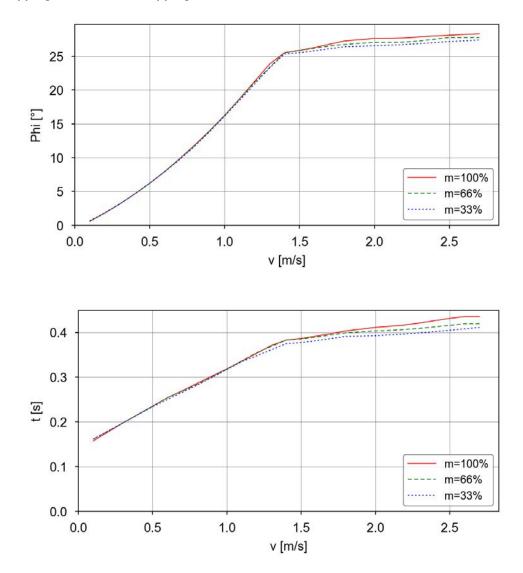
Category 1, Axis 1



14.1 IRB 6660 1.90 m 205 kg Continued



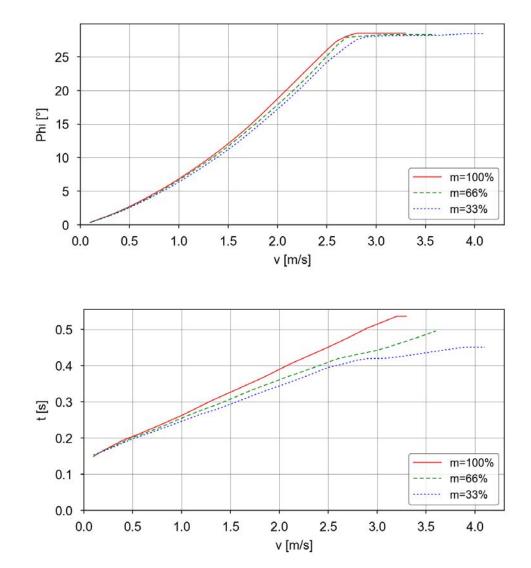
Extension zone 1, stopping distance and stopping time



Continues on next page 324

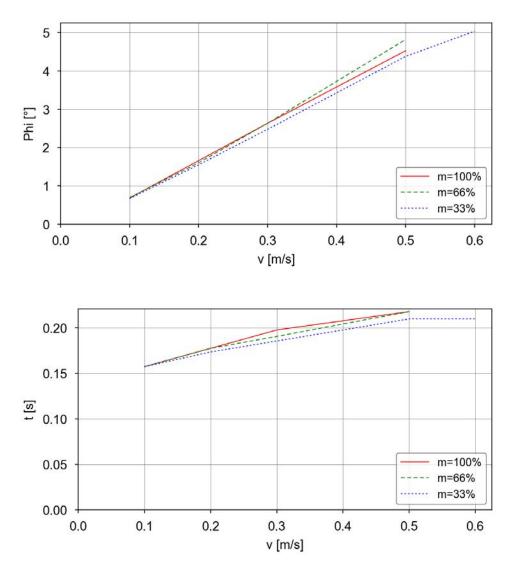
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

14.1 IRB 6660 1.90 m 205 kg Continued

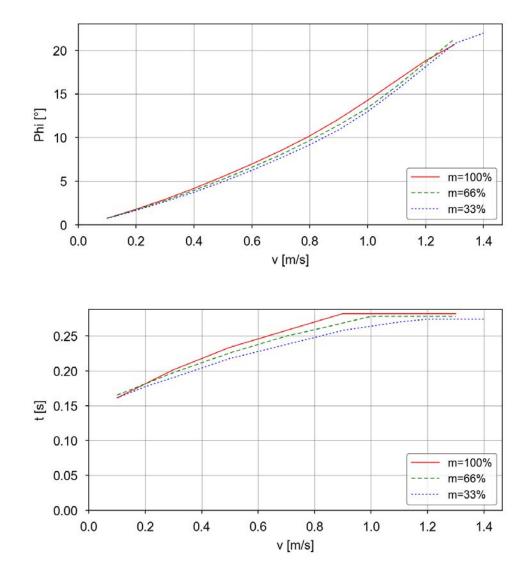


14.1 IRB 6660 1.90 m 205 kg Continued

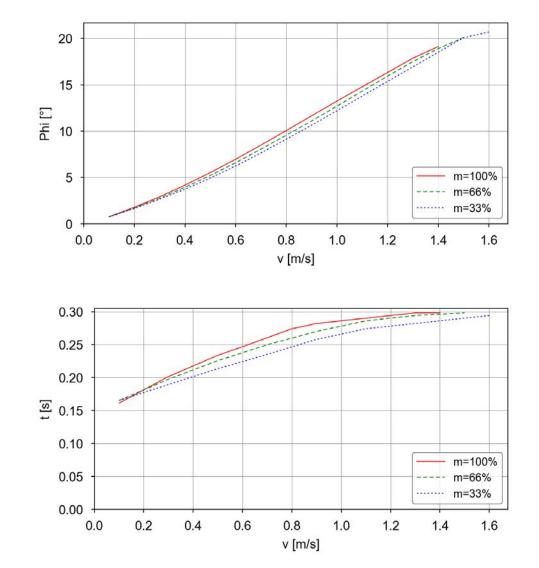
Category 1, Axis 2



14.1 IRB 6660 1.90 m 205 kg Continued

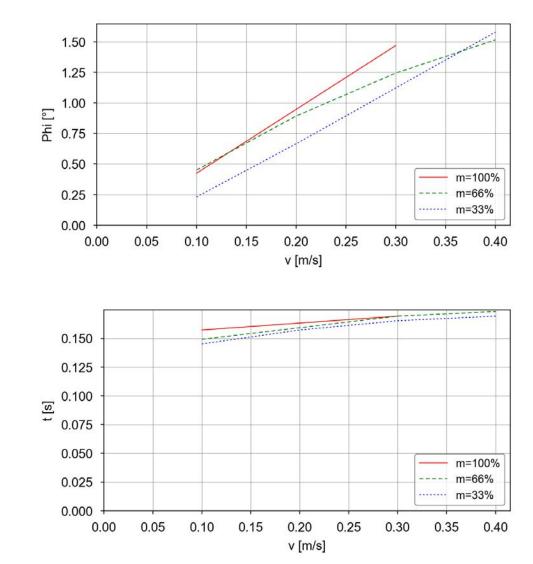


14.1 IRB 6660 1.90 m 205 kg Continued



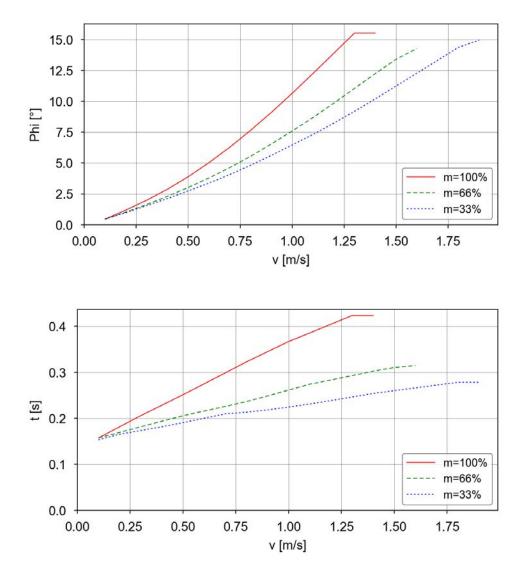
14.1 IRB 6660 1.90 m 205 kg Continued

Category 1, Axis 3

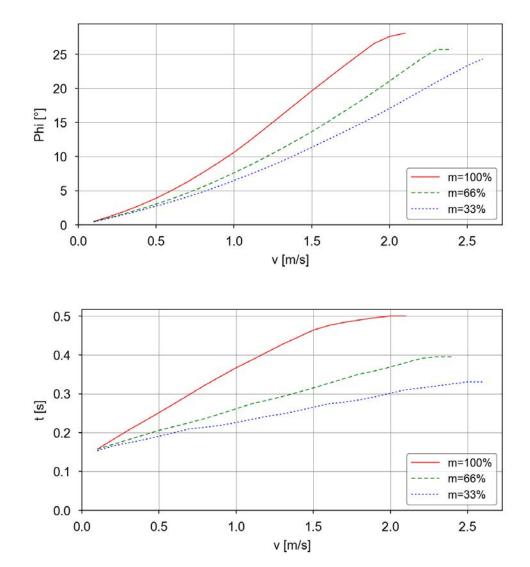


Extension zone 0, stopping distance and stopping time

14.1 IRB 6660 1.90 m 205 kg Continued



14.1 IRB 6660 1.90 m 205 kg Continued



14.2 IRB 6660 3.10 m 130 kg

14.2 IRB 6660 3.10 m 130 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

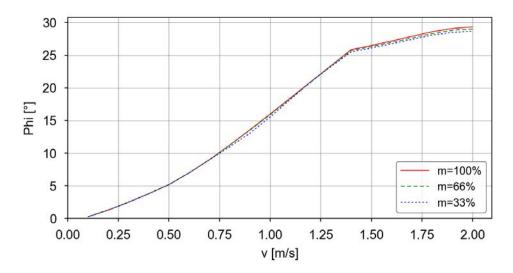
Axis	Distance (degrees)	Stop time (s)
1	39.8	0.61
2	34.0	0.42
3	36.6	0.44

Category 1, extension zones

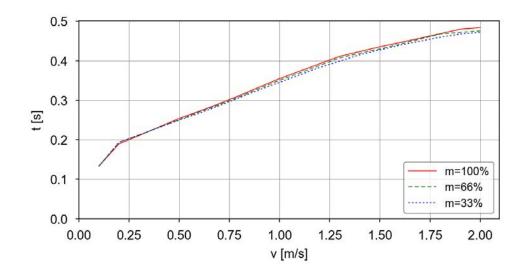
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.035
1	1.035	2.071
2	2.071	max reach

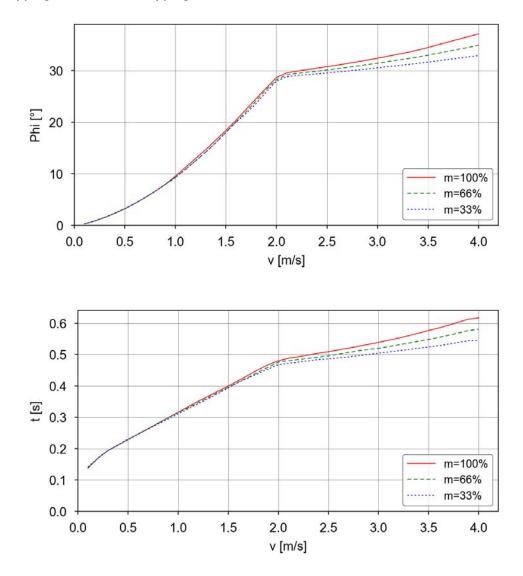
Category 1, Axis 1



14.2 IRB 6660 3.10 m 130 kg Continued



Extension zone 1, stopping distance and stopping time

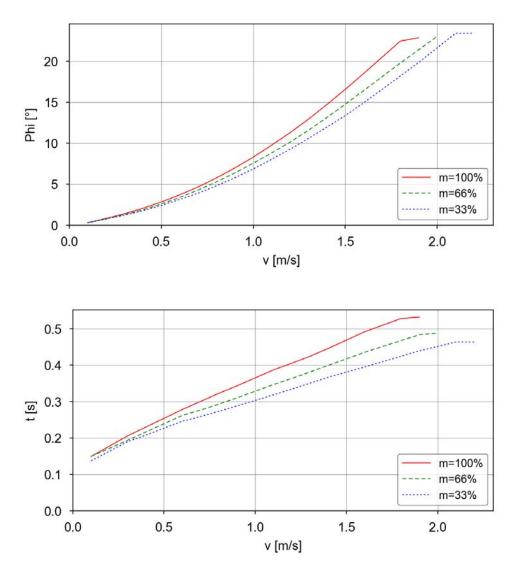


14.2 IRB 6660 3.10 m 130 kg Continued

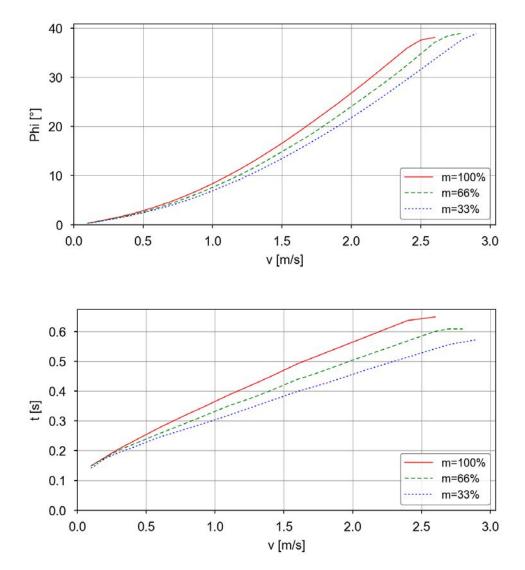
> 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 2 3 0 4 5 6 1 v [m/s] 0.8 0.6 t [s] 0.4 MARTINE. m=100% 0.2 m=66% m=33% 0.0 2 1 3 4 5 0 6 v [m/s]

14.2 IRB 6660 3.10 m 130 kg Continued

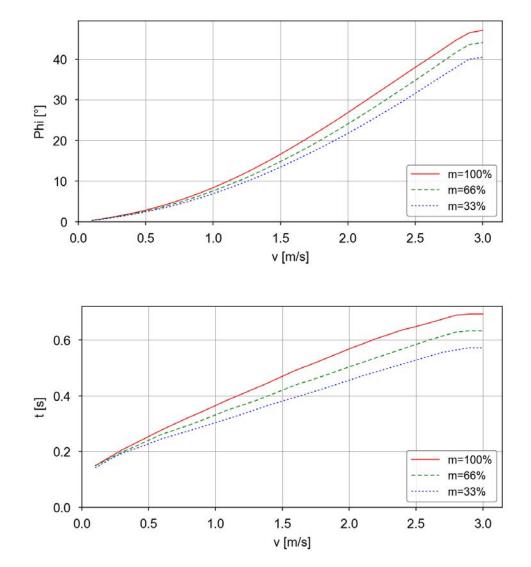
Category 1, Axis 2



14.2 IRB 6660 3.10 m 130 kg Continued

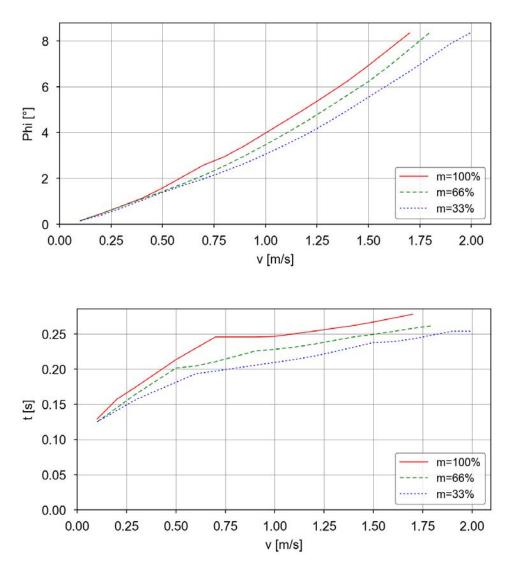


14.2 IRB 6660 3.10 m 130 kg Continued

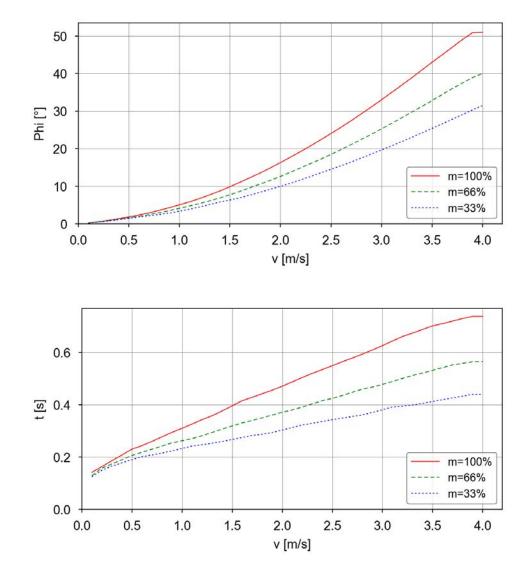


14.2 IRB 6660 3.10 m 130 kg Continued

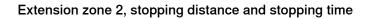
Category 1, Axis 3

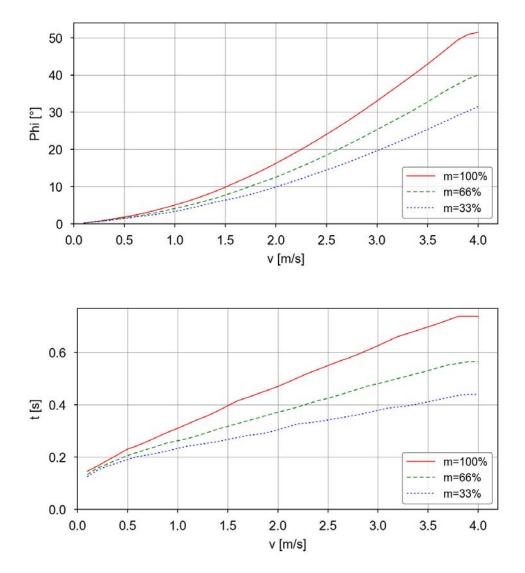


14.2 IRB 6660 3.10 m 130 kg Continued



14.2 IRB 6660 3.10 m 130 kg Continued





14.3 IRB 6660 3.35 m 100 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

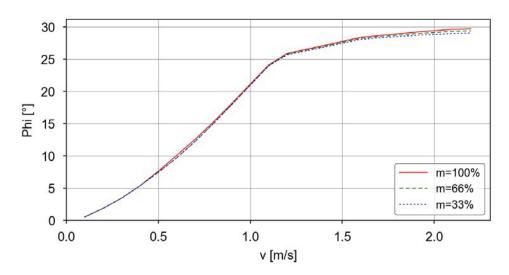
Axis	Distance (degrees)	Stop time (s)
1	40.1	0.63
2	33.9	0.42
3	36.5	0.46

Category 1, extension zones

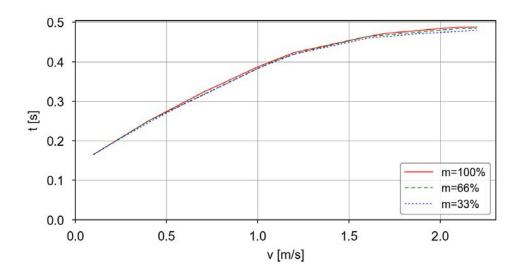
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.118
1	1.118	2.235
2	2.235	max reach

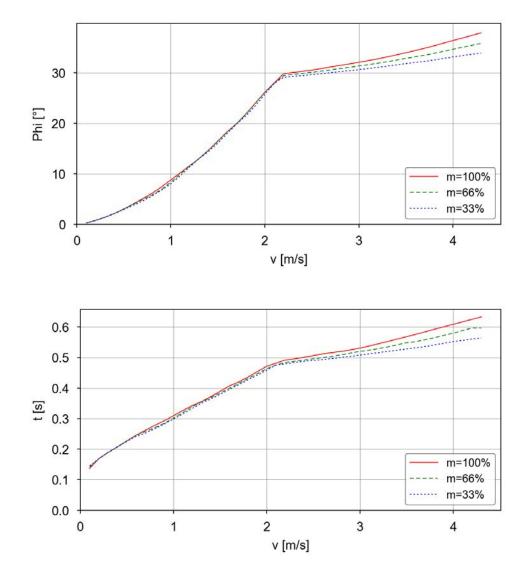
Category 1, Axis 1



14.3 IRB 6660 3.35 m 100 kg Continued

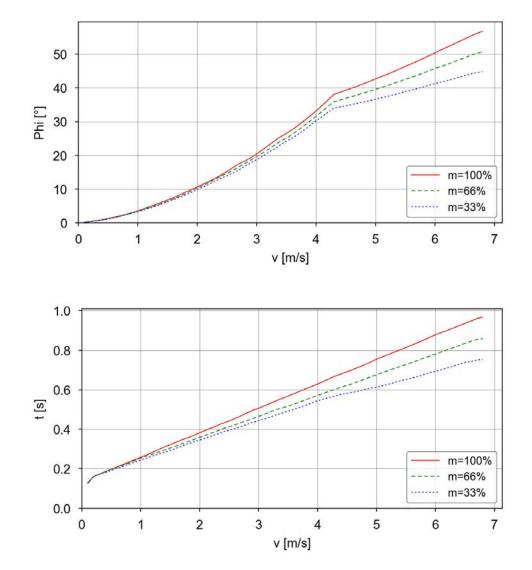


Extension zone 1, stopping distance and stopping time



Continues on next page 342

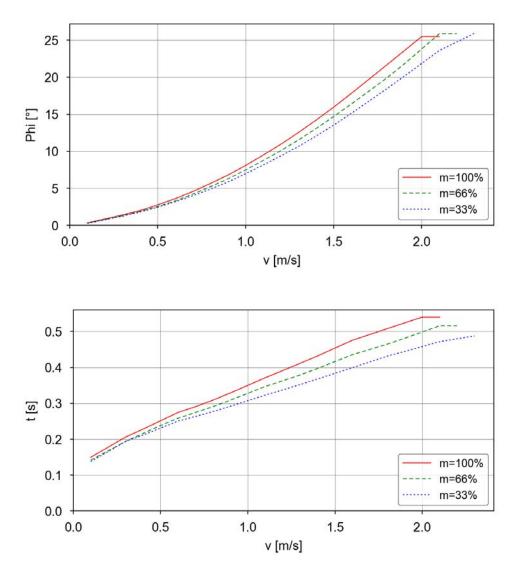
14.3 IRB 6660 3.35 m 100 kg Continued



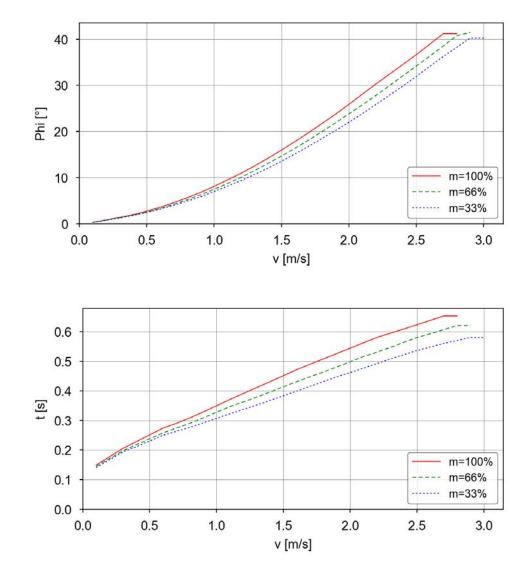
Extension zone 2, stopping distance and stopping time

14.3 IRB 6660 3.35 m 100 kg Continued

Category 1, Axis 2



14.3 IRB 6660 3.35 m 100 kg Continued

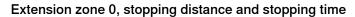


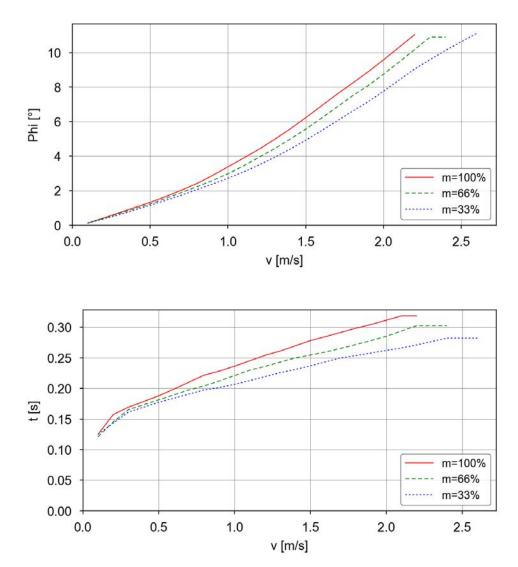
14.3 IRB 6660 3.35 m 100 kg Continued

> 40 30 Phi [°] 20 m=100% 10 1...... m=66% m=33% 0 1.0 0.0 0.5 1.5 2.0 3.0 2.5 v [m/s] 0.6 0.4 t [s] 10.00 Sec. a.a. 0.2 m=100% m=66% m=33% 0.0 1.5 0.0 0.5 1.0 2.0 2.5 3.0 v [m/s]

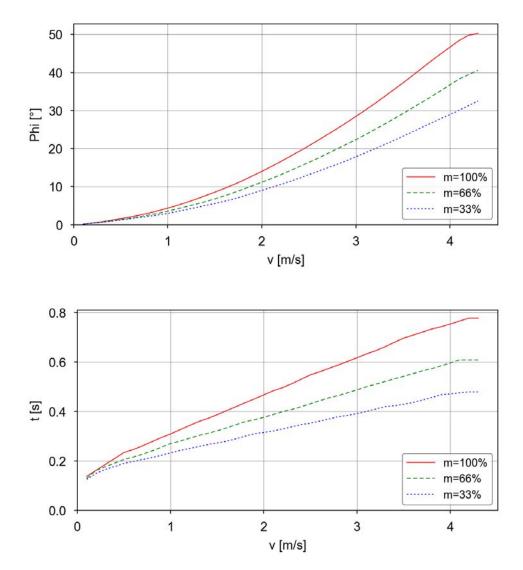
14.3 IRB 6660 3.35 m 100 kg Continued

Category 1, Axis 3

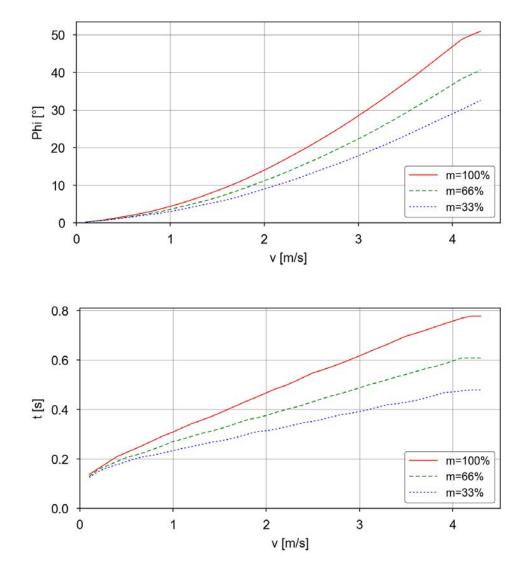




14.3 IRB 6660 3.35 m 100 kg Continued



14.3 IRB 6660 3.35 m 100 kg Continued



Extension zone 2, stopping distance and stopping time

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15.1 IRB 6700 2.60 m 200 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

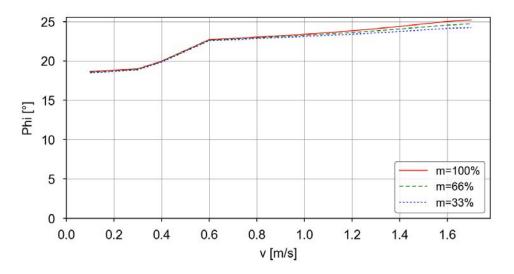
Axis	Distance (degrees)	Stop time (s)
1	40.8	0.66
2	25.1	0.37
3	19.3	0.25

Category 1, extension zones

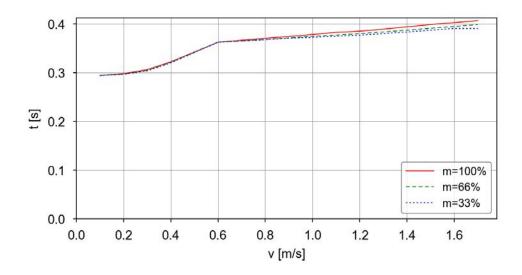
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.867
1	0.867	1.734
2	1.734	max reach

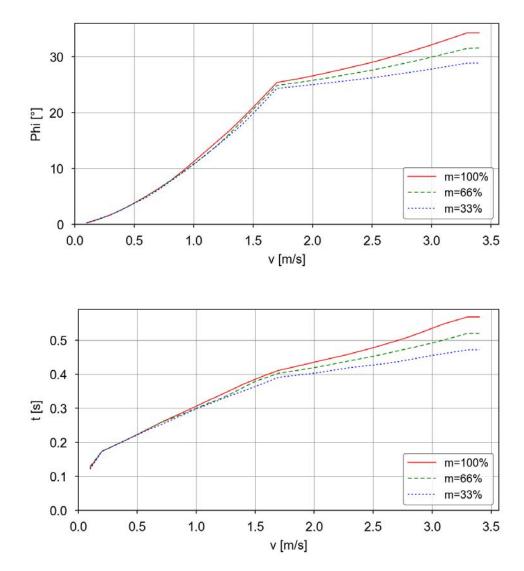
Category 1, Axis 1



15.1 IRB 6700 2.60 m 200 kg Continued

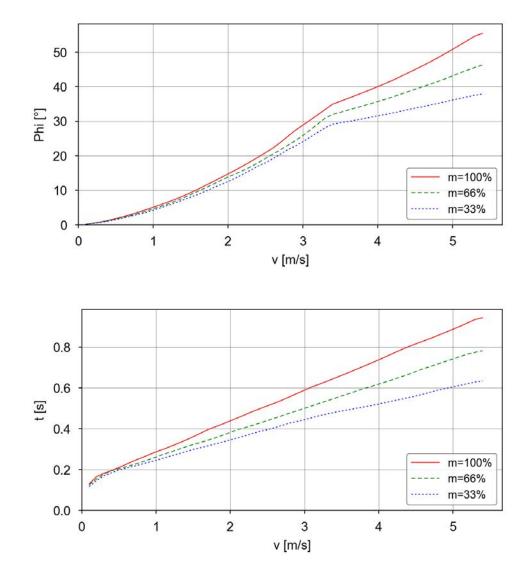


Extension zone 1, stopping distance and stopping time



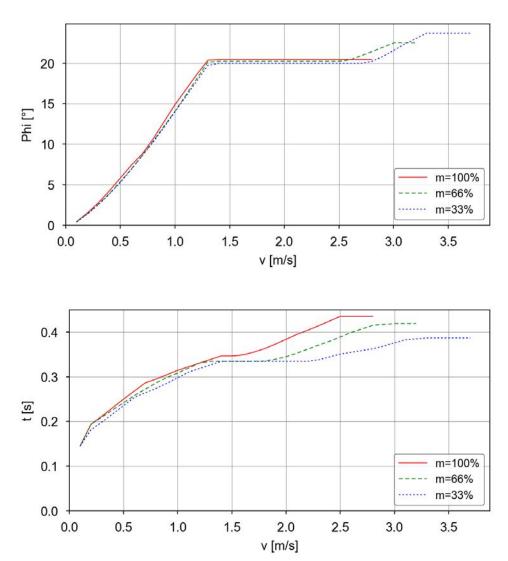
Continues on next page 352

15.1 IRB 6700 2.60 m 200 kg Continued

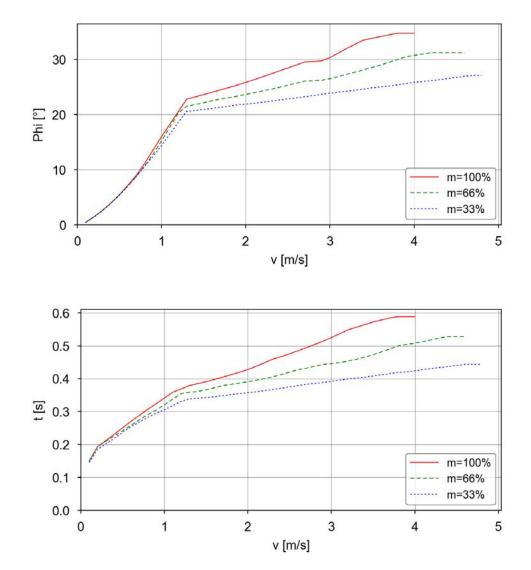


15.1 IRB 6700 2.60 m 200 kg Continued

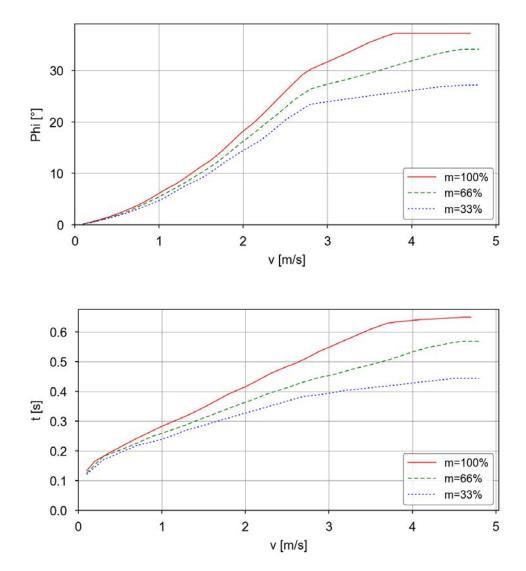
Category 1, Axis 2



15.1 IRB 6700 2.60 m 200 kg Continued

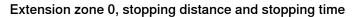


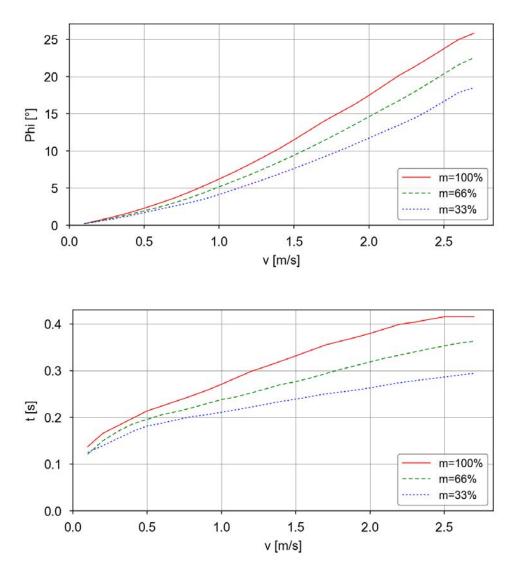
15.1 IRB 6700 2.60 m 200 kg Continued



15.1 IRB 6700 2.60 m 200 kg Continued

Category 1, Axis 3

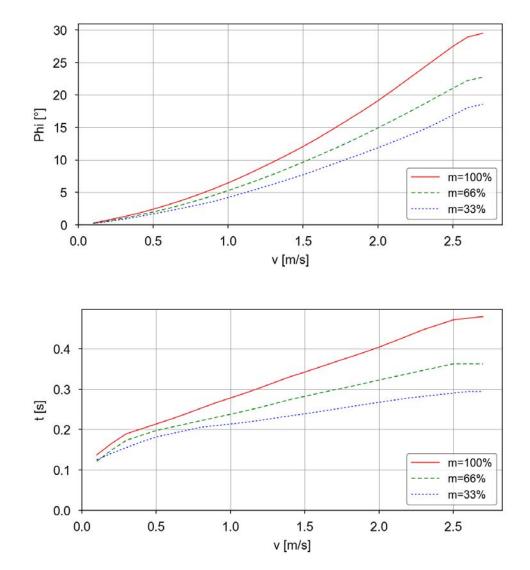




15.1 IRB 6700 2.60 m 200 kg Continued

30 25 20 Phi [°] 15 10 m=100% 5 m=66% m=33% 0 1.0 1.5 2.0 0.0 0.5 2.5 v [m/s] 0.4 0.3 t [s] 0.2 1111 m=100% 0.1 m=66% m=33% 0.0 0.5 0.0 1.0 1.5 2.0 2.5 v [m/s]

15.1 IRB 6700 2.60 m 200 kg Continued



Extension zone 2, stopping distance and stopping time

15.2 IRB 6700 2.65 m 235 kg

15.2 IRB 6700 2.65 m 235 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

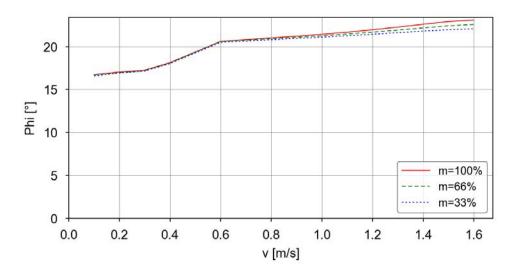
Axis	Distance (degrees)	Stop time (s)
1	38.2	0.68
2	20.3	0.37
3	14.4	0.22

Category 1, extension zones

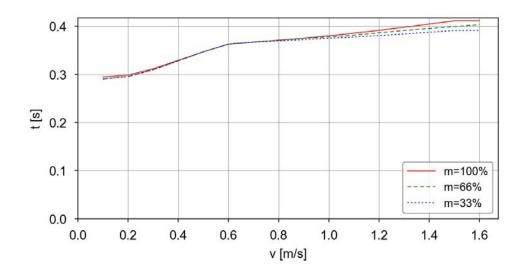
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.883
1	0.883	1.767
2	1.767	max reach

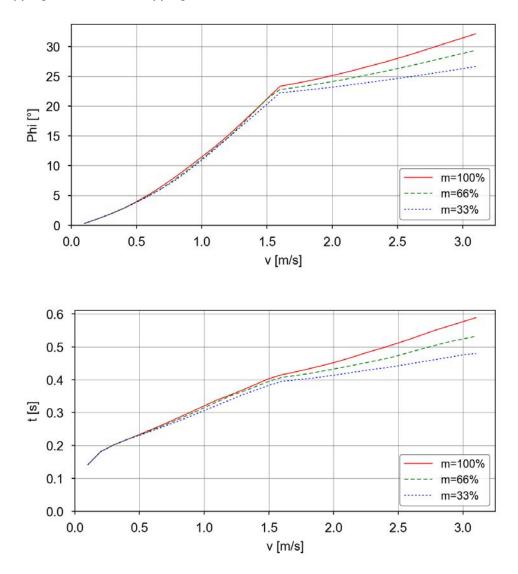
Category 1, Axis 1



15.2 IRB 6700 2.65 m 235 kg Continued



Extension zone 1, stopping distance and stopping time

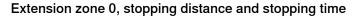


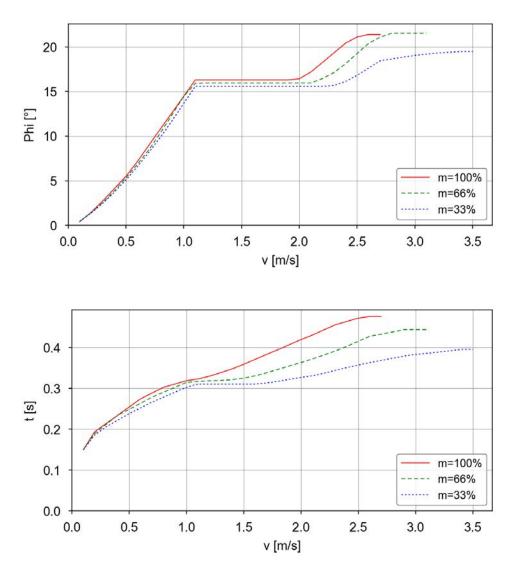
15.2 IRB 6700 2.65 m 235 kg Continued

> 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 2 3 5 0 4 1 v [m/s] 1.0 0.8 0.6 t [s] 0.4 100000 m=100% 0.2 m=66% m=33% 0.0 2 1 3 5 0 4 v [m/s]

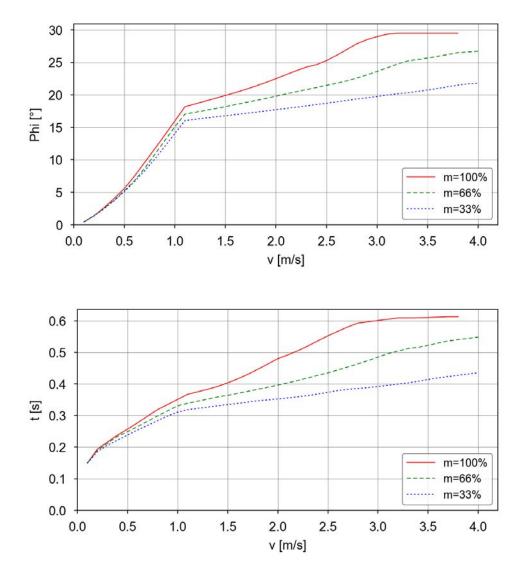
15.2 IRB 6700 2.65 m 235 kg Continued

Category 1, Axis 2

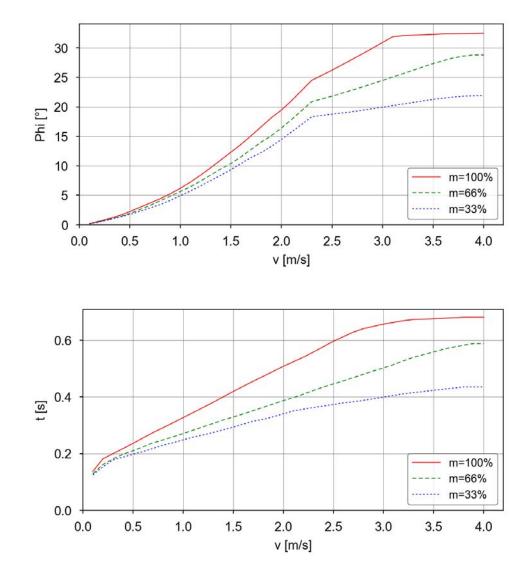




15.2 IRB 6700 2.65 m 235 kg Continued

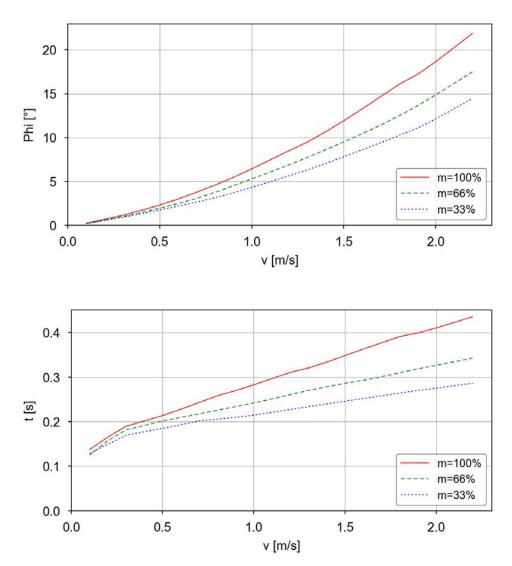


15.2 IRB 6700 2.65 m 235 kg Continued

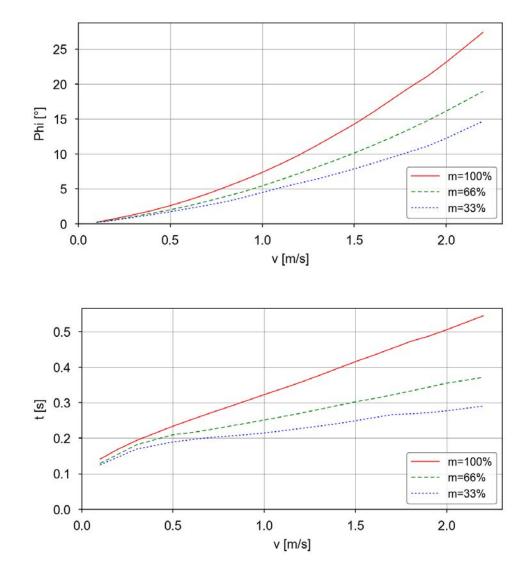


15.2 IRB 6700 2.65 m 235 kg Continued

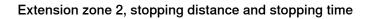
Category 1, Axis 3

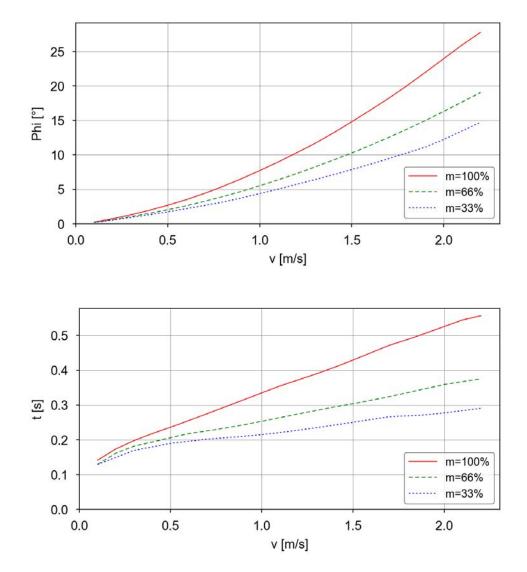


15.2 IRB 6700 2.65 m 235 kg Continued



15.2 IRB 6700 2.65 m 235 kg Continued





15.3 IRB 6700 2.70 m 300 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

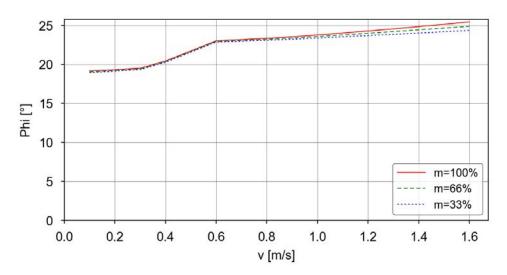
Axis	Distance (degrees)	Stop time (s)
1	37.4	0.66
2	21.6	0.39
3	17.5	0.27

Category 1, extension zones

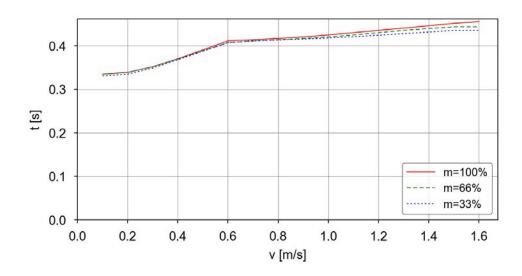
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.907
1	0.907	1.813
2	1.813	max reach

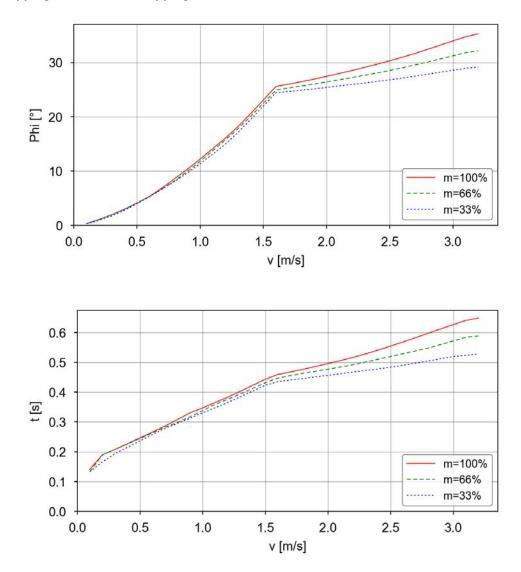
Category 1, Axis 1



15.3 IRB 6700 2.70 m 300 kg Continued

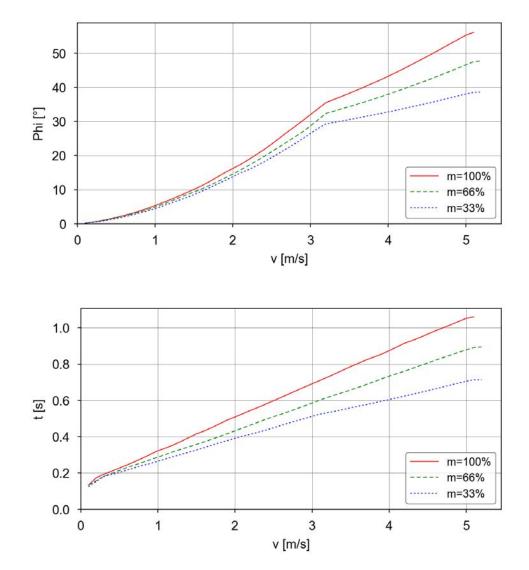


Extension zone 1, stopping distance and stopping time



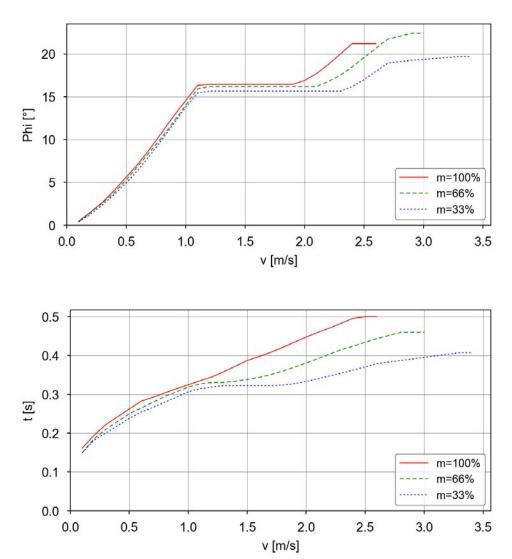
Continues on next page 370

15.3 IRB 6700 2.70 m 300 kg Continued

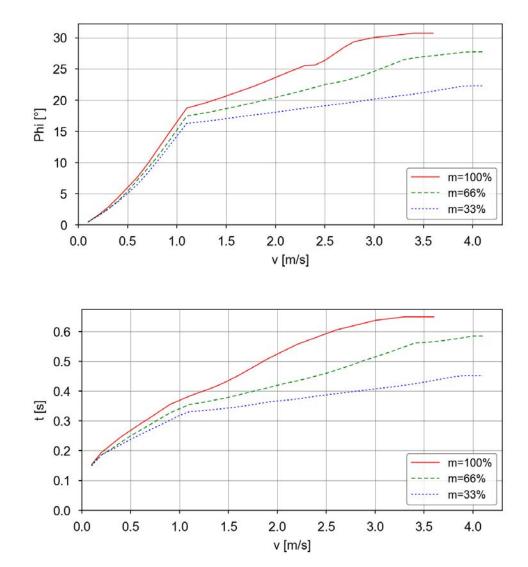


15.3 IRB 6700 2.70 m 300 kg Continued

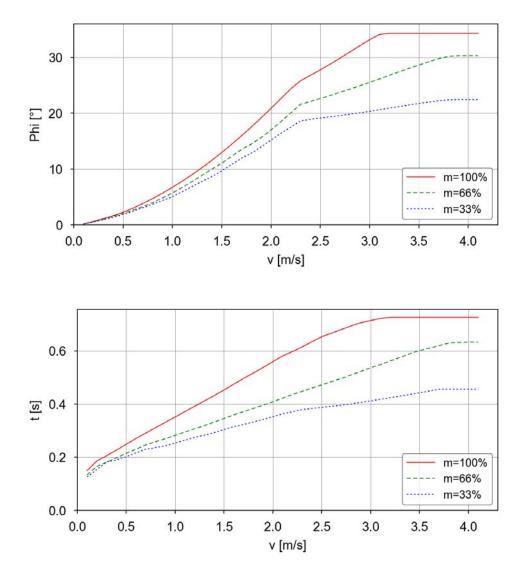
Category 1, Axis 2



15.3 IRB 6700 2.70 m 300 kg Continued

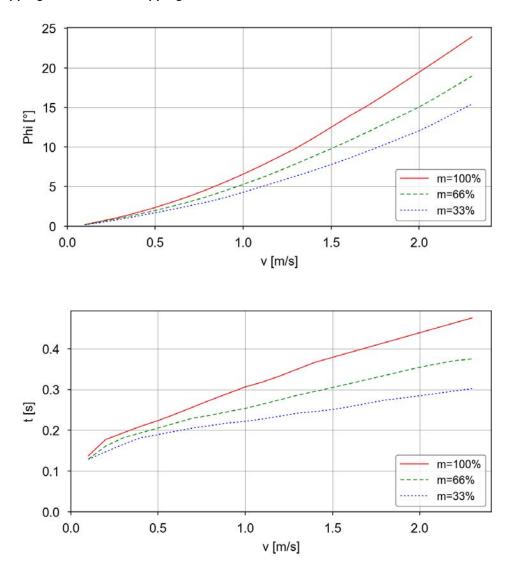


15.3 IRB 6700 2.70 m 300 kg Continued

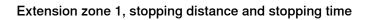


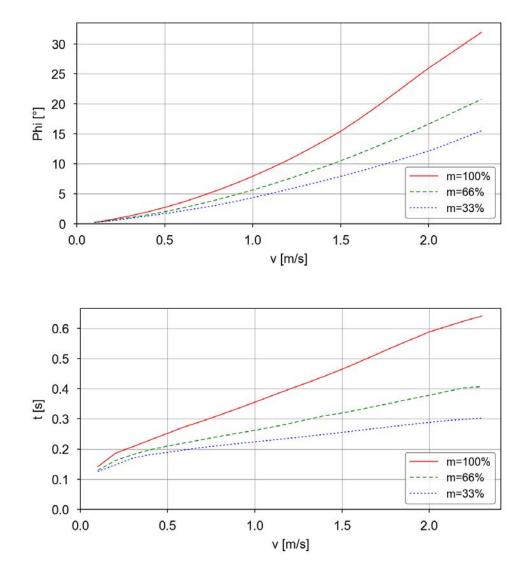
15.3 IRB 6700 2.70 m 300 kg Continued

Category 1, Axis 3

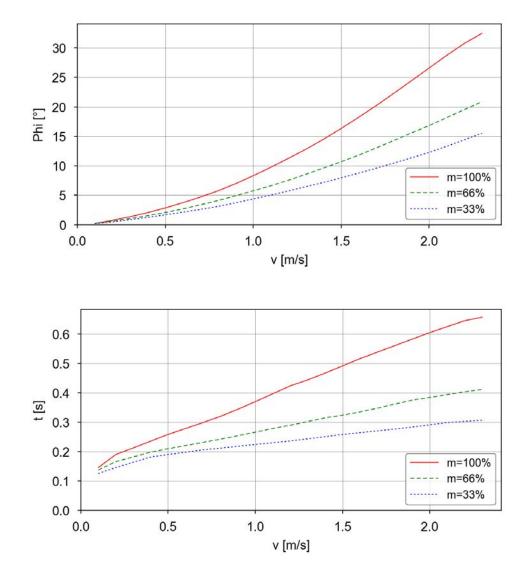


15.3 IRB 6700 2.70 m 300 kg Continued





15.3 IRB 6700 2.70 m 300 kg Continued



15.4 IRB 6700 2.80 m 205 kg

15.4 IRB 6700 2.80 m 205 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

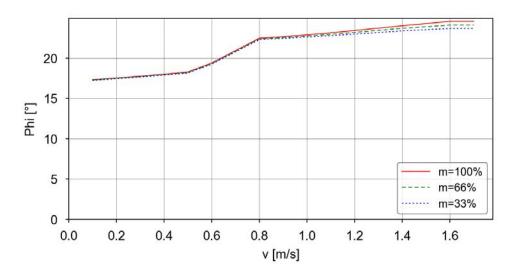
Axis	Distance (degrees)	Stop time (s)
1	40.0	0.71
2	20.6	0.37
3	14.1	0.22

Category 1, extension zones

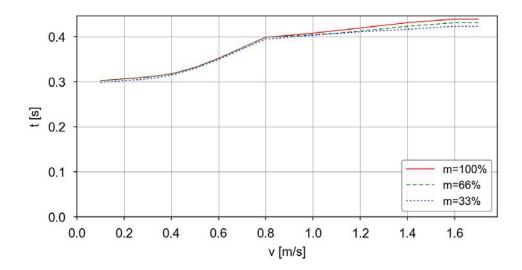
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.931
1	0.931	1.863
2	1.863	max reach

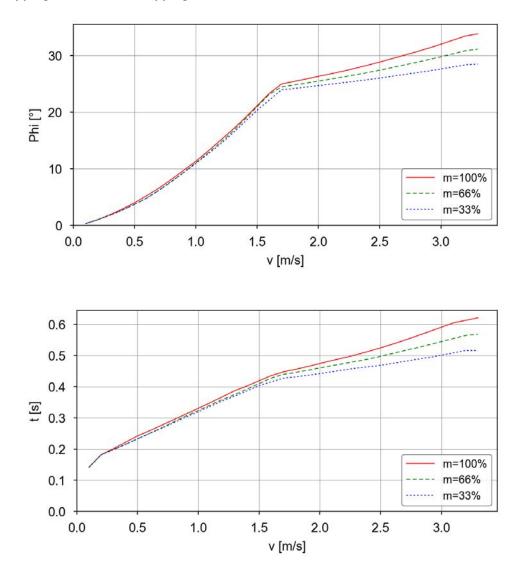
Category 1, Axis 1



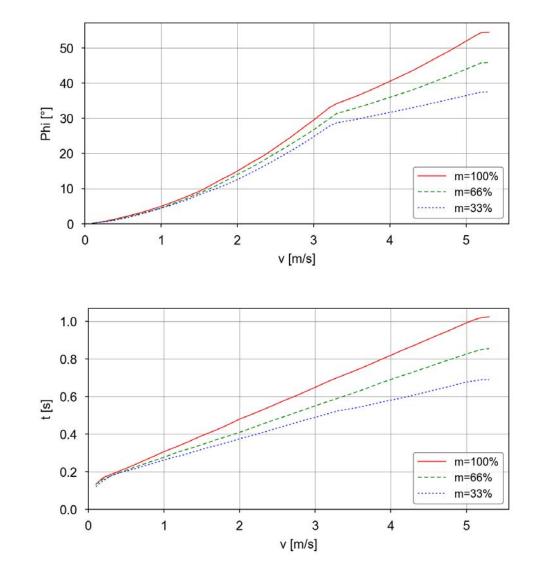
15.4 IRB 6700 2.80 m 205 kg Continued



Extension zone 1, stopping distance and stopping time

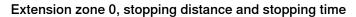


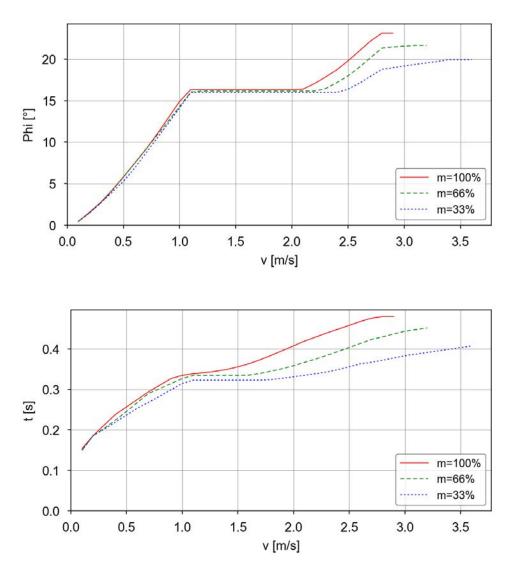
15.4 IRB 6700 2.80 m 205 kg Continued



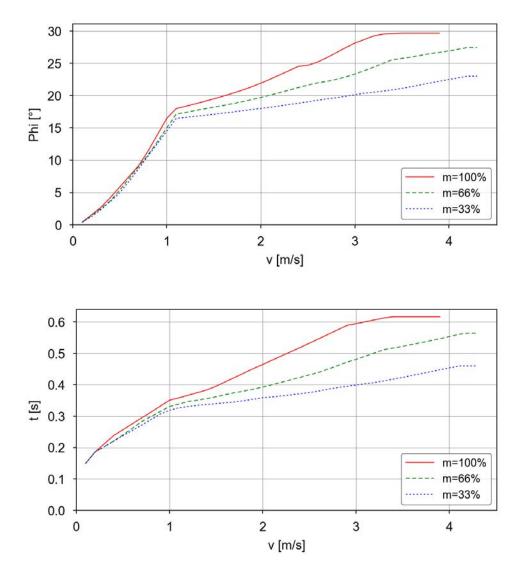
15.4 IRB 6700 2.80 m 205 kg Continued

Category 1, Axis 2

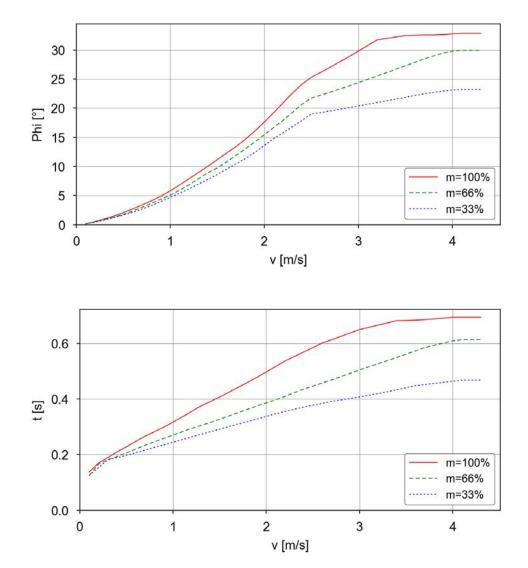




15.4 IRB 6700 2.80 m 205 kg *Continued*



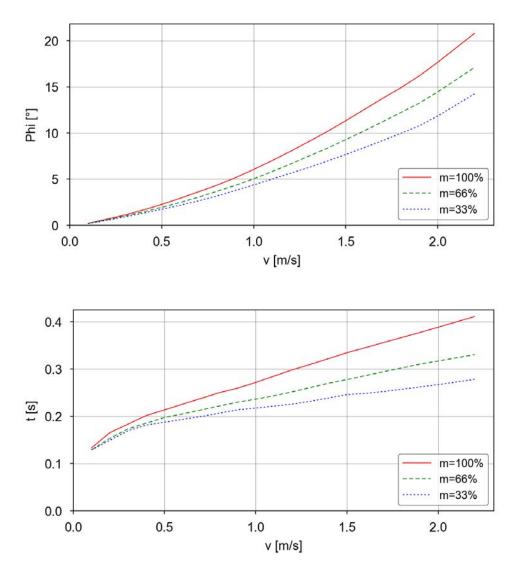
15.4 IRB 6700 2.80 m 205 kg Continued



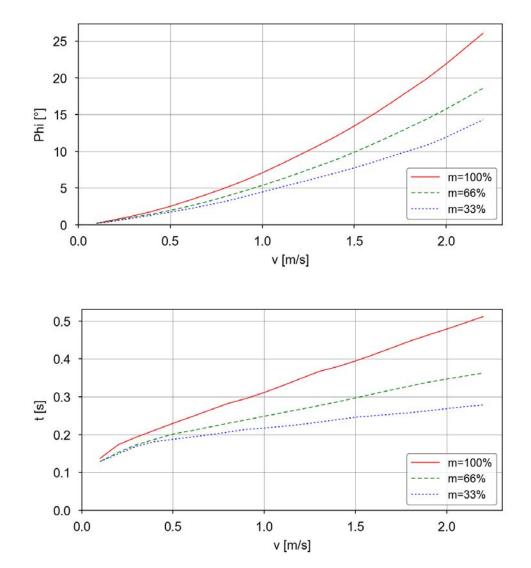
Extension zone 2, stopping distance and stopping time

15.4 IRB 6700 2.80 m 205 kg Continued

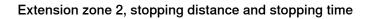
Category 1, Axis 3

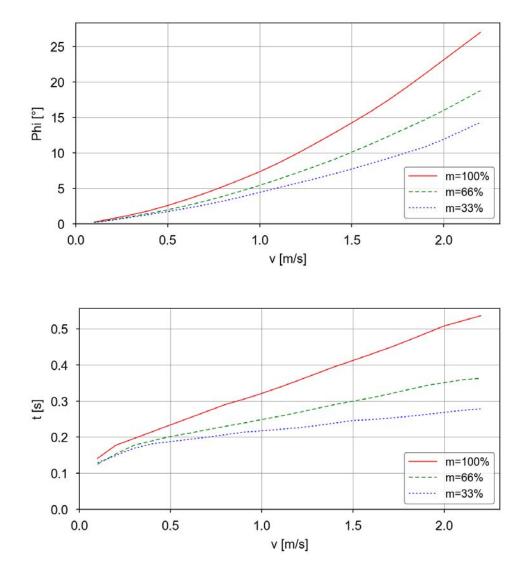


15.4 IRB 6700 2.80 m 205 kg Continued



15.4 IRB 6700 2.80 m 205 kg Continued





15.5 IRB 6700 2.85 m 155 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

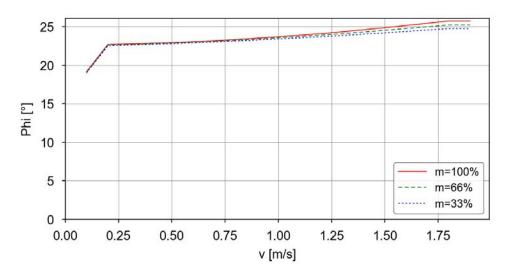
Axis	Distance (degrees)	Stop time (s)
1	40.9	0.66
2	25.1	0.37
3	19.3	0.25

Category 1, extension zones

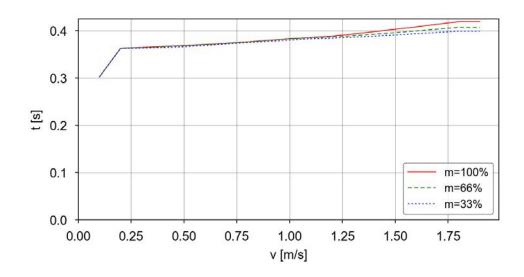
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.949
1	0.949	1.898
2	1.898	max reach

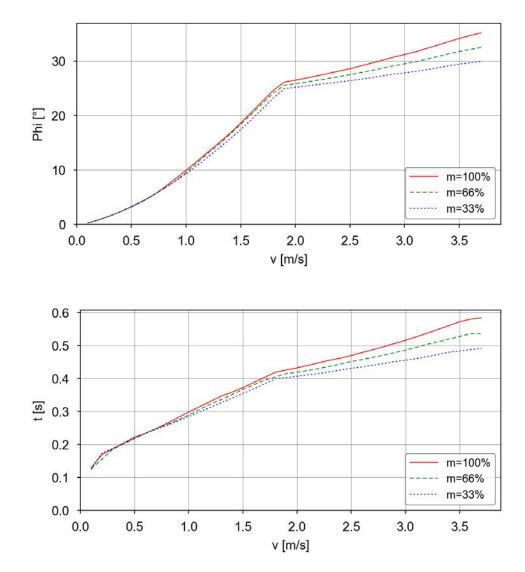
Category 1, Axis 1



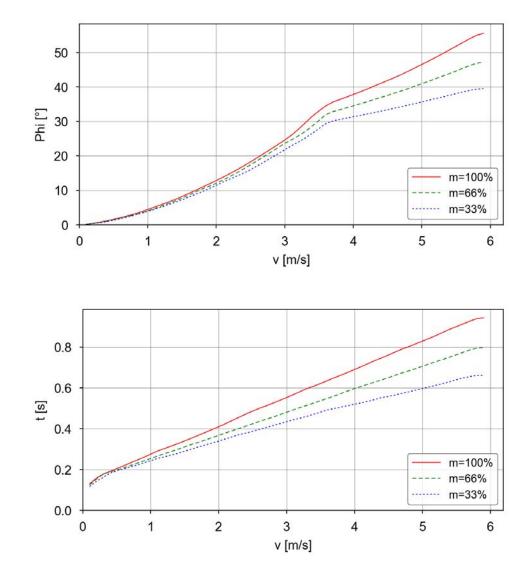
15.5 IRB 6700 2.85 m 155 kg Continued



Extension zone 1, stopping distance and stopping time

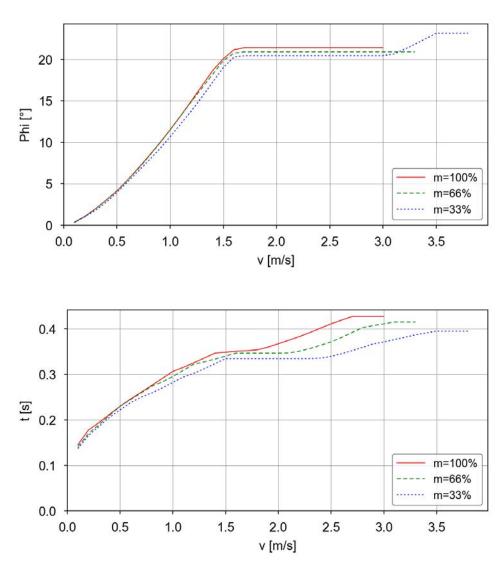


15.5 IRB 6700 2.85 m 155 kg Continued

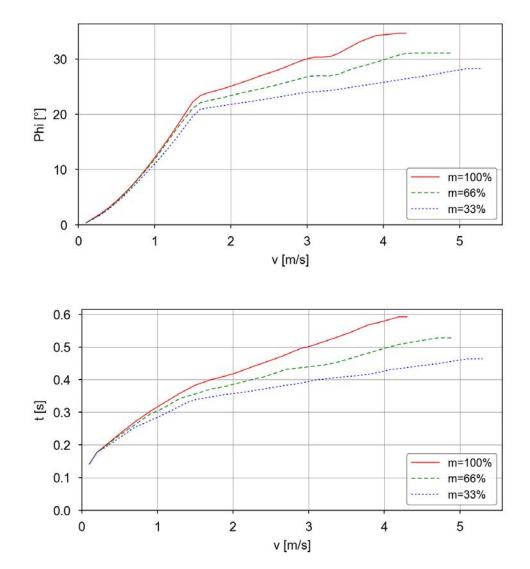


15.5 IRB 6700 2.85 m 155 kg Continued

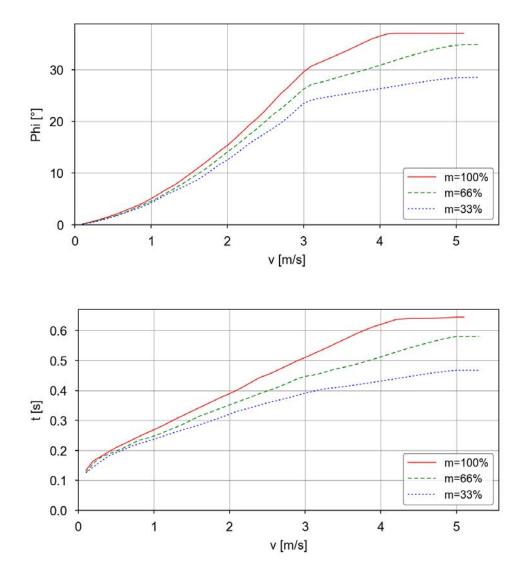
Category 1, Axis 2



15.5 IRB 6700 2.85 m 155 kg Continued

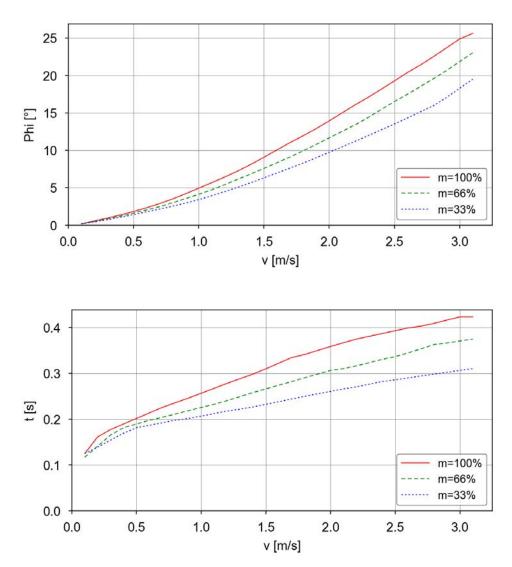


15.5 IRB 6700 2.85 m 155 kg Continued

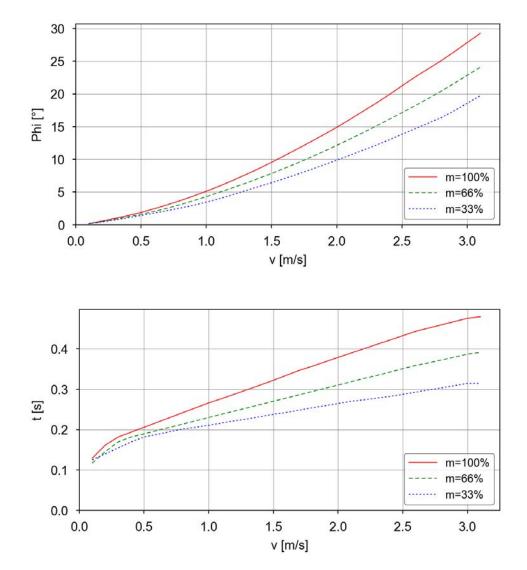


15.5 IRB 6700 2.85 m 155 kg Continued

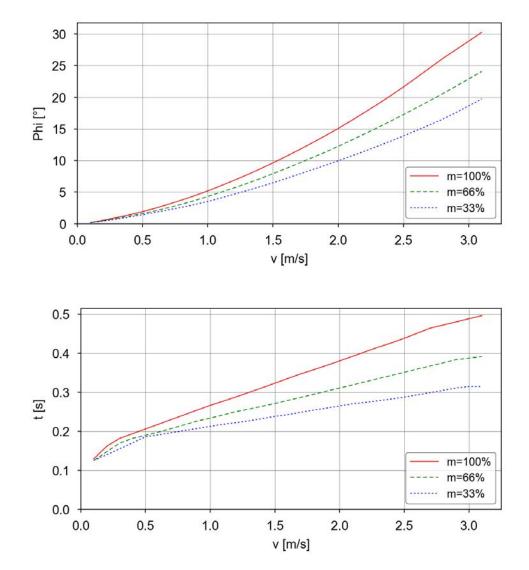
Category 1, Axis 3



15.5 IRB 6700 2.85 m 155 kg Continued



15.5 IRB 6700 2.85 m 155 kg Continued



15.6 IRB 6700 3.00 m 245 kg

15.6 IRB 6700 3.00 m 245 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

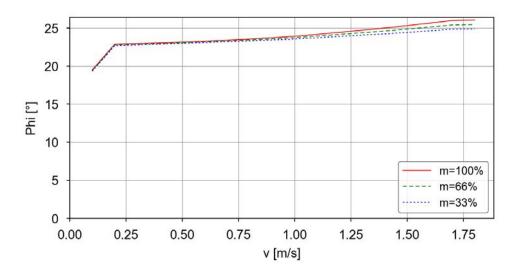
Axis	Distance (degrees)	Stop time (s)
1	38.8	0.68
2	21.7	0.39
3	17.9	0.29

Category 1, extension zones

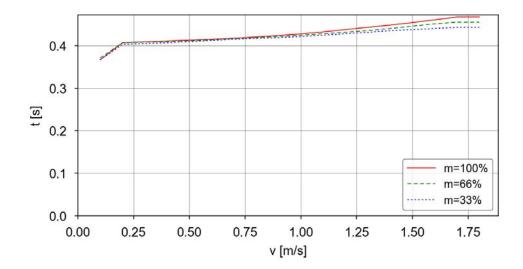
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.989
1	0.989	1.978
2	1.978	max reach

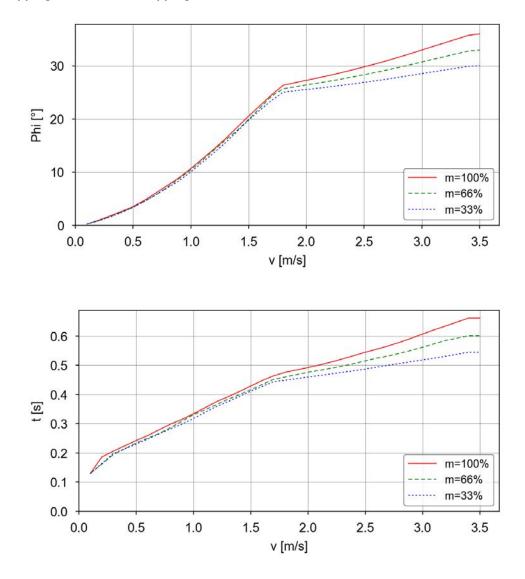
Category 1, Axis 1



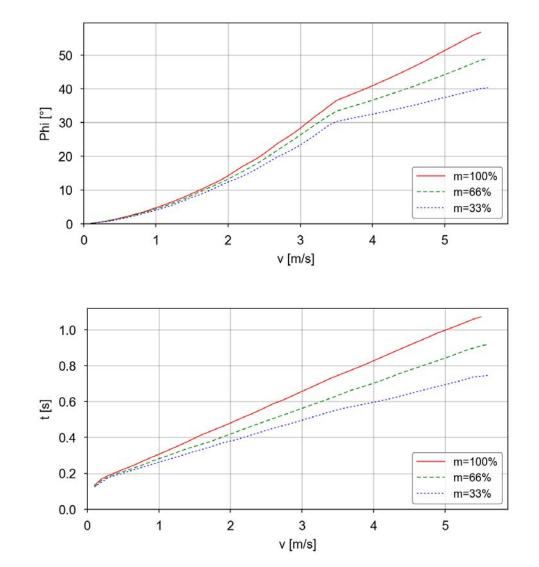
15.6 IRB 6700 3.00 m 245 kg Continued



Extension zone 1, stopping distance and stopping time

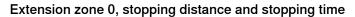


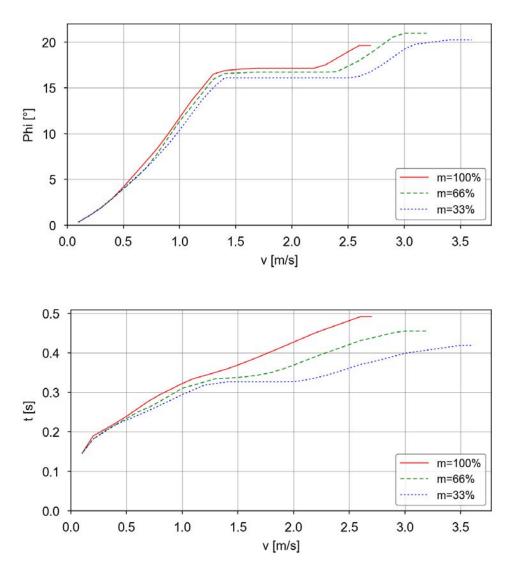
15.6 IRB 6700 3.00 m 245 kg *Continued*



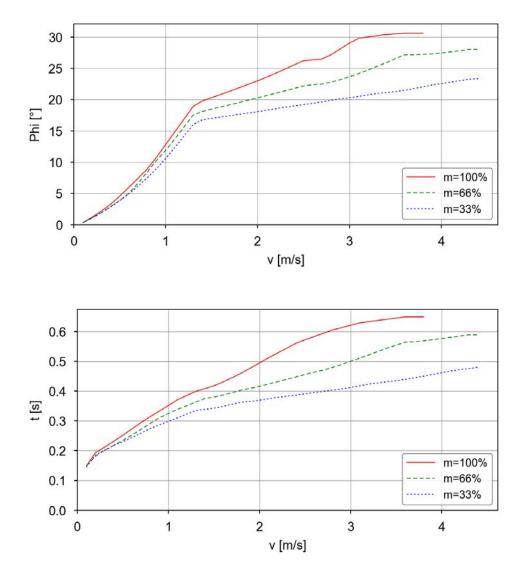
15.6 IRB 6700 3.00 m 245 kg Continued

Category 1, Axis 2

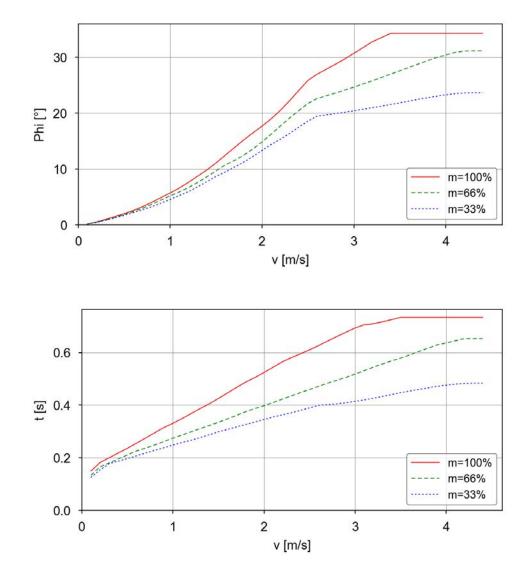




15.6 IRB 6700 3.00 m 245 kg *Continued*

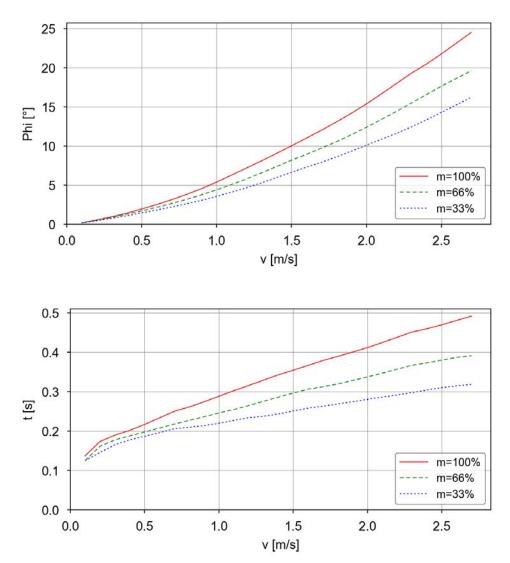


15.6 IRB 6700 3.00 m 245 kg Continued

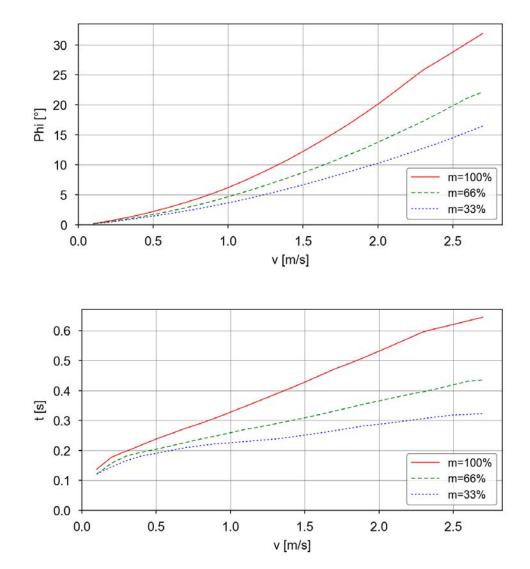


15.6 IRB 6700 3.00 m 245 kg Continued

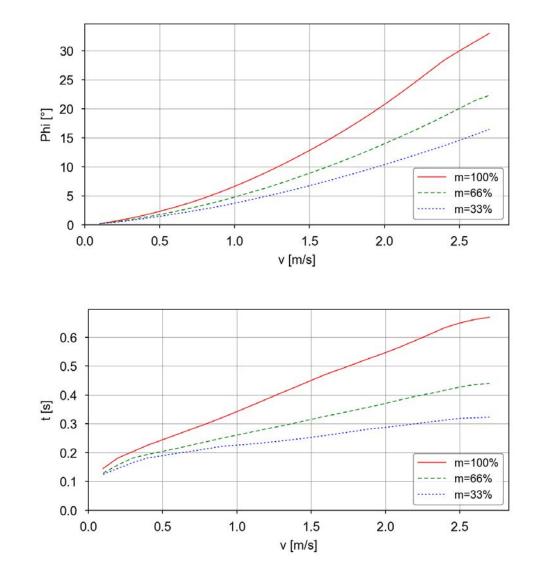
Category 1, Axis 3



15.6 IRB 6700 3.00 m 245 kg Continued



15.6 IRB 6700 3.00 m 245 kg *Continued*



15.7 IRB 6700 3.05 m 175 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

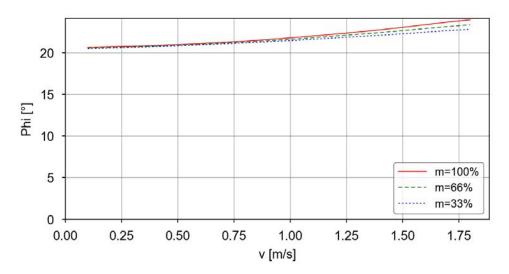
Axis	Distance (degrees)	Stop time (s)
1	40.9	0.73
2	21.1	0.37
3	15.6	0.25

Category 1, extension zones

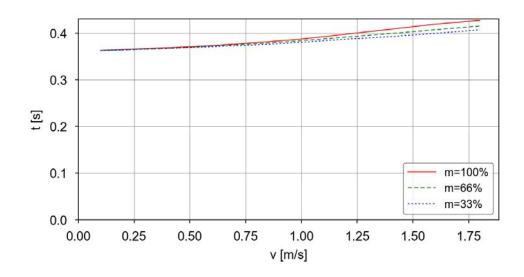
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.019
1	1.019	2.037
2	2.037	max reach

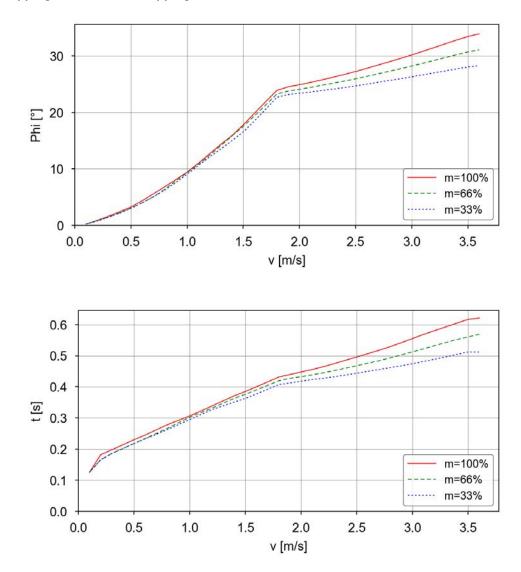
Category 1, Axis 1



15.7 IRB 6700 3.05 m 175 kg Continued



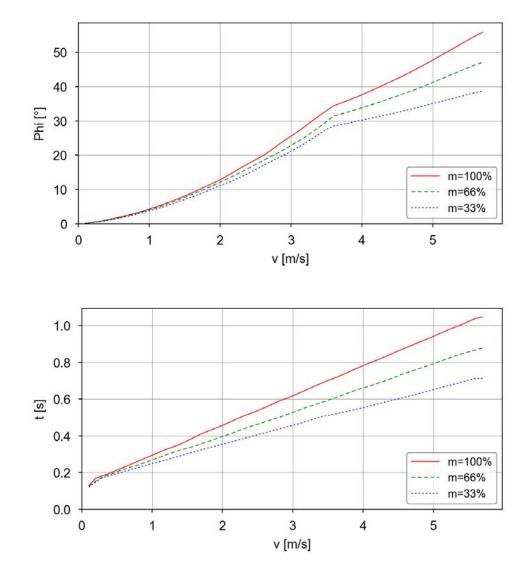
Extension zone 1, stopping distance and stopping time



Continues on next page 406

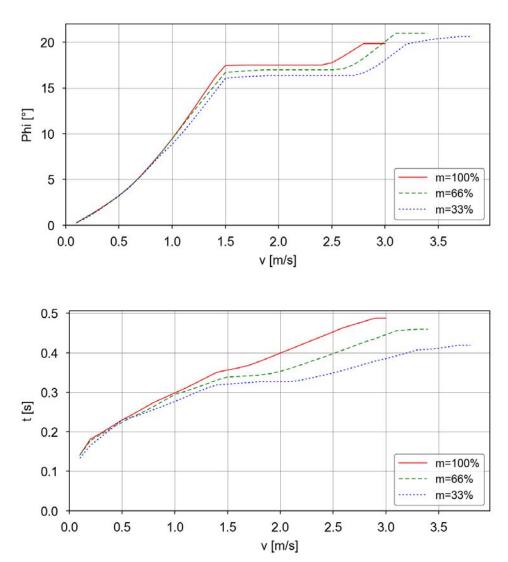
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

15.7 IRB 6700 3.05 m 175 kg Continued

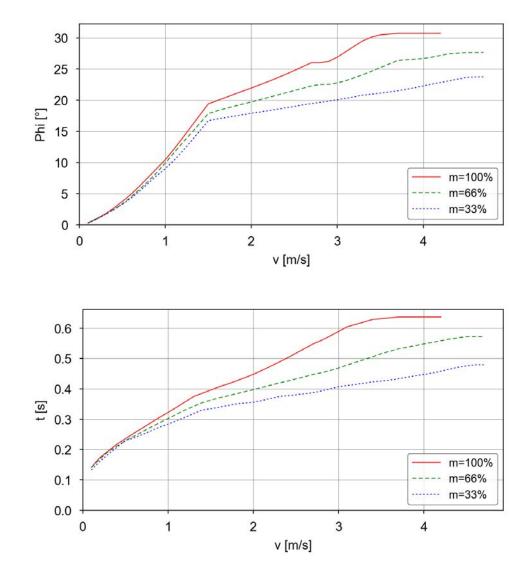


15.7 IRB 6700 3.05 m 175 kg Continued

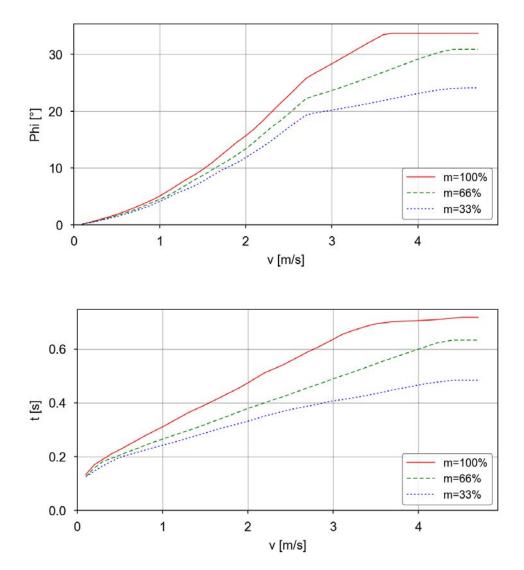
Category 1, Axis 2



15.7 IRB 6700 3.05 m 175 kg Continued

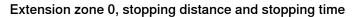


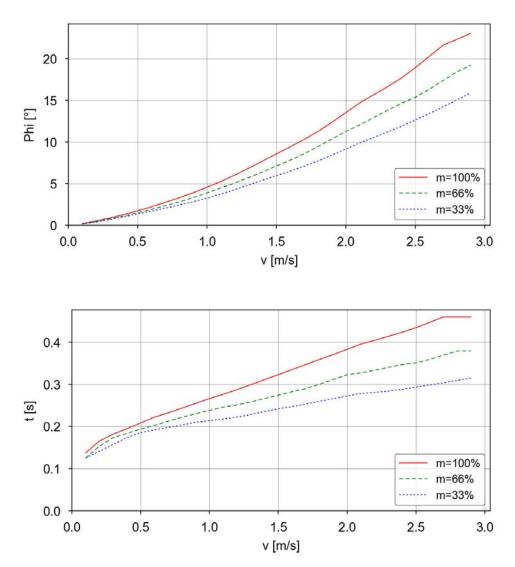
15.7 IRB 6700 3.05 m 175 kg Continued



15.7 IRB 6700 3.05 m 175 kg Continued

Category 1, Axis 3

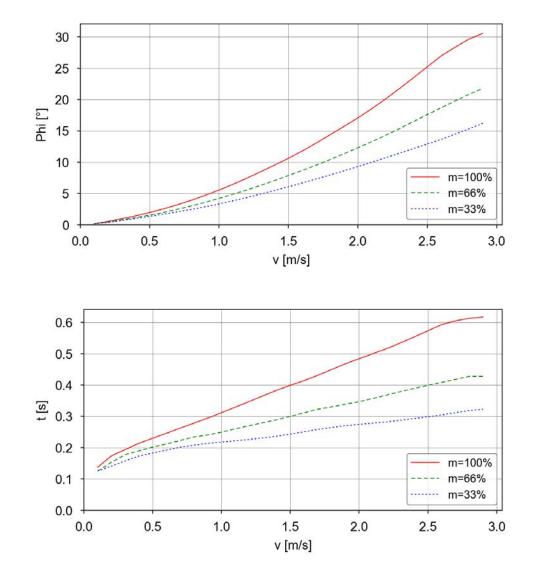




15.7 IRB 6700 3.05 m 175 kg Continued

30 25 20 Phi [°] 15 10 m=100% 5 m=66% m=33% 0 0.5 1.0 1.5 2.0 3.0 0.0 2.5 v [m/s] 0.6 0.5 0.4 <u>ت</u> 0.3 0.2 ----m=100% 0.1 m=66% m=33% 0.0 1.5 0.0 0.5 1.0 2.0 3.0 2.5 v [m/s]

15.7 IRB 6700 3.05 m 175 kg Continued



15.8 IRB 6700 3.20 m 150 kg

15.8 IRB 6700 3.20 m 150 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

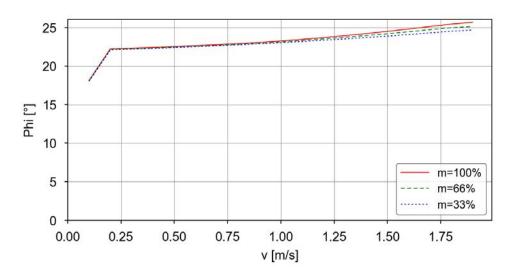
Axis	Distance (degrees)	Stop time (s)
1	41.7	0.75
2	21.3	0.39
3	15.7	0.25

Category 1, extension zones

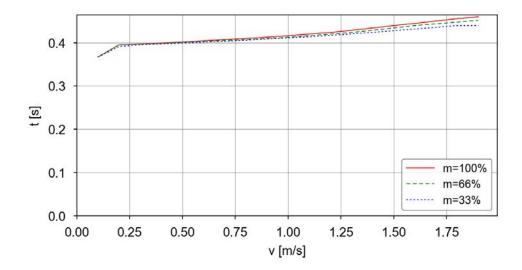
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.067
1	1.067	2.133
2	2.133	max reach

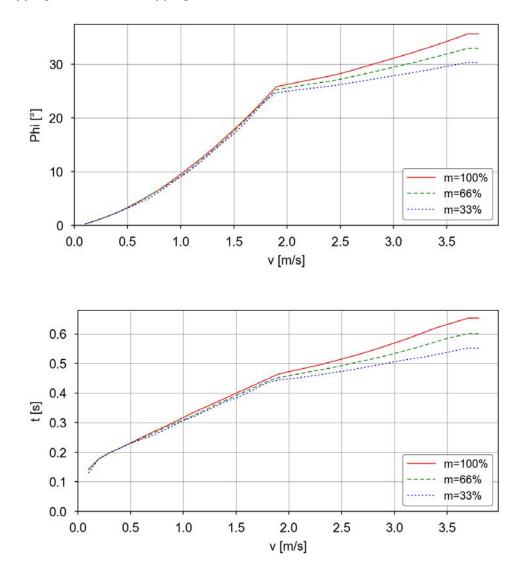
Category 1, Axis 1



15.8 IRB 6700 3.20 m 150 kg Continued



Extension zone 1, stopping distance and stopping time



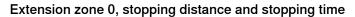
Continues on next page

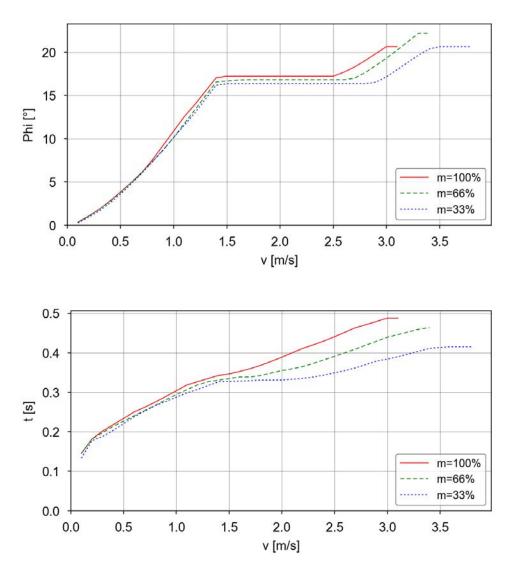
15.8 IRB 6700 3.20 m 150 kg Continued

> 60 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 2 0 3 4 5 6 1 v [m/s] 1.0 0.8 t [s] 0.6 0.4 and an and a state of the m=100% 0.2 m=66% m=33% 0.0 2 3 1 4 5 0 6 v [m/s]

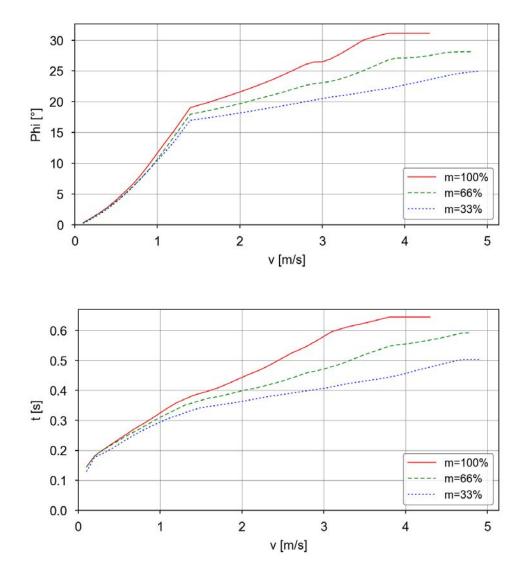
15.8 IRB 6700 3.20 m 150 kg Continued

Category 1, Axis 2

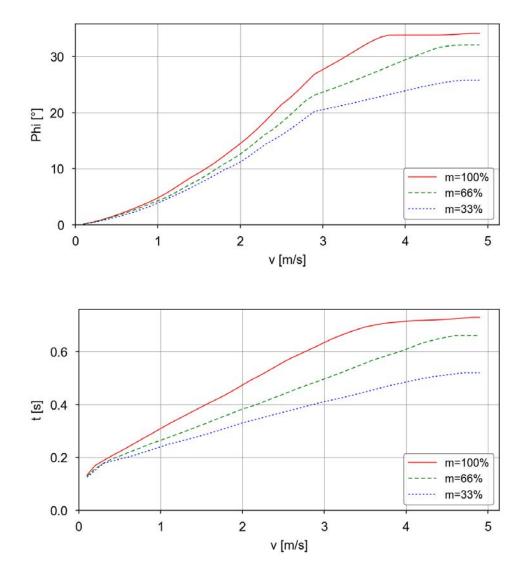




15.8 IRB 6700 3.20 m 150 kg Continued

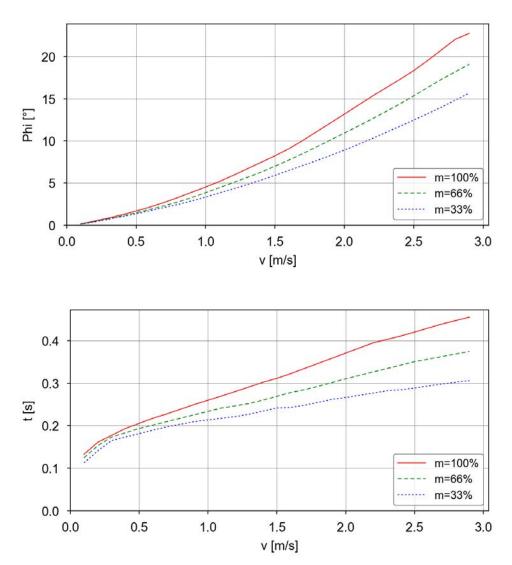


15.8 IRB 6700 3.20 m 150 kg Continued

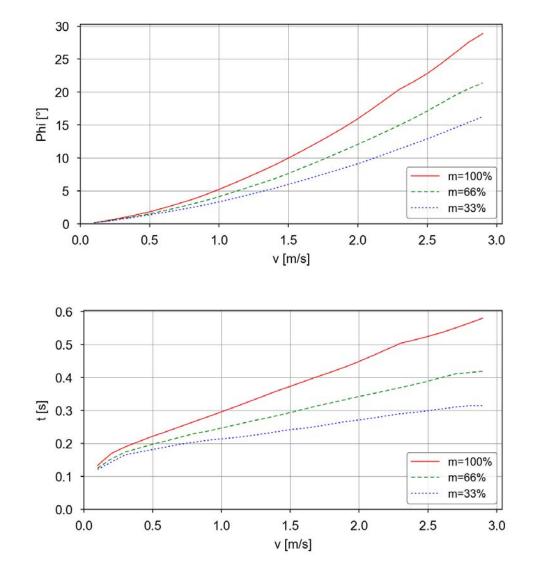


15.8 IRB 6700 3.20 m 150 kg Continued

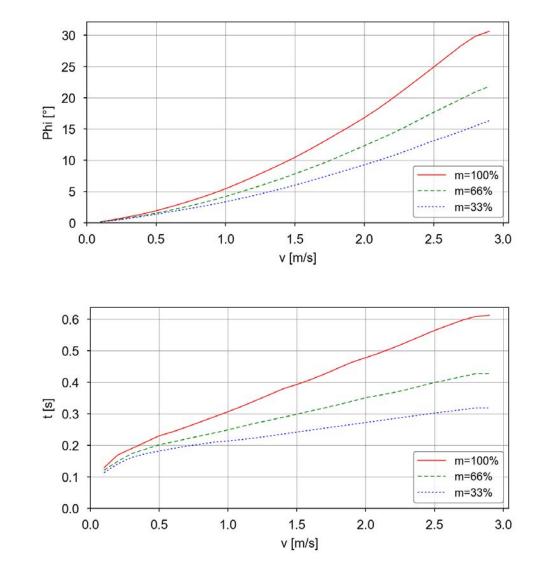
Category 1, Axis 3



15.8 IRB 6700 3.20 m 150 kg Continued



15.8 IRB 6700 3.20 m 150 kg Continued



15.9 IRB 6700Inv LeanID m 2.60 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

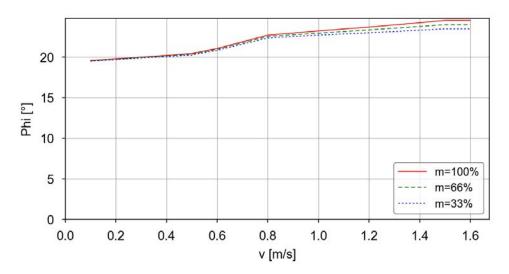
Axis	Distance (degrees)	Stop time (s)
1	33.1	0.58
2	21.0	0.37
3	14.7	0.22

Category 1, extension zones

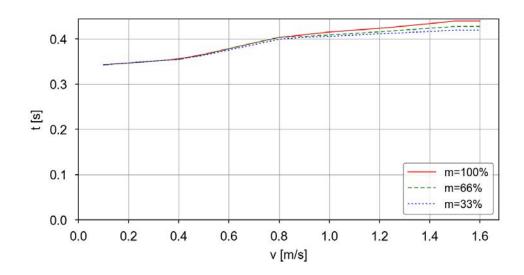
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.872
1	0.872	1.744
2	1.744	max reach

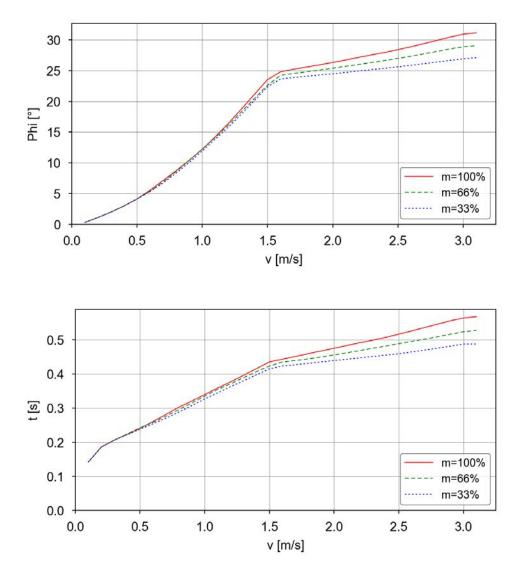
Category 1, Axis 1



15.9 IRB 6700Inv LeanID m 2.60 kg Continued

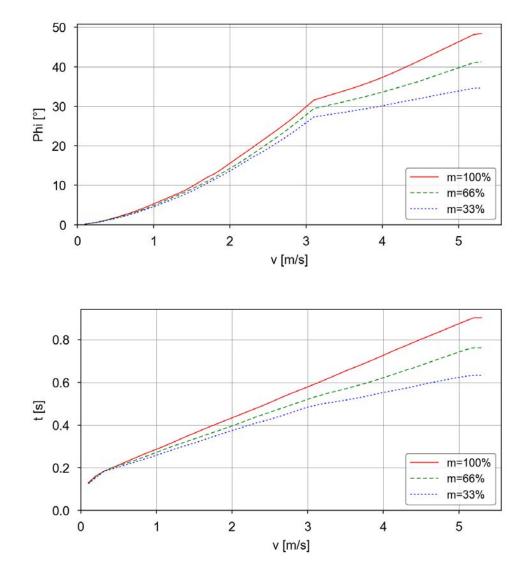


Extension zone 1, stopping distance and stopping time



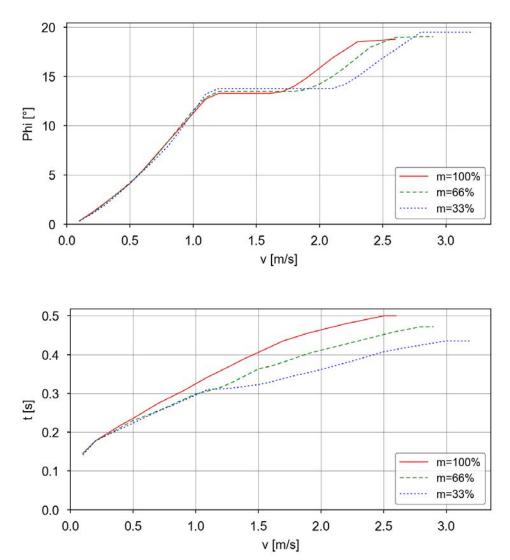
Continues on next page

15.9 IRB 6700Inv LeanID m 2.60 kg Continued

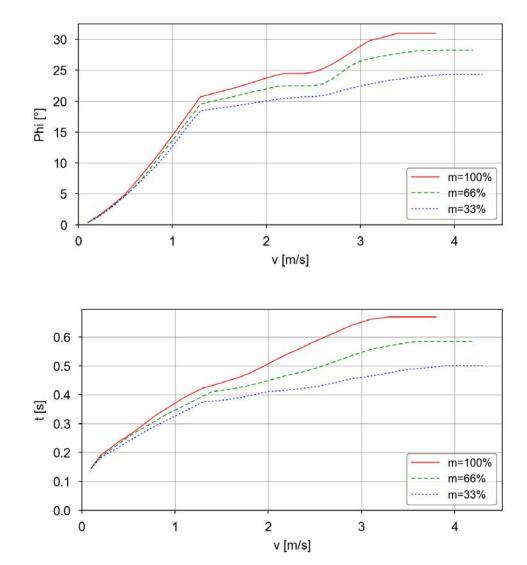


15.9 IRB 6700Inv LeanID m 2.60 kg *Continued*

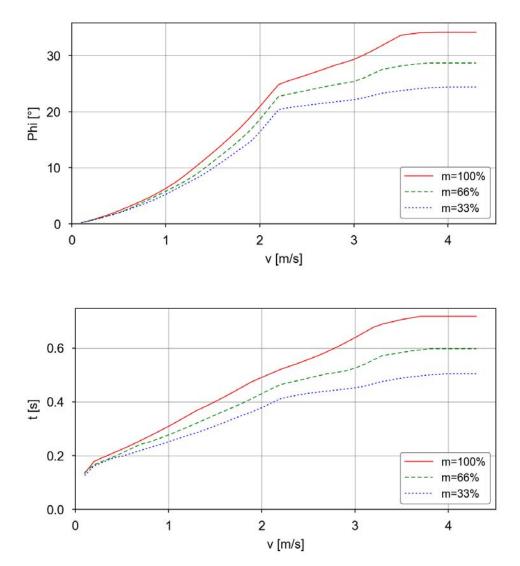
Category 1, Axis 2



15.9 IRB 6700Inv LeanID m 2.60 kg Continued



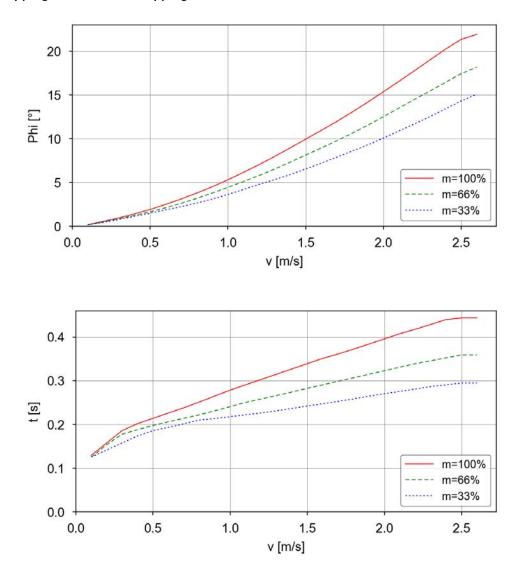
15.9 IRB 6700Inv LeanID m 2.60 kg *Continued*



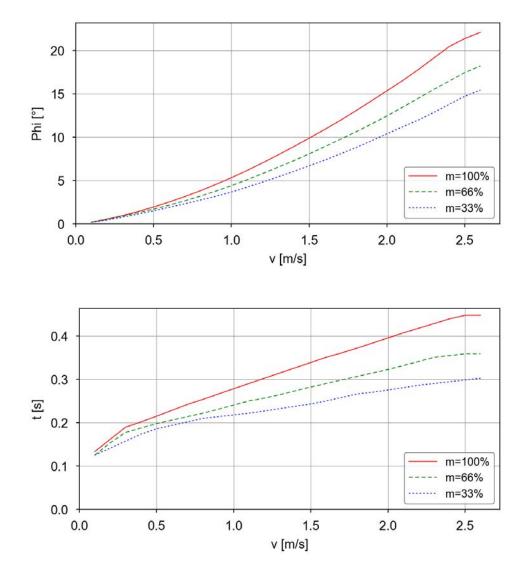
15.9 IRB 6700Inv LeanID m 2.60 kg Continued

Category 1, Axis 3

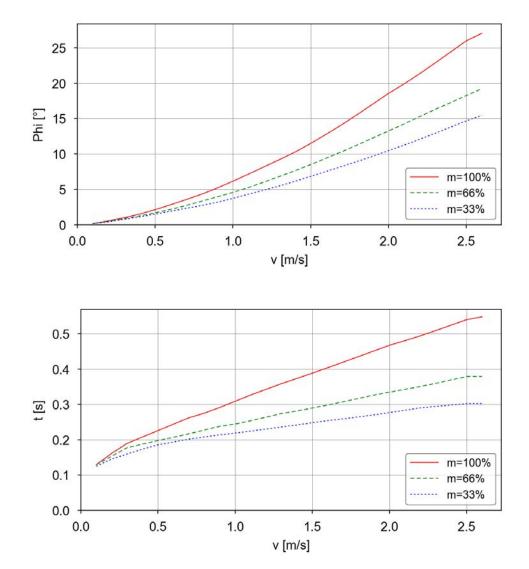
Extension zone 0, stopping distance and stopping time



15.9 IRB 6700Inv LeanID m 2.60 kg *Continued*



15.9 IRB 6700Inv LeanID m 2.60 kg Continued



15.10 IRB 6700Inv LeanID m 2.90 kg

15.10 IRB 6700Inv LeanID m 2.90 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

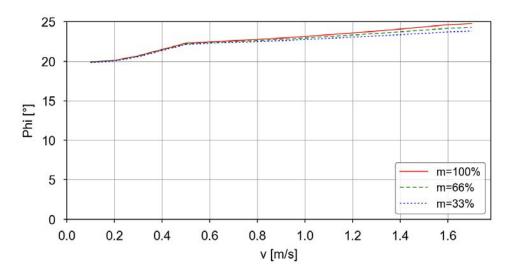
Axis	Distance (degrees)	Stop time (s)
1	33.1	0.56
2	21.1	0.37
3	14.6	0.22

Category 1, extension zones

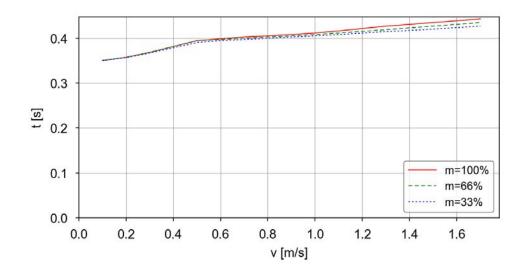
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.955
1	0.955	1.909
2	1.909	max reach

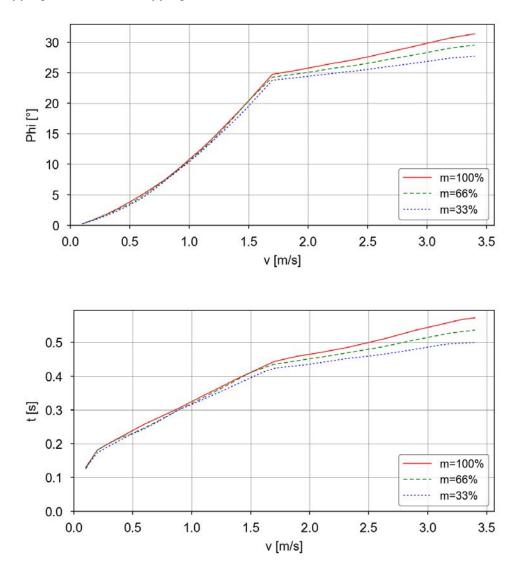
Category 1, Axis 1



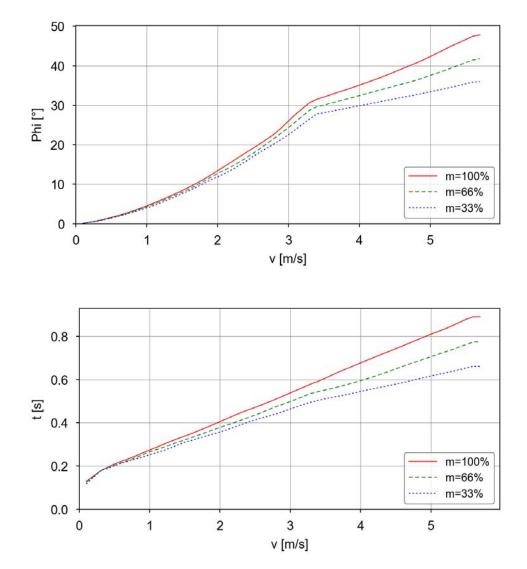
15.10 IRB 6700Inv LeanID m 2.90 kg Continued



Extension zone 1, stopping distance and stopping time

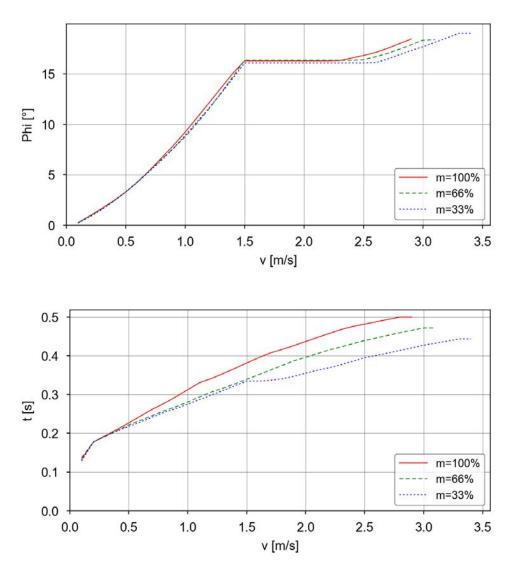


15.10 IRB 6700Inv LeanID m 2.90 kg Continued

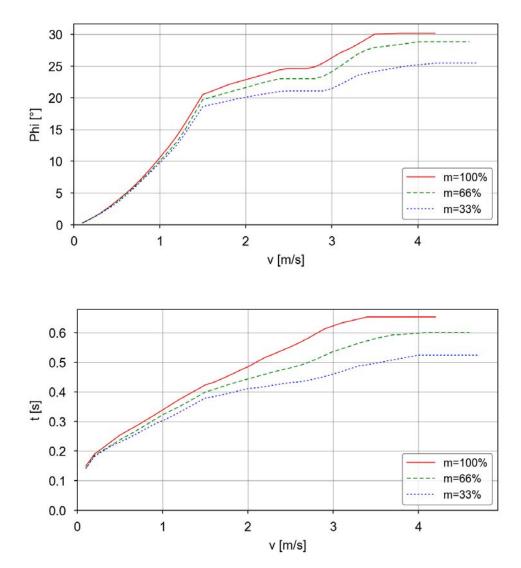


15.10 IRB 6700Inv LeanID m 2.90 kg Continued

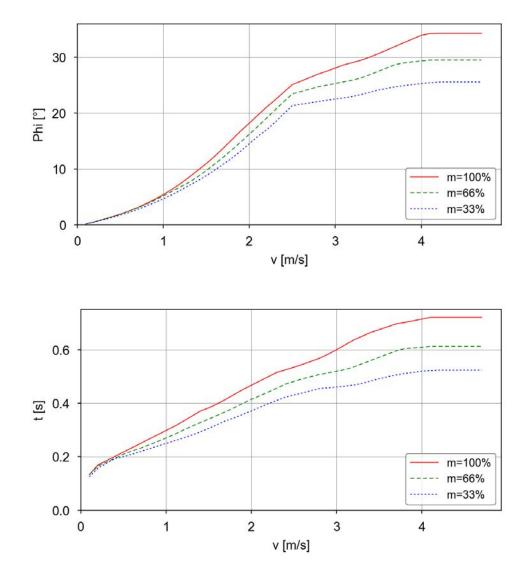
Category 1, Axis 2



15.10 IRB 6700Inv LeanID m 2.90 kg Continued

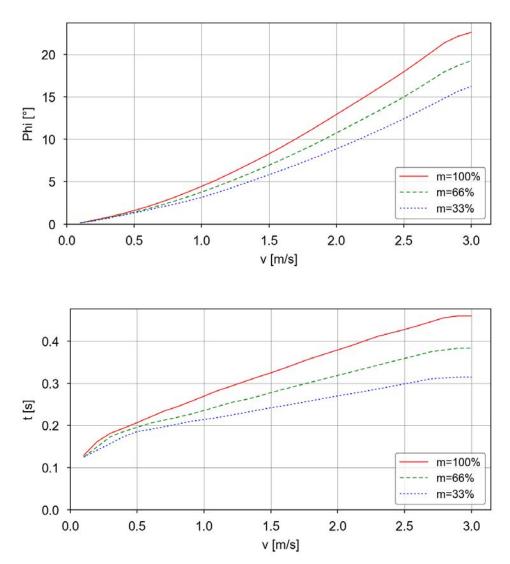


15.10 IRB 6700Inv LeanID m 2.90 kg Continued

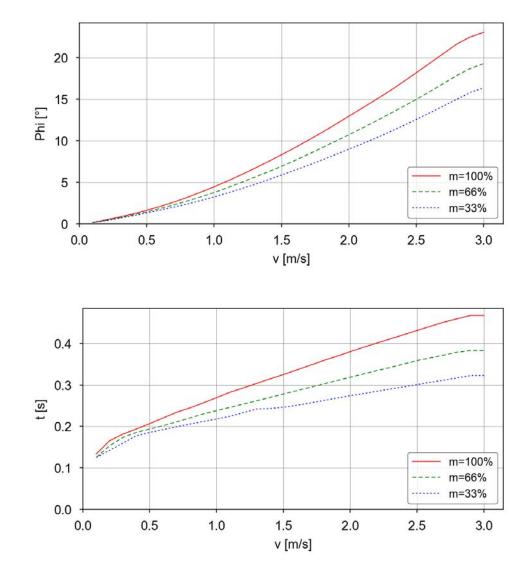


15.10 IRB 6700Inv LeanID m 2.90 kg Continued

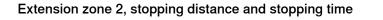
Category 1, Axis 3

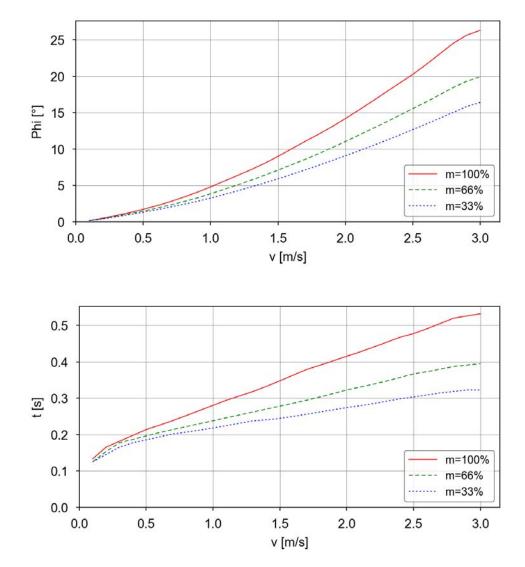


15.10 IRB 6700Inv LeanID m 2.90 kg Continued



15.10 IRB 6700Inv LeanID m 2.90 kg Continued





15.11 IRB 6700Inv 2.60 m 300 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

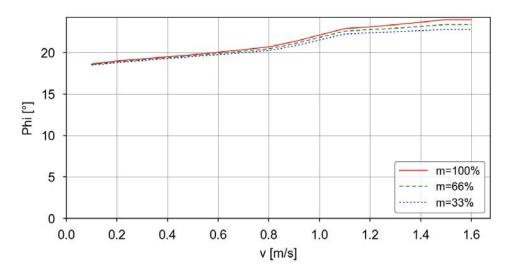
Axis	Distance (degrees)	Stop time (s)
1	32.5	0.56
2	20.3	0.34
3	13.8	0.2

Category 1, extension zones

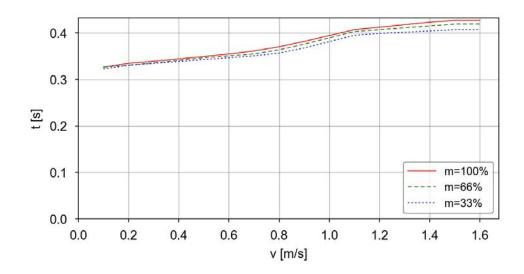
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.872
1	0.872	1.744
2	1.744	max reach

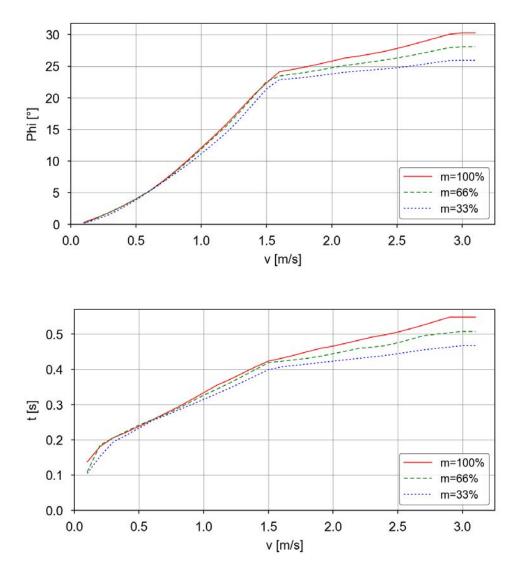
Category 1, Axis 1



15.11 IRB 6700Inv 2.60 m 300 kg Continued

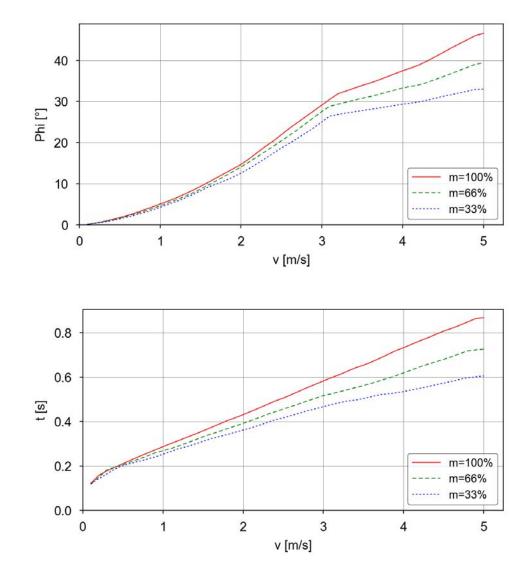


Extension zone 1, stopping distance and stopping time



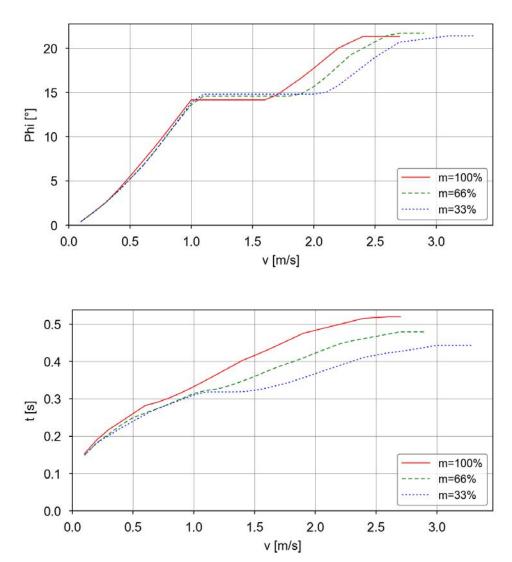
Continues on next page

15.11 IRB 6700Inv 2.60 m 300 kg Continued

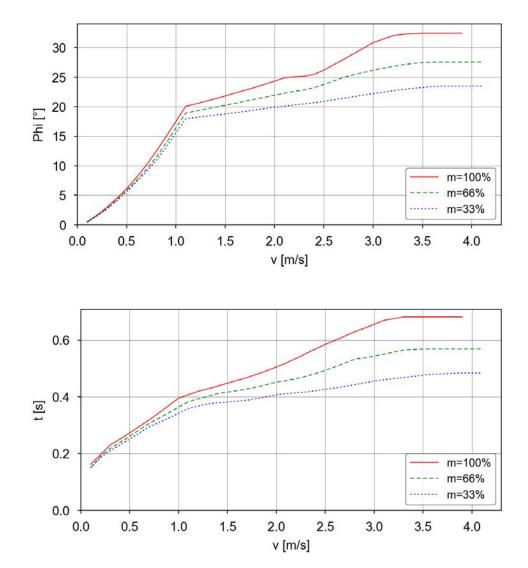


15.11 IRB 6700Inv 2.60 m 300 kg Continued

Category 1, Axis 2

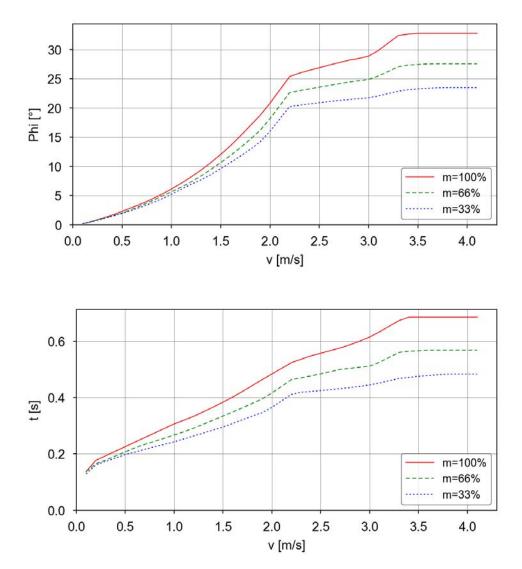


15.11 IRB 6700Inv 2.60 m 300 kg Continued



15.11 IRB 6700Inv 2.60 m 300 kg Continued

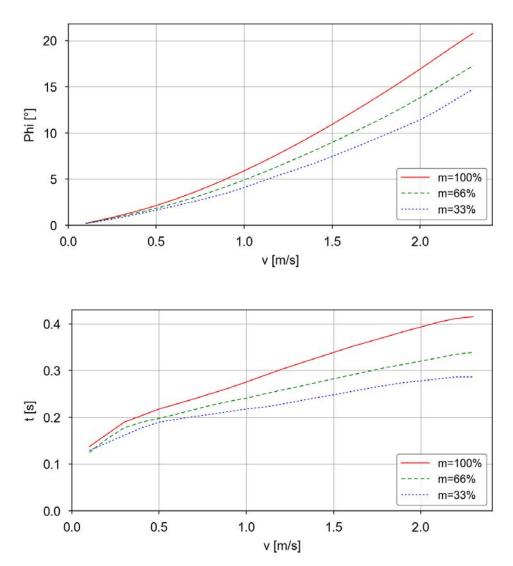
Extension zone 2, stopping distance and stopping time



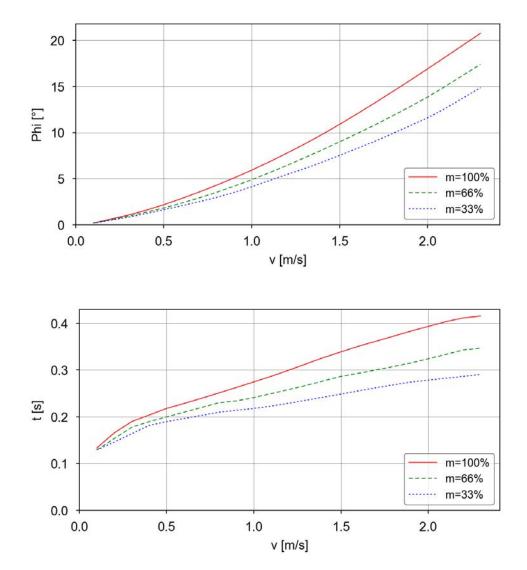
Continues on next page

15.11 IRB 6700Inv 2.60 m 300 kg Continued

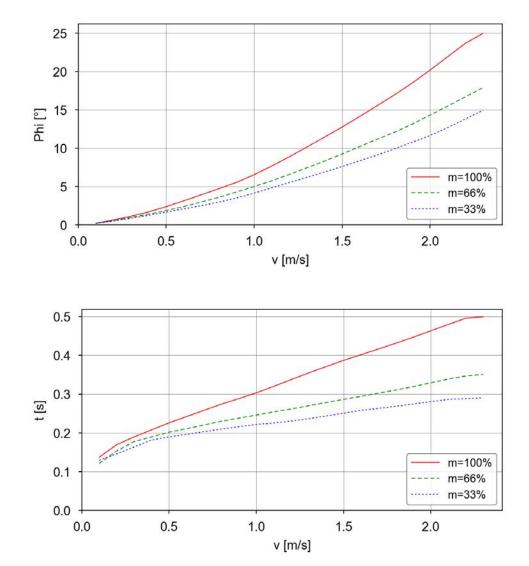
Category 1, Axis 3



15.11 IRB 6700Inv 2.60 m 300 kg Continued



15.11 IRB 6700Inv 2.60 m 300 kg Continued



15.12 IRB 6700Inv 2.90 m 245 kg

15.12 IRB 6700Inv 2.90 m 245 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

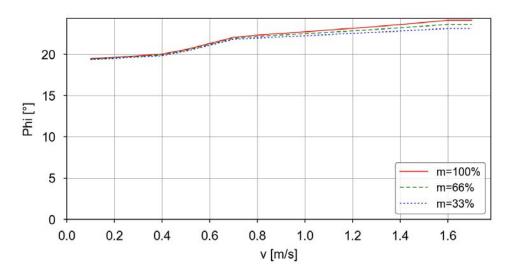
Axis	Distance (degrees)	Stop time (s)
1	31.4	0.54
2	20.0	0.34
3	13.2	0.2

Category 1, extension zones

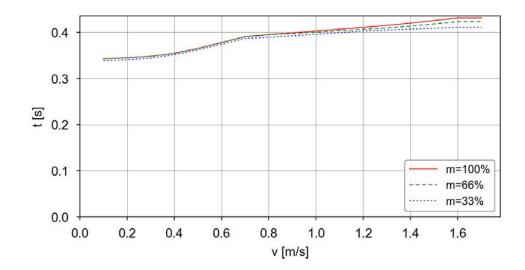
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.955
1	0.955	1.909
2	1.909	max reach

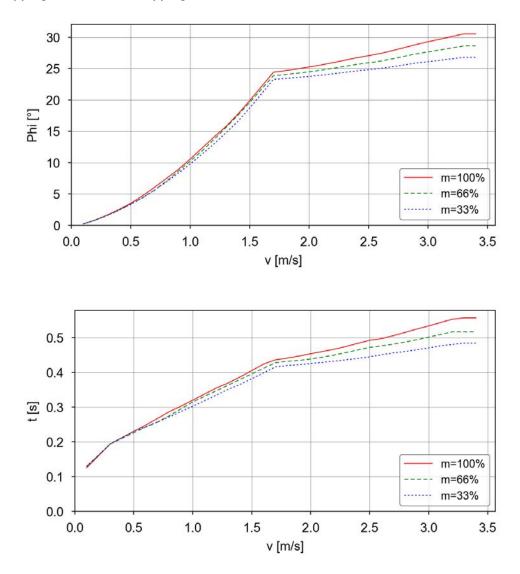
Category 1, Axis 1



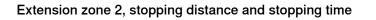
15.12 IRB 6700Inv 2.90 m 245 kg Continued

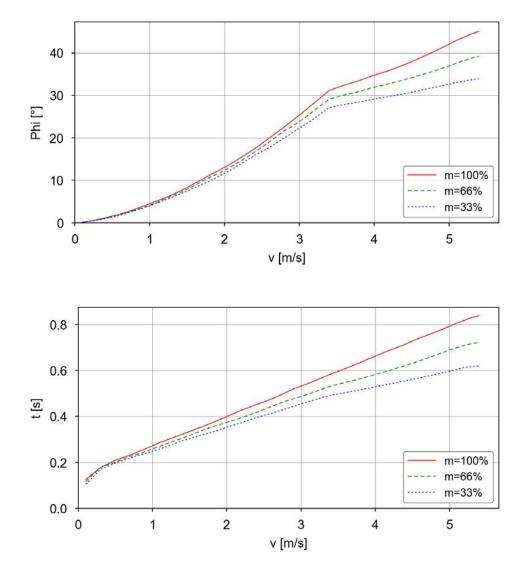


Extension zone 1, stopping distance and stopping time



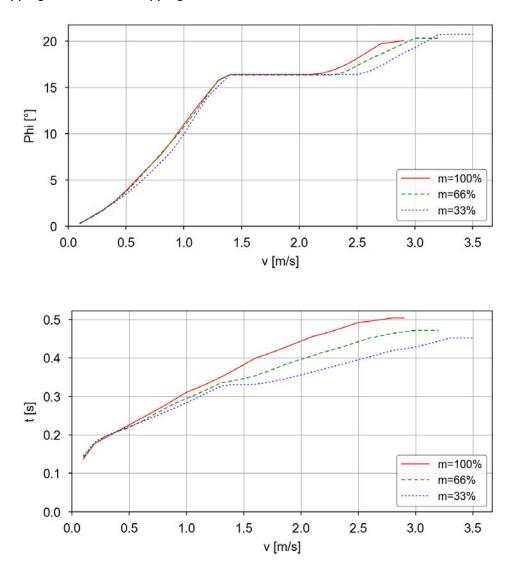
15.12 IRB 6700Inv 2.90 m 245 kg *Continued*



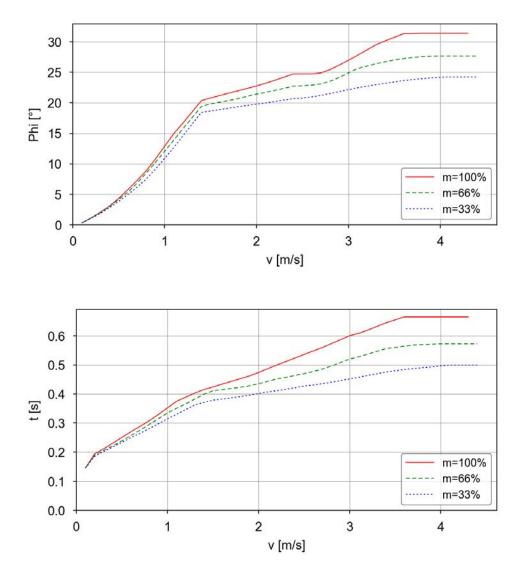


15.12 IRB 6700Inv 2.90 m 245 kg Continued

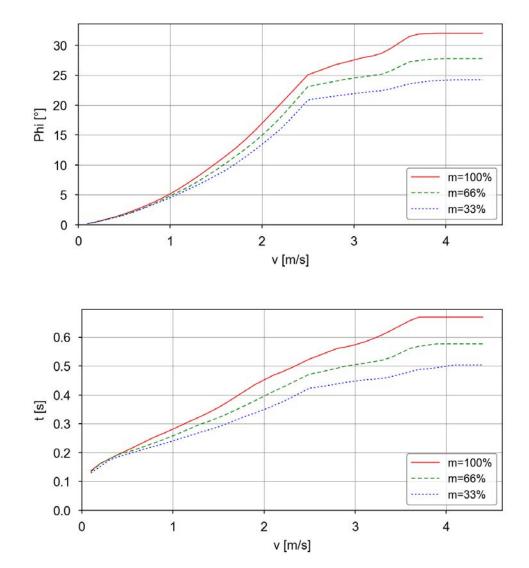
Category 1, Axis 2



15.12 IRB 6700Inv 2.90 m 245 kg *Continued*

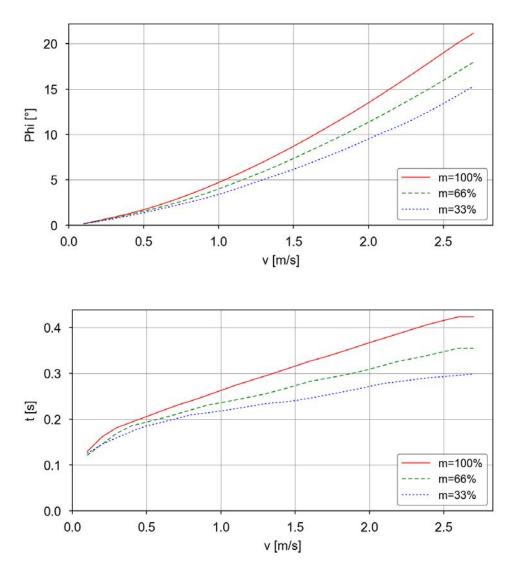


15.12 IRB 6700Inv 2.90 m 245 kg Continued

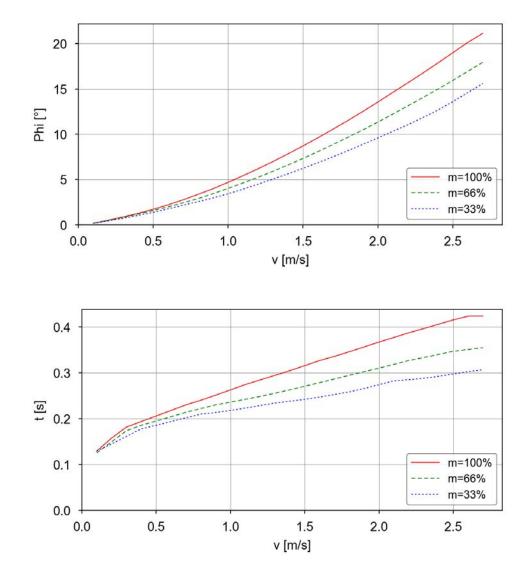


15.12 IRB 6700Inv 2.90 m 245 kg Continued

Category 1, Axis 3



15.12 IRB 6700Inv 2.90 m 245 kg Continued



15.12 IRB 6700Inv 2.90 m 245 kg *Continued*

> 20 15 Phi [°] 10 m=100% 5 m=66% m=33% 0 1.0 0.0 0.5 1.5 2.0 2.5 v [m/s] 0.4 0.3 t [s] 0.2 And the second second m=100% 0.1 m=66% m=33% 0.0 0.5 1.0 0.0 1.5 2.0 2.5 v [m/s]

15.13 IRB 6700LeanID 2.60 m 175 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

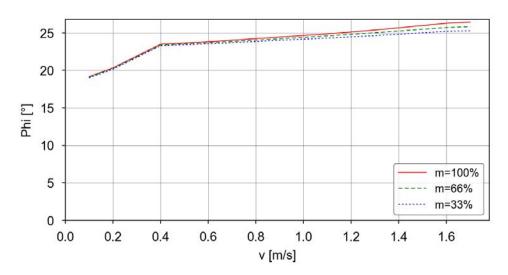
Axis	Distance (degrees)	Stop time (s)
1	36.6	0.58
2	24.4	0.34
3	15.7	0.2

Category 1, extension zones

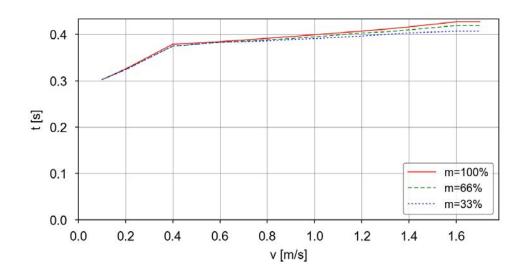
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.867
1	0.867	1.734
2	1.734	max reach

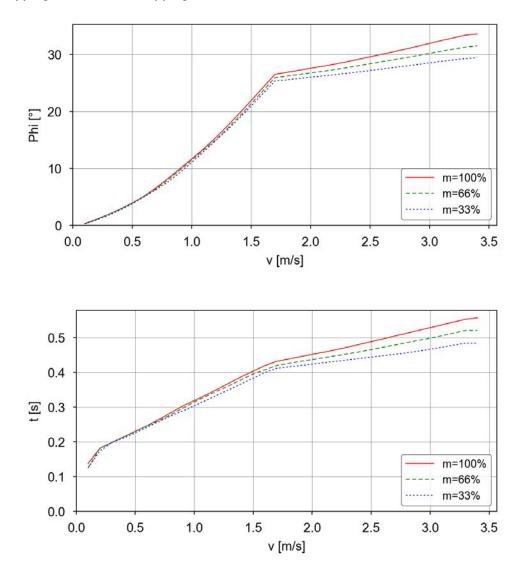
Category 1, Axis 1



15.13 IRB 6700LeanID 2.60 m 175 kg Continued



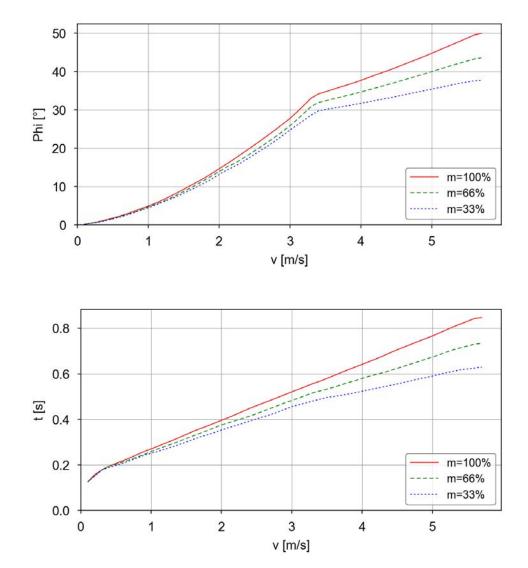
Extension zone 1, stopping distance and stopping time



Continues on next page

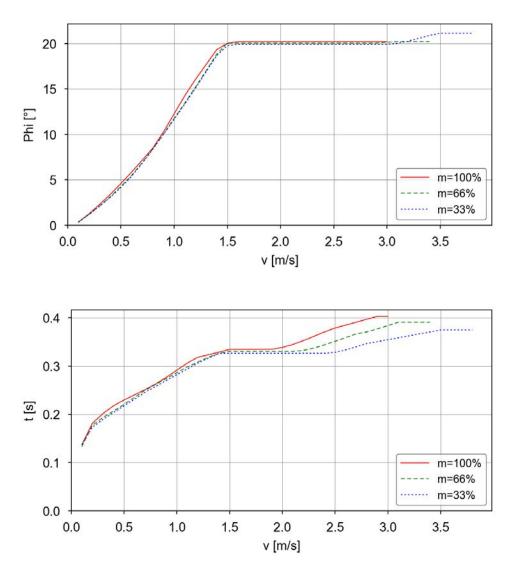
Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

15.13 IRB 6700LeanID 2.60 m 175 kg Continued

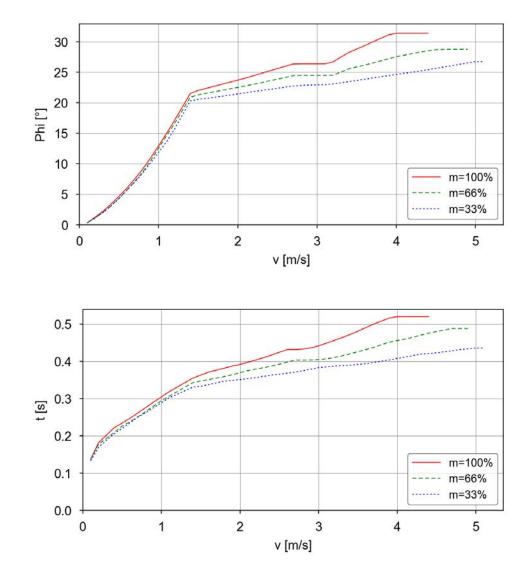


15.13 IRB 6700LeanID 2.60 m 175 kg Continued

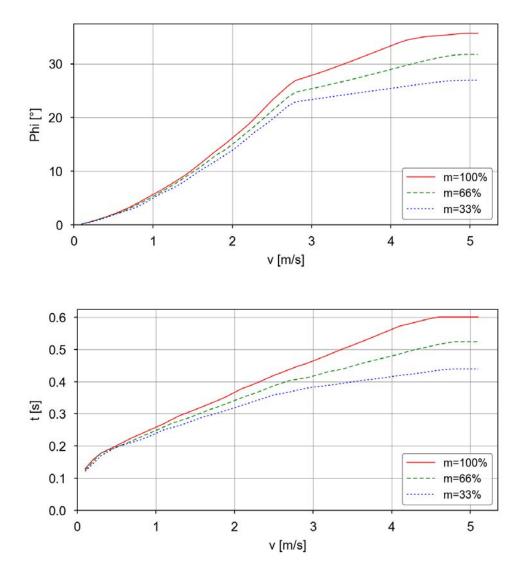
Category 1, Axis 2



15.13 IRB 6700LeanID 2.60 m 175 kg Continued

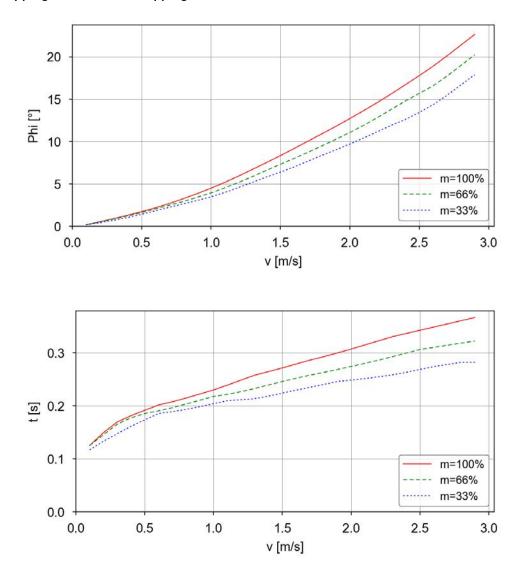


15.13 IRB 6700LeanID 2.60 m 175 kg Continued

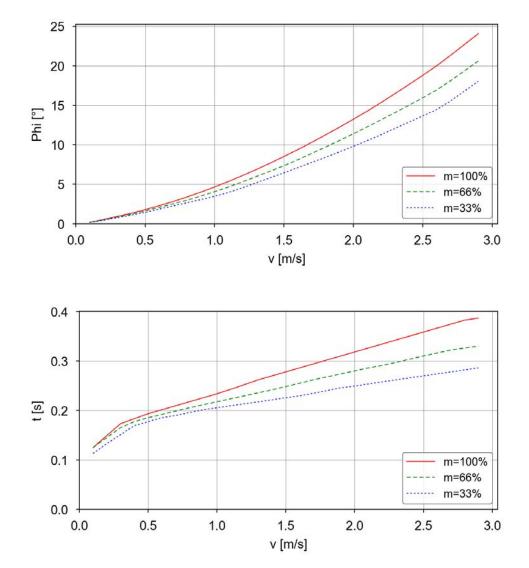


15.13 IRB 6700LeanID 2.60 m 175 kg Continued

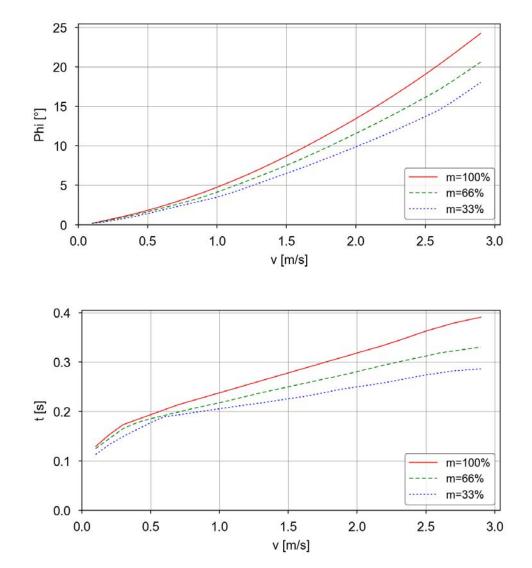
Category 1, Axis 3



15.13 IRB 6700LeanID 2.60 m 175 kg Continued



15.13 IRB 6700LeanID 2.60 m 175 kg Continued



15.14 IRB 6700LeanID 2.65 m 220 kg

15.14 IRB 6700LeanID 2.65 m 220 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

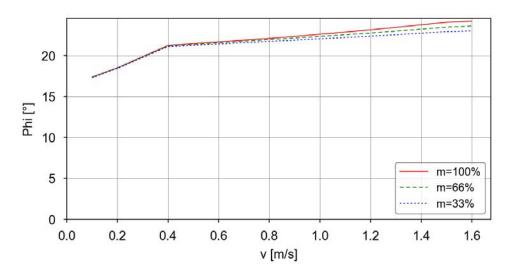
Axis	Distance (degrees)	Stop time (s)
1	35.8	0.63
2	19.5	0.34
3	12.3	0.17

Category 1, extension zones

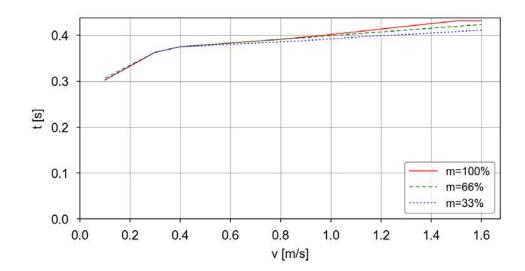
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.883
1	0.883	1.767
2	1.767	max reach

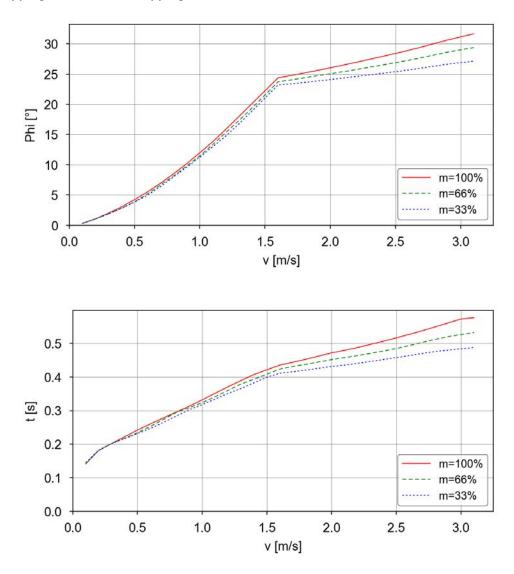
Category 1, Axis 1



15.14 IRB 6700LeanID 2.65 m 220 kg Continued

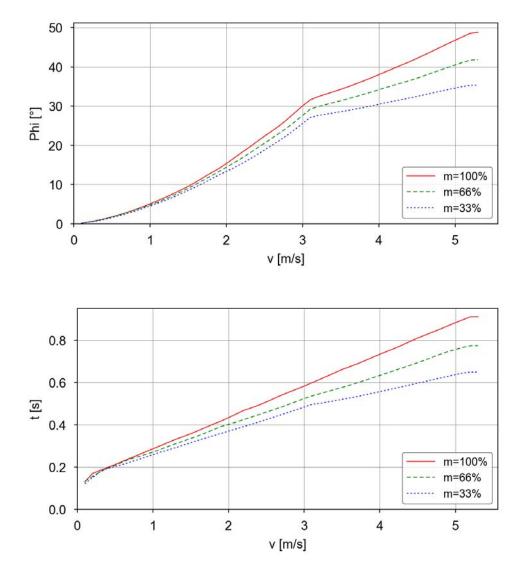


Extension zone 1, stopping distance and stopping time



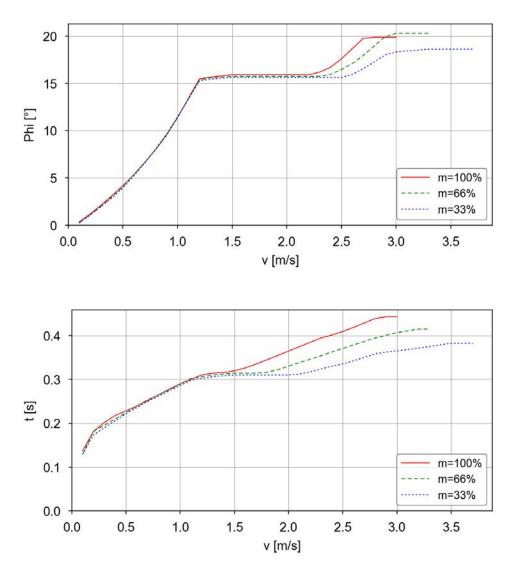
Continues on next page

15.14 IRB 6700LeanID 2.65 m 220 kg Continued

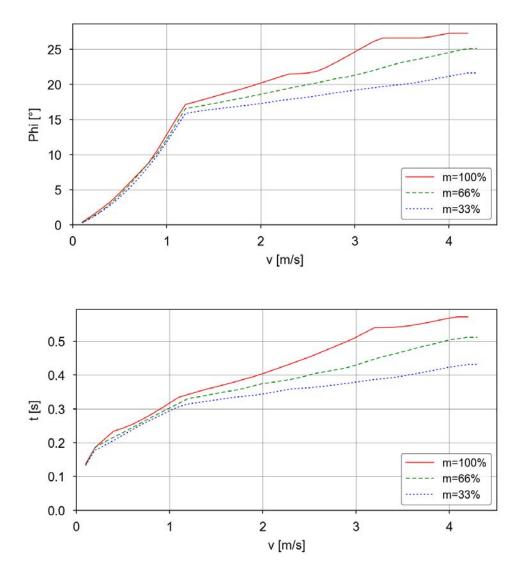


15.14 IRB 6700LeanID 2.65 m 220 kg Continued

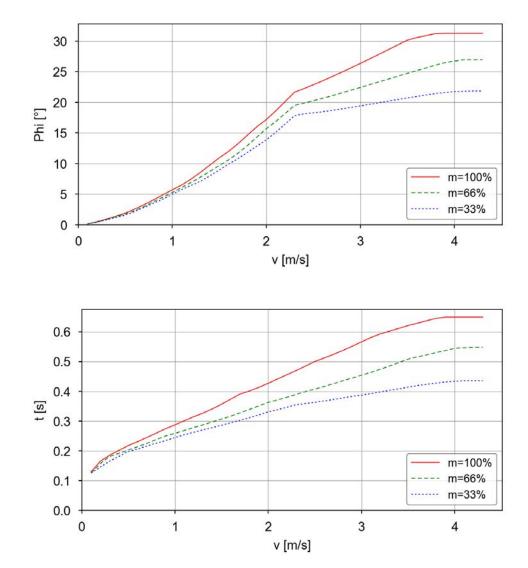
Category 1, Axis 2



15.14 IRB 6700LeanID 2.65 m 220 kg Continued



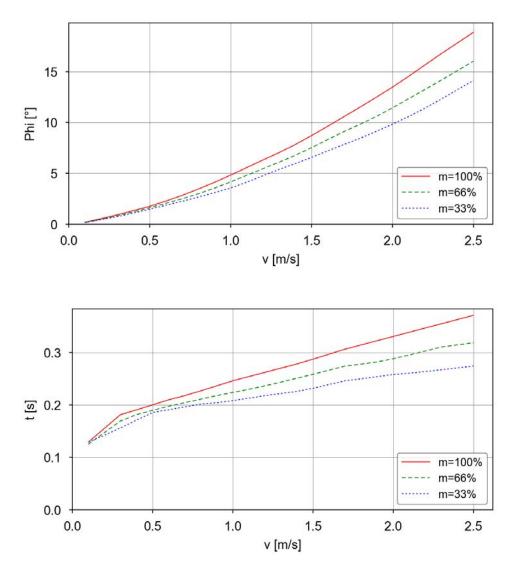
15.14 IRB 6700LeanID 2.65 m 220 kg Continued



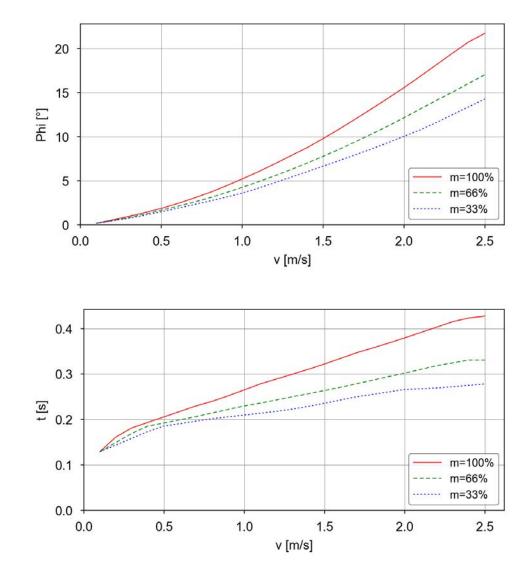
15 IRB 6700

15.14 IRB 6700LeanID 2.65 m 220 kg Continued

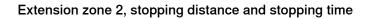
Category 1, Axis 3

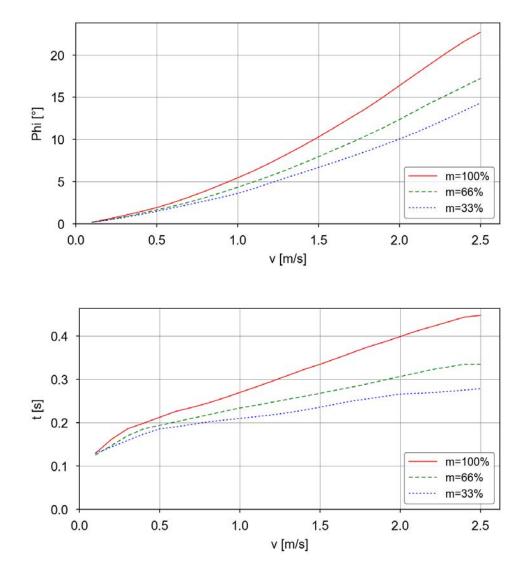


15.14 IRB 6700LeanID 2.65 m 220 kg Continued



15.14 IRB 6700LeanID 2.65 m 220 kg Continued





15.15 IRB 6700LeanID 2.70 m 270 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

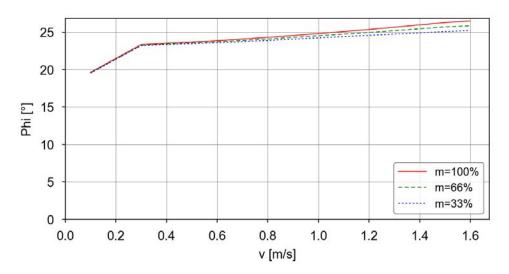
Axis	Distance (degrees)	Stop time (s)
1	35.2	0.61
2	20.8	0.37
3	14.9	0.22

Category 1, extension zones

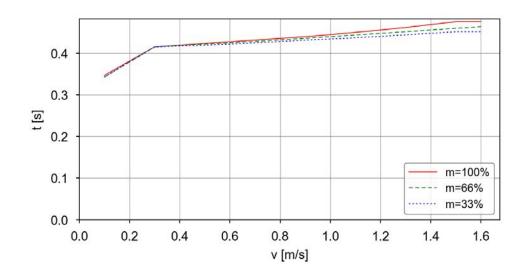
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.907
1	0.907	1.813
2	1.813	max reach

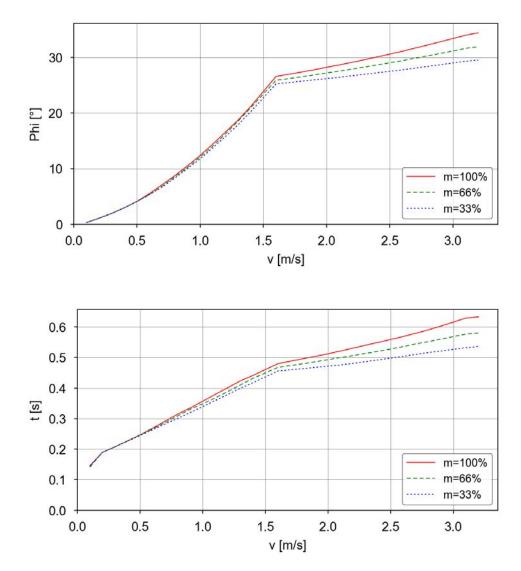
Category 1, Axis 1



15.15 IRB 6700LeanID 2.70 m 270 kg Continued

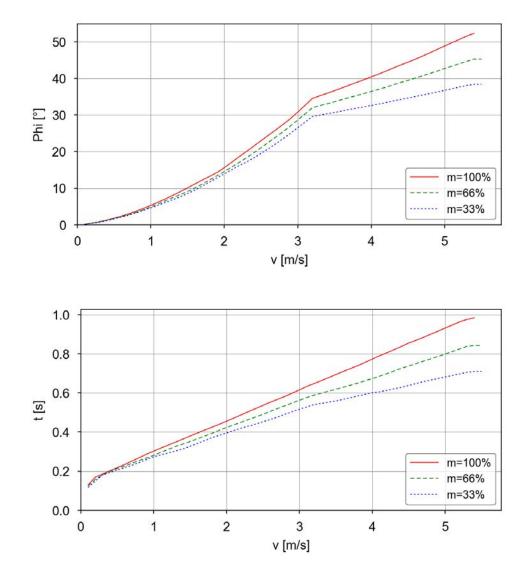


Extension zone 1, stopping distance and stopping time



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15.15 IRB 6700LeanID 2.70 m 270 kg Continued

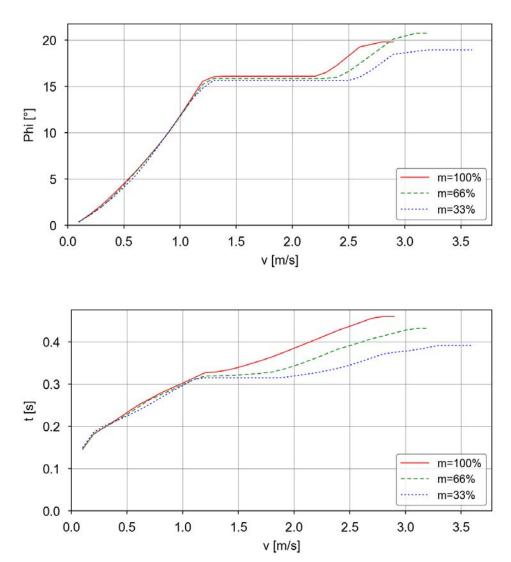


Extension zone 2, stopping distance and stopping time

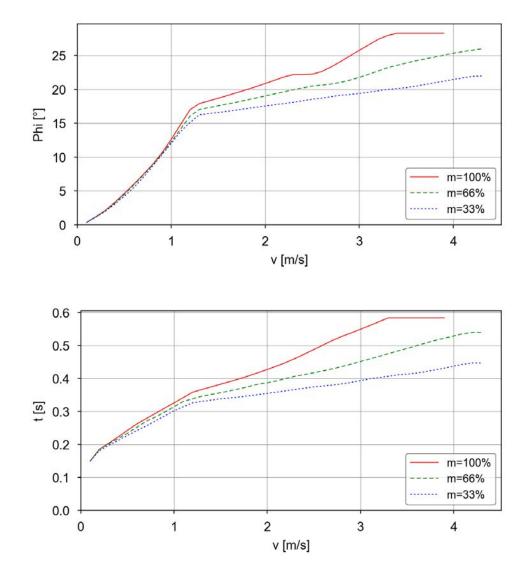
15 IRB 6700

15.15 IRB 6700LeanID 2.70 m 270 kg Continued

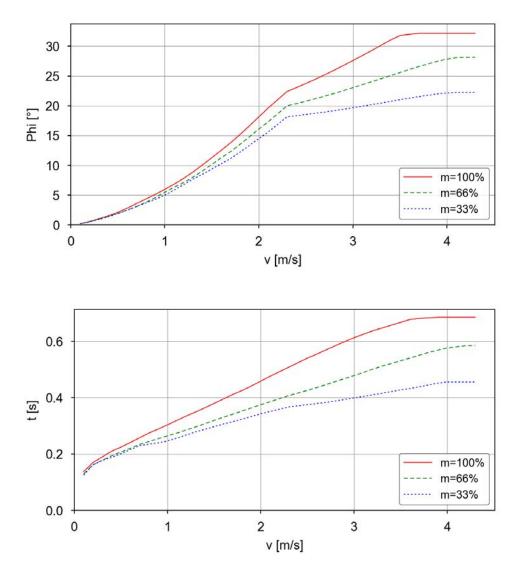
Category 1, Axis 2



15.15 IRB 6700LeanID 2.70 m 270 kg Continued

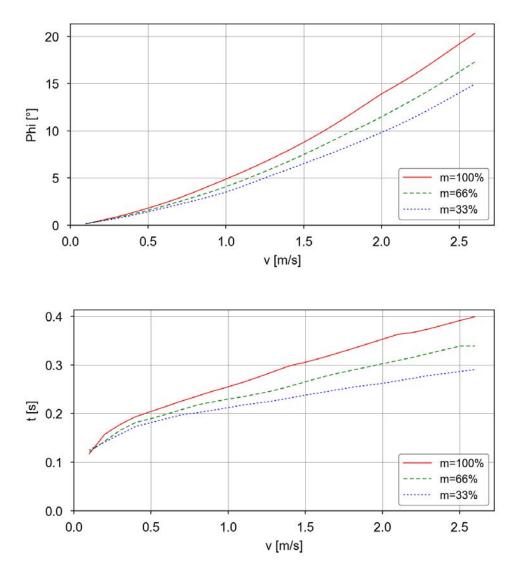


15.15 IRB 6700LeanID 2.70 m 270 kg *Continued*

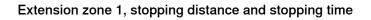


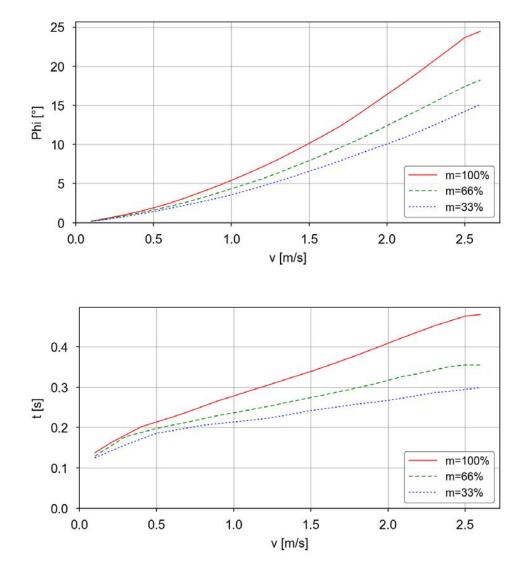
15.15 IRB 6700LeanID 2.70 m 270 kg Continued

Category 1, Axis 3

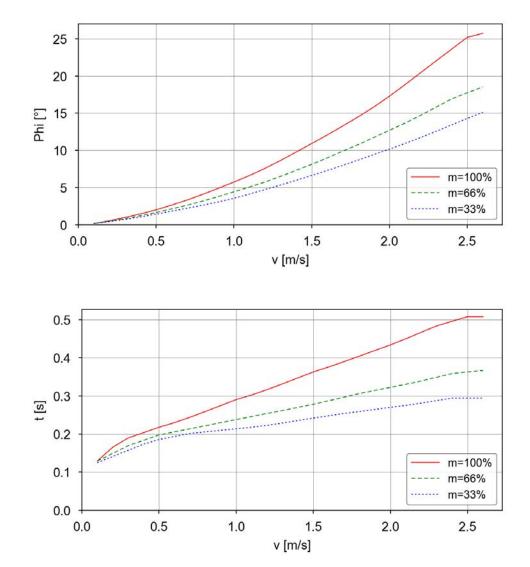


15.15 IRB 6700LeanID 2.70 m 270 kg *Continued*





15.15 IRB 6700LeanID 2.70 m 270 kg Continued



15.16 IRB 6700LeanID 2.80 m 200 kg

15.16 IRB 6700LeanID 2.80 m 200 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

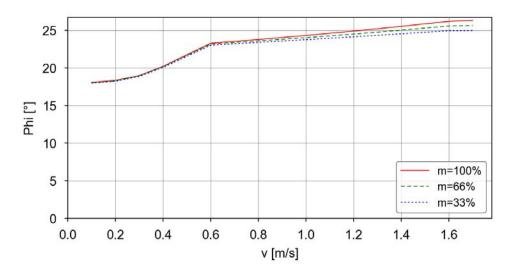
Axis	Distance (degrees)	Stop time (s)
1	39.0	0.68
2	20.3	0.37
3	13.2	0.2

Category 1, extension zones

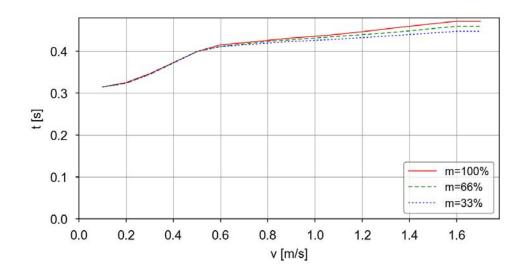
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.931
1	0.931	1.863
2	1.863	max reach

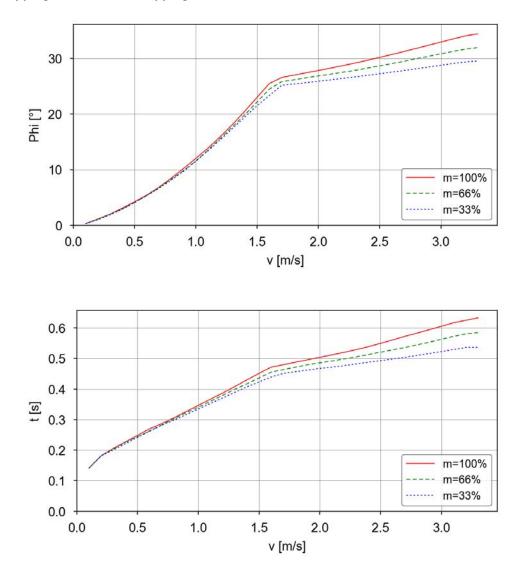
Category 1, Axis 1



15.16 IRB 6700LeanID 2.80 m 200 kg Continued

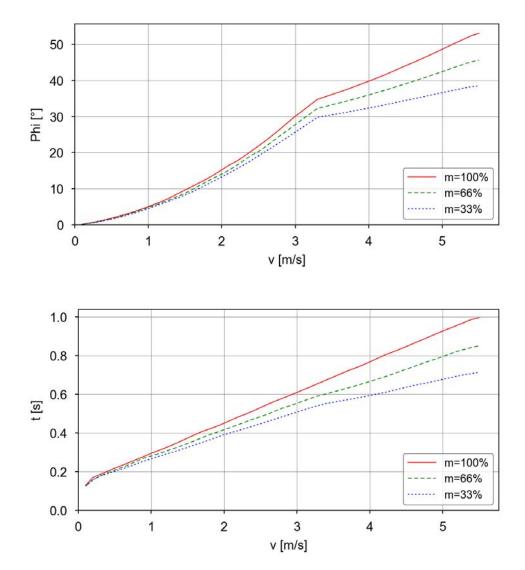


Extension zone 1, stopping distance and stopping time



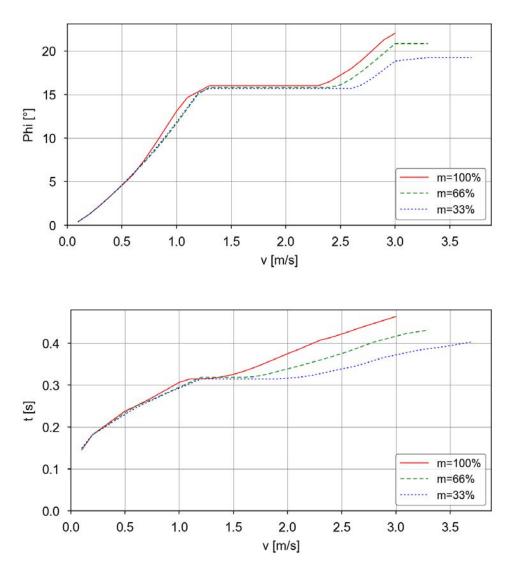
Continues on next page

15.16 IRB 6700LeanID 2.80 m 200 kg *Continued*

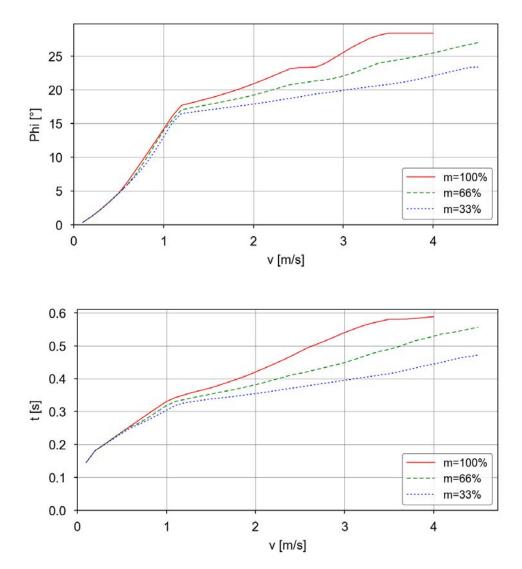


15.16 IRB 6700LeanID 2.80 m 200 kg Continued

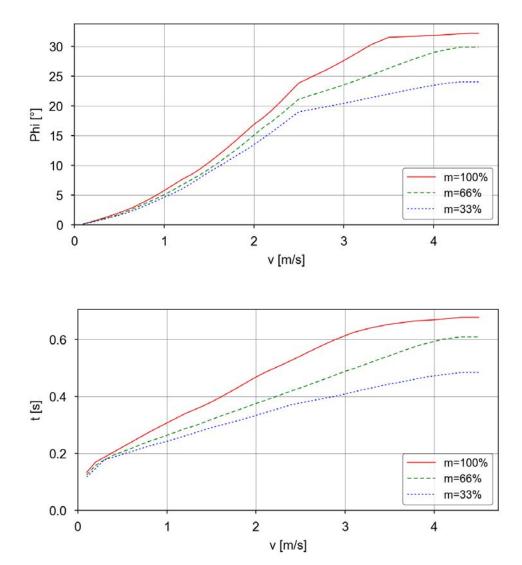
Category 1, Axis 2



15.16 IRB 6700LeanID 2.80 m 200 kg *Continued*



15.16 IRB 6700LeanID 2.80 m 200 kg Continued

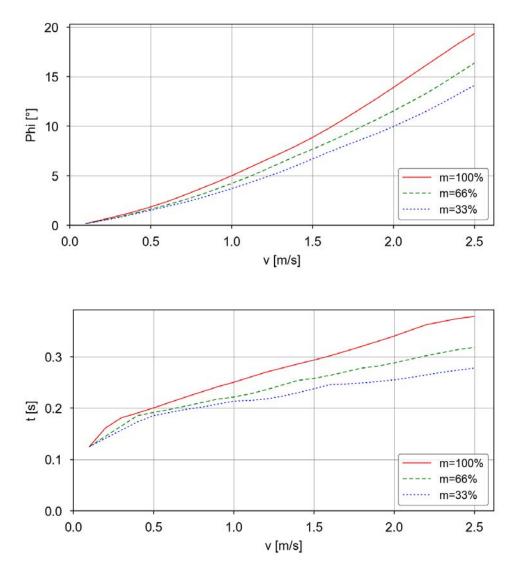


Extension zone 2, stopping distance and stopping time

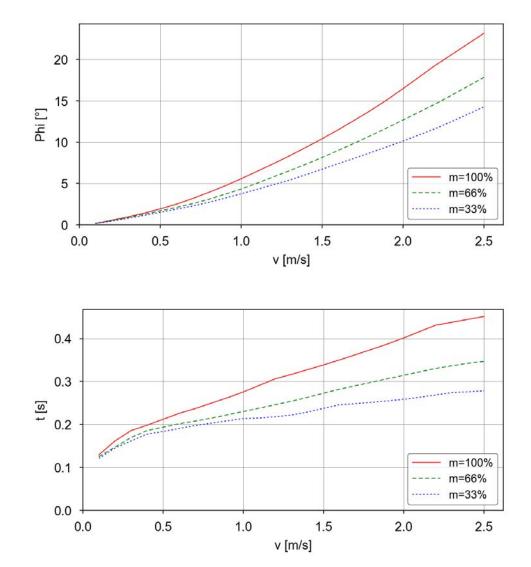
15 IRB 6700

15.16 IRB 6700LeanID 2.80 m 200 kg *Continued*

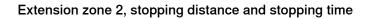
Category 1, Axis 3

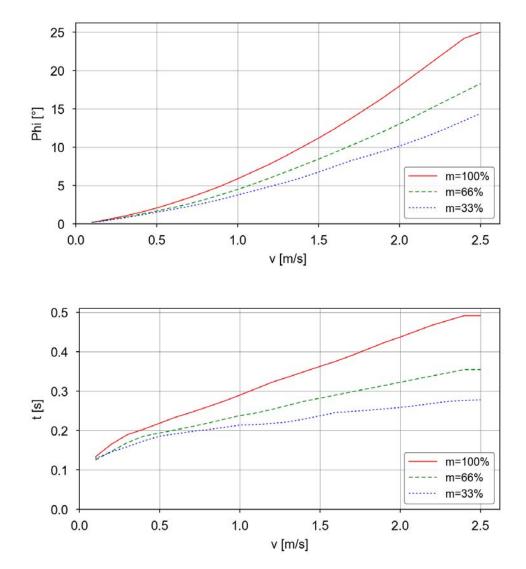


15.16 IRB 6700LeanID 2.80 m 200 kg Continued



15.16 IRB 6700LeanID 2.80 m 200 kg *Continued*





15.17 IRB 6700LeanID 2.85 m 140 kg

15.17 IRB 6700LeanID 2.85 m 140 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

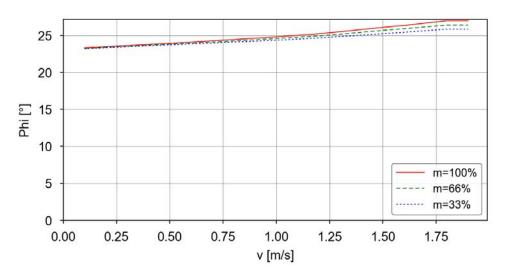
Axis	Distance (degrees)	Stop time (s)
1	38.9	0.61
2	25.0	0.37
3	17.7	0.22

Category 1, extension zones

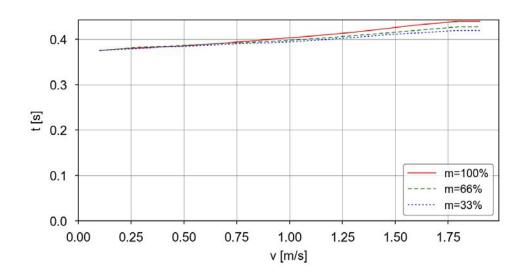
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.949
1	0.949	1.898
2	1.898	max reach

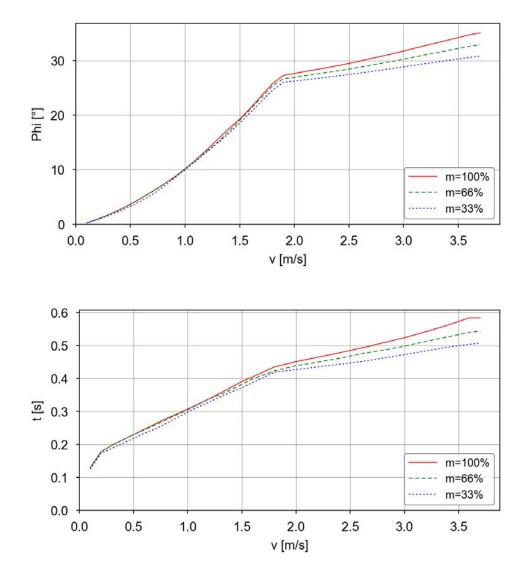
Category 1, Axis 1



15.17 IRB 6700LeanID 2.85 m 140 kg Continued



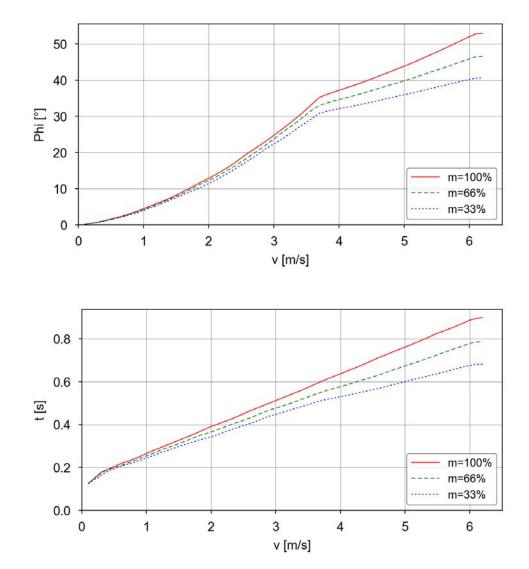
Extension zone 1, stopping distance and stopping time



Continues on next page 496

Product specification - Robot stopping distances according to ISO 10218-1 3HAC048645-001 Revision: AC

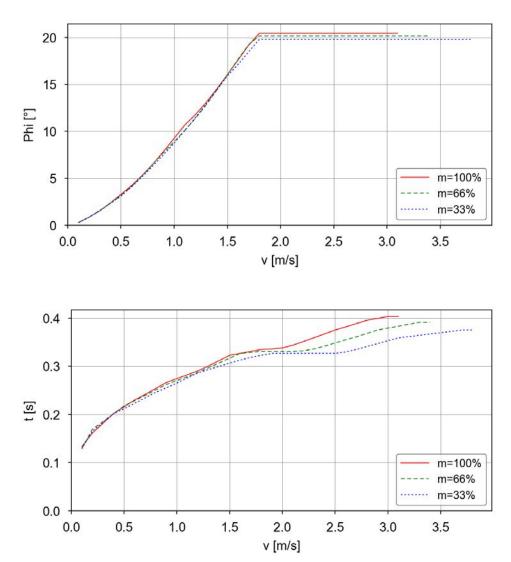
15.17 IRB 6700LeanID 2.85 m 140 kg Continued



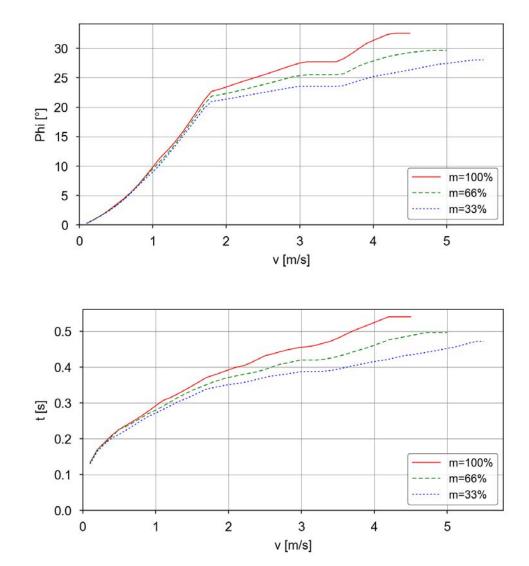
15 IRB 6700

15.17 IRB 6700LeanID 2.85 m 140 kg Continued

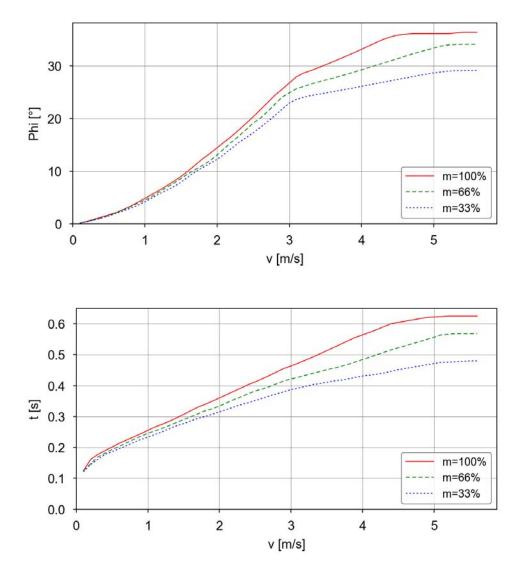
Category 1, Axis 2



15.17 IRB 6700LeanID 2.85 m 140 kg Continued

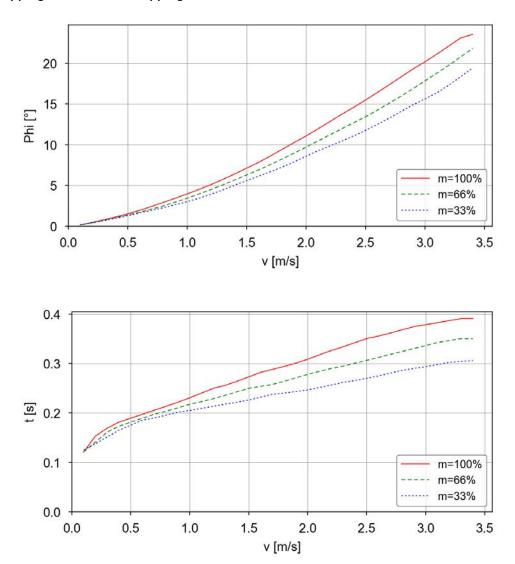


15.17 IRB 6700LeanID 2.85 m 140 kg Continued

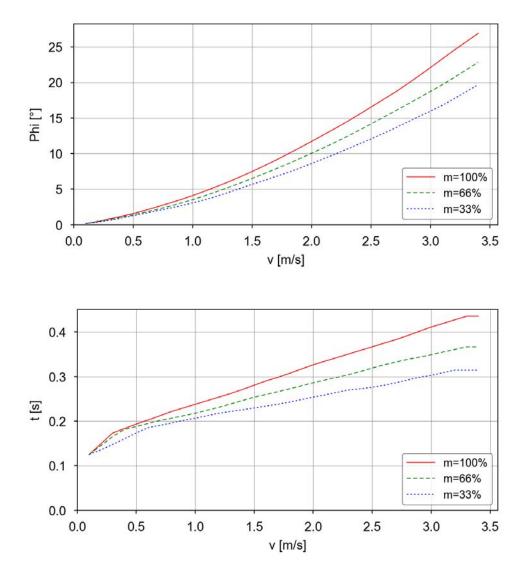


15.17 IRB 6700LeanID 2.85 m 140 kg Continued

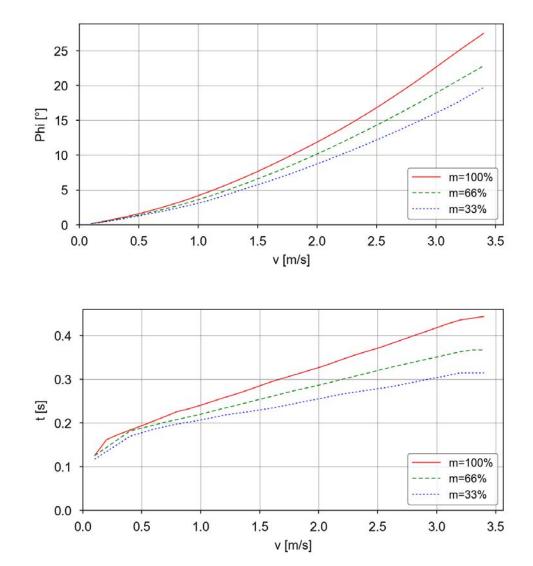
Category 1, Axis 3



15.17 IRB 6700LeanID 2.85 m 140 kg Continued



15.17 IRB 6700LeanID 2.85 m 140 kg Continued



15.18 IRB 6700LeanID 3.00 m 220 kg

15.18 IRB 6700LeanID 3.00 m 220 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

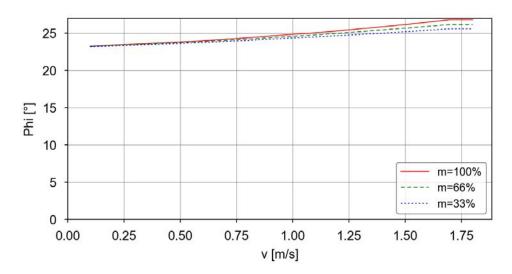
Axis	Distance (degrees)	Stop time (s)
1	36.6	0.63
2	20.9	0.37
3	16.1	0.25

Category 1, extension zones

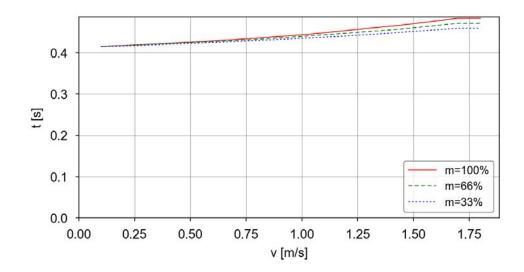
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.989
1	0.989	1.978
2	1.978	max reach

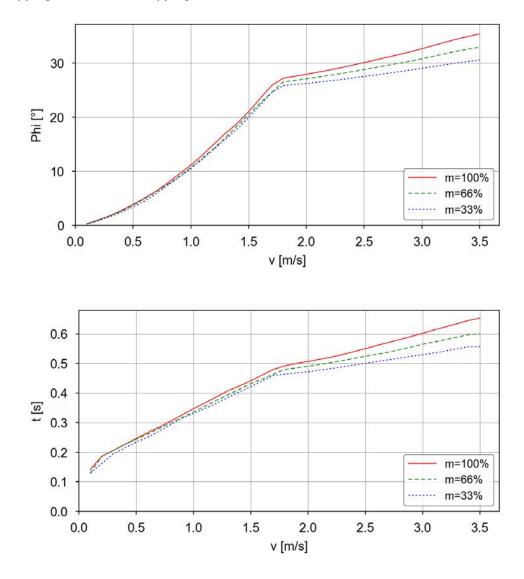
Category 1, Axis 1



15.18 IRB 6700LeanID 3.00 m 220 kg Continued

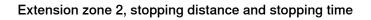


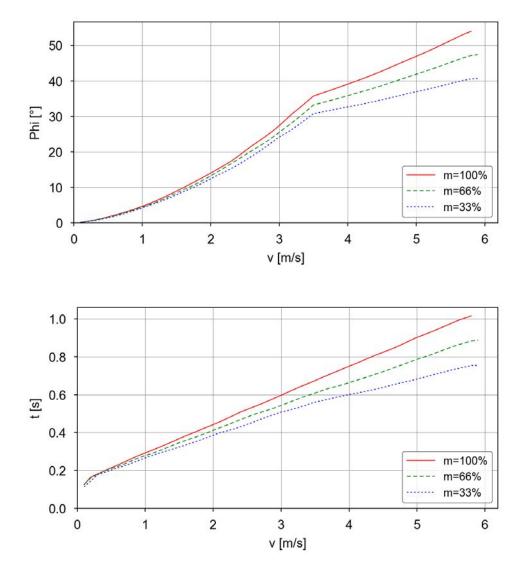
Extension zone 1, stopping distance and stopping time



Continues on next page

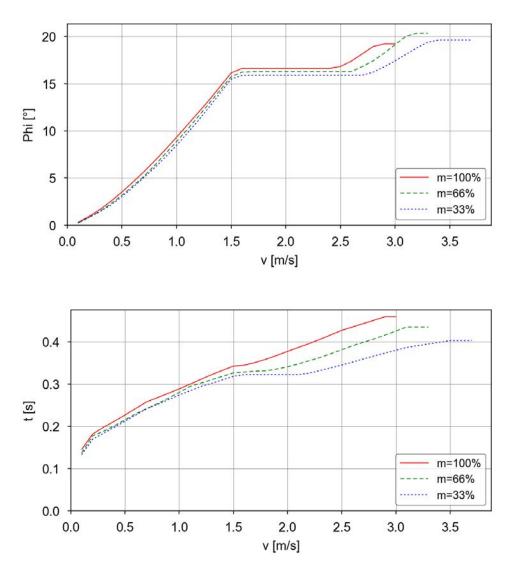
15.18 IRB 6700LeanID 3.00 m 220 kg Continued



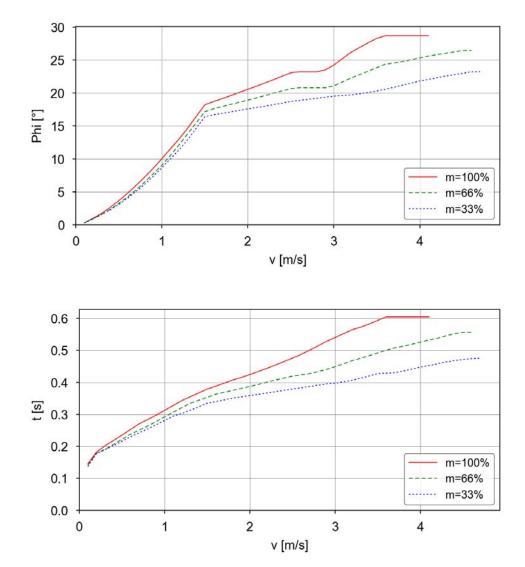


15.18 IRB 6700LeanID 3.00 m 220 kg Continued

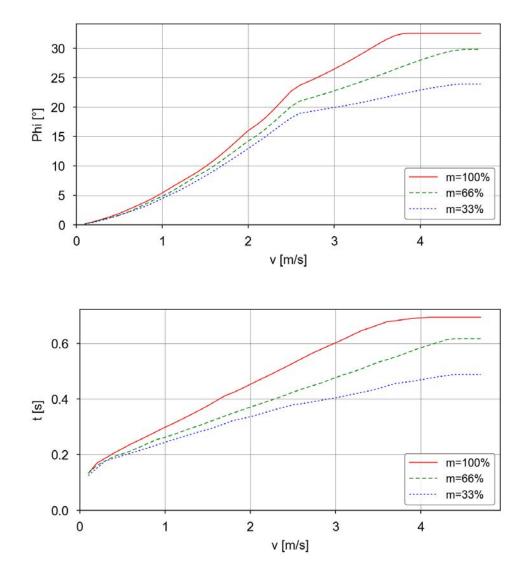
Category 1, Axis 2



15.18 IRB 6700LeanID 3.00 m 220 kg *Continued*

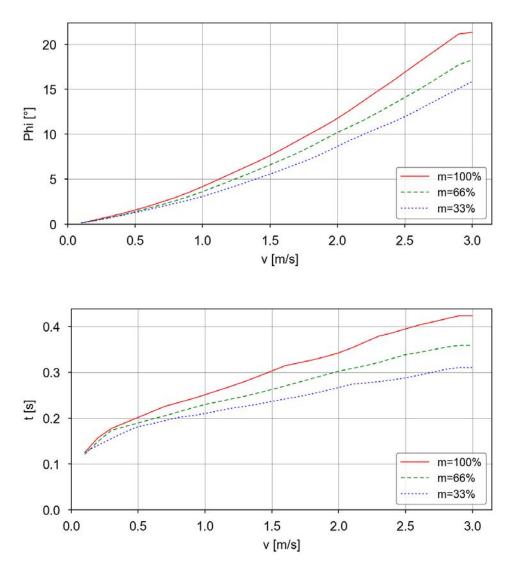


15.18 IRB 6700LeanID 3.00 m 220 kg Continued

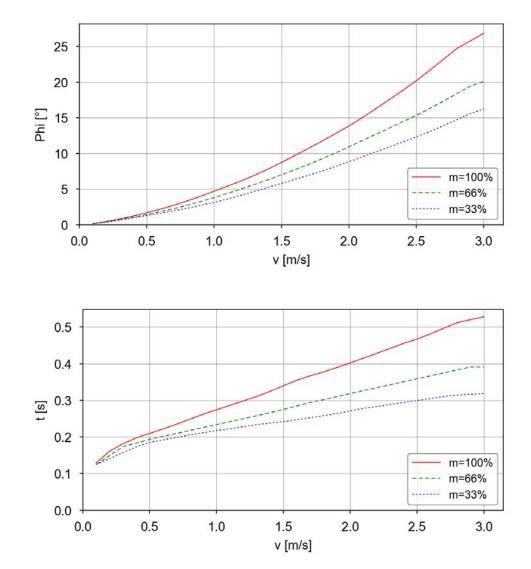


15.18 IRB 6700LeanID 3.00 m 220 kg Continued

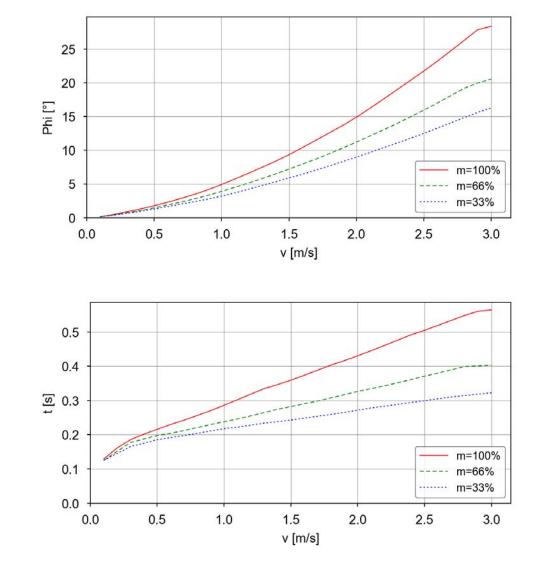
Category 1, Axis 3



15.18 IRB 6700LeanID 3.00 m 220 kg Continued



15.18 IRB 6700LeanID 3.00 m 220 kg Continued



15.19 IRB 6700LeanID 3.05 m 155 kg

15.19 IRB 6700LeanID 3.05 m 155 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

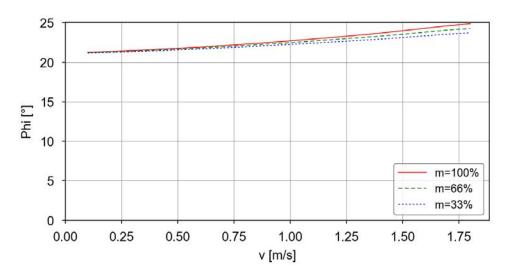
Axis	Distance (degrees)	Stop time (s)
1	38.4	0.68
2	20.2	0.37
3	14.2	0.22

Category 1, extension zones

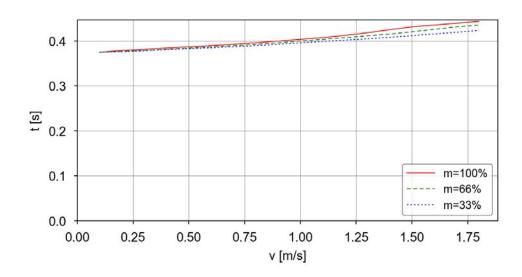
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.019
1	1.019	2.037
2	2.037	max reach

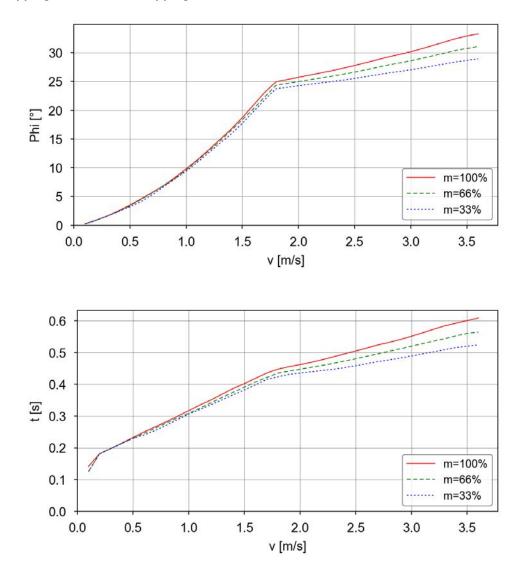
Category 1, Axis 1



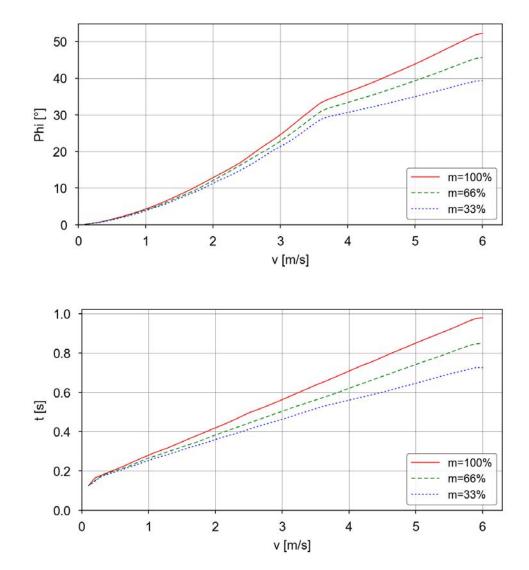
15.19 IRB 6700LeanID 3.05 m 155 kg Continued



Extension zone 1, stopping distance and stopping time

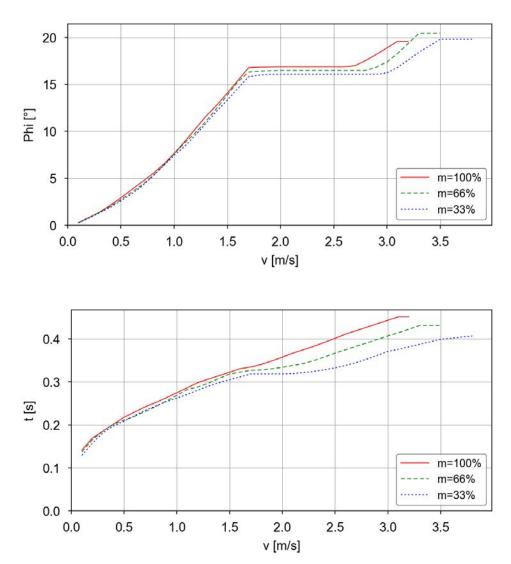


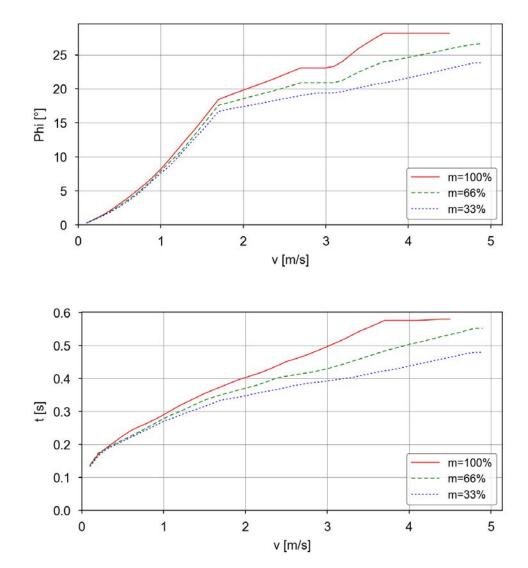
Continues on next page



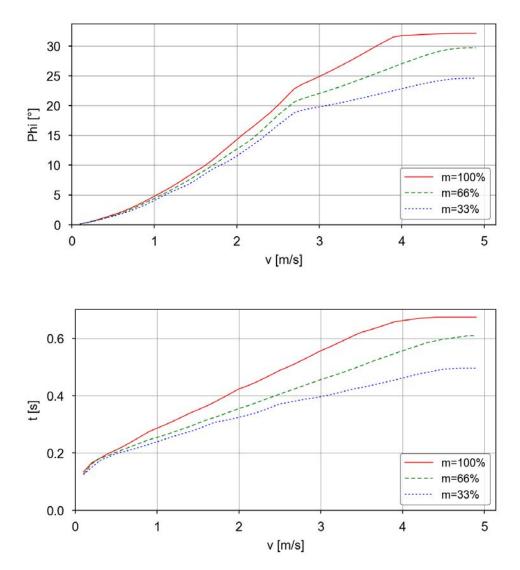
15.19 IRB 6700LeanID 3.05 m 155 kg Continued

Category 1, Axis 2

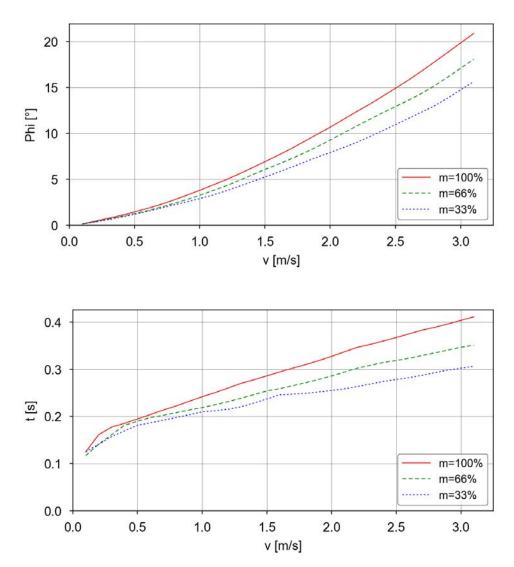




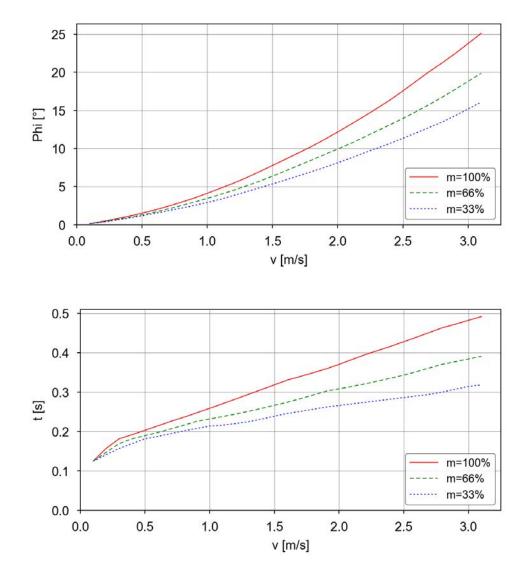
15.19 IRB 6700LeanID 3.05 m 155 kg Continued

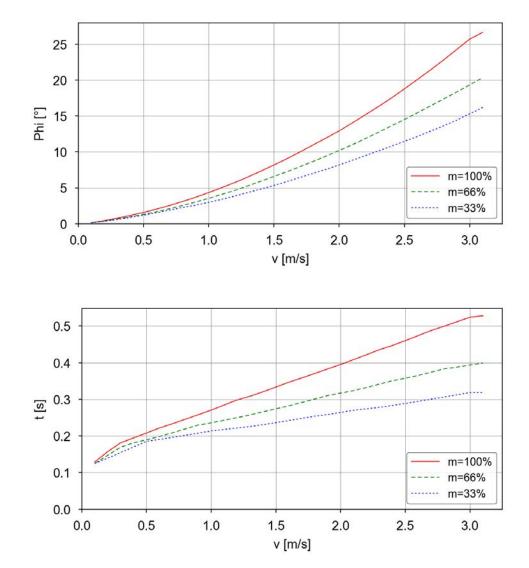


Category 1, Axis 3



15.19 IRB 6700LeanID 3.05 m 155 kg Continued





15.20 IRB 6700LeanID 3.20 m 145 kg

15.20 IRB 6700LeanID 3.20 m 145 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

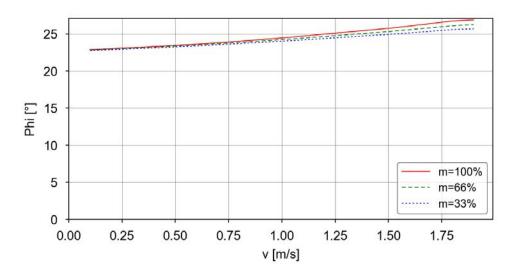
Axis	Distance (degrees)	Stop time (s)
1	40.6	0.73
2	20.9	0.37
3	14.7	0.22

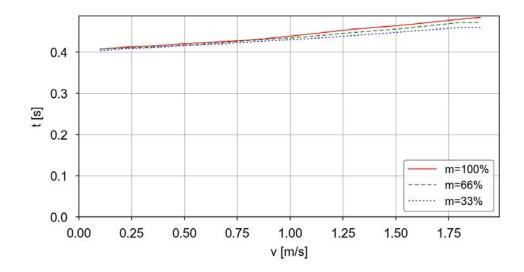
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

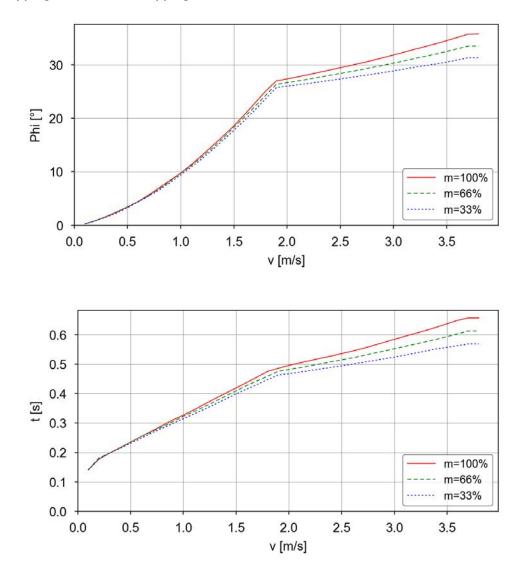
Zone	wcp min (m)	wcp max (m)
0	0	1.067
1	1.067	2.133
2	2.133	max reach

Category 1, Axis 1

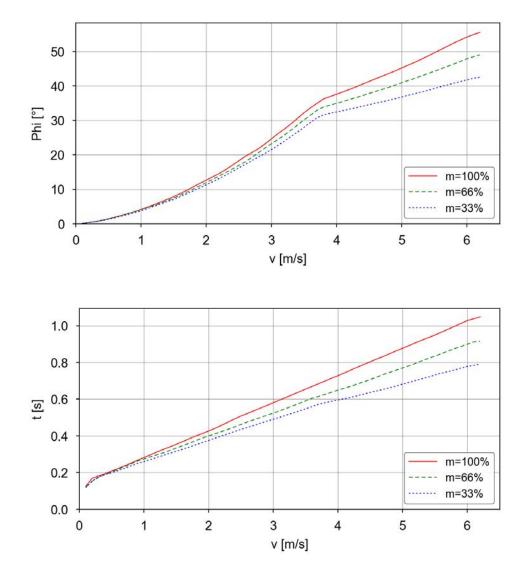




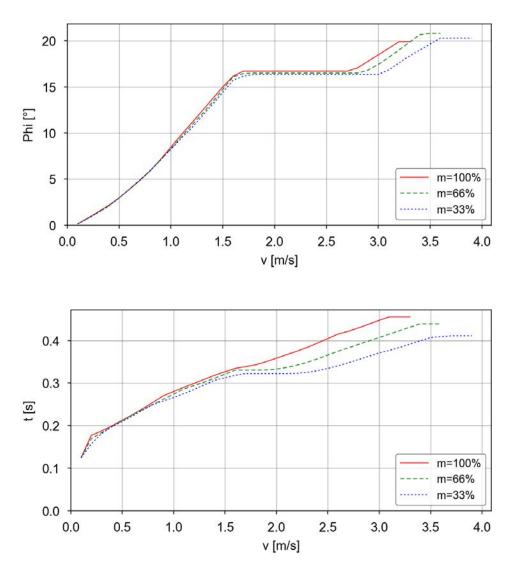
Extension zone 1, stopping distance and stopping time

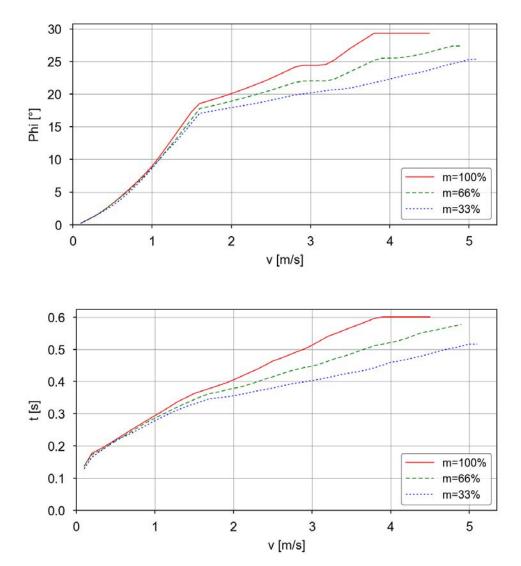


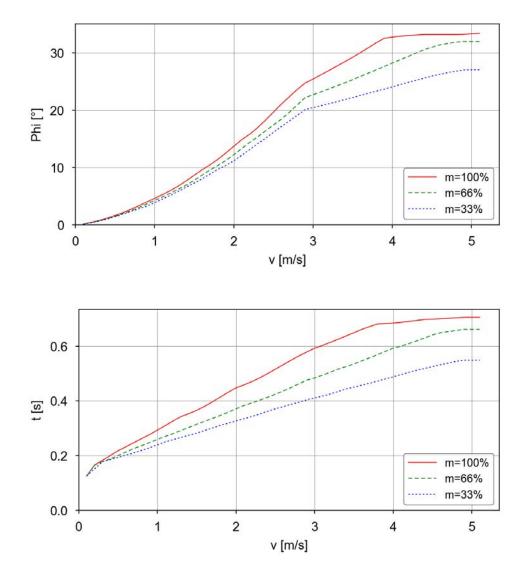
Continues on next page



Category 1, Axis 2

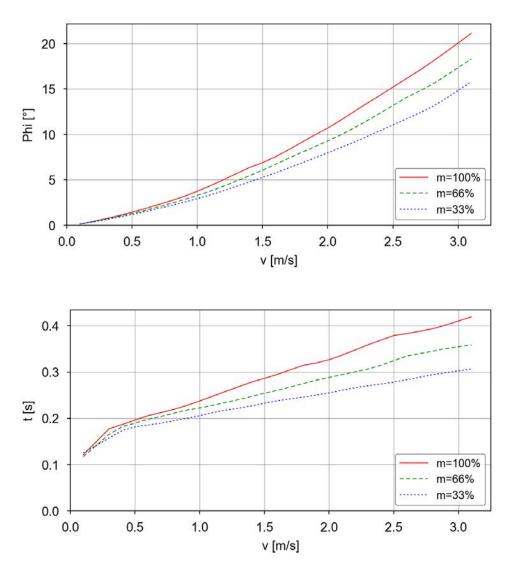


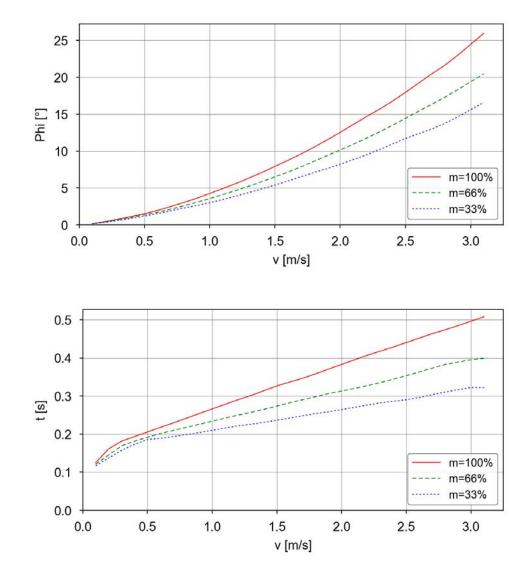


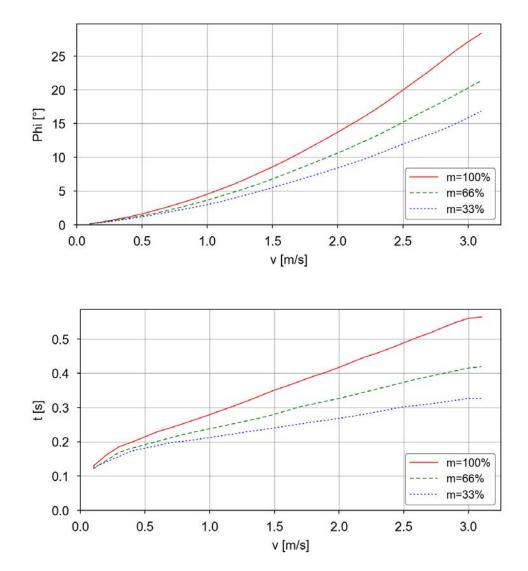


15.20 IRB 6700LeanID 3.20 m 145 kg Continued

Category 1, Axis 3







16.1 IRB 6790 2.65 m 235 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

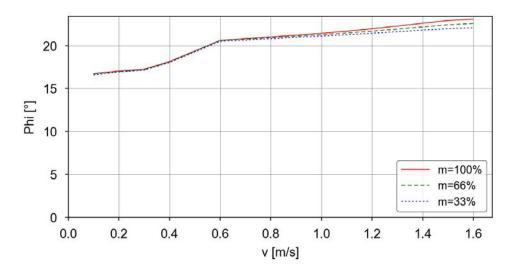
Axis	Distance (degrees)	Stop time (s)
1	38.2	0.68
2	20.3	0.37
3	14.4	0.22

Category 1, extension zones

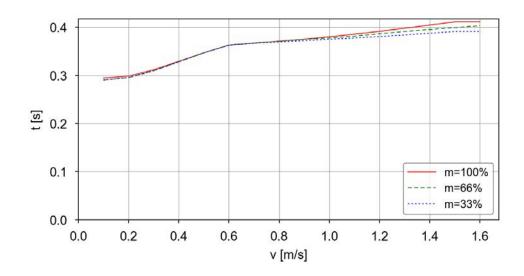
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.883
1	0.883	1.767
2	1.767	max reach

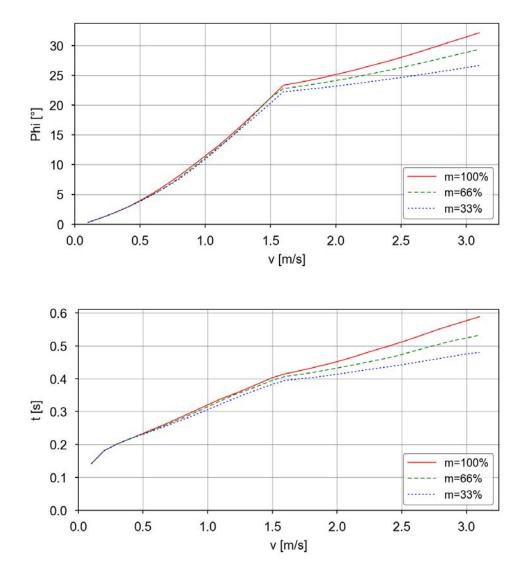
Category 1, Axis 1



16.1 IRB 6790 2.65 m 235 kg Continued

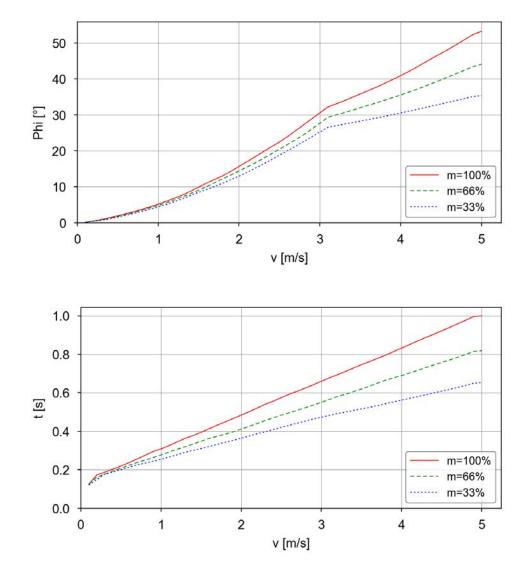


Extension zone 1, stopping distance and stopping time



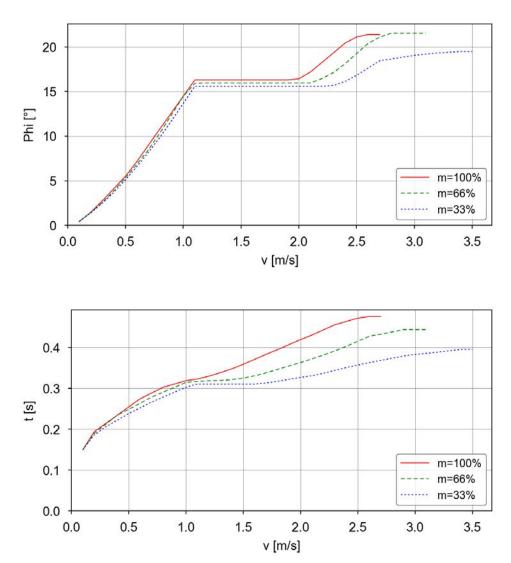
Continues on next page

16.1 IRB 6790 2.65 m 235 kg Continued

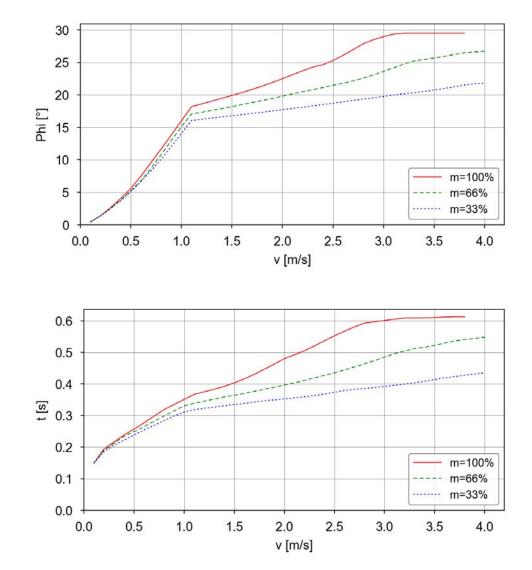


16.1 IRB 6790 2.65 m 235 kg Continued

Category 1, Axis 2



16.1 IRB 6790 2.65 m 235 kg Continued



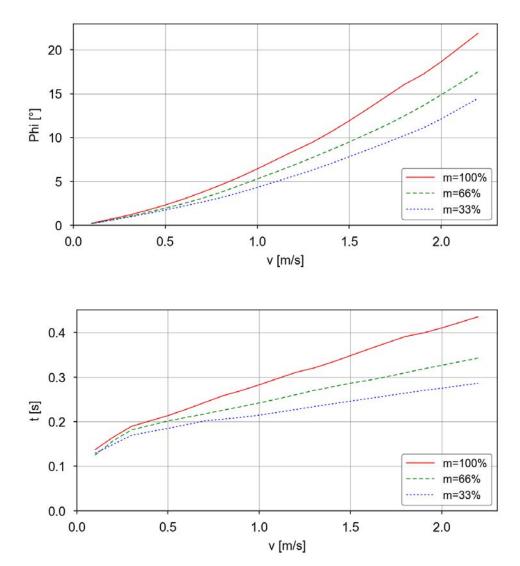
16.1 IRB 6790 2.65 m 235 kg Continued

30 25 20 Phi [°] 15 10 m=100% 5 -- m=66% m=33% 0 0.5 1.0 1.5 2.0 2.5 3.0 0.0 3.5 4.0 v [m/s] 0.6 0.4 t [s] ----ALT BOTTO 0.2 m=100% -- m=66% m=33% 0.0 2.0 0.0 0.5 1.5 2.5 3.0 1.0 3.5 4.0 v [m/s]

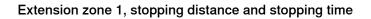
16.1 IRB 6790 2.65 m 235 kg Continued

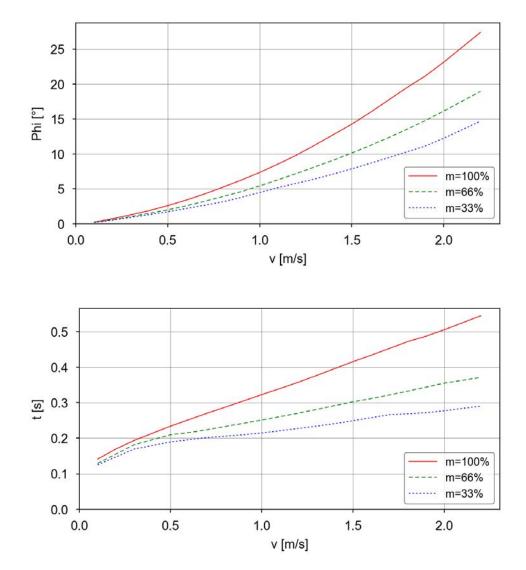
Category 1, Axis 3

Extension zone 0, stopping distance and stopping time

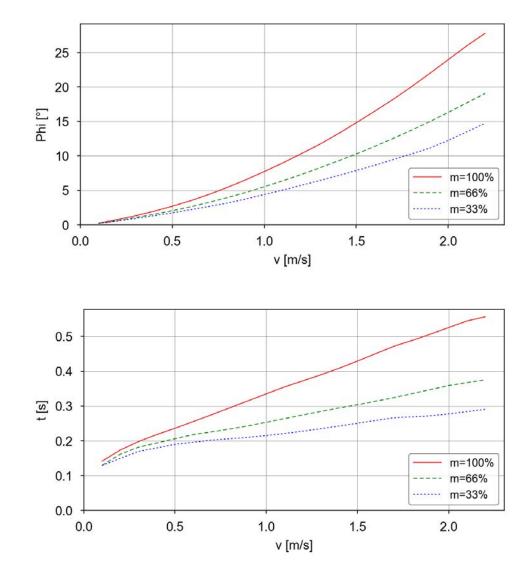


16.1 IRB 6790 2.65 m 235 kg Continued





16.1 IRB 6790 2.65 m 235 kg Continued



Extension zone 2, stopping distance and stopping time

16.2 IRB 6790 2.80 m 205 kg

16.2 IRB 6790 2.80 m 205 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

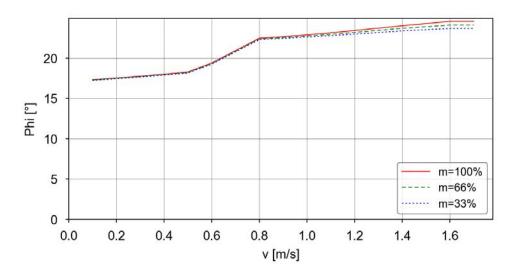
Axis	Distance (degrees)	Stop time (s)
1	40.0	0.71
2	20.6	0.37
3	14.1	0.22

Category 1, extension zones

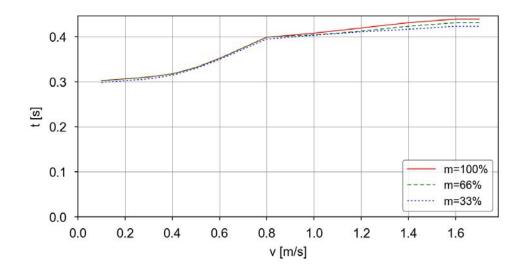
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.931
1	0.931	1.863
2	1.863	max reach

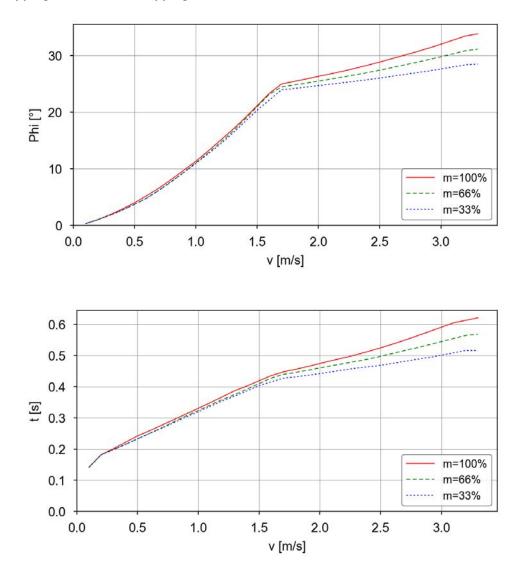
Category 1, Axis 1



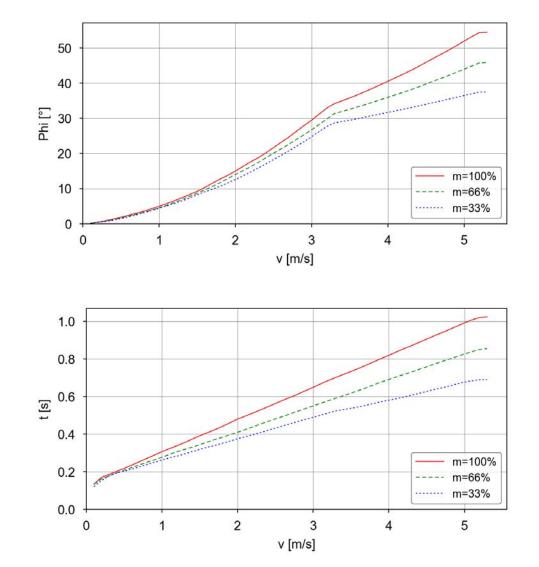
16.2 IRB 6790 2.80 m 205 kg Continued



Extension zone 1, stopping distance and stopping time

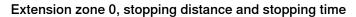


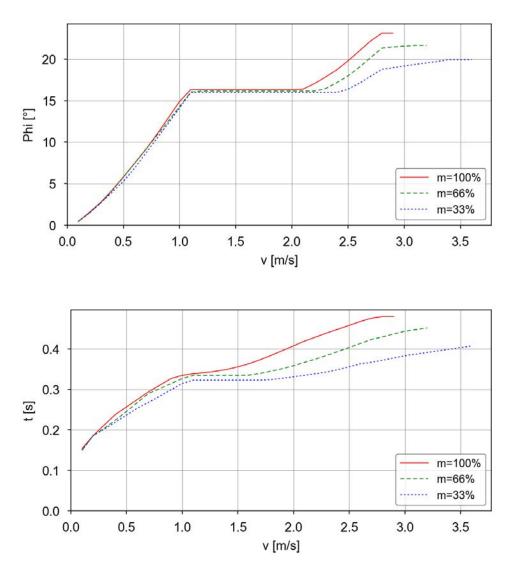
16.2 IRB 6790 2.80 m 205 kg *Continued*



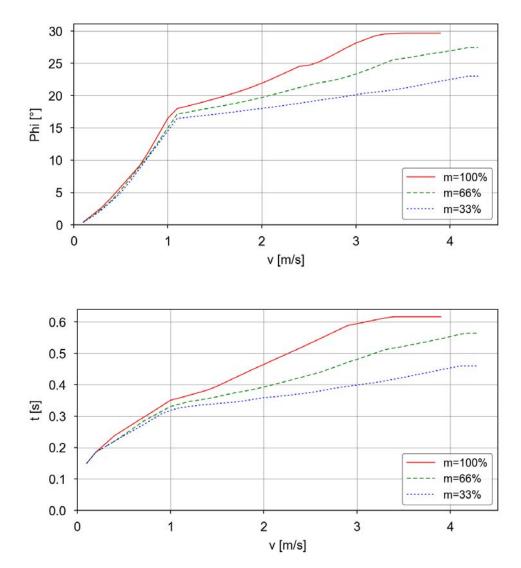
16.2 IRB 6790 2.80 m 205 kg Continued

Category 1, Axis 2

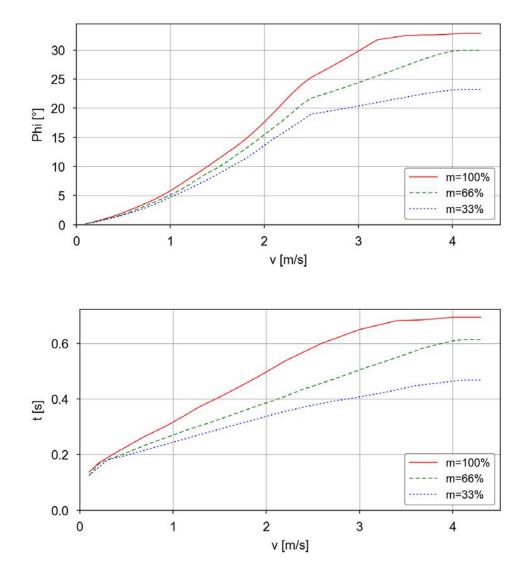




16.2 IRB 6790 2.80 m 205 kg *Continued*



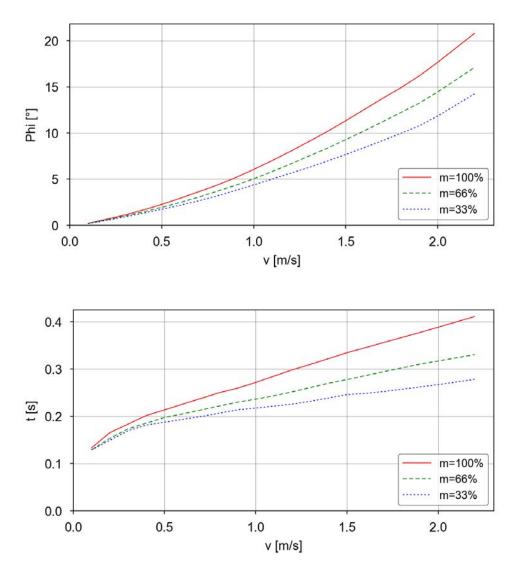
16.2 IRB 6790 2.80 m 205 kg Continued



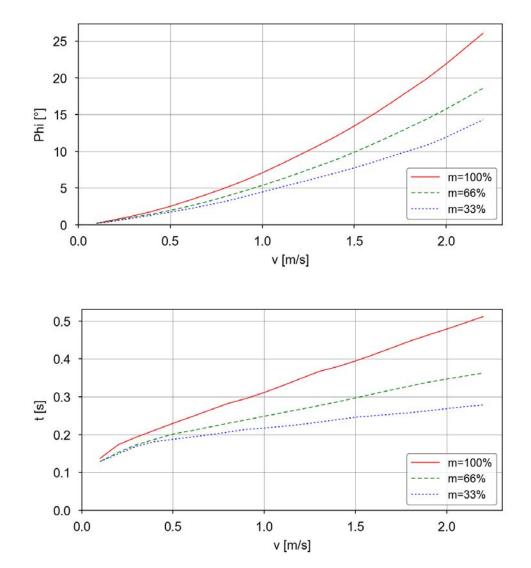
Extension zone 2, stopping distance and stopping time

16.2 IRB 6790 2.80 m 205 kg Continued

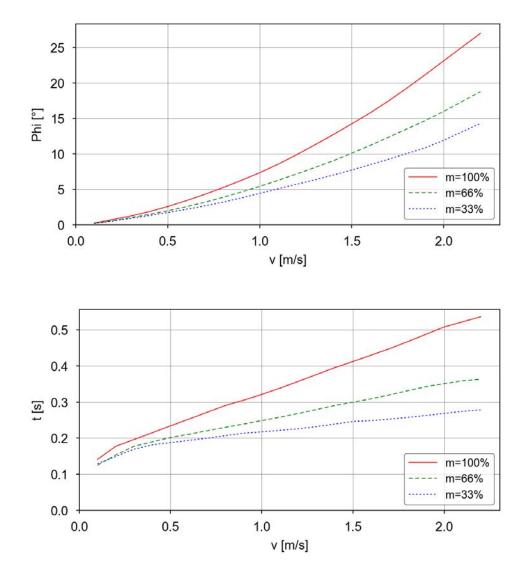
Category 1, Axis 3



16.2 IRB 6790 2.80 m 205 kg Continued



16.2 IRB 6790 2.80 m 205 kg *Continued*



17.1 IRB 7600 2.55 m 400 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

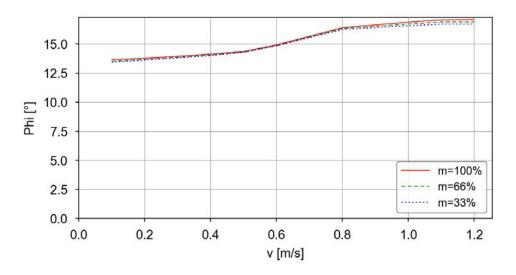
Axis	Distance (degrees)	Stop time (s)
1	31.6	0.73
2	13.1	0.37
3	9.0	0.22

Category 1, extension zones

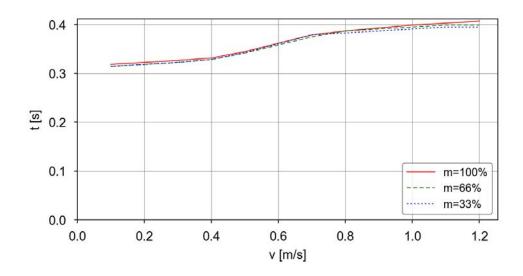
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.85
1	0.85	1.7
2	1.7	max reach

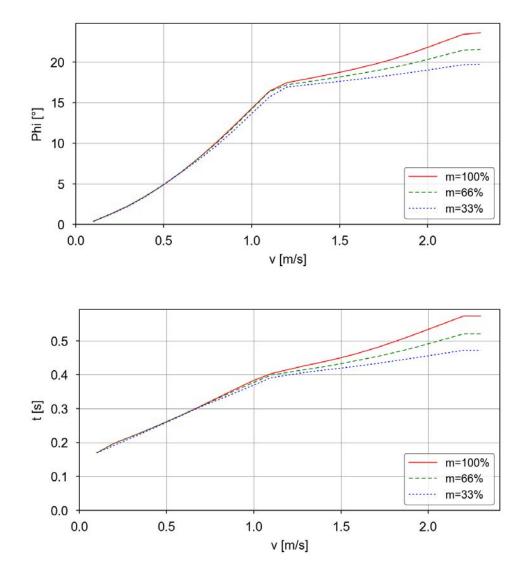
Category 1, Axis 1



17.1 IRB 7600 2.55 m 400 kg Continued



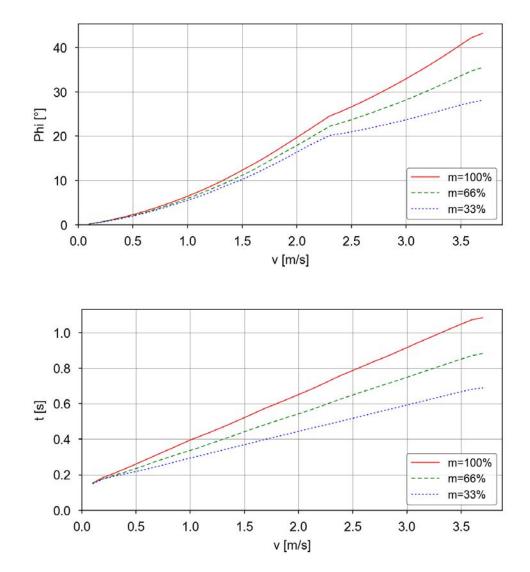
Extension zone 1, stopping distance and stopping time



Continues on next page 550

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17.1 IRB 7600 2.55 m 400 kg Continued

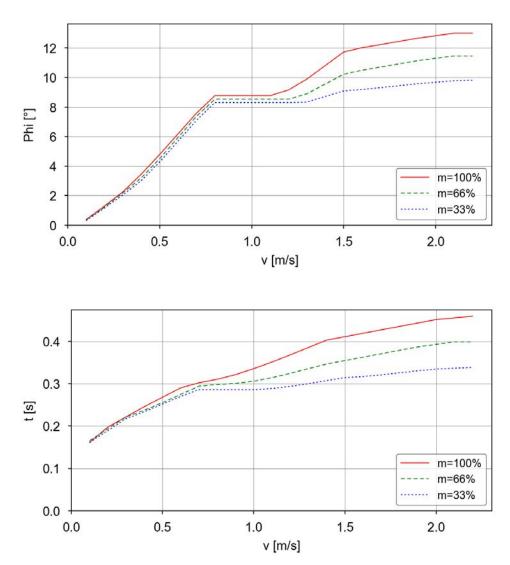


Extension zone 2, stopping distance and stopping time

17.1 IRB 7600 2.55 m 400 kg Continued

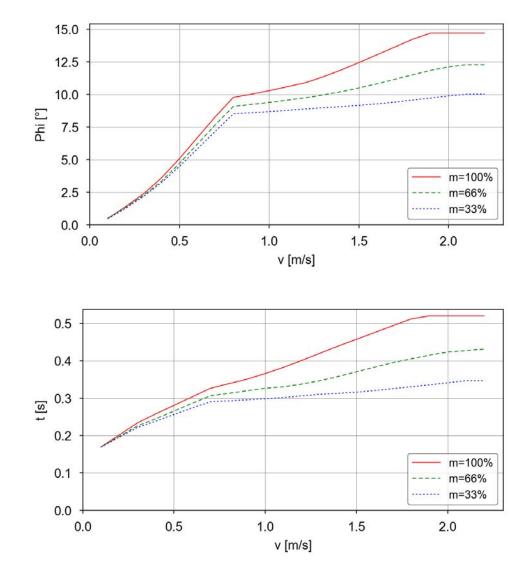
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time

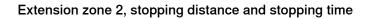


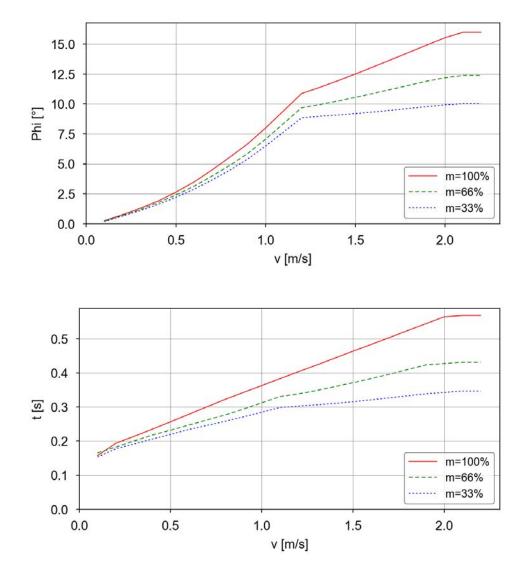
Continues on next page 552

17.1 IRB 7600 2.55 m 400 kg Continued



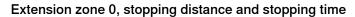
17.1 IRB 7600 2.55 m 400 kg Continued

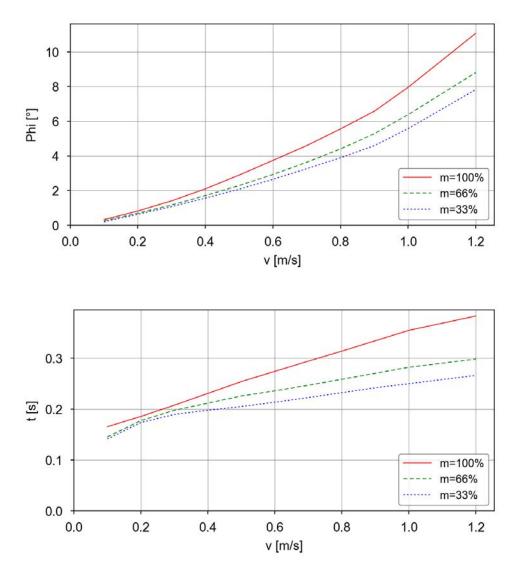




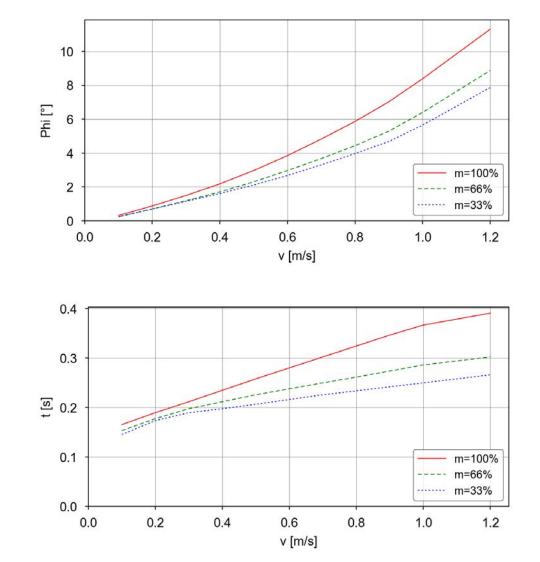
17.1 IRB 7600 2.55 m 400 kg Continued

Category 1, Axis 3

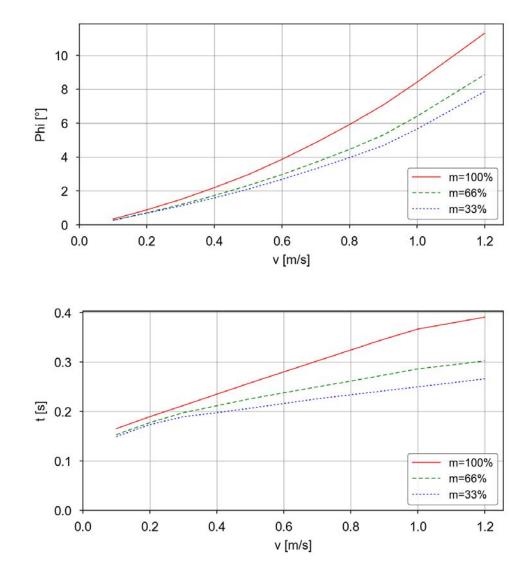




17.1 IRB 7600 2.55 m 400 kg Continued



17.1 IRB 7600 2.55 m 400 kg Continued



17.2 IRB 7600 2.55 m 500 kg

17.2 IRB 7600 2.55 m 500 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

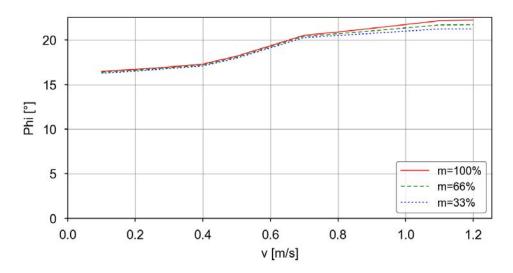
Axis	Distance (degrees)	Stop time (s)
1	32.6	0.75
2	9.0	0.29
3	7.6	0.2

Category 1, extension zones

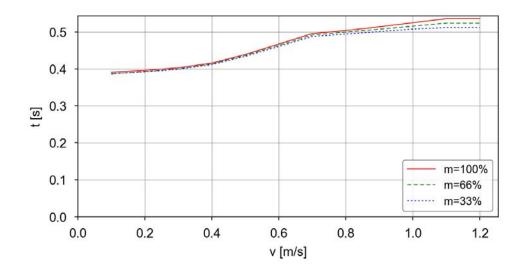
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.85
1	0.85	1.7
2	1.7	max reach

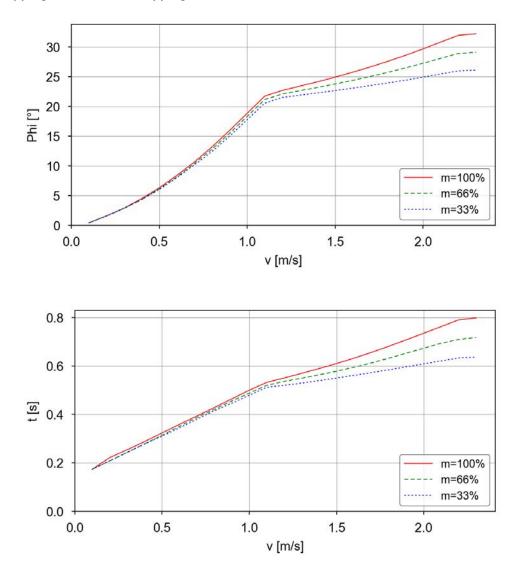
Category 1, Axis 1



17.2 IRB 7600 2.55 m 500 kg Continued



Extension zone 1, stopping distance and stopping time



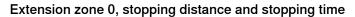
Continues on next page

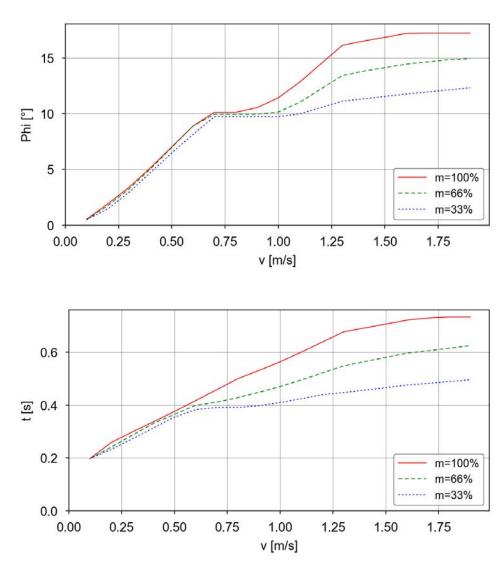
17.2 IRB 7600 2.55 m 500 kg Continued

60 50 40 Phi [°] 30 20 m=100% 10 m=66% m=33% 0 1.0 0.0 0.5 1.5 2.0 2.5 3.0 3.5 v [m/s] 1.50 1.25 1.00 <u>s</u> 0.75 0.50 m=100% 0.25 m=66% m=33% 0.00 0.5 1.0 1.5 2.0 2.5 3.0 3.5 0.0 v [m/s]

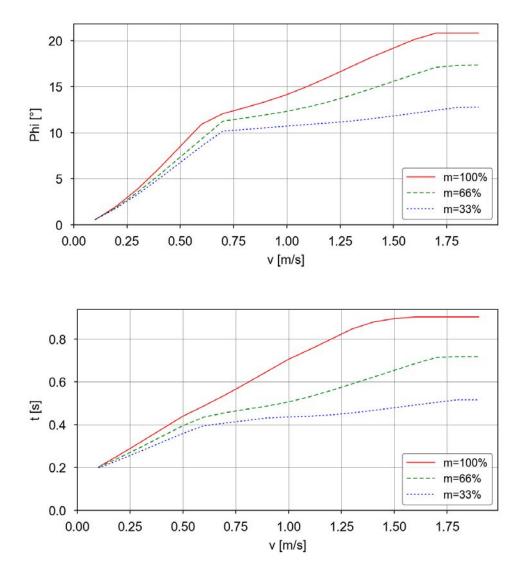
17.2 IRB 7600 2.55 m 500 kg Continued

Category 1, Axis 2

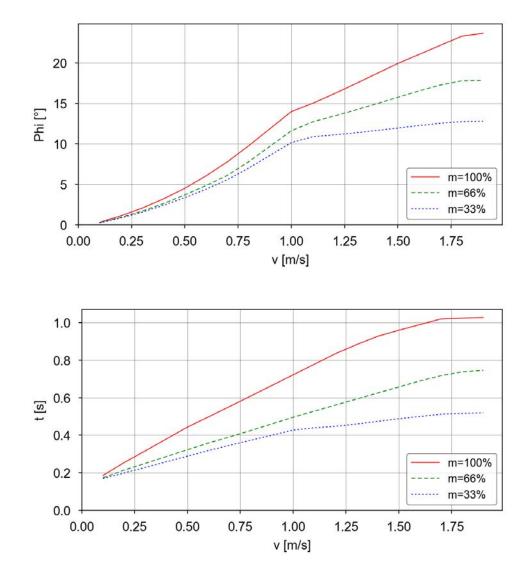




17.2 IRB 7600 2.55 m 500 kg Continued

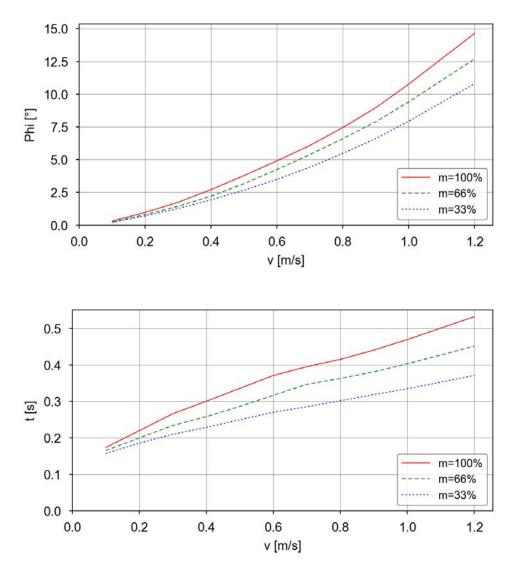


17.2 IRB 7600 2.55 m 500 kg Continued

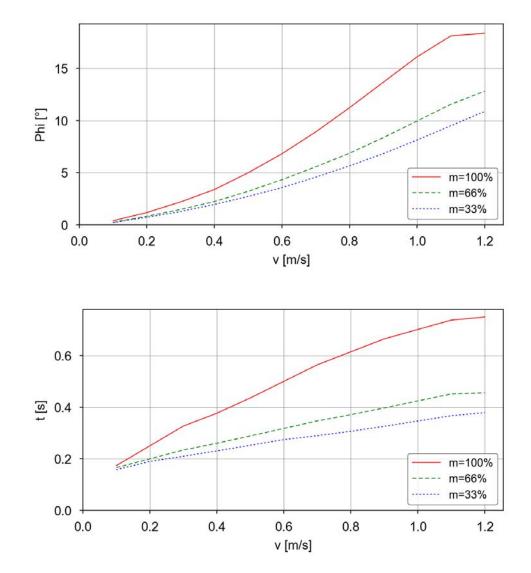


17.2 IRB 7600 2.55 m 500 kg Continued

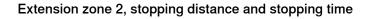
Category 1, Axis 3

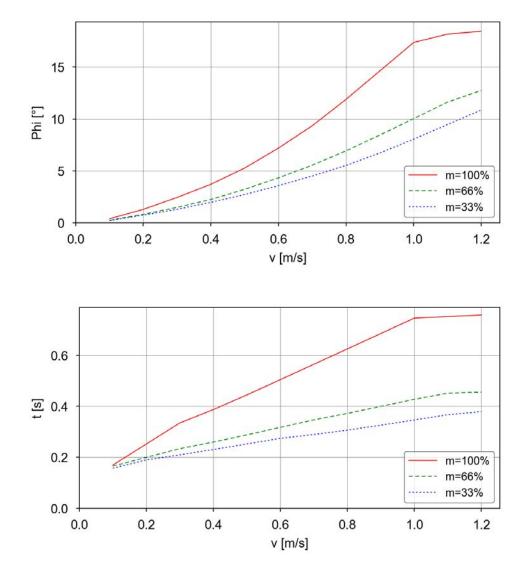


17.2 IRB 7600 2.55 m 500 kg Continued



17.2 IRB 7600 2.55 m 500 kg Continued





17.3 IRB 7600 2.80 m 340 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

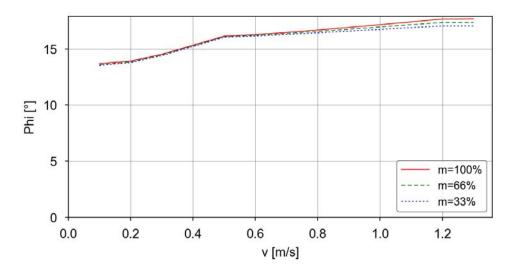
Axis	Distance (degrees)	Stop time (s)
1	31.1	0.71
2	12.9	0.37
3	9.0	0.22

Category 1, extension zones

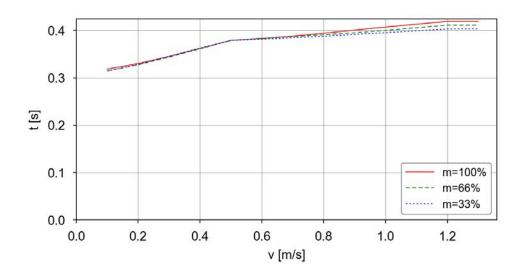
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.932
1	0.932	1.865
2	1.865	max reach

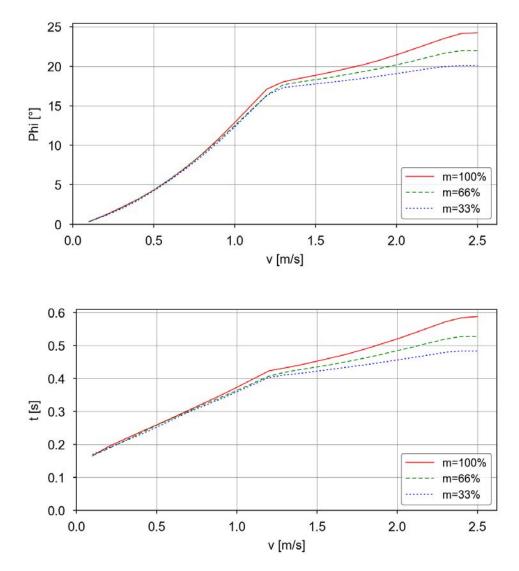
Category 1, Axis 1



17.3 IRB 7600 2.80 m 340 kg Continued

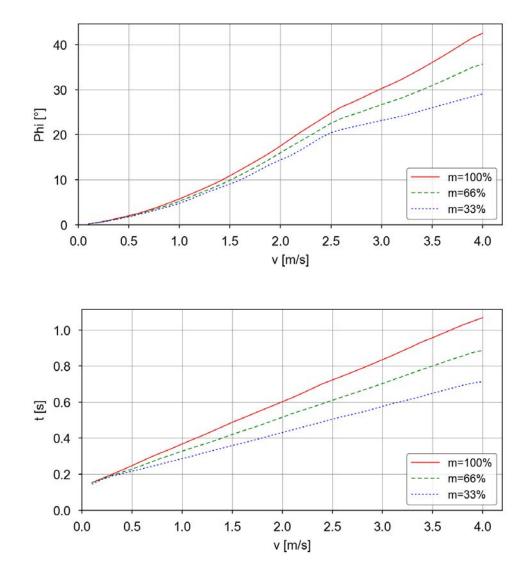


Extension zone 1, stopping distance and stopping time



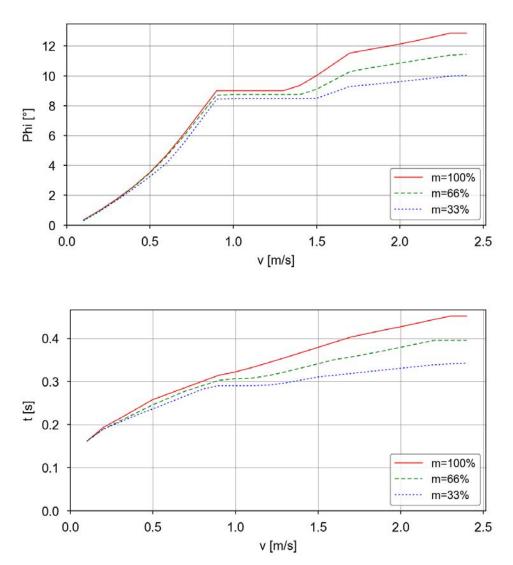
Continues on next page 568

17.3 IRB 7600 2.80 m 340 kg Continued

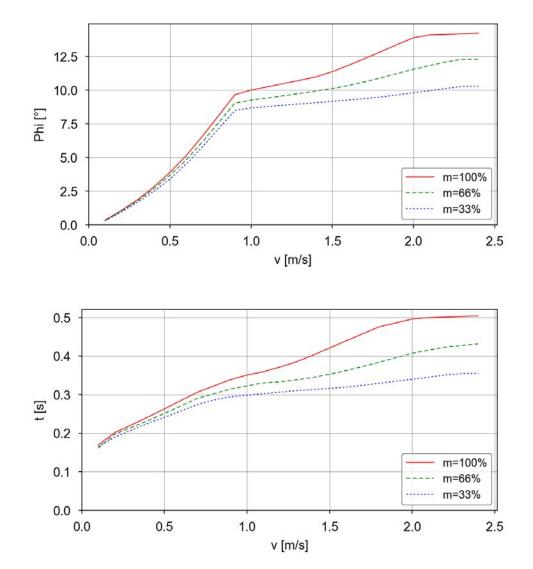


17.3 IRB 7600 2.80 m 340 kg Continued

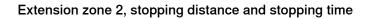
Category 1, Axis 2

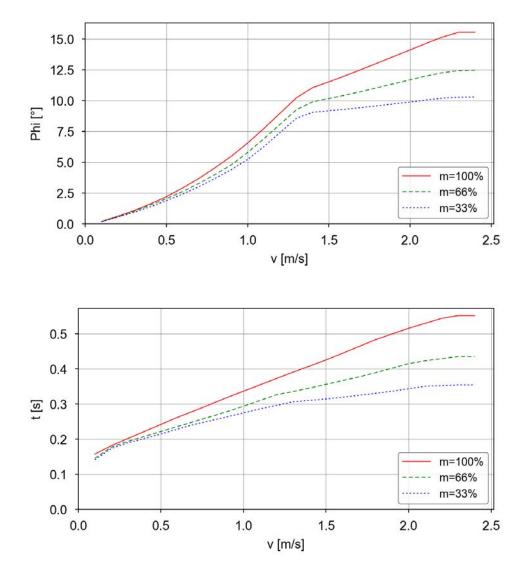


17.3 IRB 7600 2.80 m 340 kg Continued



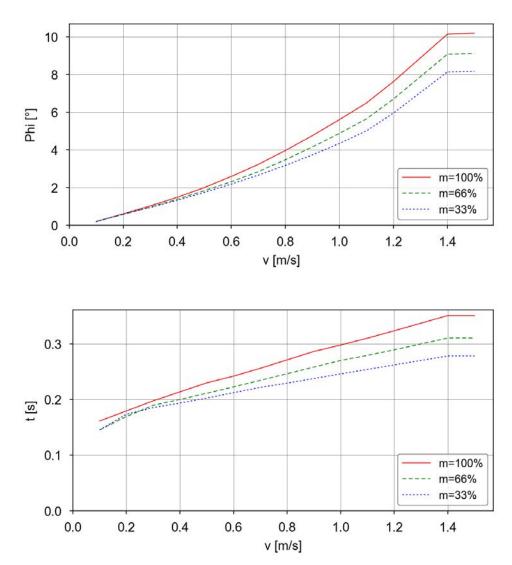
17.3 IRB 7600 2.80 m 340 kg Continued





17.3 IRB 7600 2.80 m 340 kg Continued

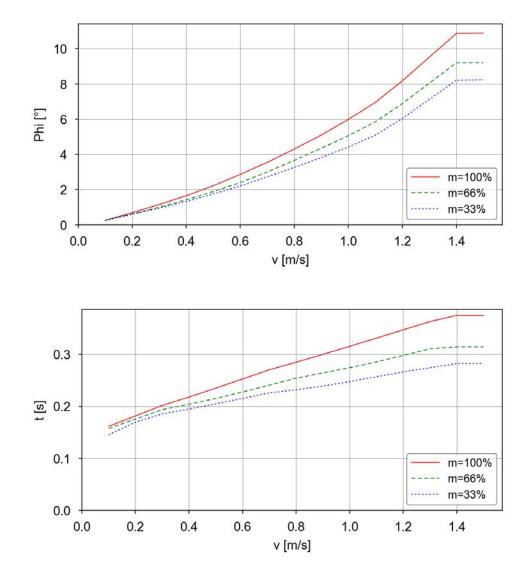
Category 1, Axis 3



17.3 IRB 7600 2.80 m 340 kg Continued

> 10 8 Phi [°] 6 4 m=100% ABARARA 2 m=66% m=33% 0 0.2 0.4 0.6 0.8 1.0 0.0 1.2 1.4 v [m/s] 0.3 <u>ت</u> 0.2 T. Maran 0.1 m=100% m=66% m=33% 0.0 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 v [m/s]

17.3 IRB 7600 2.80 m 340 kg Continued



17.4 IRB 7600 3.05 m 325 kg

17.4 IRB 7600 3.05 m 325 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

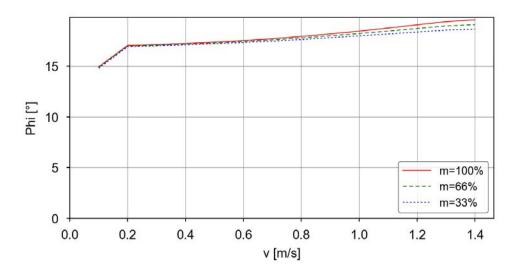
Axis	Distance (degrees)	Stop time (s)
1	33.0	0.78
2	9.0	0.29
3	8.4	0.22

Category 1, extension zones

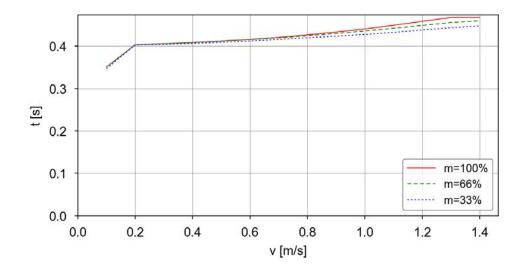
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.015
1	1.015	2.03
2	2.03	max reach

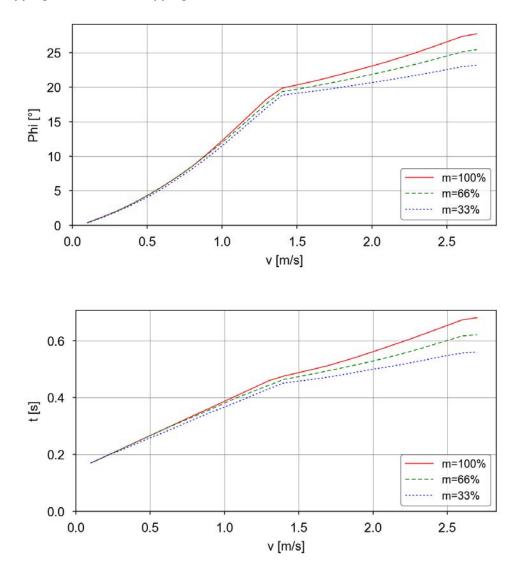
Category 1, Axis 1



17.4 IRB 7600 3.05 m 325 kg Continued

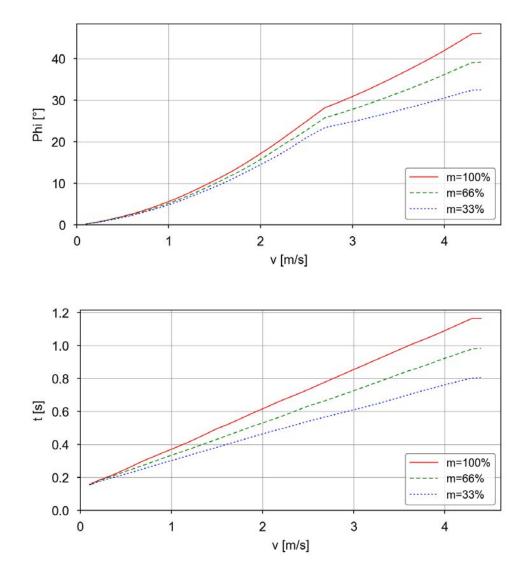


Extension zone 1, stopping distance and stopping time



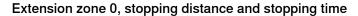
Continues on next page

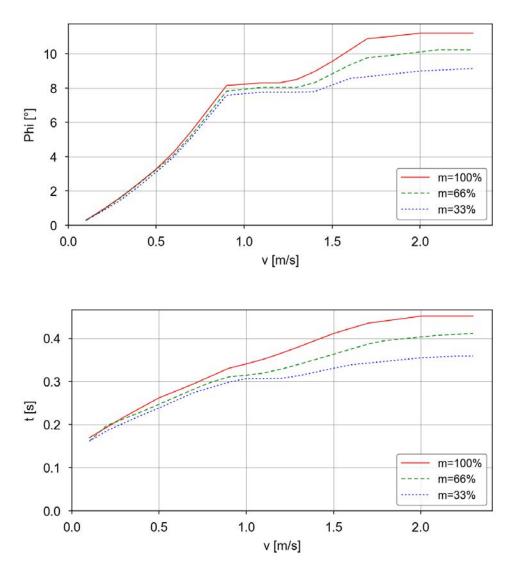
17.4 IRB 7600 3.05 m 325 kg Continued



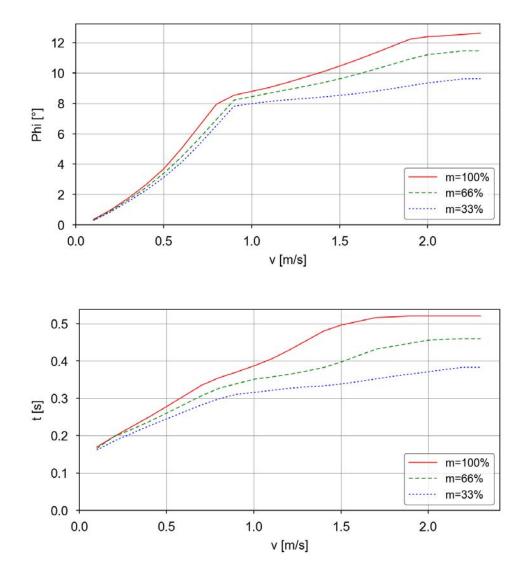
17.4 IRB 7600 3.05 m 325 kg Continued

Category 1, Axis 2

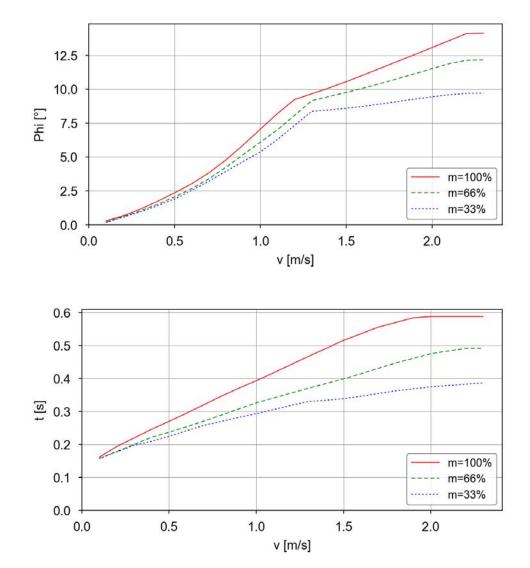




17.4 IRB 7600 3.05 m 325 kg Continued

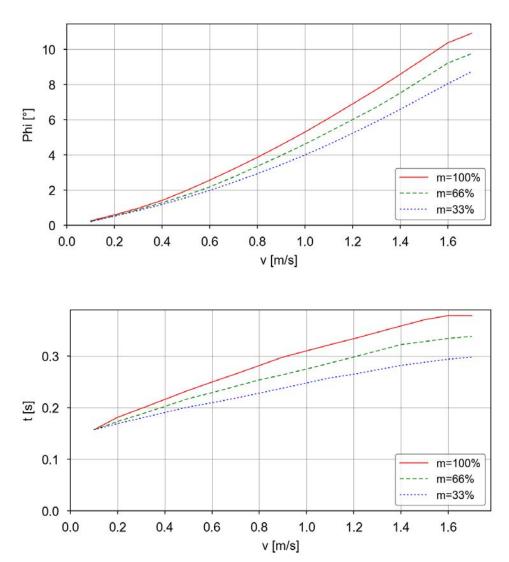


17.4 IRB 7600 3.05 m 325 kg Continued

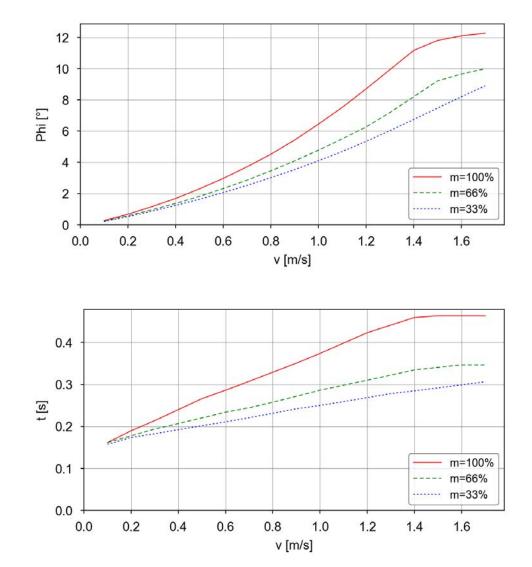


17.4 IRB 7600 3.05 m 325 kg Continued

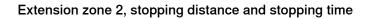
Category 1, Axis 3

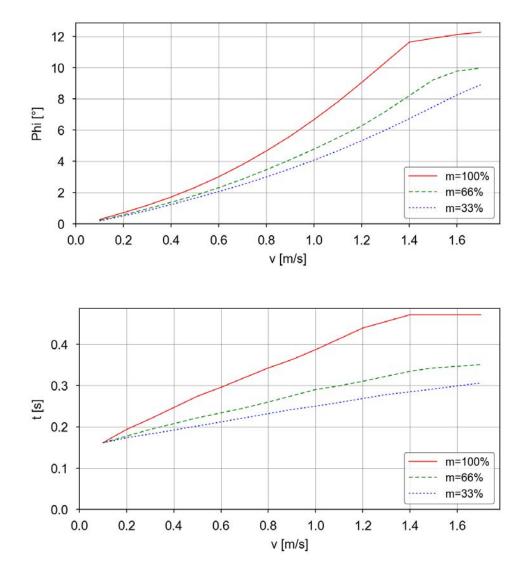


17.4 IRB 7600 3.05 m 325 kg Continued



17.4 IRB 7600 3.05 m 325 kg Continued





17.5 IRB 7600 3.50 m 150 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

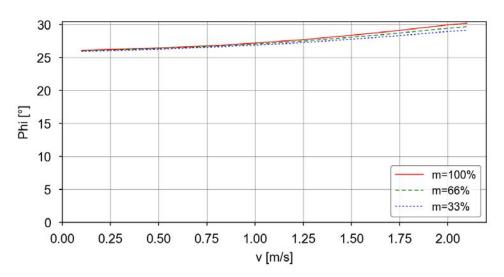
Axis	Distance (degrees)	Stop time (s)
1	47.1	0.85
2	11.5	0.32
3	8.8	0.22

Category 1, extension zones

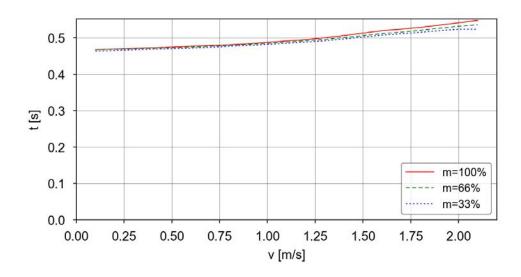
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.167
1	1.167	2.333
2	2.333	max reach

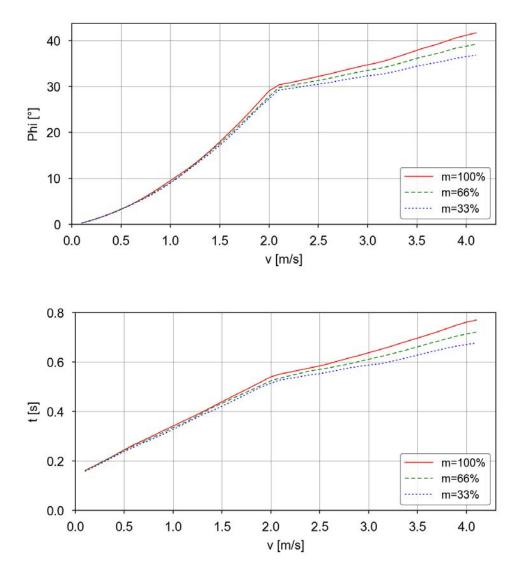
Category 1, Axis 1



17.5 IRB 7600 3.50 m 150 kg Continued

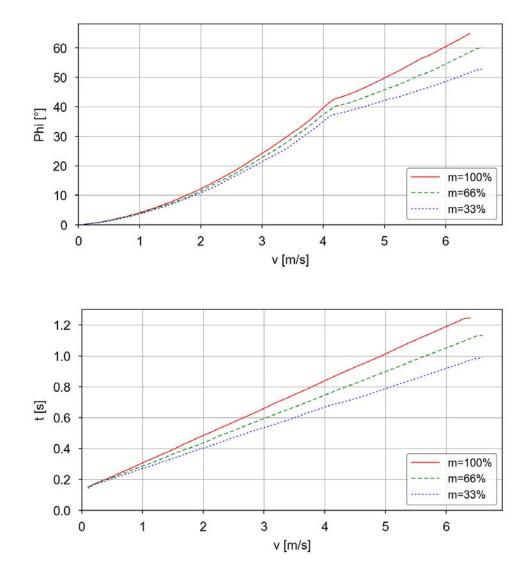


Extension zone 1, stopping distance and stopping time



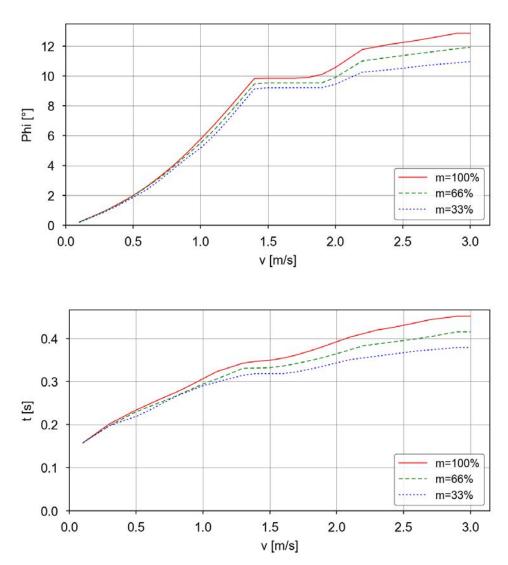
Continues on next page 586

17.5 IRB 7600 3.50 m 150 kg Continued

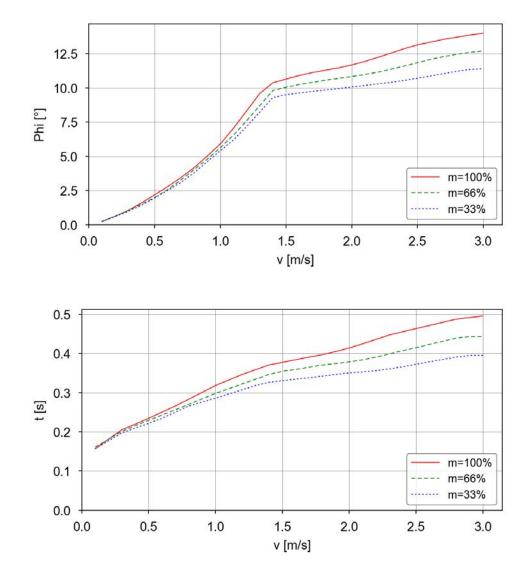


17.5 IRB 7600 3.50 m 150 kg Continued

Category 1, Axis 2



17.5 IRB 7600 3.50 m 150 kg Continued

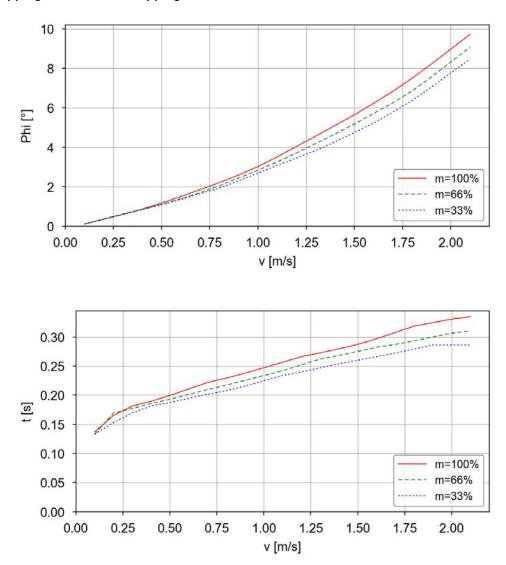


17.5 IRB 7600 3.50 m 150 kg Continued

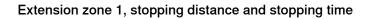
15.0 12.5 10.0 Phi [°] 7.5 5.0 m=100% 2.5 m=66% m=33% 0.0 0.5 1.0 1.5 2.0 3.0 0.0 2.5 v [m/s] 0.5 0.4 0.3 t [s] 0.2 m=100% 0.1 m=66% m=33% 0.0 1.5 0.0 0.5 1.0 2.0 2.5 3.0 v [m/s]

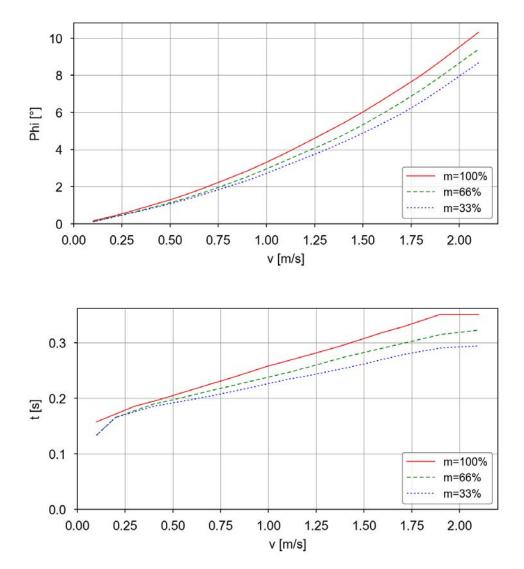
17.5 IRB 7600 3.50 m 150 kg Continued

Category 1, Axis 3

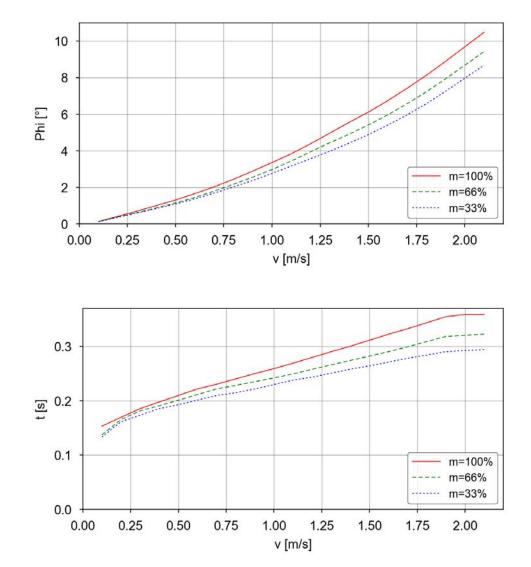


17.5 IRB 7600 3.50 m 150 kg Continued





17.5 IRB 7600 3.50 m 150 kg Continued



17.6 IRB 7600LeanID 2.55 m 390 kg

17.6 IRB 7600LeanID 2.55 m 390 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

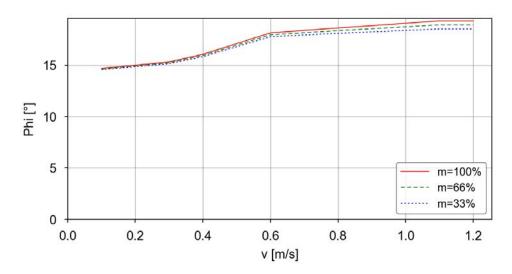
Axis	Distance (degrees)	Stop time (s)
1	27.5	0.63
2	10.3	0.29
3	6.8	0.17

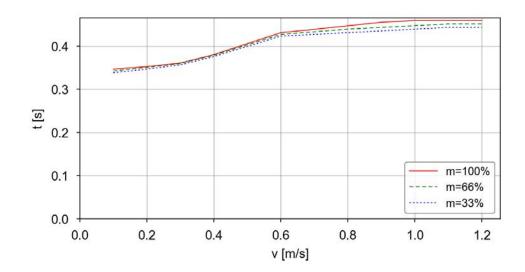
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

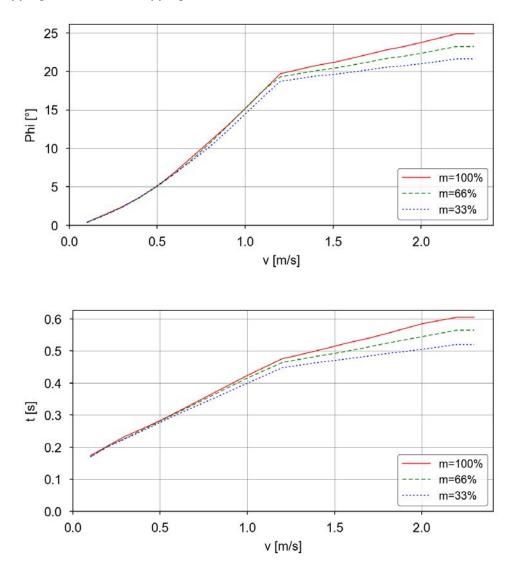
Zone	wcp min (m)	wcp max (m)
0	0	0.85
1	0.85	1.7
2	1.7	max reach

Category 1, Axis 1

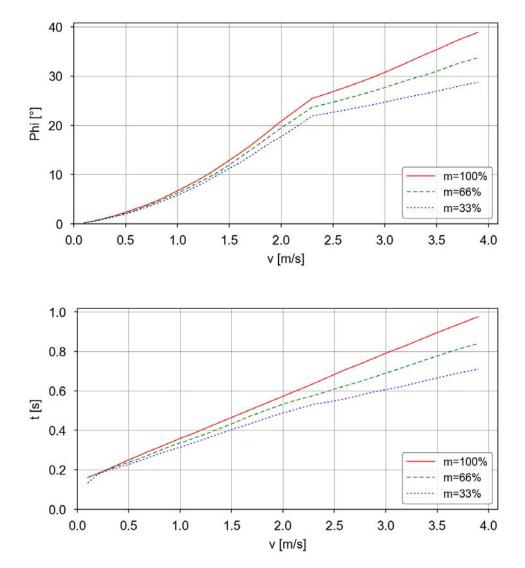




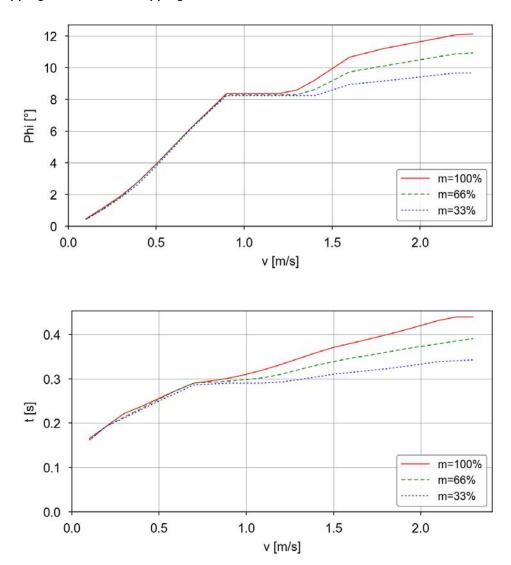
Extension zone 1, stopping distance and stopping time

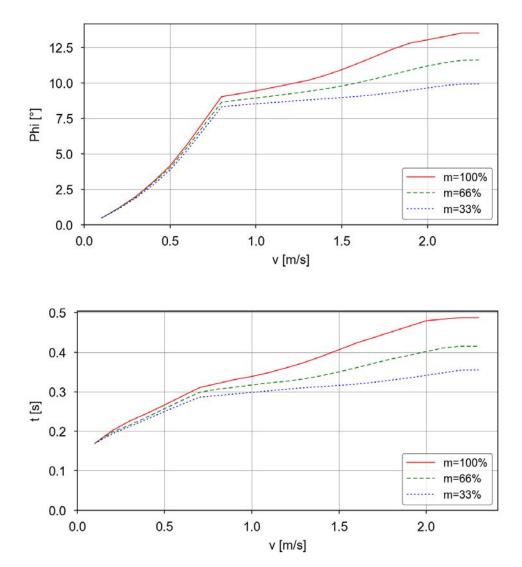


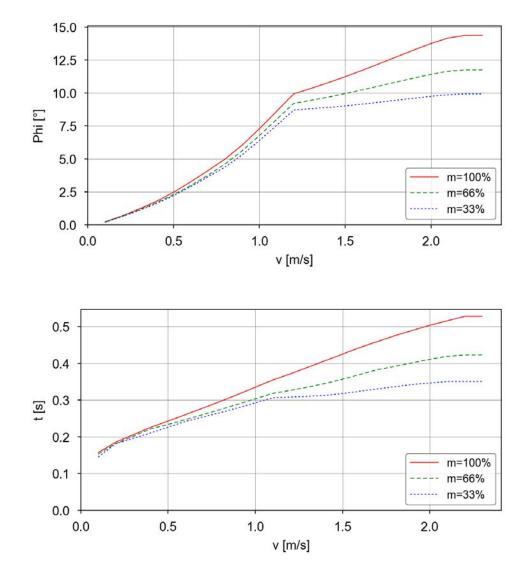
Continues on next page



Category 1, Axis 2

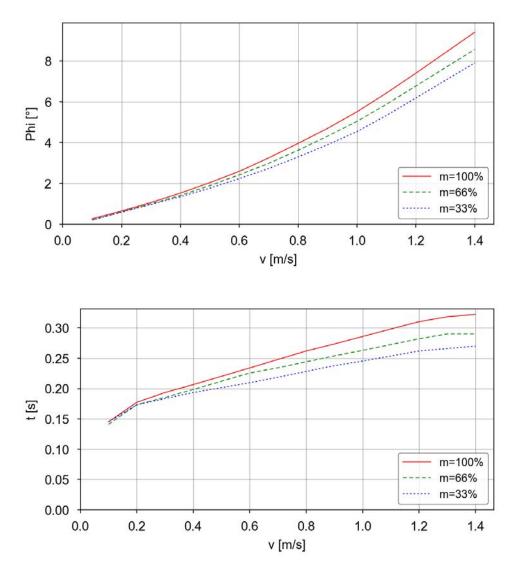


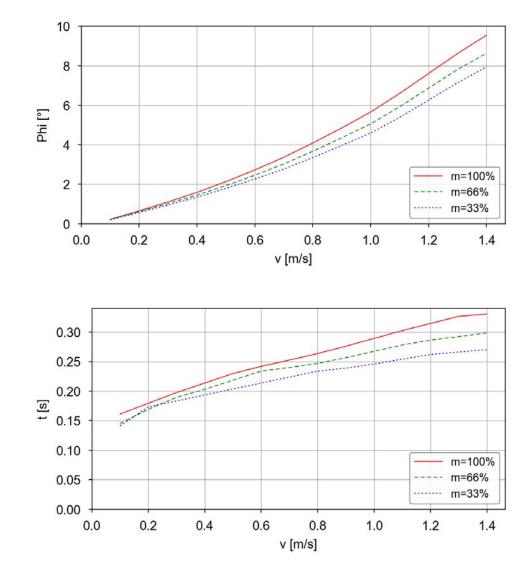


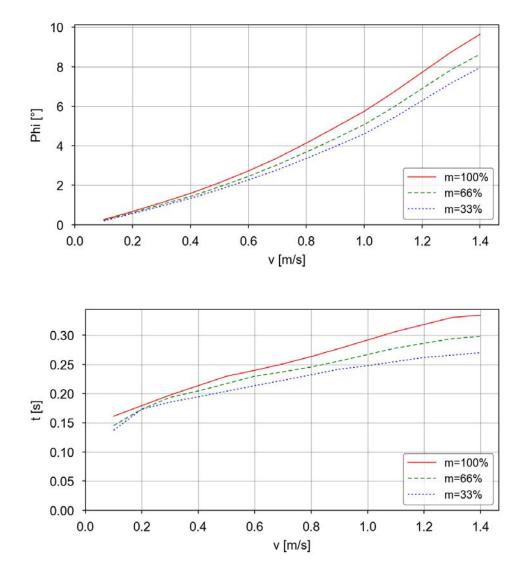


17.6 IRB 7600LeanID 2.55 m 390 kg *Continued*

Category 1, Axis 3







17.7 IRB 7600LeanID 2.8 m 320 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

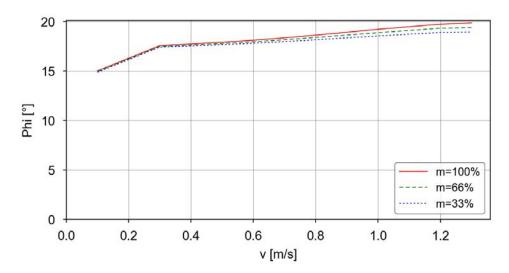
Axis	Distance (degrees)	Stop time (s)
1	28.3	0.66
2	10.7	0.32
3	7.2	0.17

Category 1, extension zones

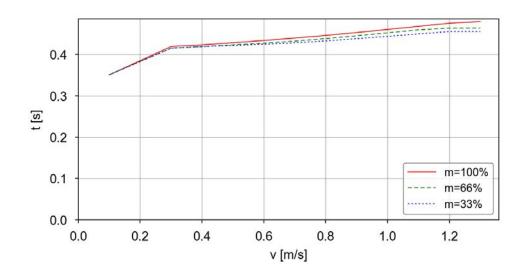
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	0.932
1	0.932	1.865
2	1.865	max reach

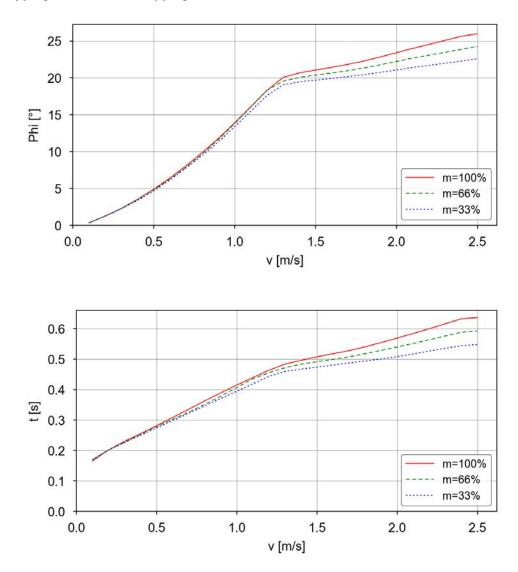
Category 1, Axis 1



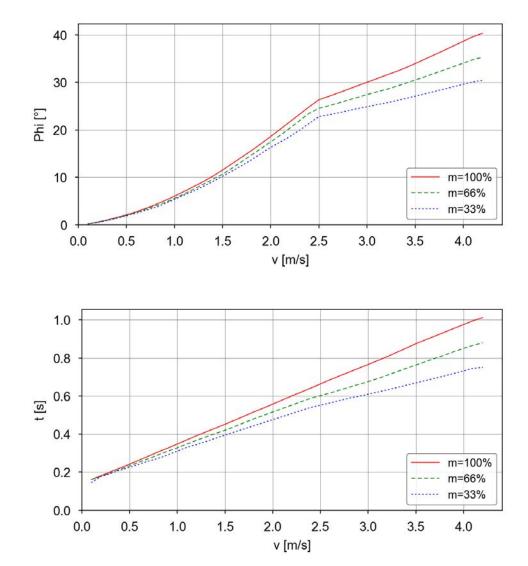
17.7 IRB 7600LeanID 2.8 m 320 kg Continued



Extension zone 1, stopping distance and stopping time

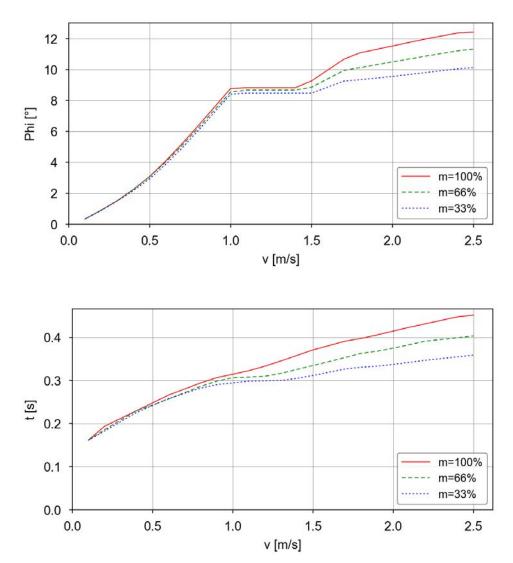


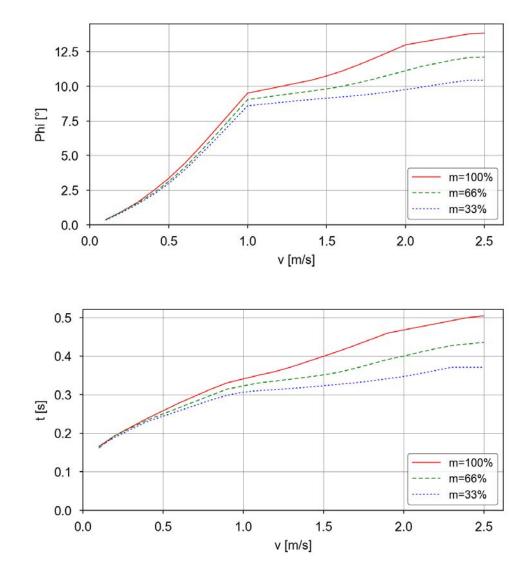
Continues on next page



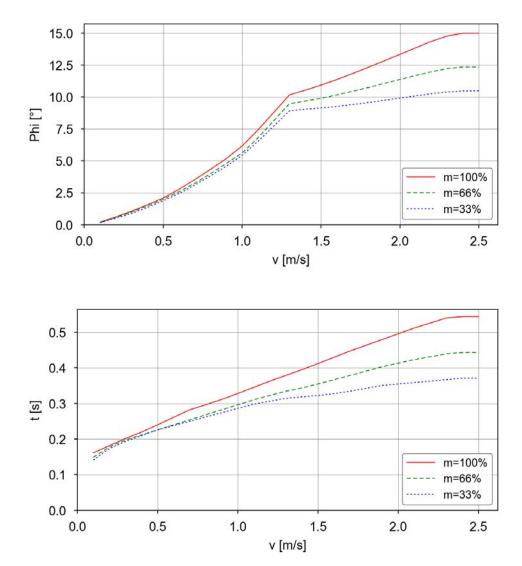
17.7 IRB 7600LeanID 2.8 m 320 kg Continued

Category 1, Axis 2

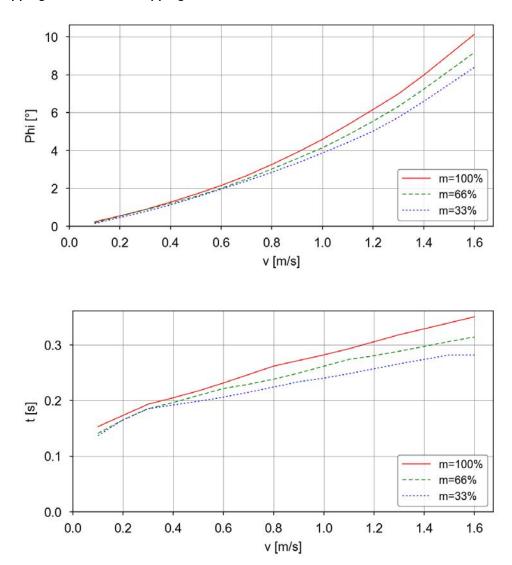




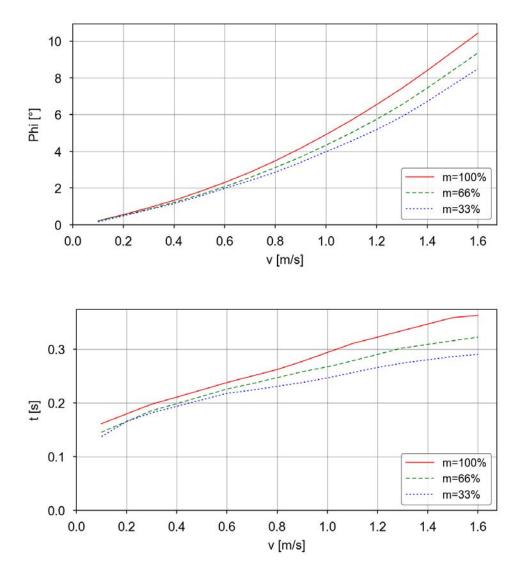
17.7 IRB 7600LeanID 2.8 m 320 kg Continued

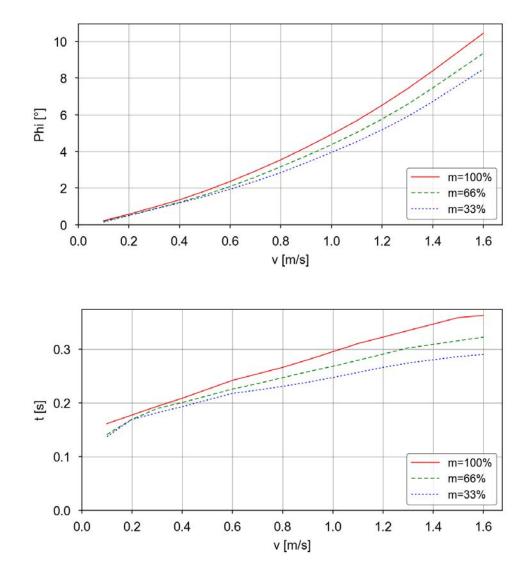


Category 1, Axis 3



17.7 IRB 7600LeanID 2.8 m 320 kg Continued





17.8 IRB 7600LeanID 3.1 m 290 kg

17.8 IRB 7600LeanID 3.1 m 290 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

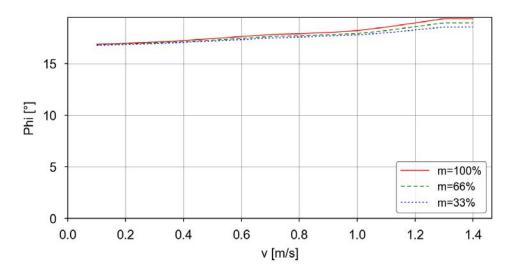
Axis	Distance (degrees)	Stop time (s)
1	30.1	0.71
2	8.4	0.27
3	6.7	0.17

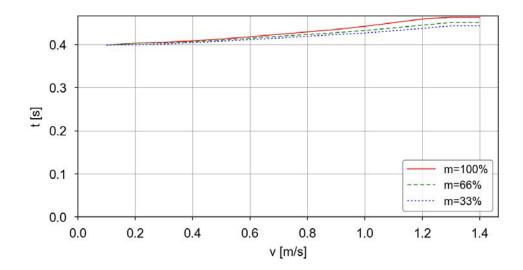
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

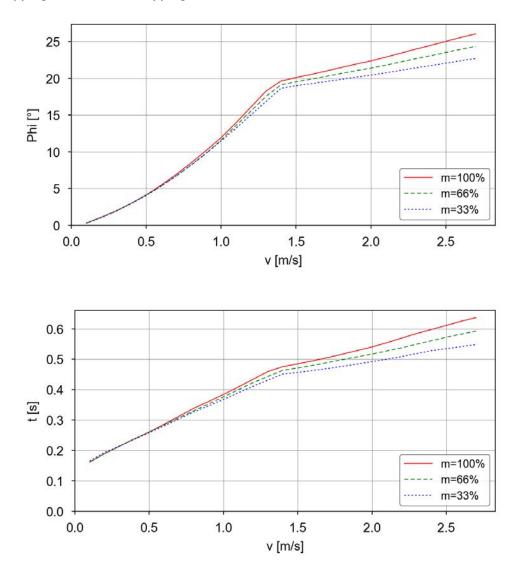
Zone	wcp min (m)	wcp max (m)
0	0	1.015
1	1.015	2.03
2	2.03	max reach

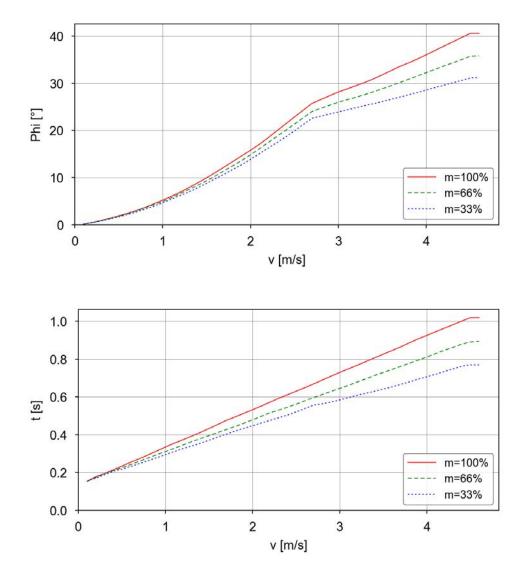
Category 1, Axis 1



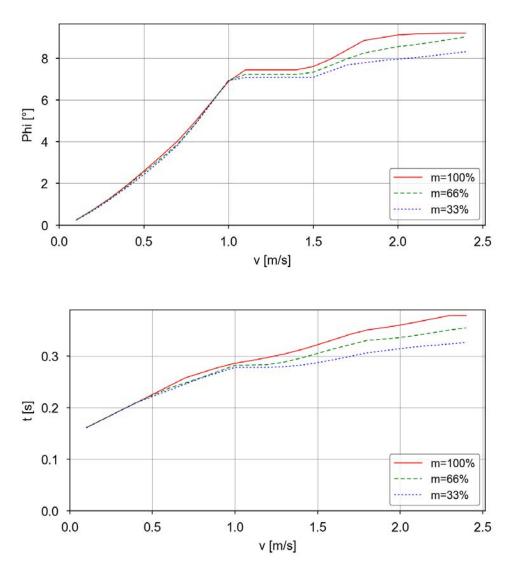


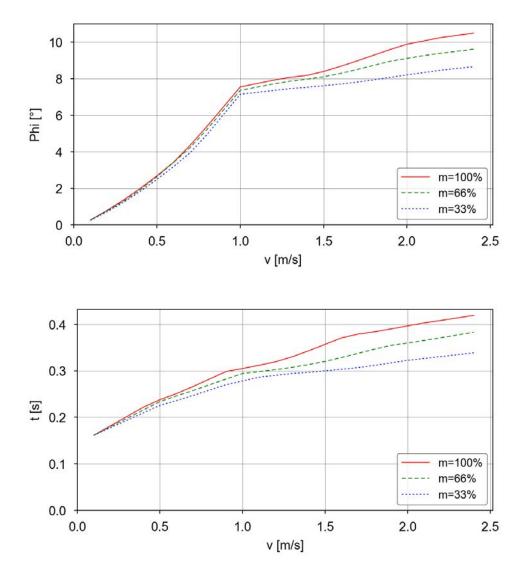
Extension zone 1, stopping distance and stopping time

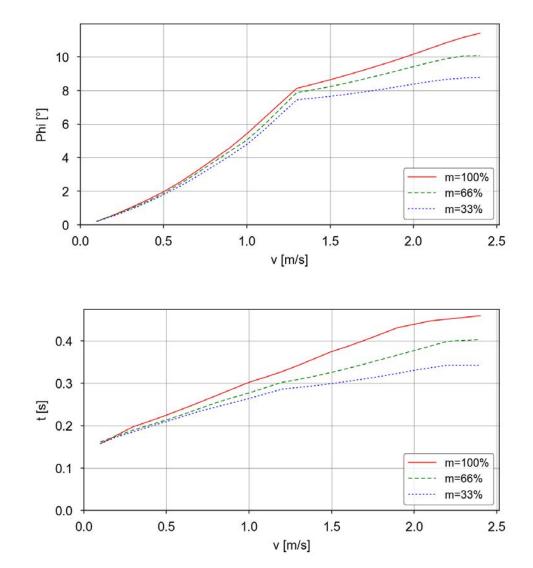




Category 1, Axis 2

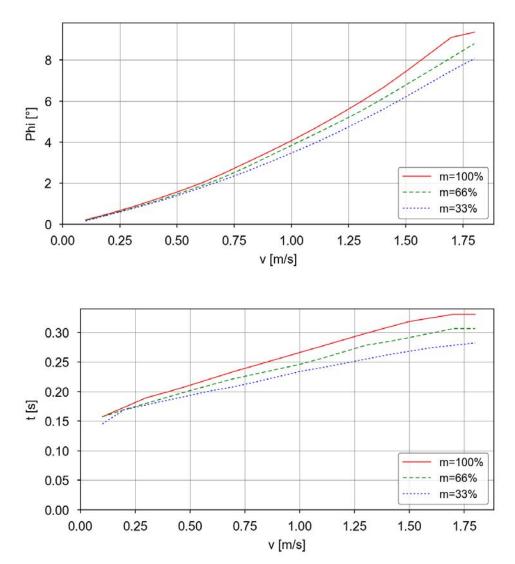


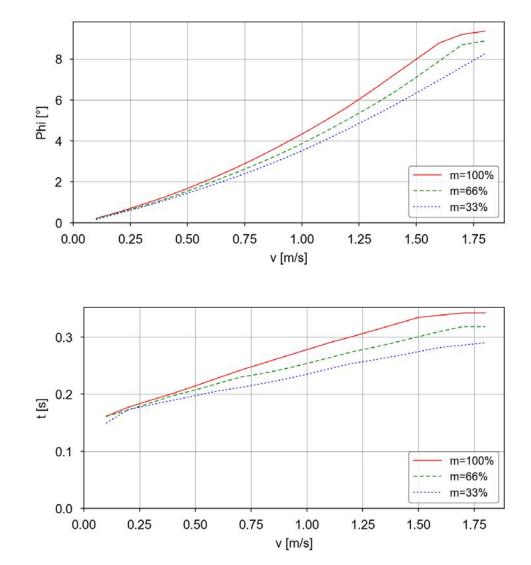


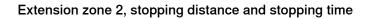


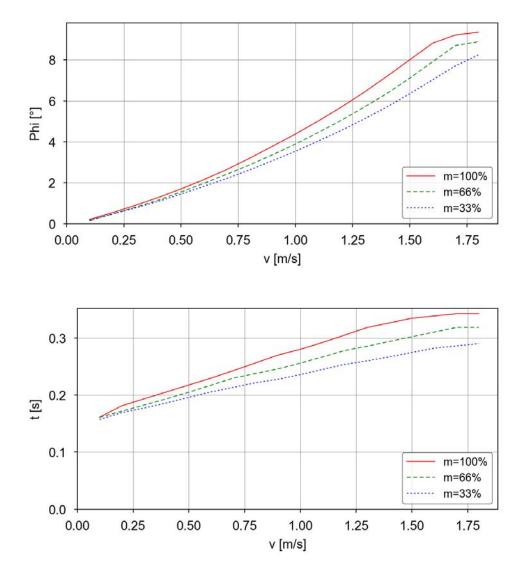
17.8 IRB 7600LeanID 3.1 m 290 kg Continued

Category 1, Axis 3









18.1 IRB 8700 3.50 m 800 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

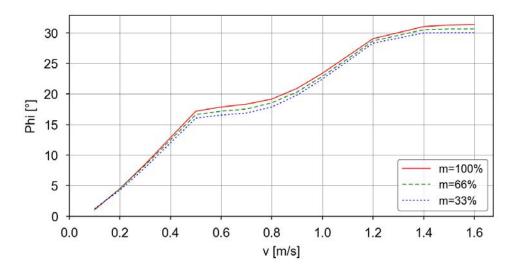
Axis	Distance (degrees)	Stop time (s)
1	44.4	1.31
2	11.4	0.32
3	13.0	0.37

Category 1, extension zones

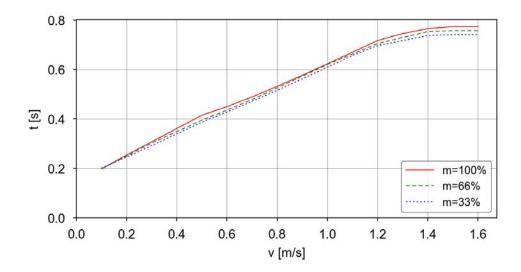
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.169
1	1.169	2.338
2	2.338	max reach

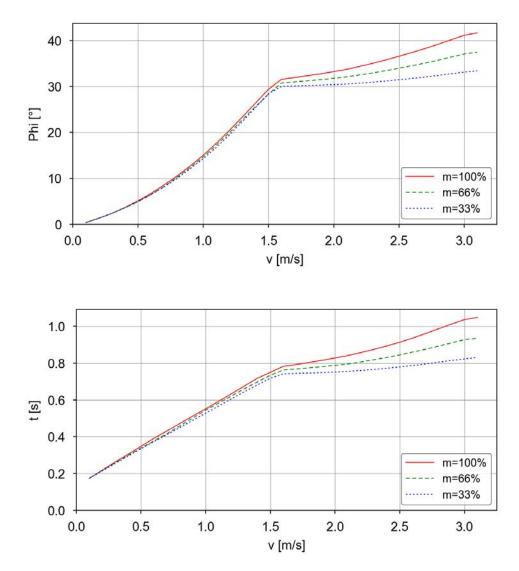
Category 1, Axis 1



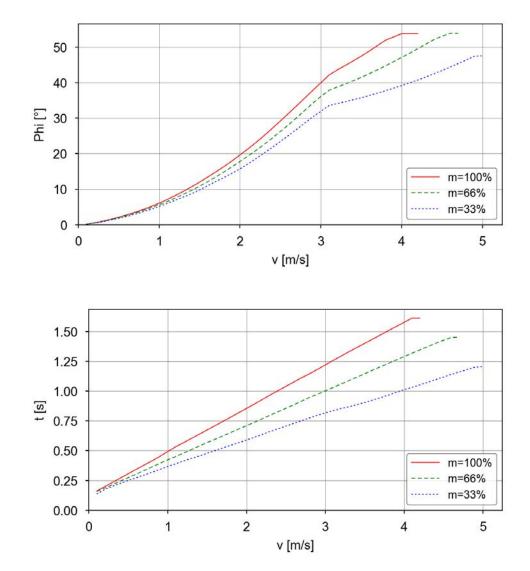
18.1 IRB 8700 3.50 m 800 kg Continued



Extension zone 1, stopping distance and stopping time



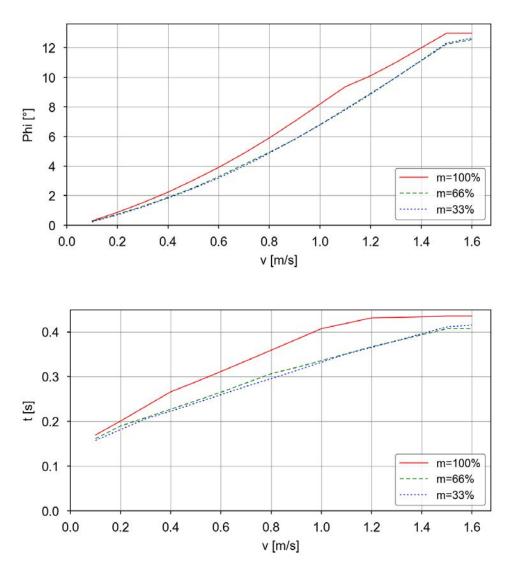
18.1 IRB 8700 3.50 m 800 kg Continued



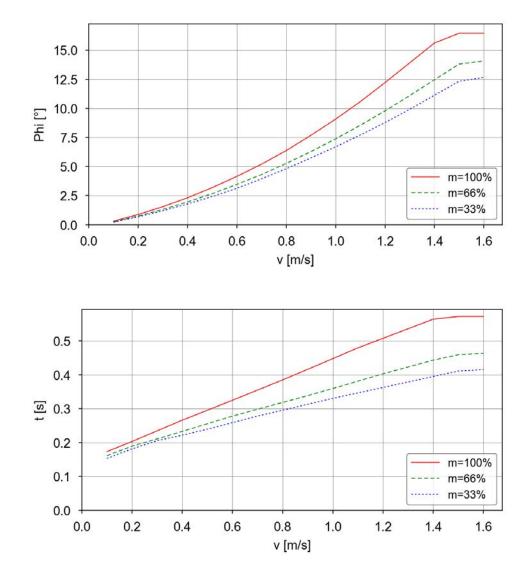
Extension zone 2, stopping distance and stopping time

18.1 IRB 8700 3.50 m 800 kg Continued

Category 1, Axis 2



18.1 IRB 8700 3.50 m 800 kg Continued

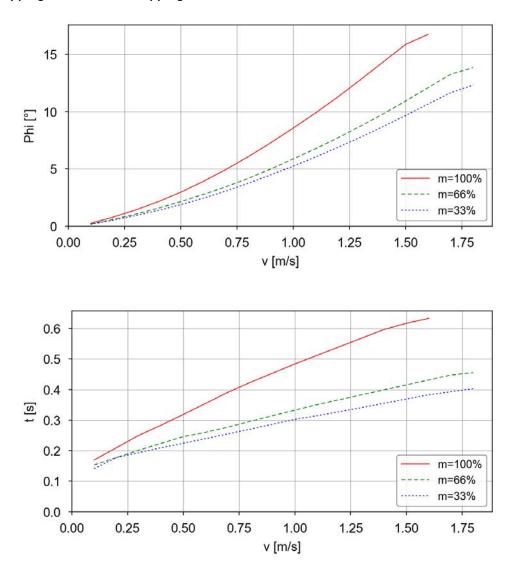


18.1 IRB 8700 3.50 m 800 kg Continued

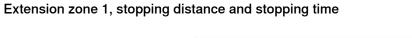
> 15 Phi [°] 10 5 -----m=100% --- m=66% m=33% 0 0.4 0.6 0.8 1.0 1.2 1.6 0.0 0.2 1.4 v [m/s] 0.6 0.5 0.4 <u>v</u> 0.3 0.2 m=100% 0.1 m=66% m=33% 0.0 0.0 0.2 0.6 0.8 1.0 0.4 1.2 1.4 1.6 v [m/s]

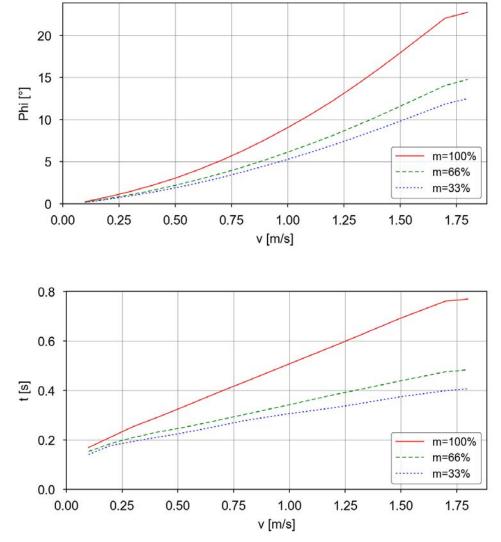
18.1 IRB 8700 3.50 m 800 kg Continued

Category 1, Axis 3

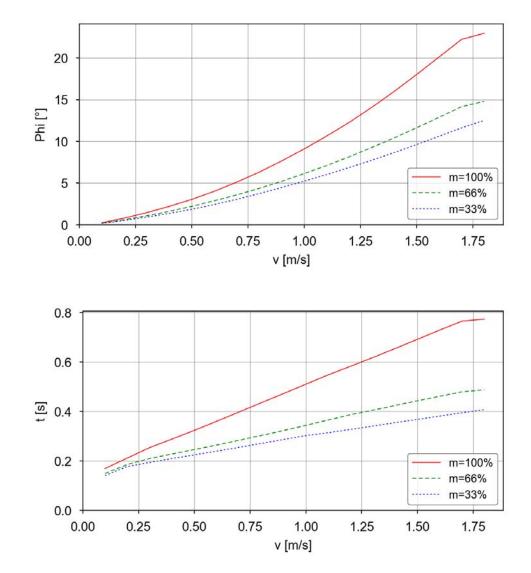


18.1 IRB 8700 3.50 m 800 kg Continued





18.1 IRB 8700 3.50 m 800 kg Continued



18.2 IRB 8700 4.20 m 550 kg

18.2 IRB 8700 4.20 m 550 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

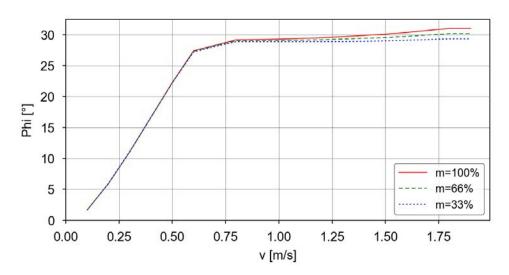
Axis	Distance (degrees)	Stop time (s)
1	44.4	1.33
2	10.0	0.27
3	14.4	0.44

Category 1, extension zones

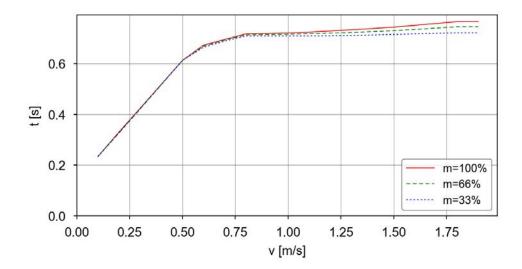
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.399
1	1.399	2.798
2	2.798	max reach

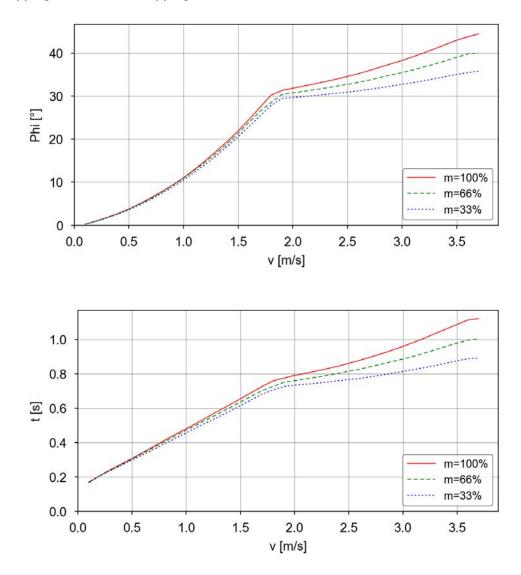
Category 1, Axis 1



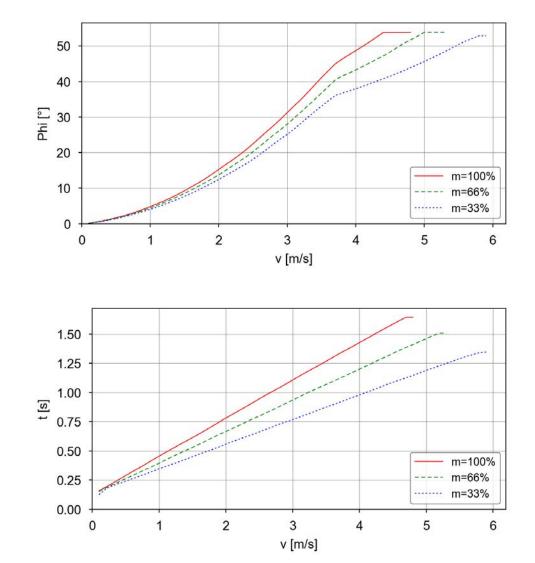
18.2 IRB 8700 4.20 m 550 kg Continued



Extension zone 1, stopping distance and stopping time

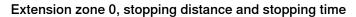


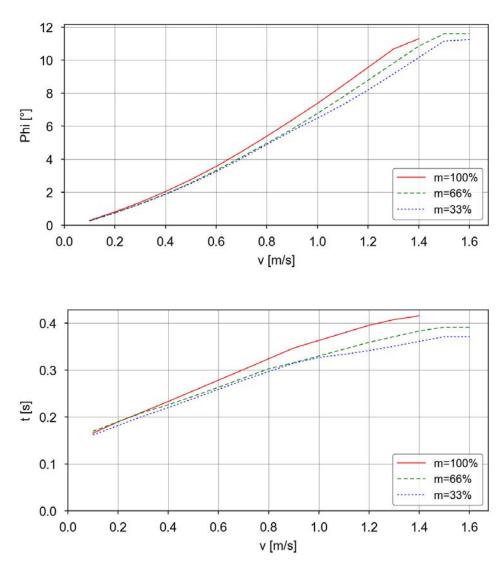
18.2 IRB 8700 4.20 m 550 kg Continued



18.2 IRB 8700 4.20 m 550 kg Continued

Category 1, Axis 2

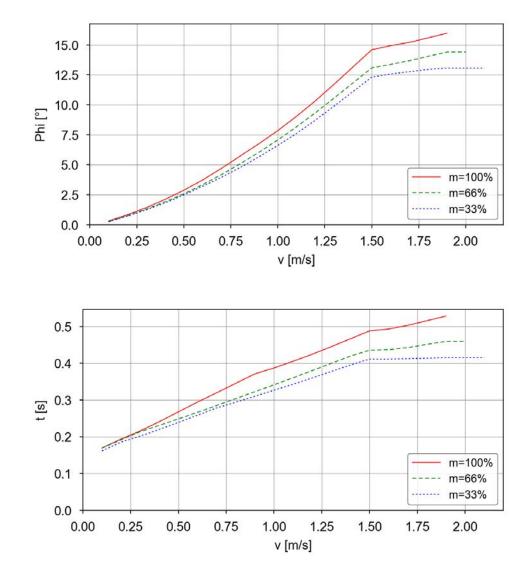




18.2 IRB 8700 4.20 m 550 kg Continued

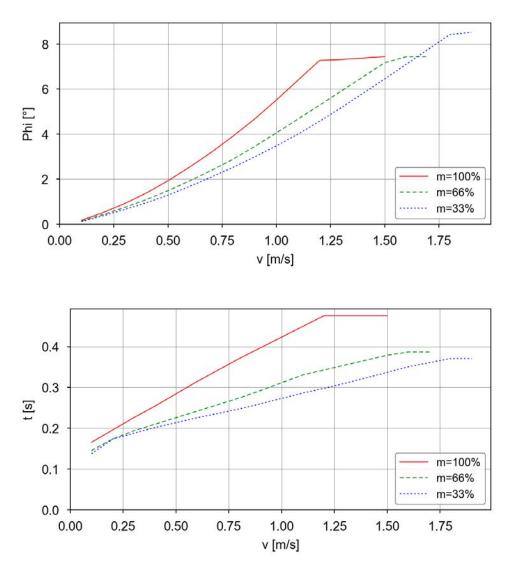
15.0 12.5 10.0 Phi [°] 7.5 5.0 m=100% 2.5 m=66% m=33% 0.0 0.2 0.4 0.6 1.0 0.0 0.8 1.2 1.4 1.6 v [m/s] 0.5 0.4 0.3 t [s] 0.2 ---m=100% 0.1 m=66% _ _ m=33% 0.0 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 v [m/s]

18.2 IRB 8700 4.20 m 550 kg Continued

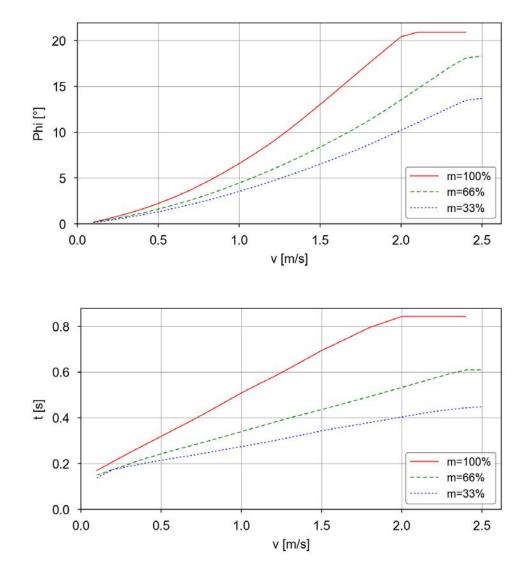


18.2 IRB 8700 4.20 m 550 kg Continued

Category 1, Axis 3

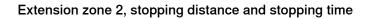


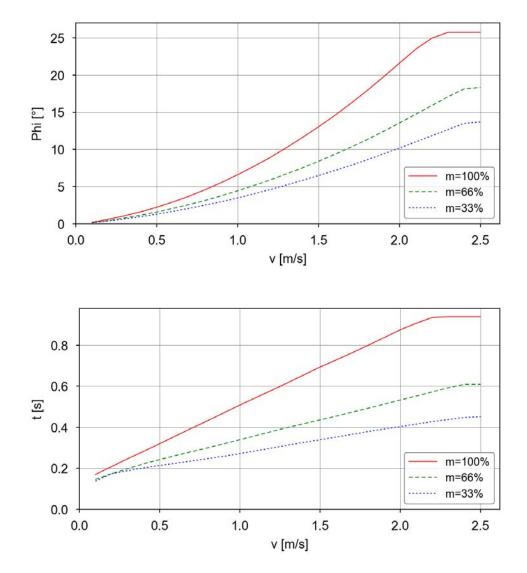
18.2 IRB 8700 4.20 m 550 kg Continued



Extension zone 1, stopping distance and stopping time

18.2 IRB 8700 4.20 m 550 kg Continued





18.3 IRB 8700LeanID 3.50 m 630 kg

18.3 IRB 8700LeanID 3.50 m 630 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

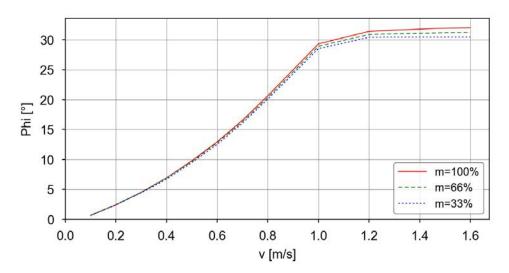
Axis	Distance (degrees)	Stop time (s)
1	44.4	1.19
2	10.1	0.27
3	9.6	0.25

Category 1, extension zones

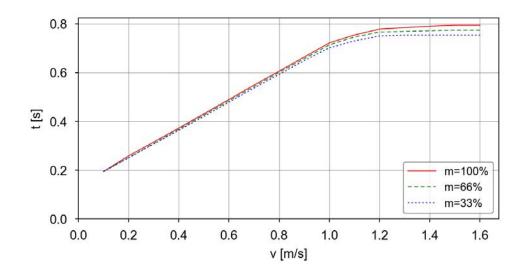
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.169
1	1.169	2.338
2	2.338	max reach

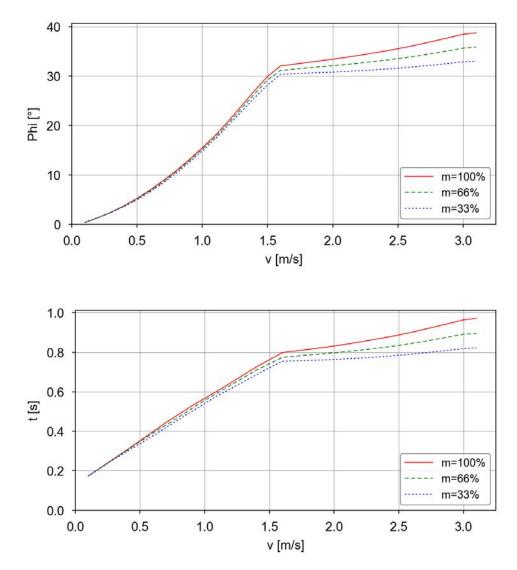
Category 1, Axis 1



18.3 IRB 8700LeanID 3.50 m 630 kg Continued

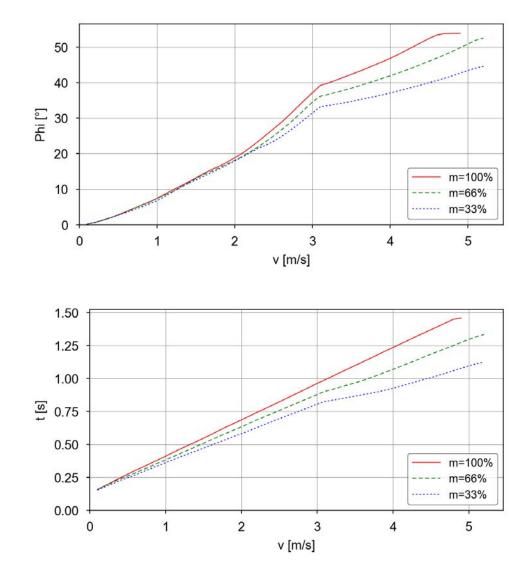


Extension zone 1, stopping distance and stopping time



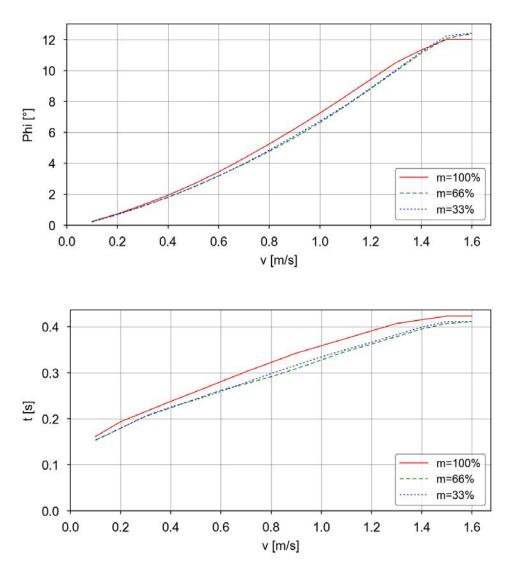
Continues on next page 640

18.3 IRB 8700LeanID 3.50 m 630 kg Continued

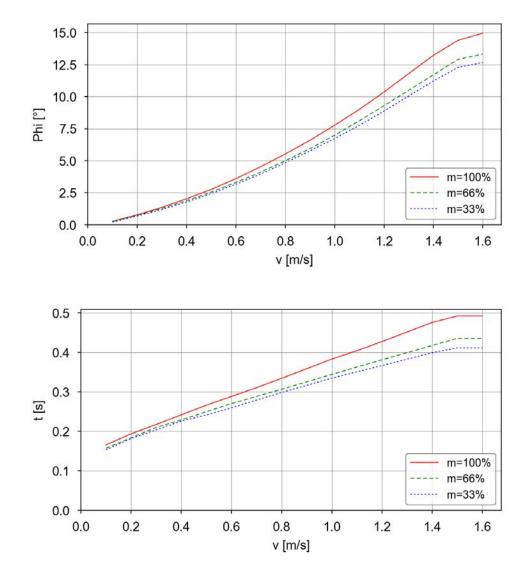


18.3 IRB 8700LeanID 3.50 m 630 kg *Continued*

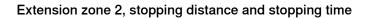
Category 1, Axis 2

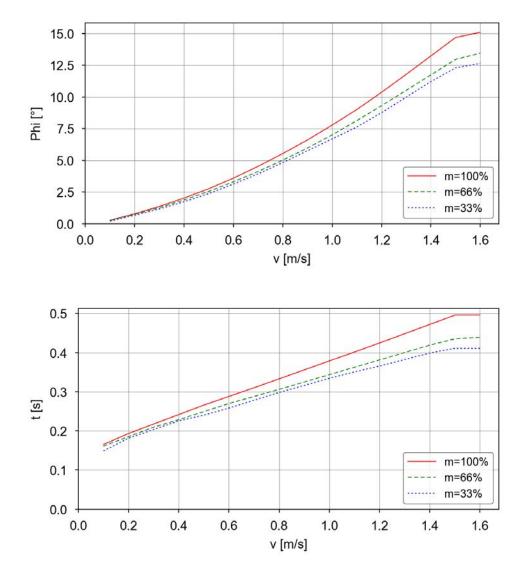


18.3 IRB 8700LeanID 3.50 m 630 kg Continued



18.3 IRB 8700LeanID 3.50 m 630 kg Continued

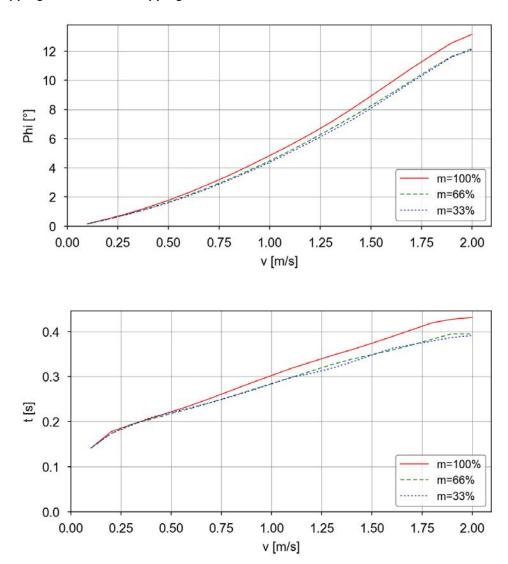




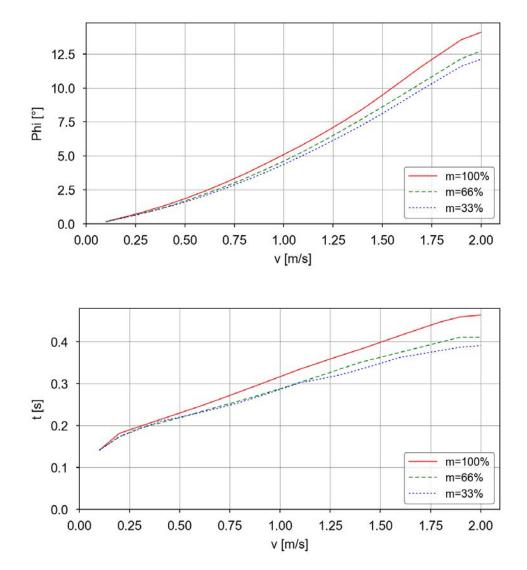
18.3 IRB 8700LeanID 3.50 m 630 kg Continued

Category 1, Axis 3

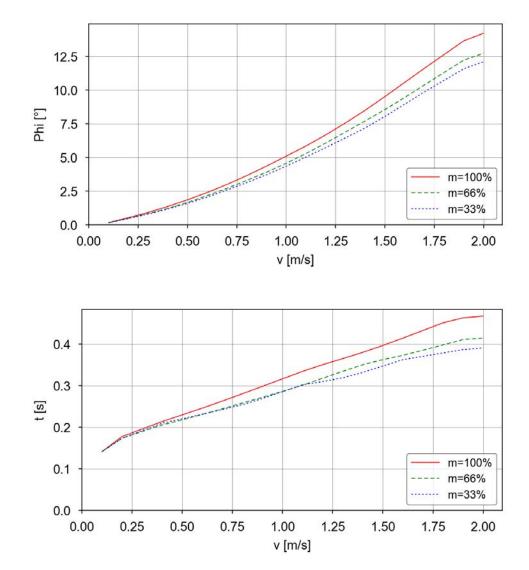
Extension zone 0, stopping distance and stopping time



18.3 IRB 8700LeanID 3.50 m 630 kg *Continued*



18.3 IRB 8700LeanID 3.50 m 630 kg Continued



18.4 IRB 8700LeanID 4.20 m 475 kg

18.4 IRB 8700LeanID 4.20 m 475 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

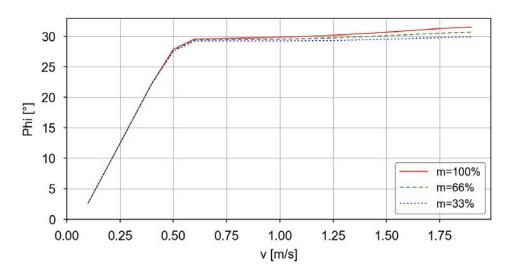
Axis	Distance (degrees)	Stop time (s)
1	44.4	1.26
2	9.5	0.25
3	12.0	0.34

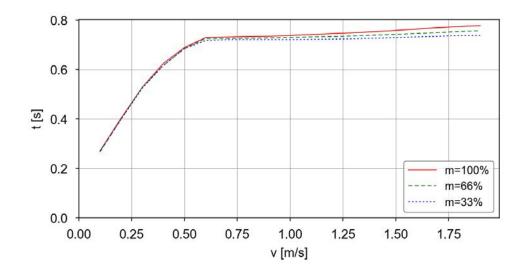
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

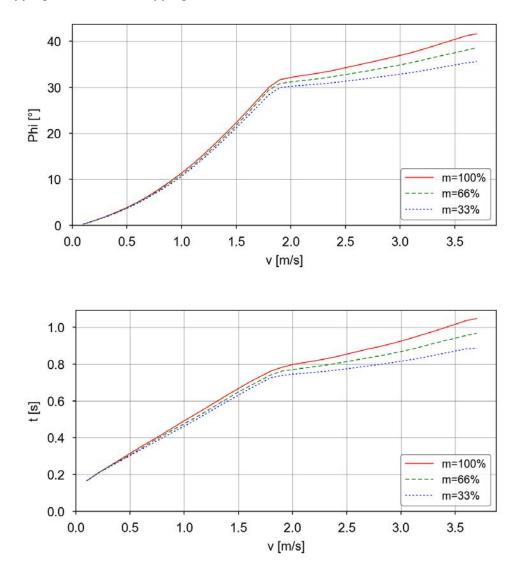
Zone	wcp min (m)	wcp max (m)
0	0	1.399
1	1.399	2.798
2	2.798	max reach

Category 1, Axis 1

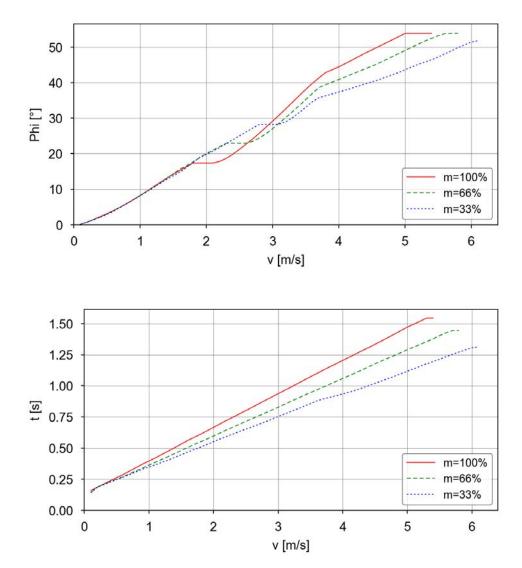




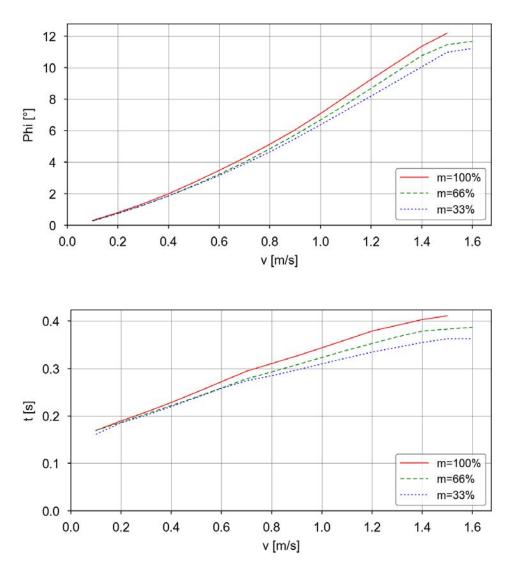
Extension zone 1, stopping distance and stopping time



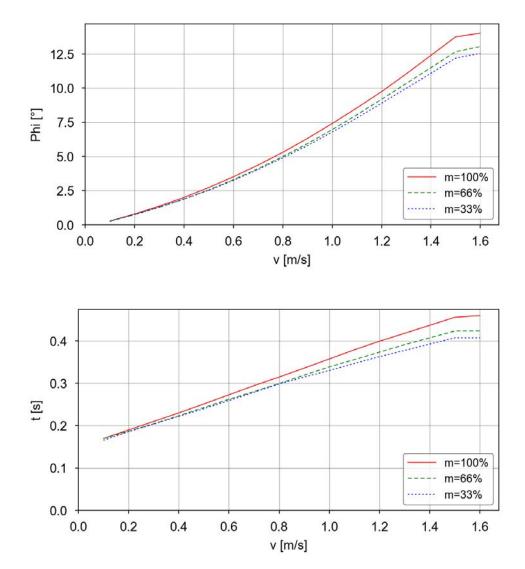
649

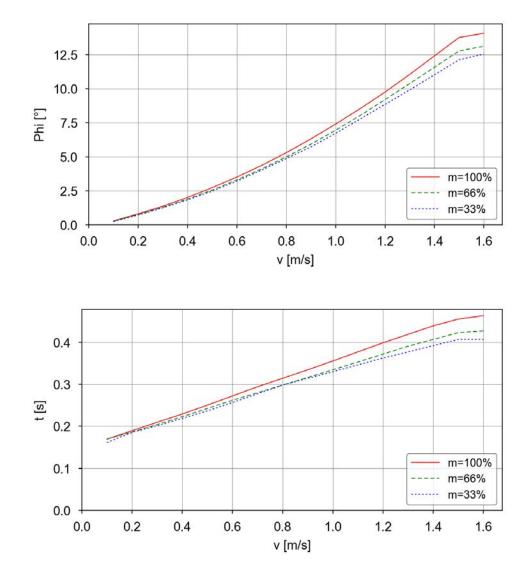


Category 1, Axis 2



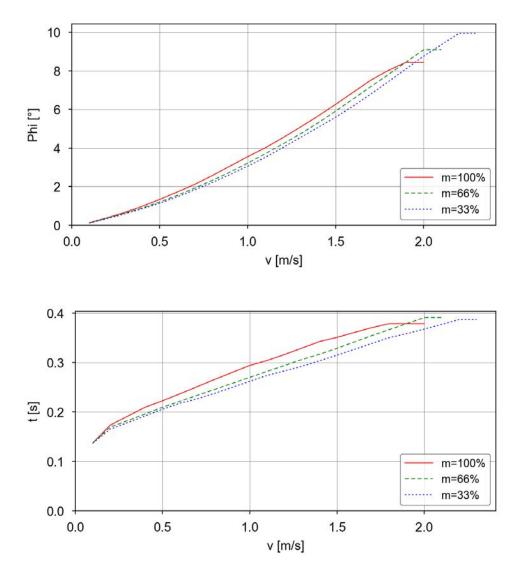
18.4 IRB 8700LeanID 4.20 m 475 kg *Continued*

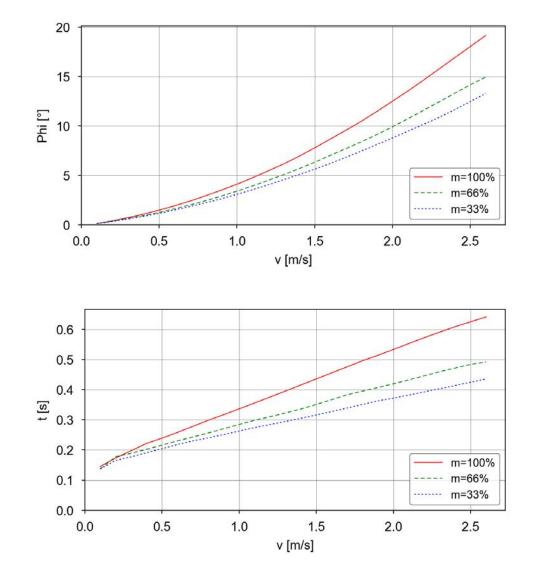




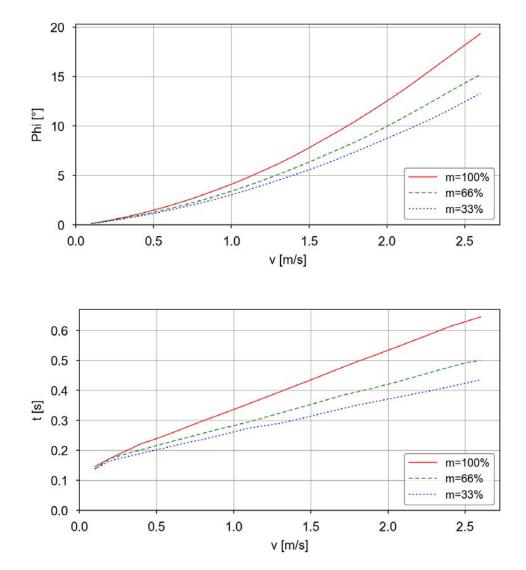
18.4 IRB 8700LeanID 4.20 m 475 kg *Continued*

Category 1, Axis 3





Extension zone 1, stopping distance and stopping time



19.1 IRB 460 2.4 m 110 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

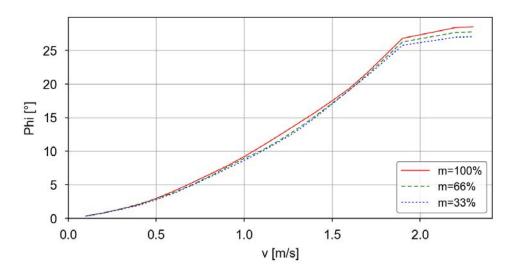
Axis	Distance (degrees)	Stop time (s)
1	41.5	0.49
2	14.6	0.17
3	13.6	0.15

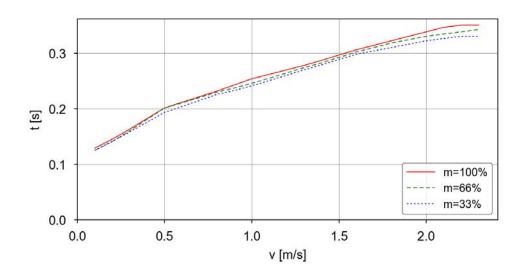
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

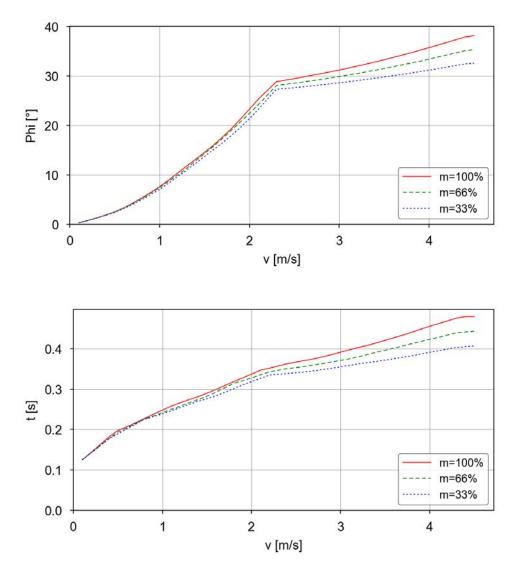
Zone	wcp min (m)	wcp max (m)
0	0	0.889
1	0.889	1.778
2	1.778	max reach

Category 1, Axis 1

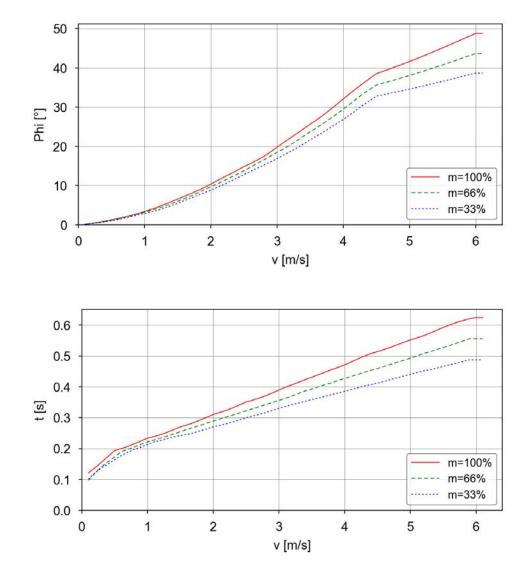




Extension zone 1, stopping distance and stopping time

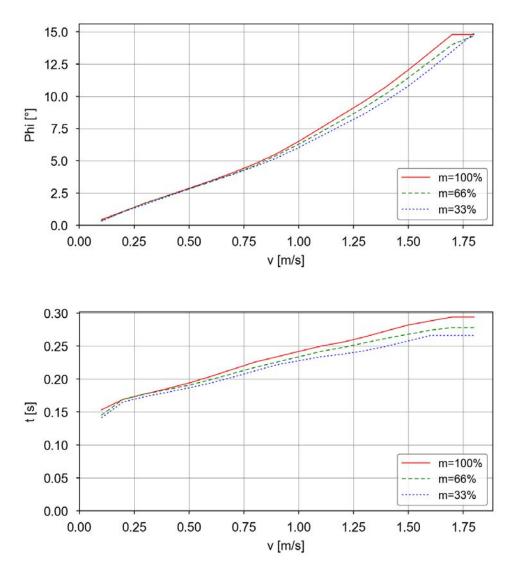


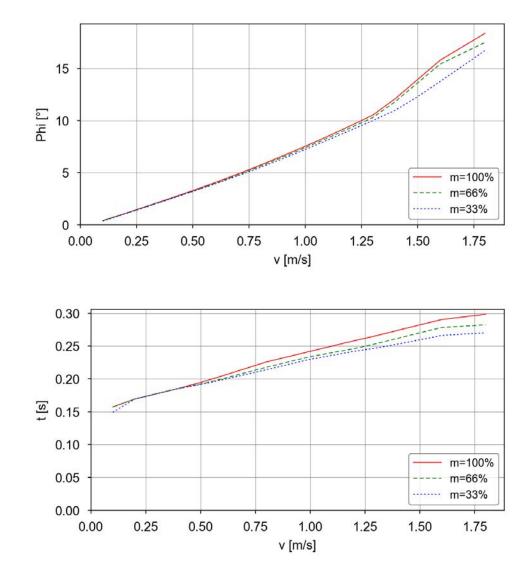
Continues on next page 658

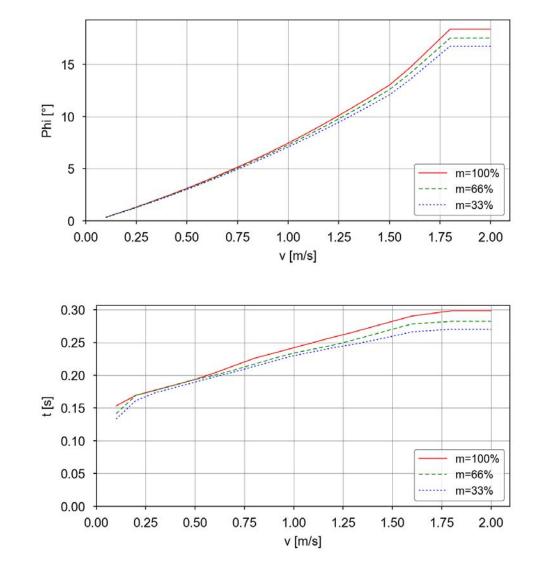


19.1 IRB 460 2.4 m 110 kg *Continued*

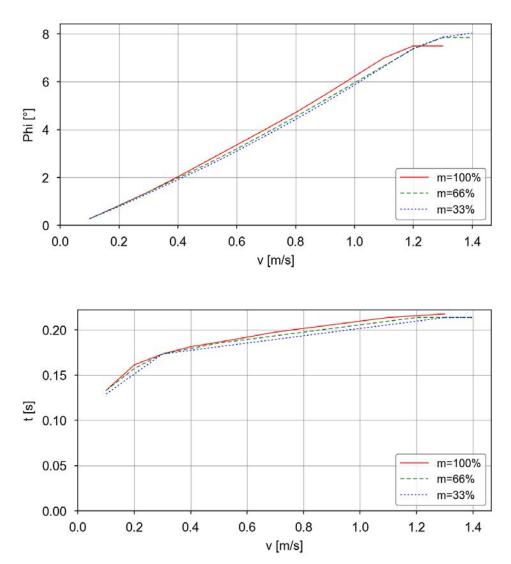
Category 1, Axis 2

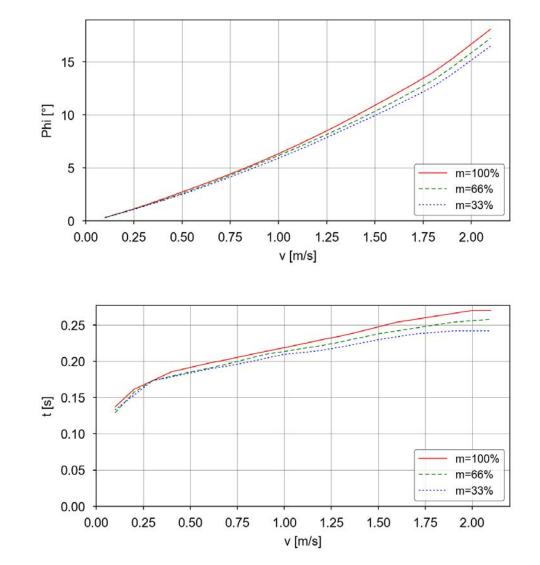


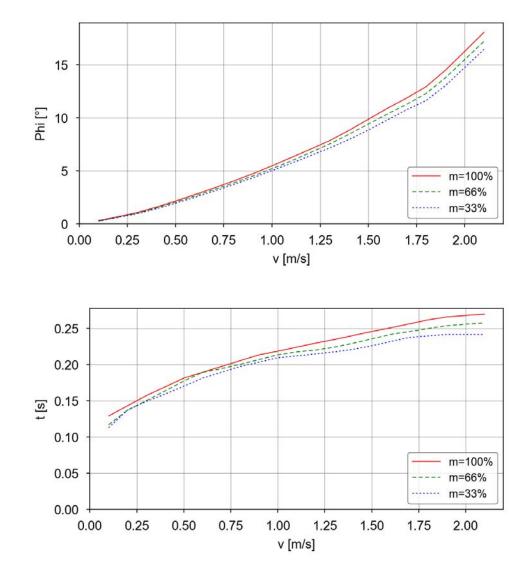




Category 1, Axis 3







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20.1 IRB 660 3.15 m 180 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

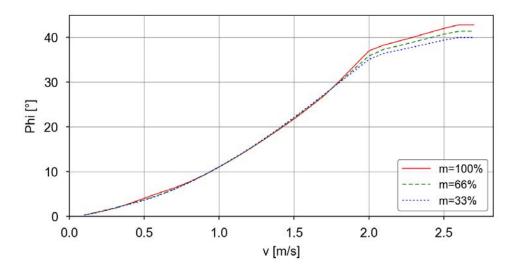
Axis	Distance (degrees)	Stop time (s)
1	64.4	0.9
2	32.6	0.39
3	27.0	0.29

Category 1, extension zones

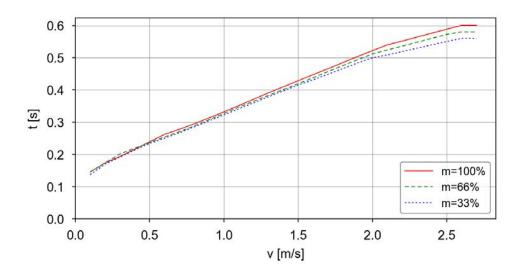
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.148
1	1.148	2.297
2	2.297	max reach

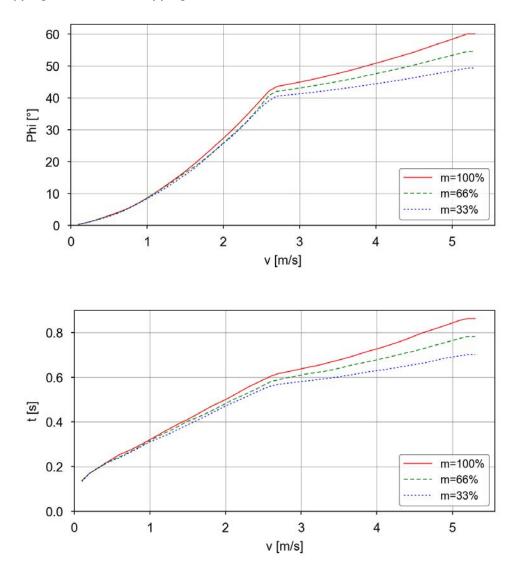
Category 1, Axis 1



20.1 IRB 660 3.15 m 180 kg Continued

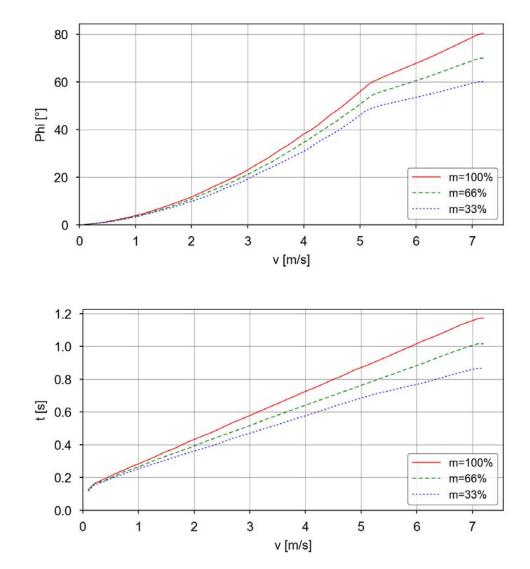


Extension zone 1, stopping distance and stopping time



Continues on next page 668

20.1 IRB 660 3.15 m 180 kg Continued

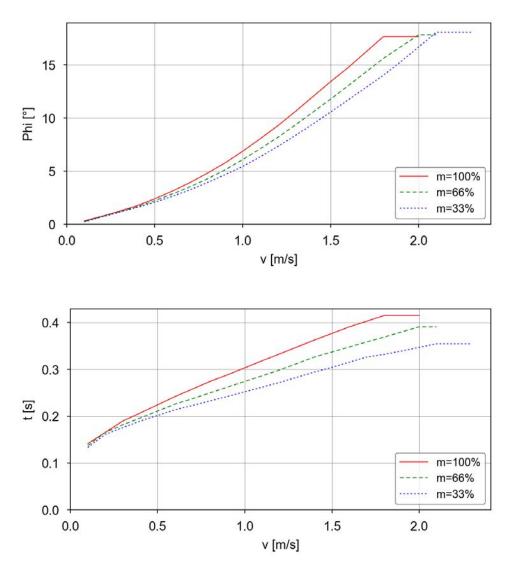


Extension zone 2, stopping distance and stopping time

20.1 IRB 660 3.15 m 180 kg Continued

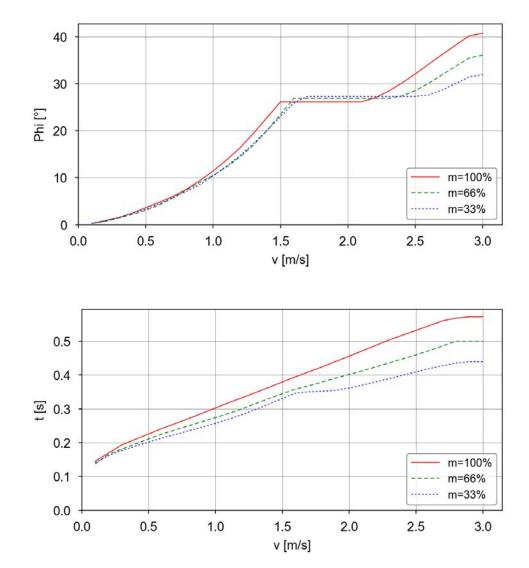
Category 1, Axis 2

Extension zone 0, stopping distance and stopping time



Continues on next page 670

20.1 IRB 660 3.15 m 180 kg Continued

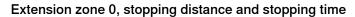


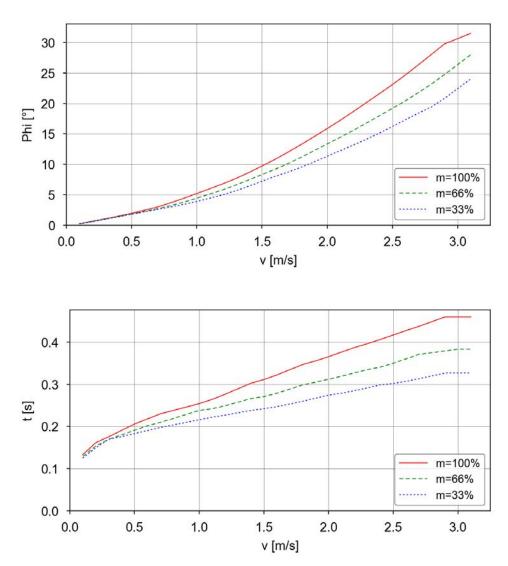
20.1 IRB 660 3.15 m 180 kg Continued

> 40 30 [°] ind 50 10 m=100% m=66% 1.1.1.1 m=33% 0 1.0 0.5 1.5 2.0 0.0 2.5 3.0 v [m/s] 0.5 0.4 <u>s</u> 0.3 Anna Anna Anna 0.2 m=100% 0.1 m=66% m=33% 0.0 1.5 0.0 0.5 1.0 2.0 2.5 3.0 v [m/s]

20.1 IRB 660 3.15 m 180 kg Continued

Category 1, Axis 3

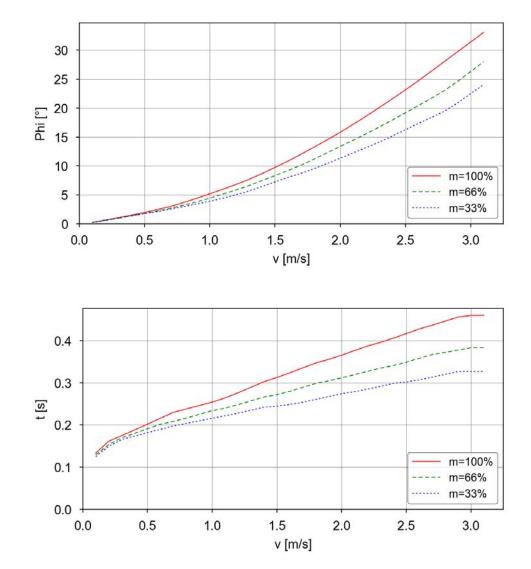




20.1 IRB 660 3.15 m 180 kg Continued

30 25 Phi [°] 20 15 10 m=100% m=66% 5 m=33% 0 1.0 0.5 1.5 2.0 2.5 0.0 3.0 v [m/s] 0.4 0.3 t [s] 0.2 AMPANATA m=100% 0.1 m=66% m=33% 0.0 0.0 0.5 1.0 1.5 2.0 2.5 3.0 v [m/s]

20.1 IRB 660 3.15 m 180 kg Continued



Extension zone 2, stopping distance and stopping time

20.2 IRB 660 3.15 m 250 kg

20.2 IRB 660 3.15 m 250 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

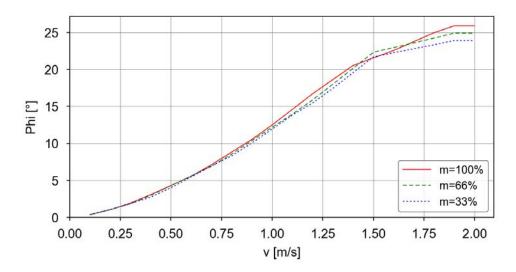
Axis	Distance (degrees)	Stop time (s)
1	43.1	0.78
2	23.2	0.37
3	21.6	0.32

Category 1, extension zones

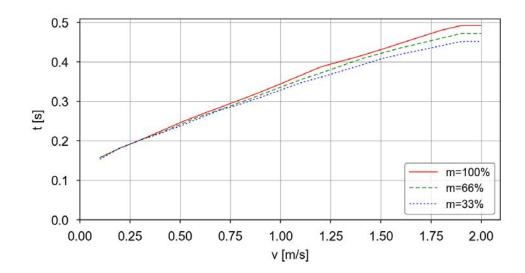
For definitions of the zones, see Extension zones for articulated robots on page 14.

Zone	wcp min (m)	wcp max (m)
0	0	1.148
1	1.148	2.297
2	2.297	max reach

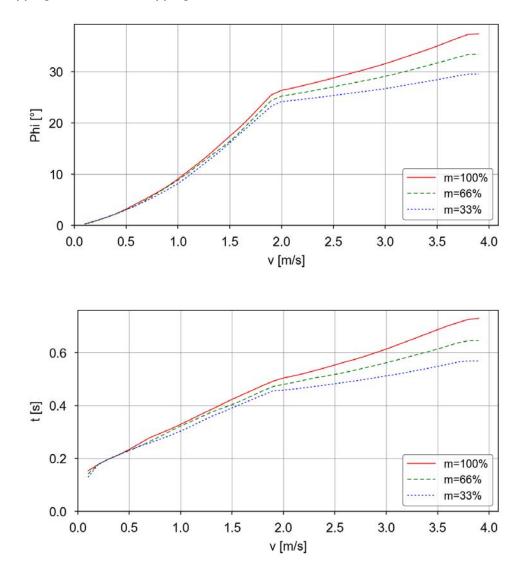
Category 1, Axis 1



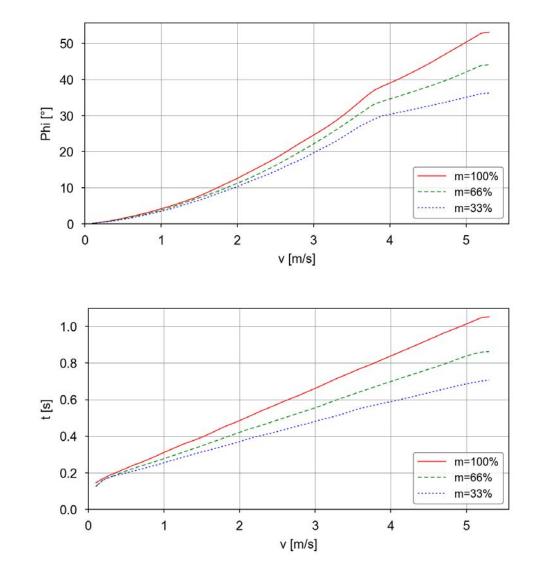
20.2 IRB 660 3.15 m 250 kg Continued



Extension zone 1, stopping distance and stopping time



20.2 IRB 660 3.15 m 250 kg Continued



m=100%

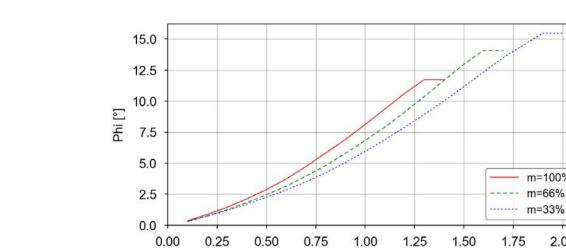
m=66%

2.00

1.75

20.2 IRB 660 3.15 m 250 kg Continued

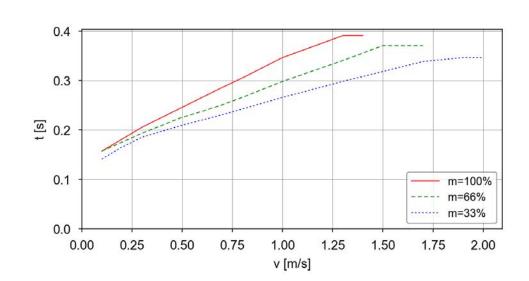
Category 1, Axis 2



Extension zone 0, stopping distance and stopping time

0.00

0.25



0.75

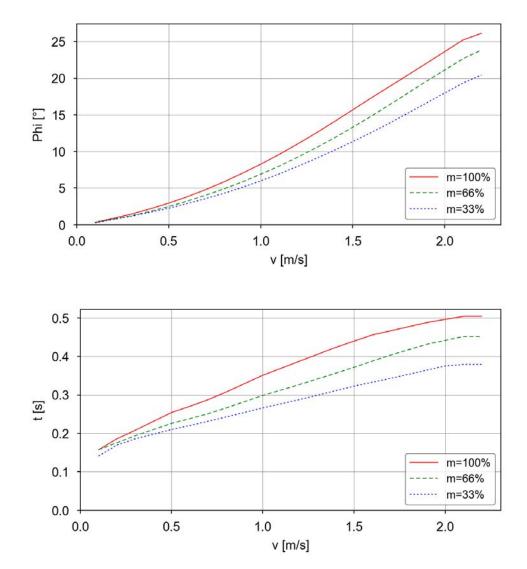
1.00

v [m/s]

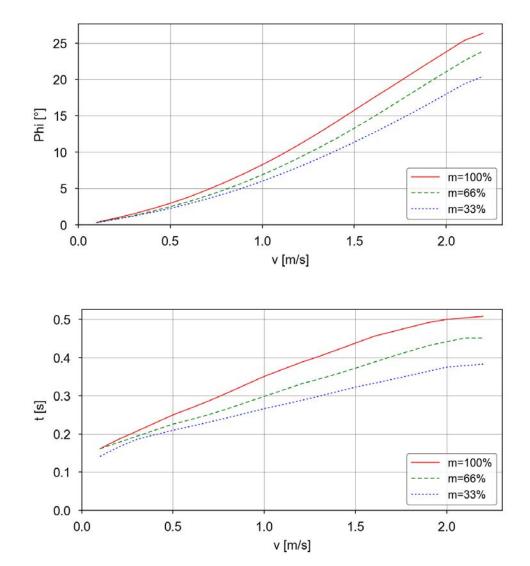
1.25

1.50

20.2 IRB 660 3.15 m 250 kg Continued

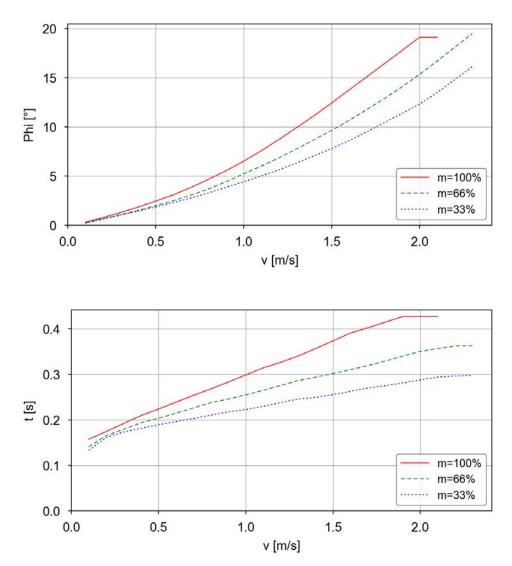


20.2 IRB 660 3.15 m 250 kg Continued

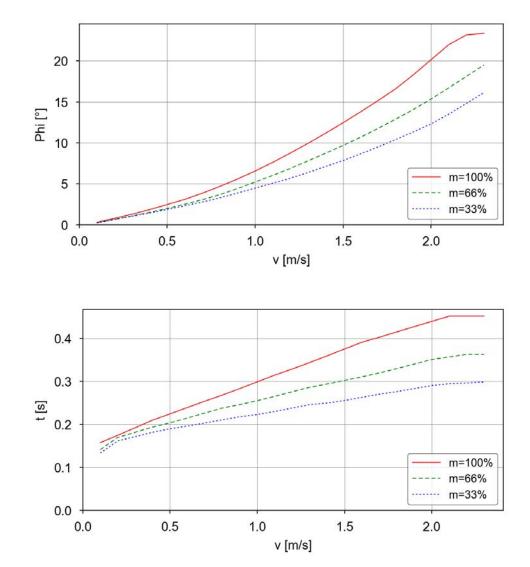


20.2 IRB 660 3.15 m 250 kg Continued

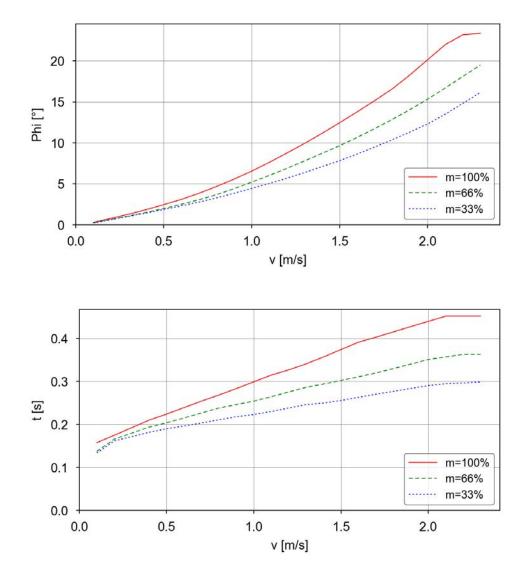
Category 1, Axis 3



20.2 IRB 660 3.15 m 250 kg Continued



20.2 IRB 660 3.15 m 250 kg Continued



21.1 IRB 760 3.2 m 445 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

Axis	Distance (degrees)	Stop time (s)
1	40.7	0.89
2	24.4	0.54
3	26.9	0.56

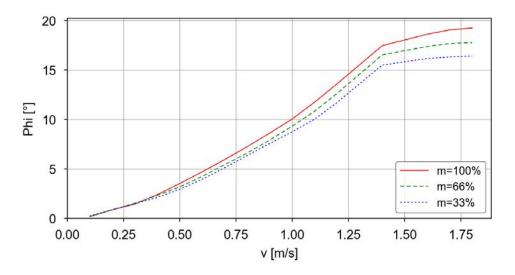
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

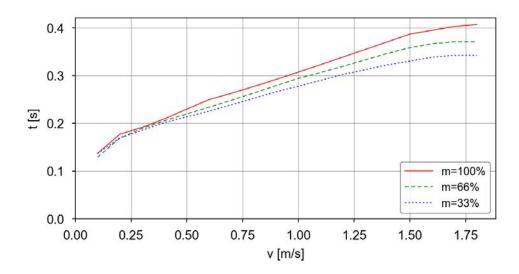
Zone	wcp min (m)	wcp max (m)
0	0	1.17
1	1.17	2.34
2	2.34	max reach

Category 1, Axis A1

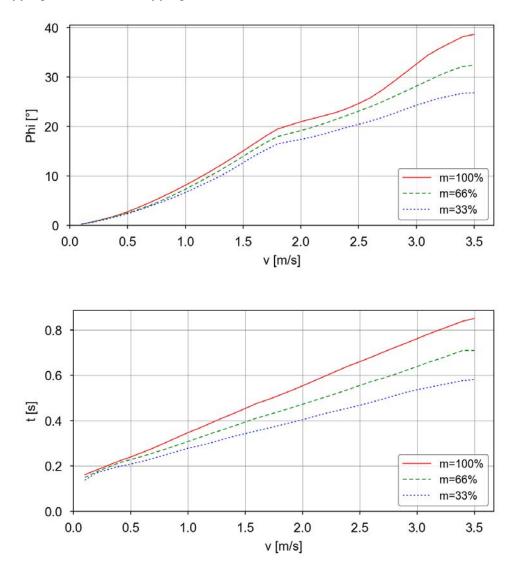
Extension zone 0, stopping distance and stopping time



21.1 IRB 760 3.2 m 445 kg Continued

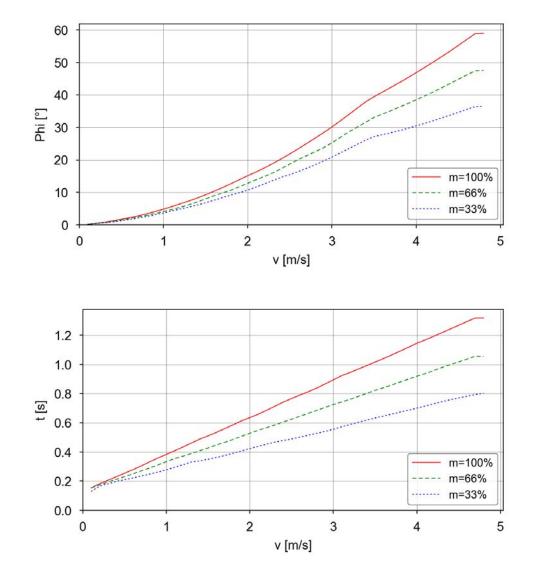


Extension zone 1, stopping distance and stopping time



Continues on next page 686

21.1 IRB 760 3.2 m 445 kg Continued

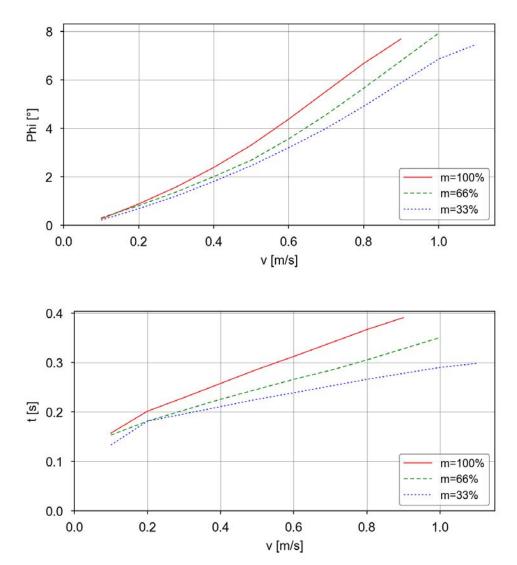


Extension zone 2, stopping distance and stopping time

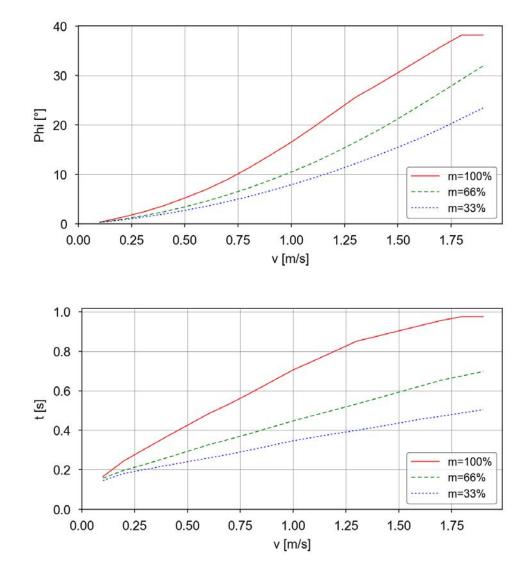
21.1 IRB 760 3.2 m 445 kg Continued

Category 1, Axis A2

Extension zone 0, stopping distance and stopping time



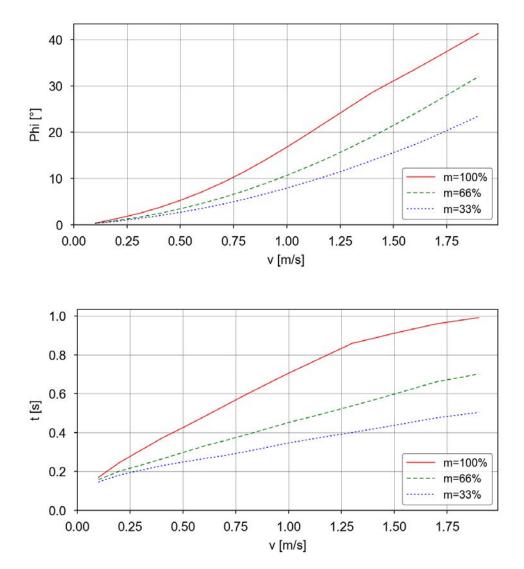
21.1 IRB 760 3.2 m 445 kg Continued



Extension zone 1, stopping distance and stopping time

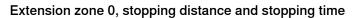
21.1 IRB 760 3.2 m 445 kg Continued

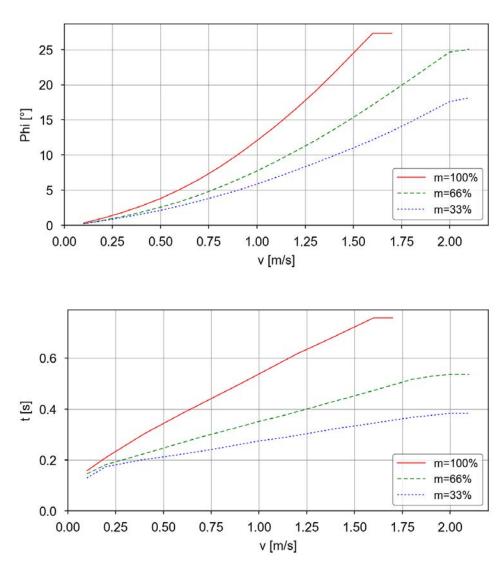
Extension zone 2, stopping distance and stopping time



21.1 IRB 760 3.2 m 445 kg Continued

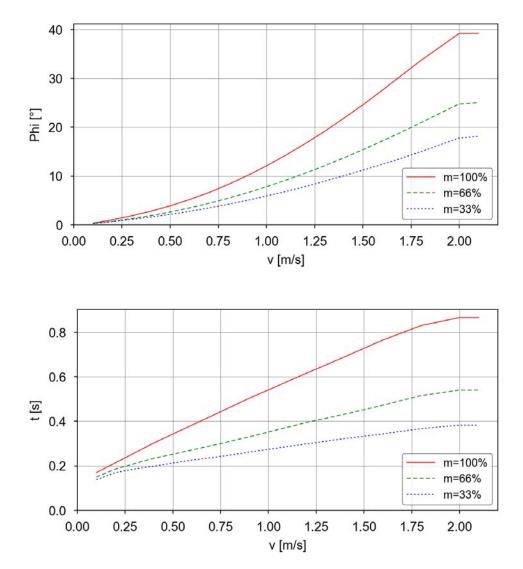
Category 1, Axis A3



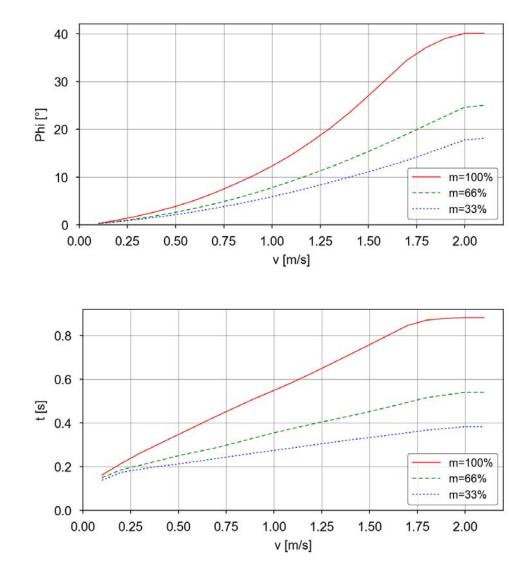


21.1 IRB 760 3.2 m 445 kg Continued

Extension zone 1, stopping distance and stopping time



21.1 IRB 760 3.2 m 445 kg Continued



Extension zone 2, stopping distance and stopping time

21.2 IRB 760 3.2 m 450 kg

21.2 IRB 760 3.2 m 450 kg

Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load. All results are from tests on one moving axis.

Axis	Distance (degrees)	Stop time (s)
1	40.2	0.83
2	0.0	0.0
3	26.4	0.49

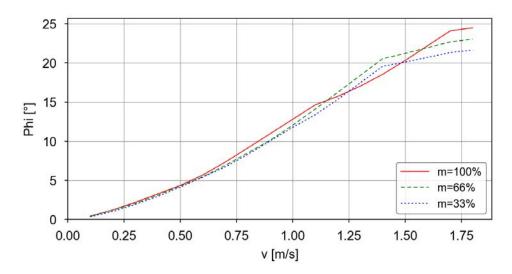
Category 1, extension zones

For definitions of the zones, see Extension zones for articulated robots on page 14.

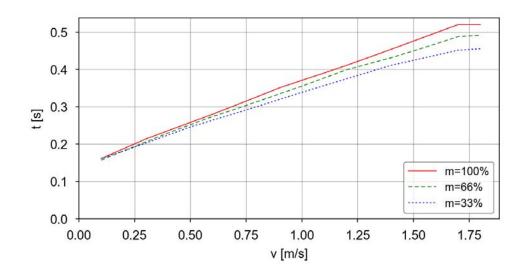
Zone	wcp min (m)	wcp max (m)
0	0	1.168
1	1.168	2.337
2	2.337	max reach

Category 1, Axis 1

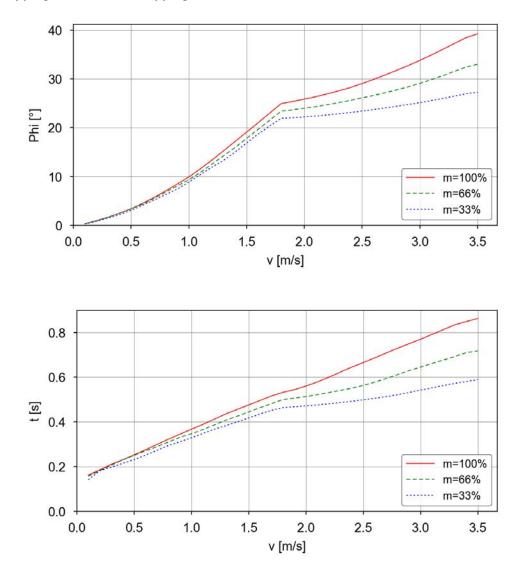
Extension zone 0, stopping distance and stopping time



21.2 IRB 760 3.2 m 450 kg Continued

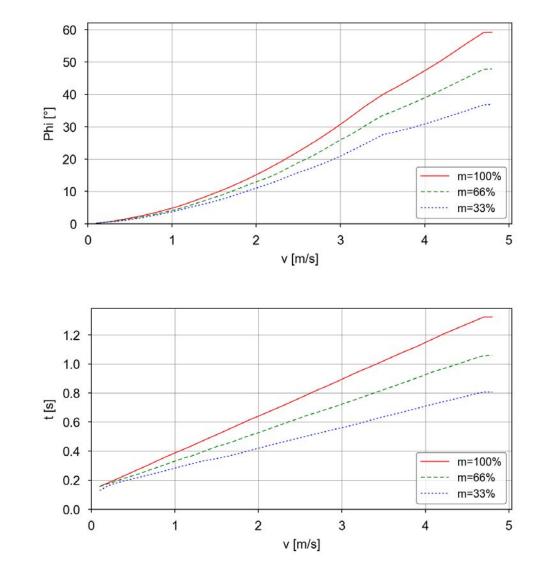


Extension zone 1, stopping distance and stopping time



Continues on next page

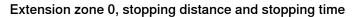
21.2 IRB 760 3.2 m 450 kg Continued

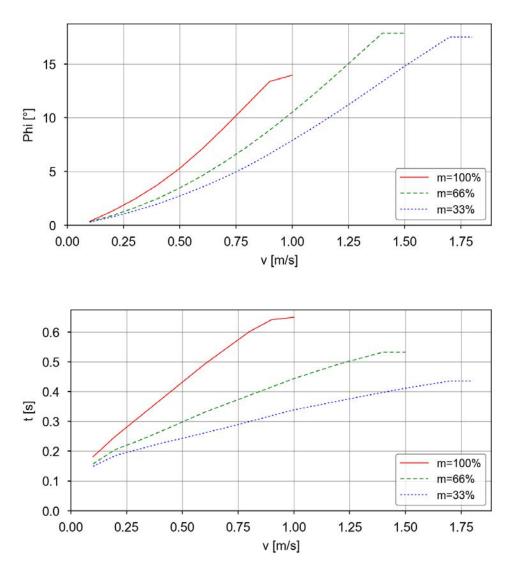


Extension zone 2, stopping distance and stopping time

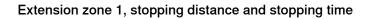
21.2 IRB 760 3.2 m 450 kg Continued

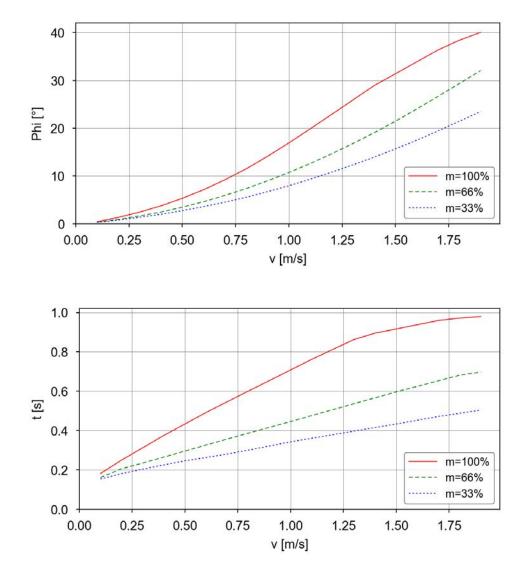
Category 1, Axis 2



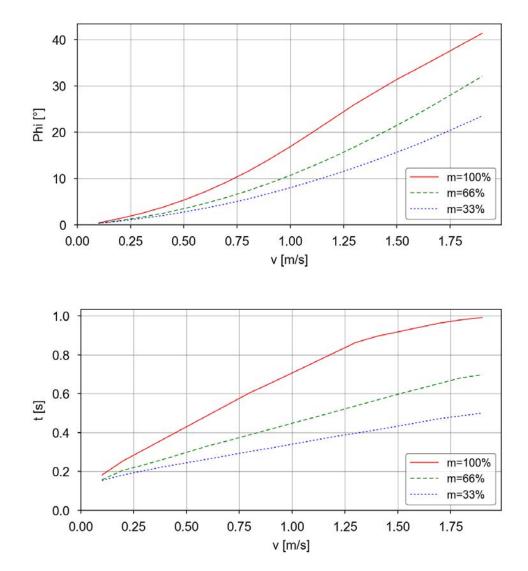


21.2 IRB 760 3.2 m 450 kg Continued





21.2 IRB 760 3.2 m 450 kg Continued

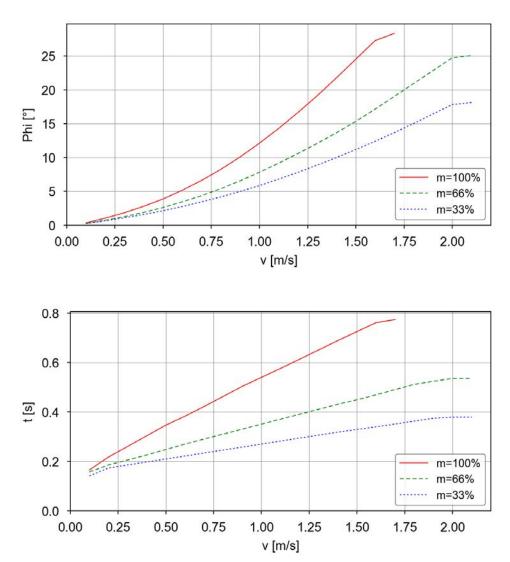


Extension zone 2, stopping distance and stopping time

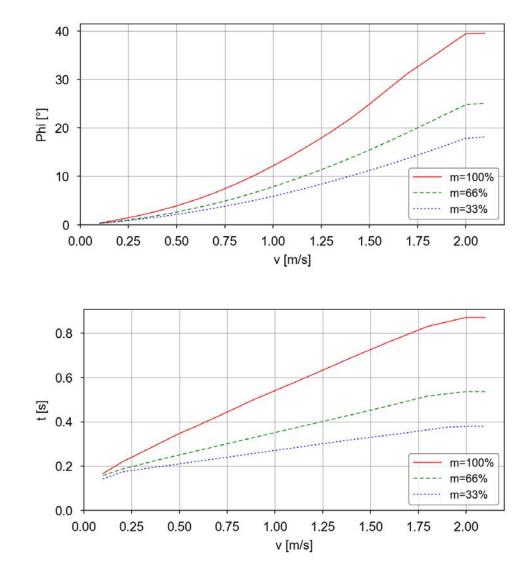
21.2 IRB 760 3.2 m 450 kg Continued

Category 1, Axis 3

Extension zone 0, stopping distance and stopping time

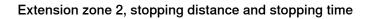


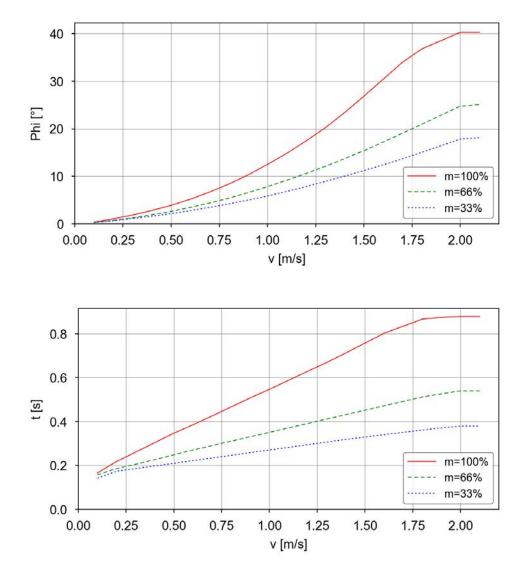
21.2 IRB 760 3.2 m 450 kg Continued



Extension zone 1, stopping distance and stopping time

21.2 IRB 760 3.2 m 450 kg Continued





22.1 IRB 360 0.8 m 1 kg

22 IRB 360

22.1 IRB 360 0.8 m 1 kg

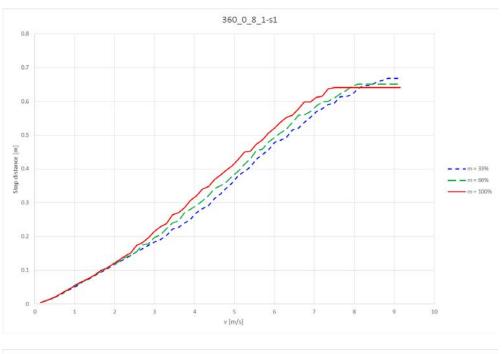
Category 0

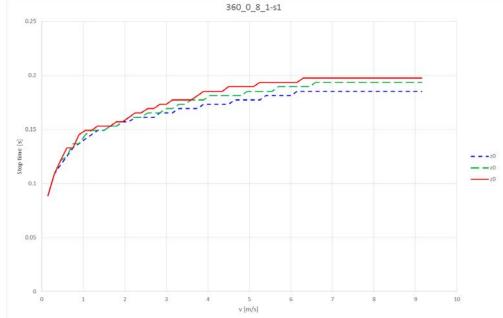
The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.57	0.18
Wash down	0.56	0.18
3AXES	0.57	0.17

22.1 IRB 360 0.8 m 1 kg Continued

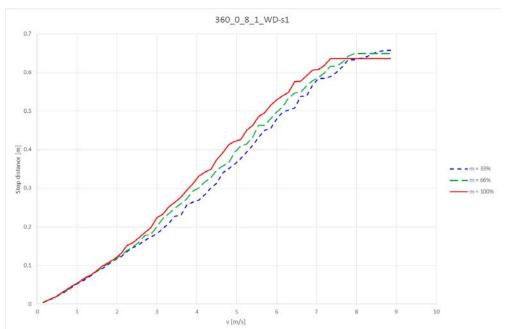
Category 1, Standard

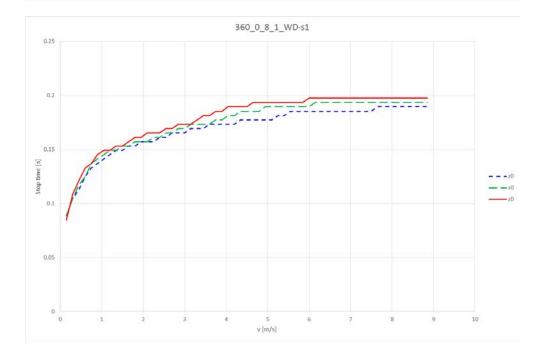




22.1 IRB 360 0.8 m 1 kg Continued

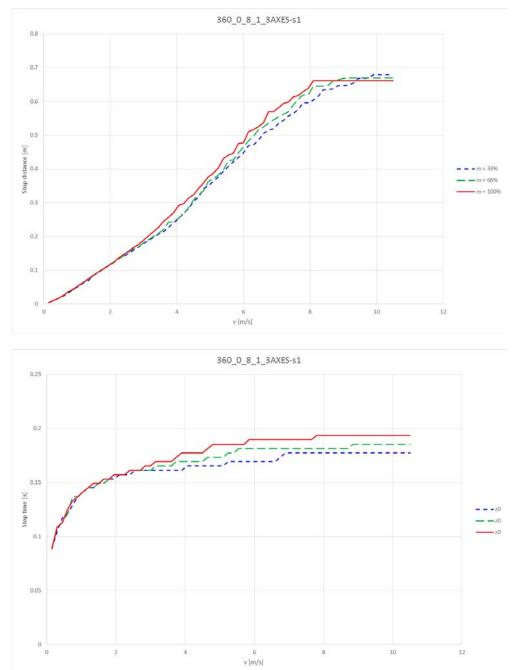
Category 1, Wash Down





22.1 IRB 360 0.8 m 1 kg Continued

Category 1, 3AXES



22.2 IRB 360 1.13 m 1 kg

22.2 IRB 360 1.13 m 1 kg

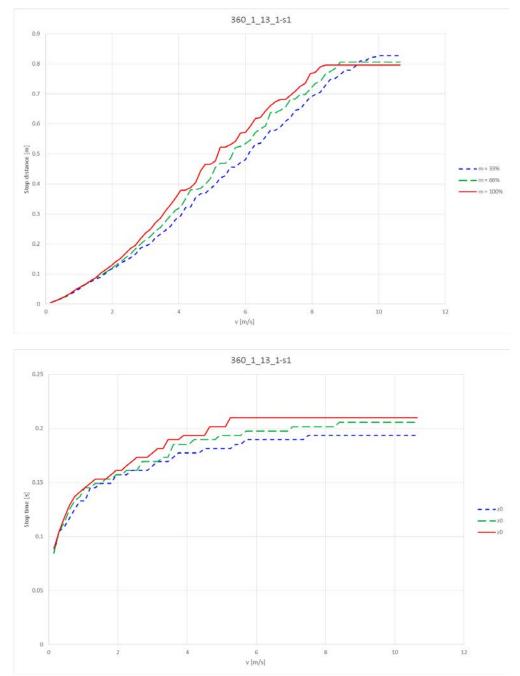
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.69	0.19
Wash down	0.69	0.19
3AXES	0.73	0.18
Stainless	0.67	0.19

22.2 IRB 360 1.13 m 1 kg Continued

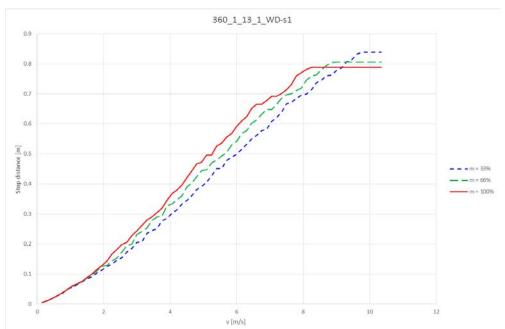
Category 1, Standard

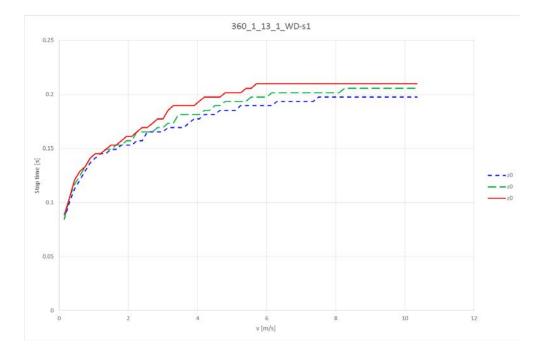


22.2 IRB 360 1.13 m 1 kg Continued

Category 1, Wash Down

Stopping distance and stopping time

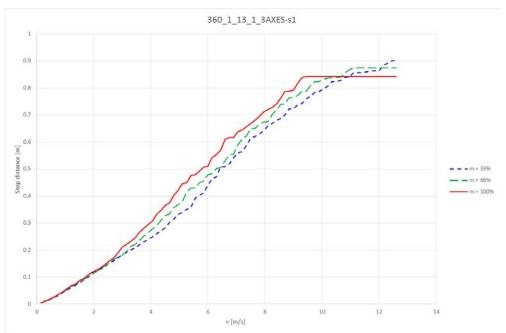


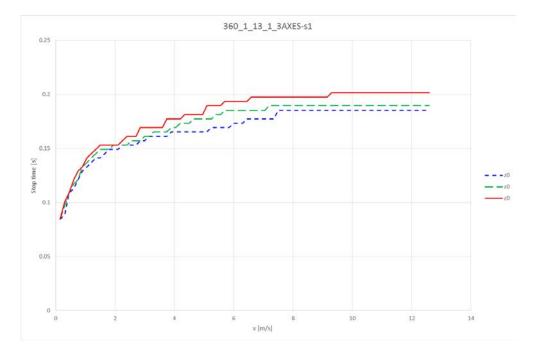


709

22.2 IRB 360 1.13 m 1 kg Continued

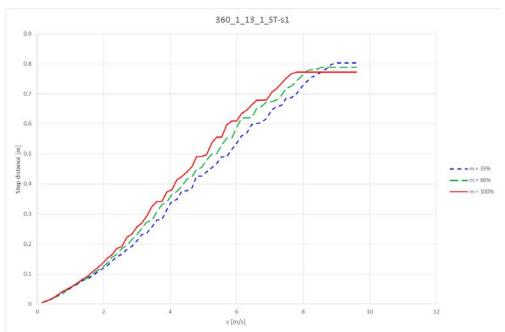
Category 1, 3AXES

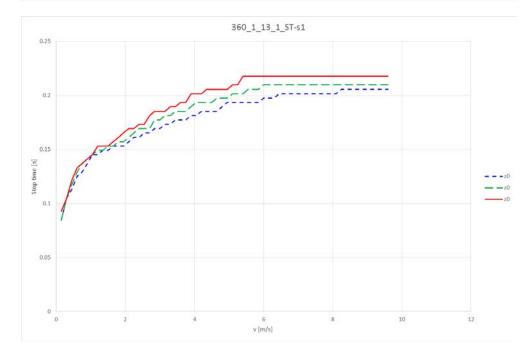




22.2 IRB 360 1.13 m 1 kg Continued

Category 1, Stainless





22.3 IRB 360 1.13 m 3 kg

22.3 IRB 360 1.13 m 3 kg

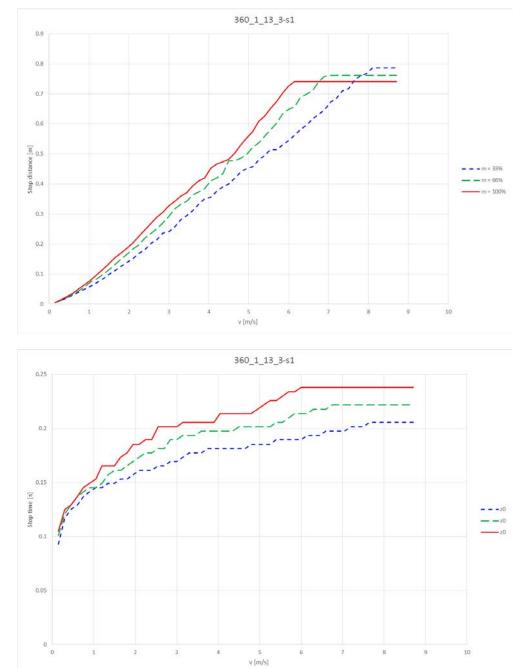
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.65	0.21
Wash down	0.65	0.21
3AXES	0.62	0.20
Stainless	0.64	0.22

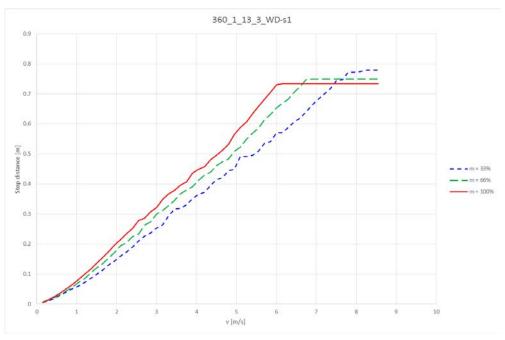
22.3 IRB 360 1.13 m 3 kg Continued

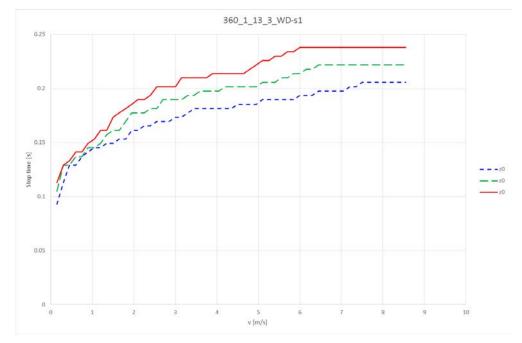
Category 1, Standard



22.3 IRB 360 1.13 m 3 kg Continued

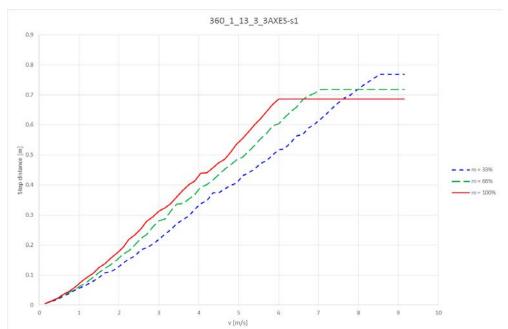
Category 1, Wash Down

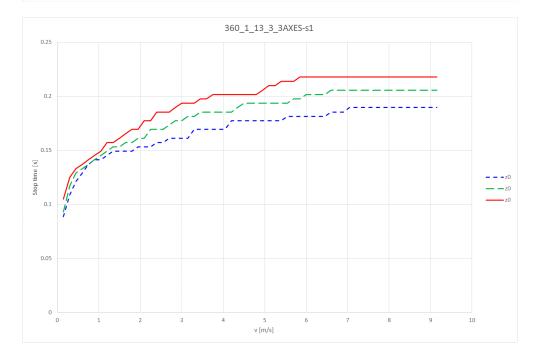




22.3 IRB 360 1.13 m 3 kg Continued

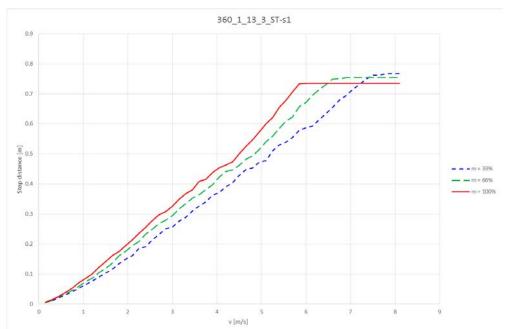
Category 1, 3AXES

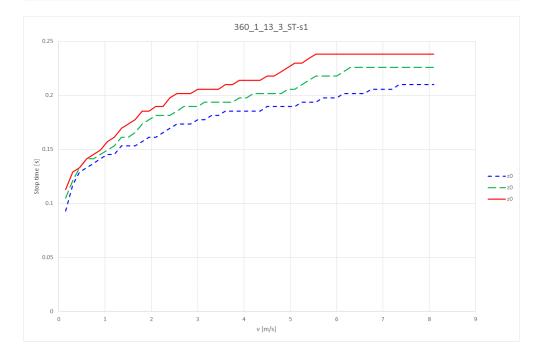




22.3 IRB 360 1.13 m 3 kg Continued

Category 1, Stainless





22.4 IRB 360 1.13 m 8 kg

22.4 IRB 360 1.13 m 8 kg

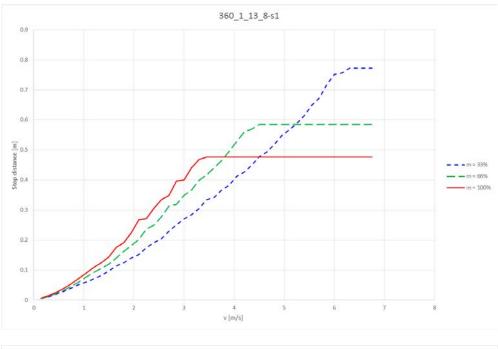
Category 0

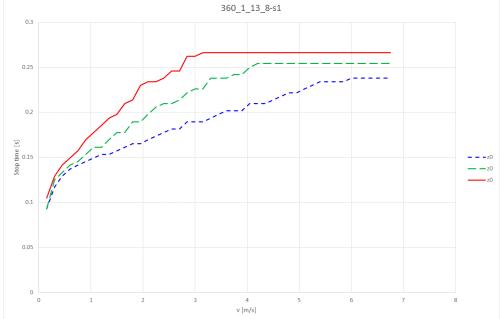
The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.65	0.33

22.4 IRB 360 1.13 m 8 kg Continued

Category 1, Standard





22.5 IRB 360 1.6 m 1 kg

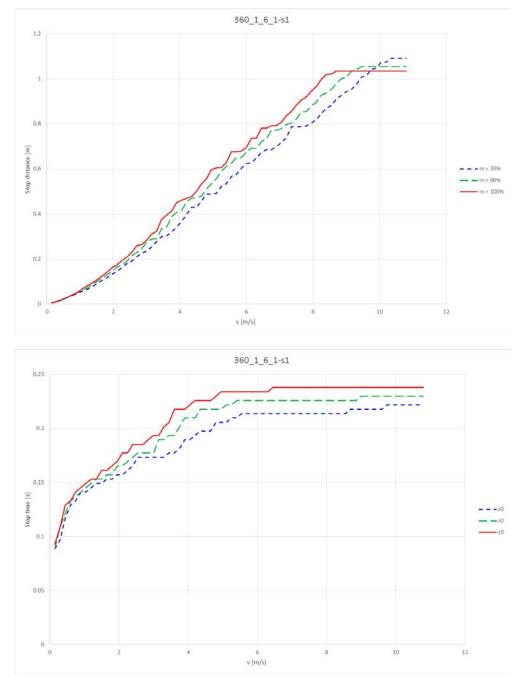
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.90	0.22

22.5 IRB 360 1.6 m 1 kg Continued

Category 1, Standard



22.6 IRB 360 1.6 m 6 kg

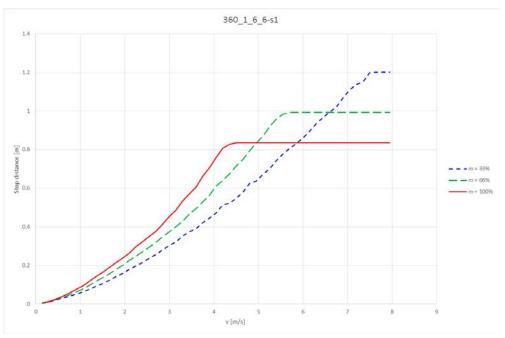
Category 0

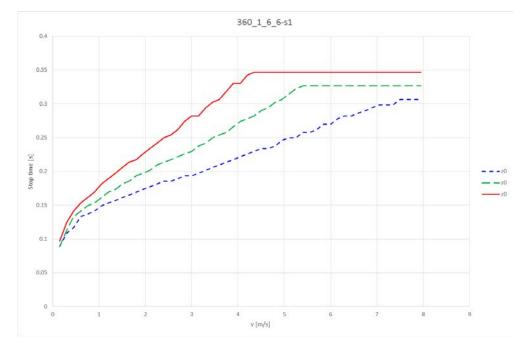
The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.93	0.36

22.6 IRB 360 1.6 m 6 kg Continued

Category 1, Standard





23.1 IRB 365 0.8 m 1.5 kg

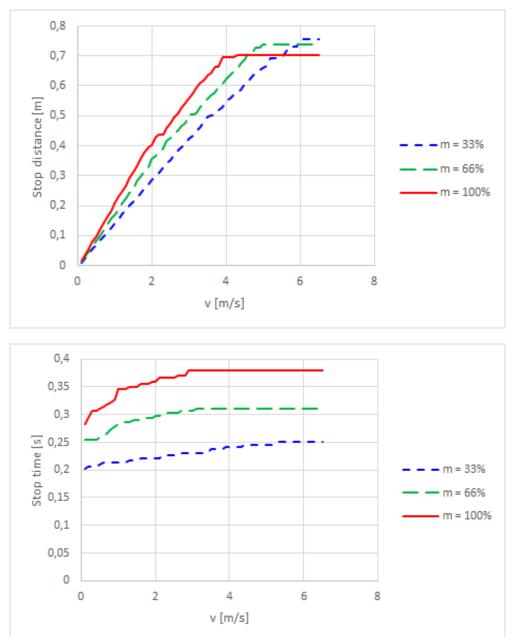
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.55	0.25

23.1 IRB 365 0.8 m 1.5 kg Continued

Category 1, Standard



23.2 IRB 365 1.1 m 1.5 kg

23.2 IRB 365 1.1 m 1.5 kg

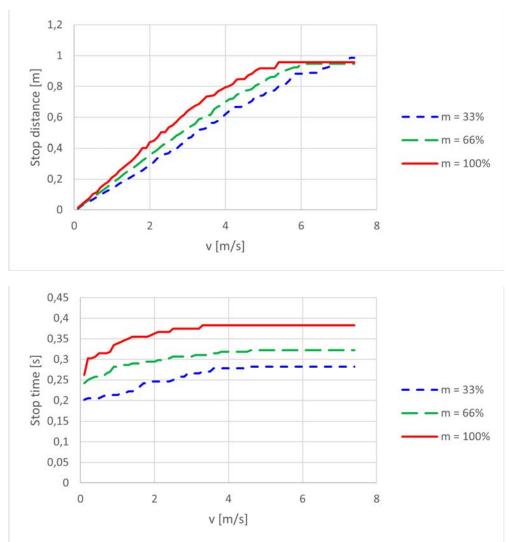
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.41	0.29

23.2 IRB 365 1.1 m 1.5 kg Continued

Category 1, Standard



23.3 IRB 365 1.3 m 1.5 kg

23.3 IRB 365 1.3 m 1.5 kg

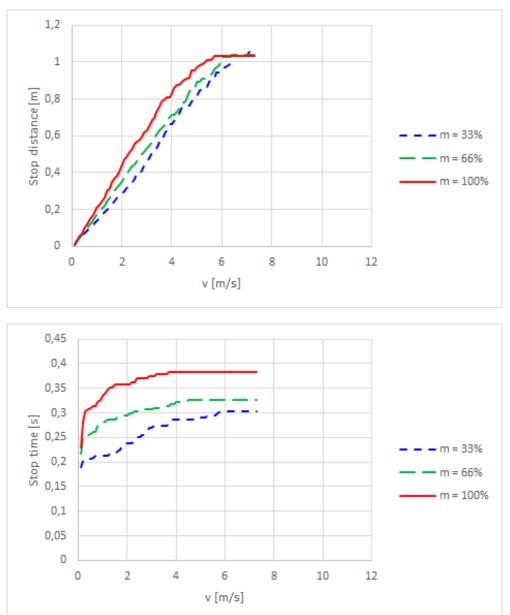
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.73	0.26

23.3 IRB 365 1.3 m 1.5 kg Continued

Category 1, Standard



24.1 IRB 390 1.3 m 10 kg

24 IRB 390

24.1 IRB 390 1.3 m 10 kg

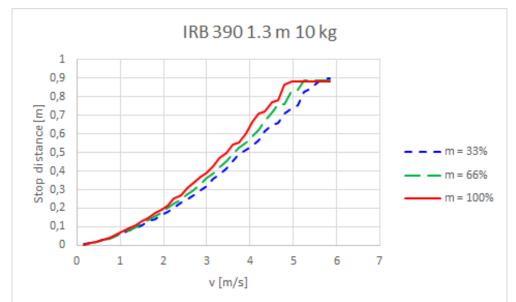
Category 0

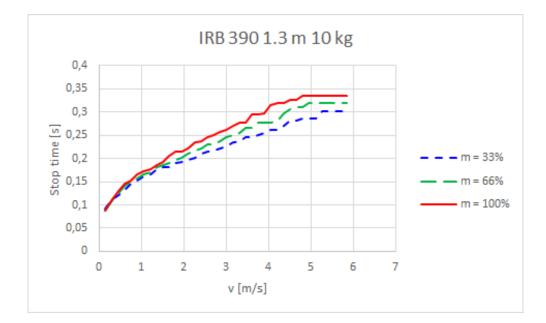
The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.71	0.29

24.1 IRB 390 1.3 m 10 kg Continued

Category 1, Standard





24.2 IRB 390 1.3 m 15 kg

24.2 IRB 390 1.3 m 15 kg

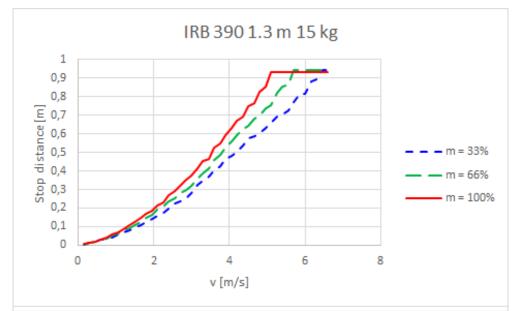
Category 0

The following table describes the stopping distance and time for category 0 emergency stop at max speed, with the arm stretched out to the maximum with maximum load.

Protection type/variant	Distance (meters)	Stop time (s)
Standard	0.72	0.28

24.2 IRB 390 1.3 m 15 kg Continued

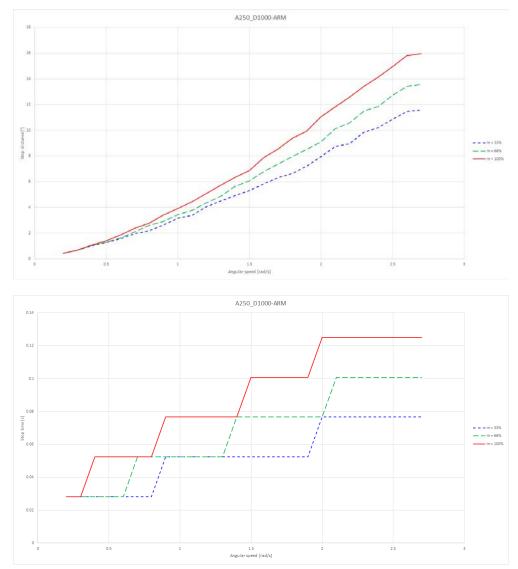
Category 1, Standard





25.1 A250_D1000

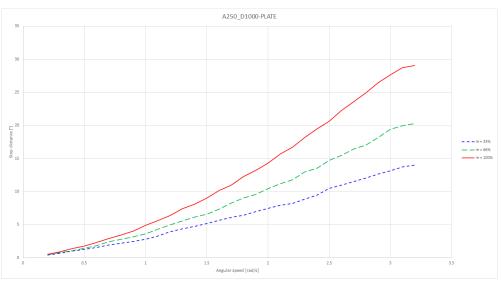
Category 0, ARM

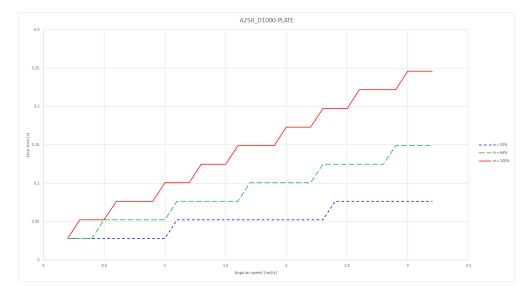


25.1 A250_D1000 Continued

Category 0, PLATE

Stopping distance and stopping time

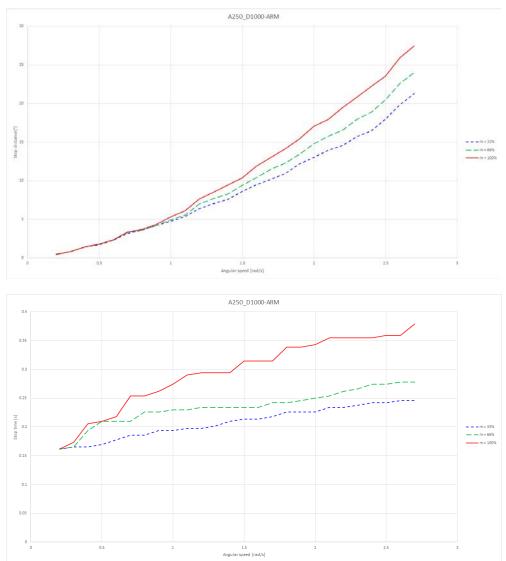




Continues on next page

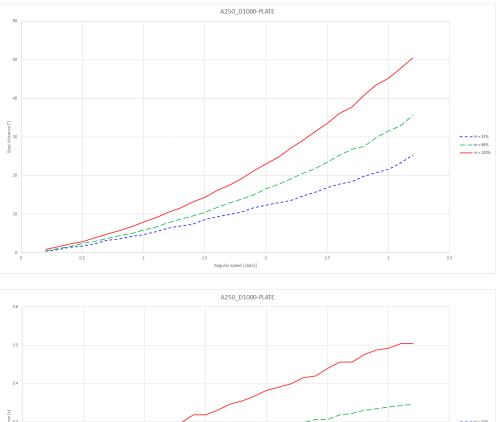
25.1 A250_D1000 Continued

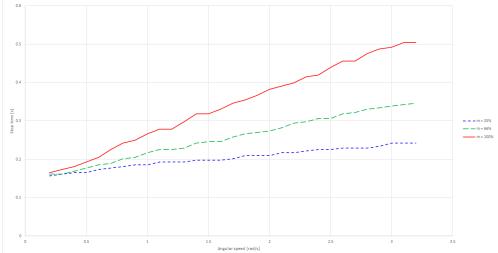
Category 1, ARM



25.1 A250_D1000 Continued

Category 1, PLATE

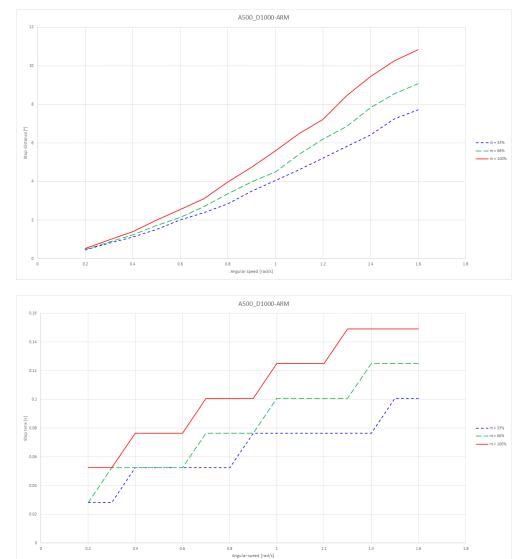




25.2 A500_D1000

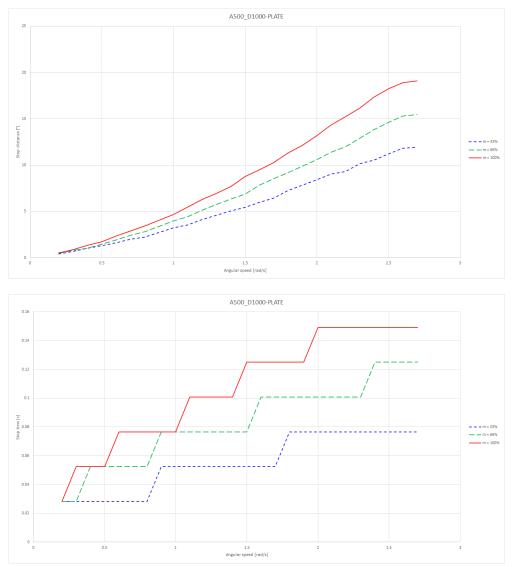
25.2 A500_D1000

Category 0, ARM



25.2 A500_D1000 Continued

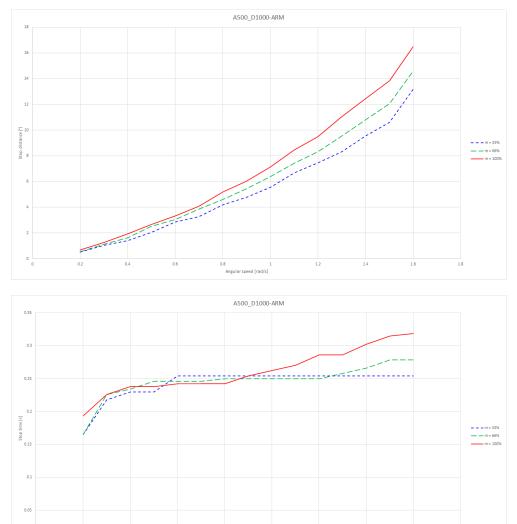
Category 0, PLATE



25.2 A500_D1000 Continued

Category 1, ARM

Stopping distance and stopping time



0.8 Angularspeed [rad/s]

1.2

1.4

1.6

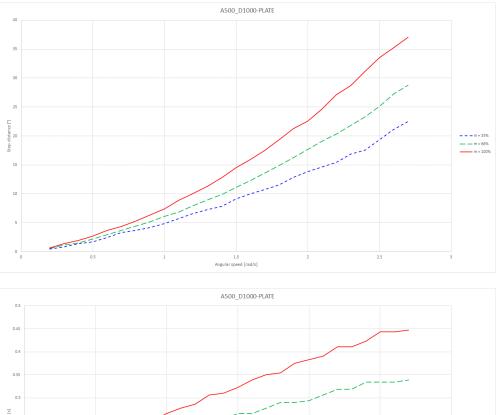
1.8

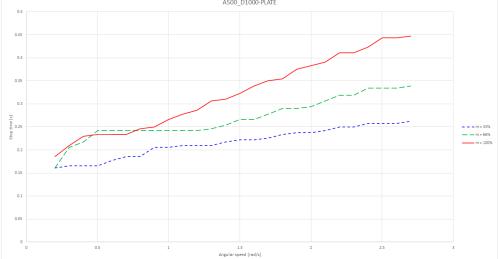
0.2

0.4

25.2 A500_D1000 Continued

Category 1, PLATE



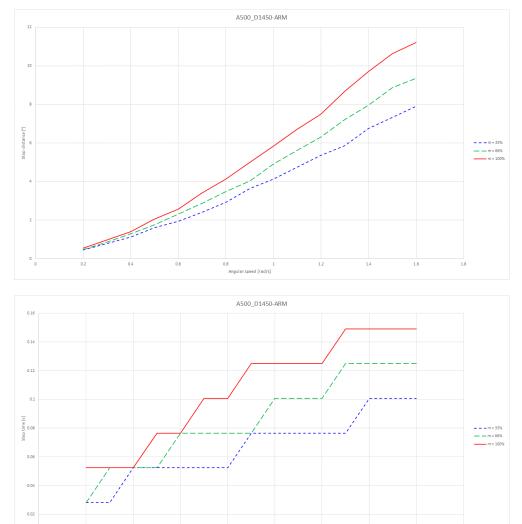


25.3 A500_D1450

25.3 A500_D1450

Category 0, ARM

Stopping distance and stopping time



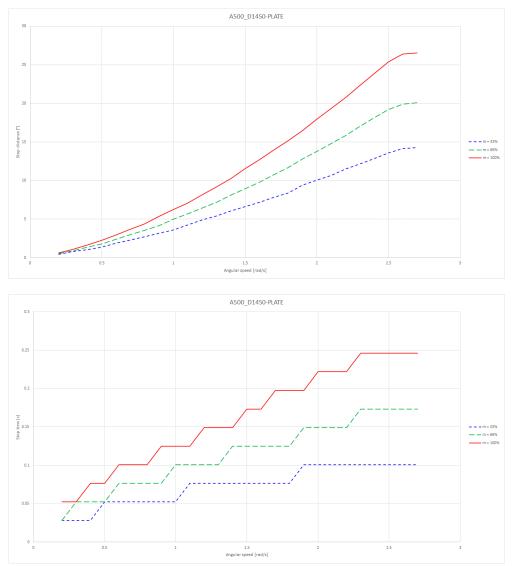
0.6

0.8 Angular speed [rad/s]

25.3 A500_D1450 *Continued*

Category 0, PLATE

Stopping distance and stopping time

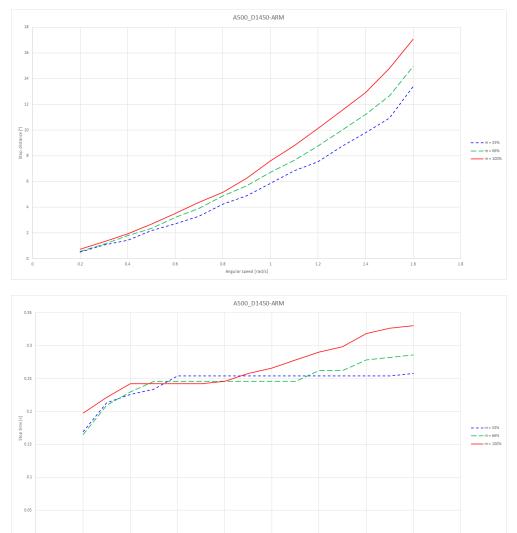


Continues on next page

25.3 A500_D1450 Continued

Category 1, ARM

Stopping distance and stopping time



0.8 Angularspeed [rad/s]

1.2

1.4

1.6

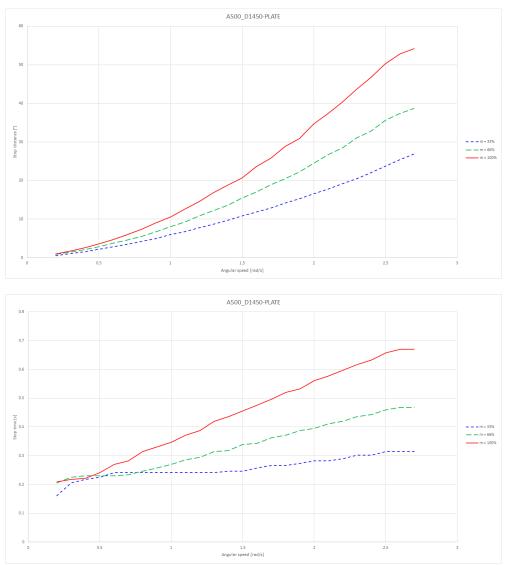
1.8

0.2

0.4

25.3 A500_D1450 *Continued*

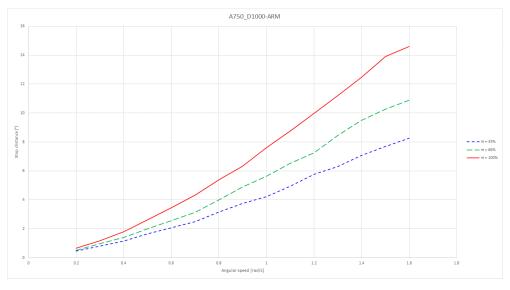
Category 1, PLATE



25.4 A750_D1000

25.4 A750_D1000

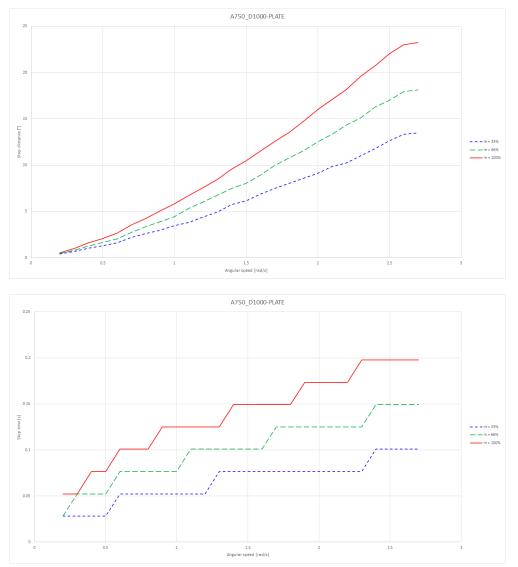
Category 0, ARM





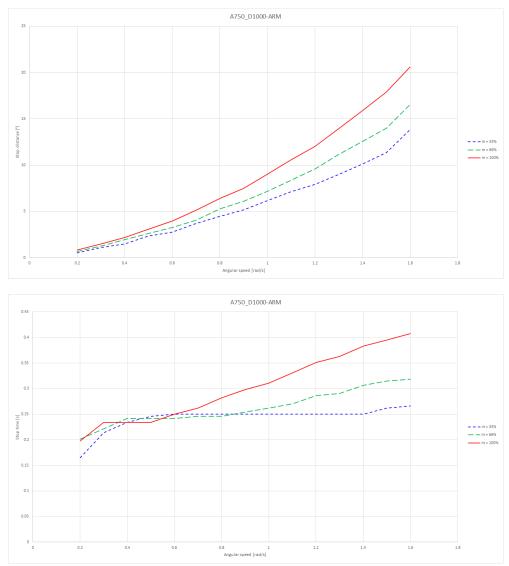
25.4 A750_D1000 Continued

Category 0, PLATE



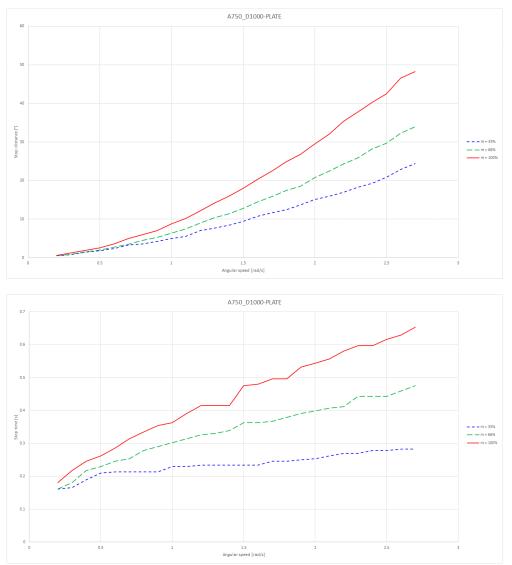
25.4 A750_D1000 Continued

Category 1, ARM



25.4 A750_D1000 Continued

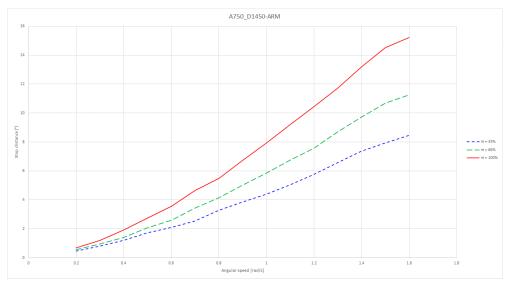
Category 1, PLATE

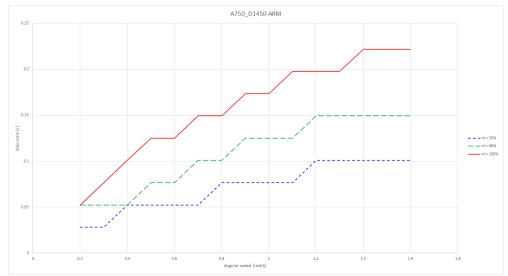


25.5 A750_D1450

25.5 A750_D1450

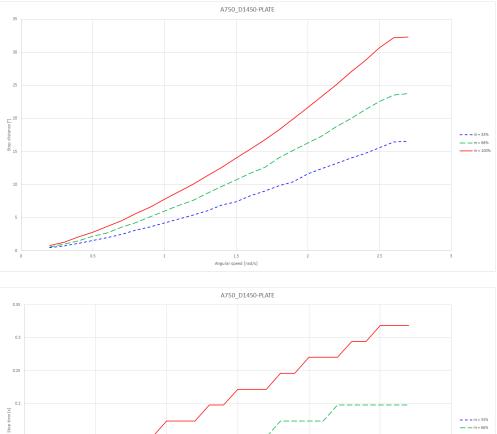
Category 0, ARM

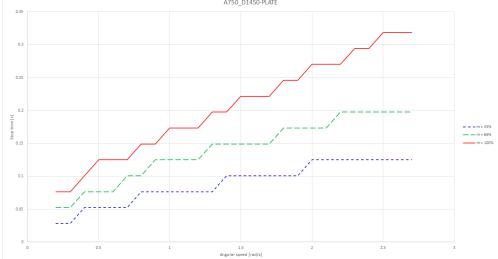




25.5 A750_D1450 Continued

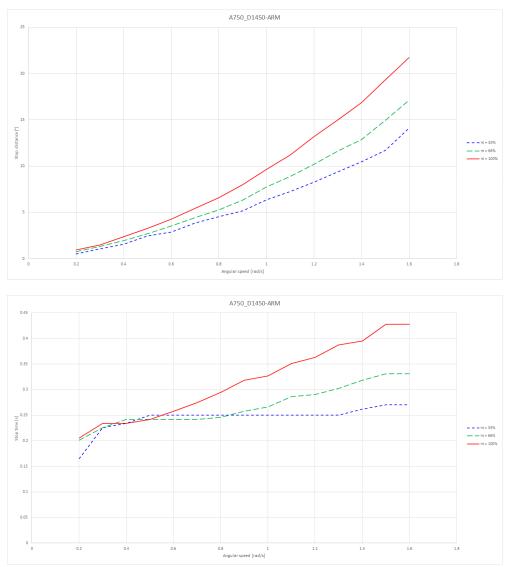
Category 0, PLATE





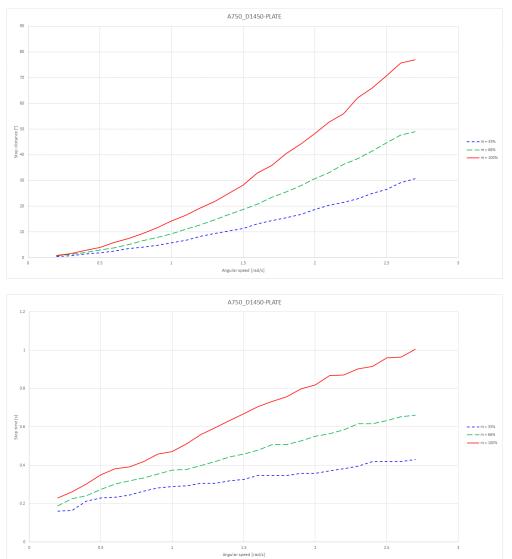
25.5 A750_D1450 Continued

Category 1, ARM



25.5 A750_D1450 Continued

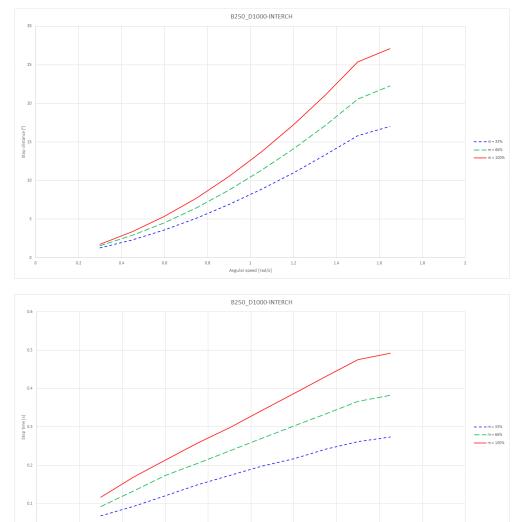
Category 1, PLATE



26.1 B250_D1000

Category 0, INTERCH

Stopping distance and stopping time



0.6

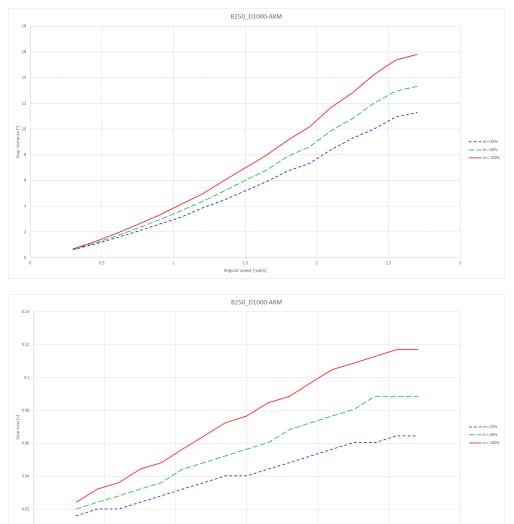
0.8

1 Angular speed [rad/s] 1.6

26.1 B250_D1000 Continued

Category 0, ARM

Stopping distance and stopping time

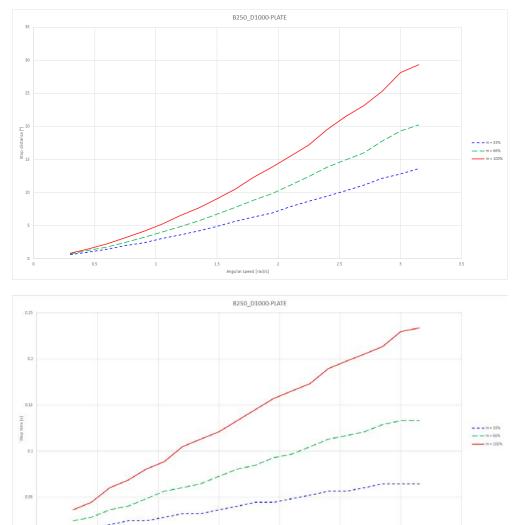


1.5 Angular speed [rad/s] 2.5

26.1 B250_D1000 Continued

Category 0, PLATE

Stopping distance and stopping time



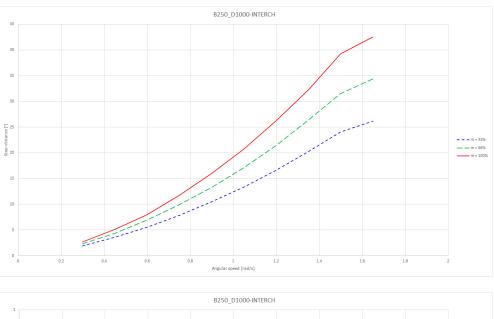
1.5

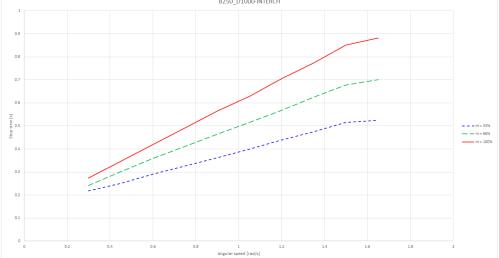
Angular speed [rad/s]

2.5

26.1 B250_D1000 Continued

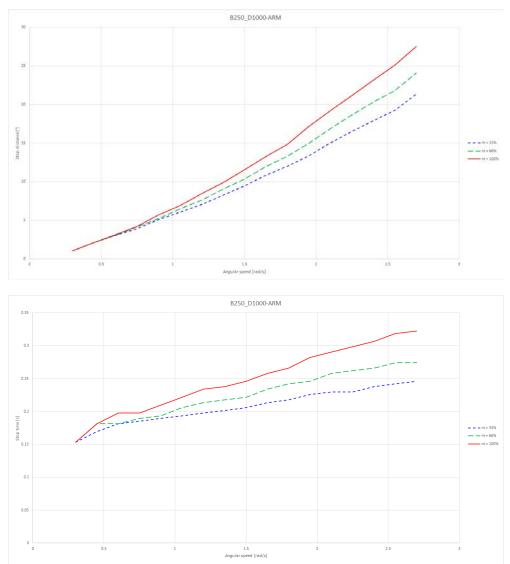
Category 1, INTERCH





26.1 B250_D1000 Continued

Category 1, ARM

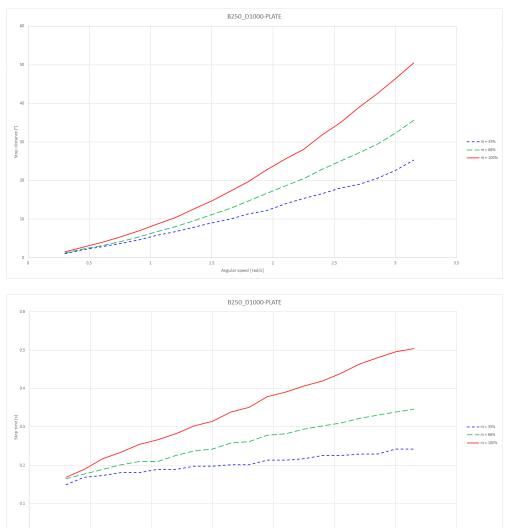


26.1 B250_D1000 Continued

Category 1, PLATE

Stopping distance and stopping time

0.5



1.5

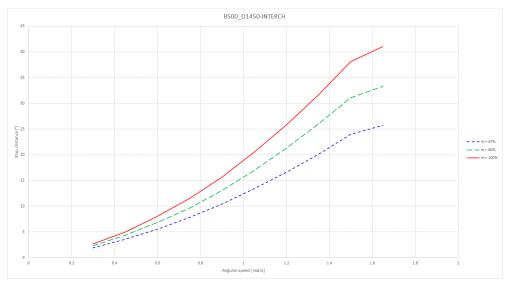
Angular speed [rad/s]

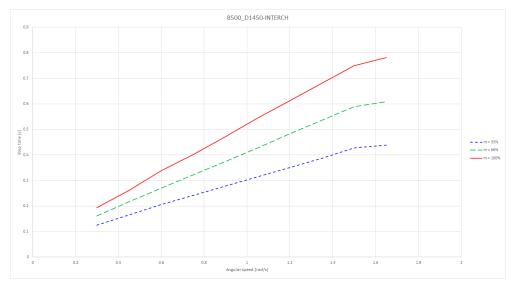
2.5

26.2 B500_D1450

26.2 B500_D1450

Category 0, INTERCH

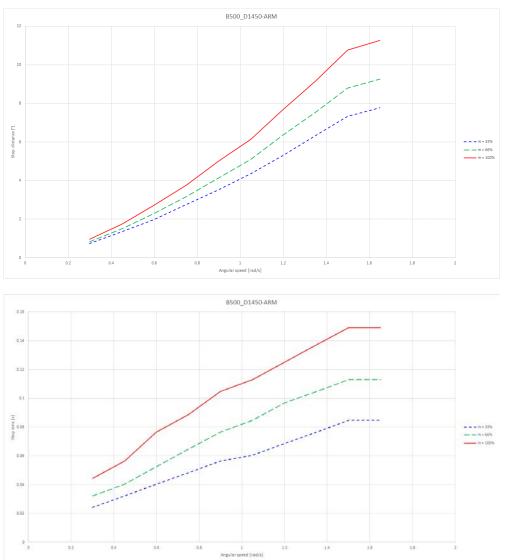




26.2 B500_D1450 Continued

Category 0, ARM

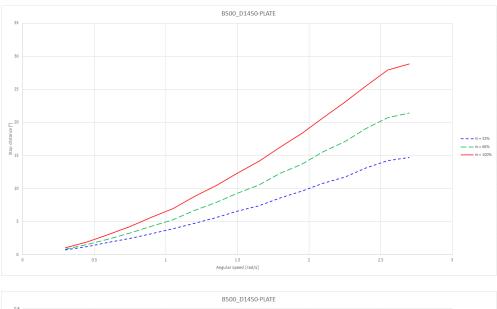
Stopping distance and stopping time

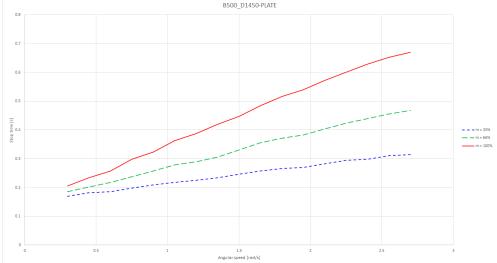


Continues on next page

26.2 B500_D1450 Continued

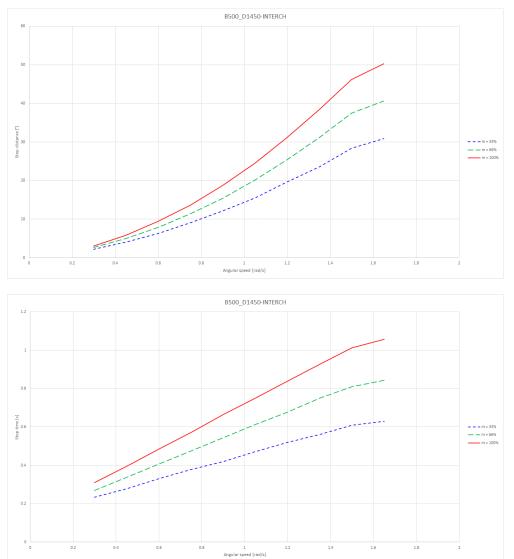
Category 0, PLATE





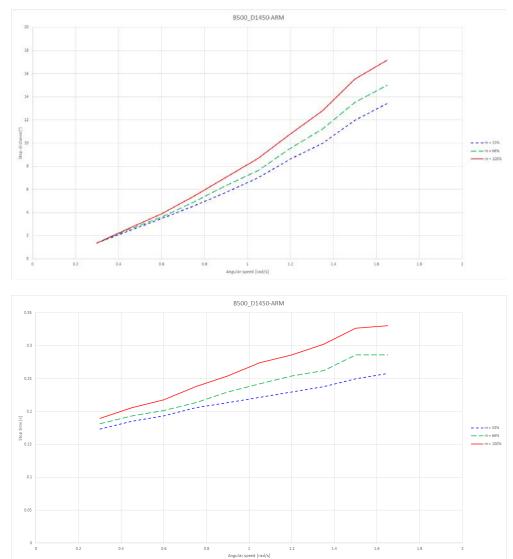
26.2 B500_D1450 *Continued*

Category 1, INTERCH



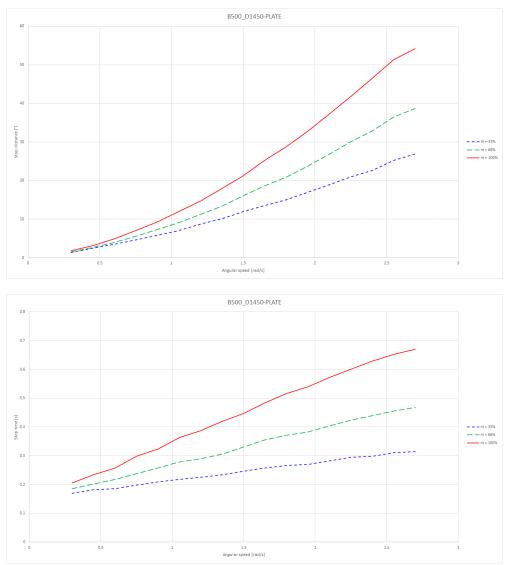
26.2 B500_D1450 Continued

Category 1, ARM



26.2 B500_D1450 *Continued*

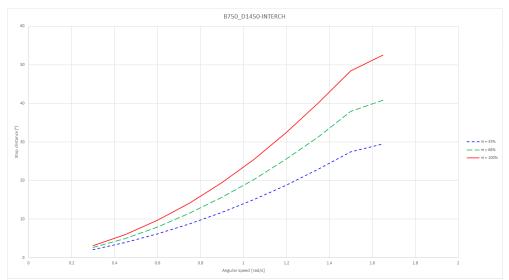
Category 1, PLATE

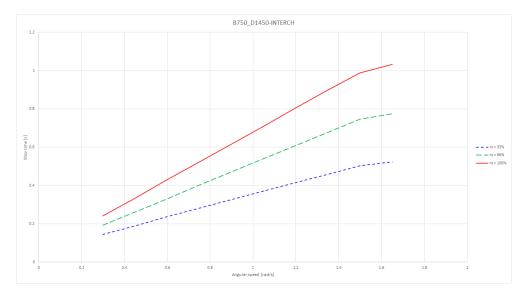


26.3 B750_D1450

26.3 B750_D1450

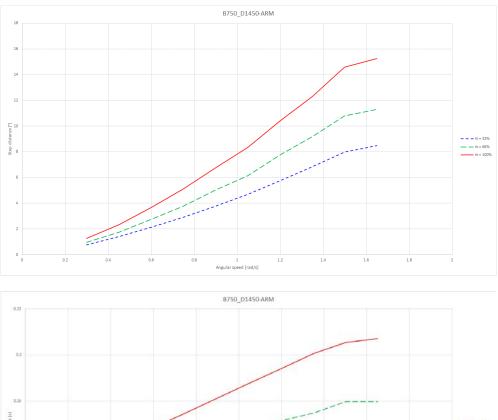
Category 0, INTERCH

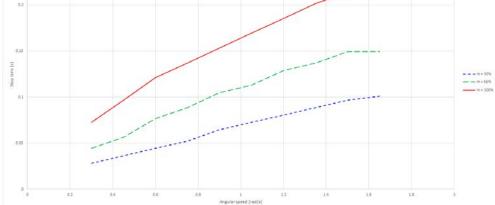




26.3 B750_D1450 *Continued*

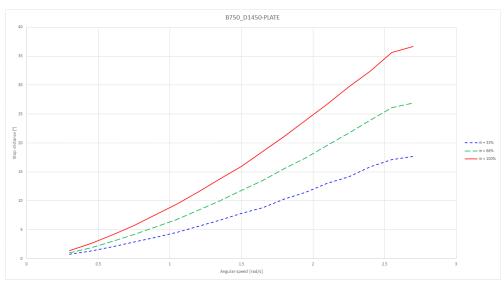
Category 0, ARM

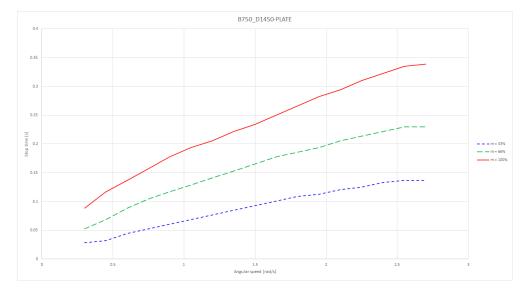




26.3 B750_D1450 Continued

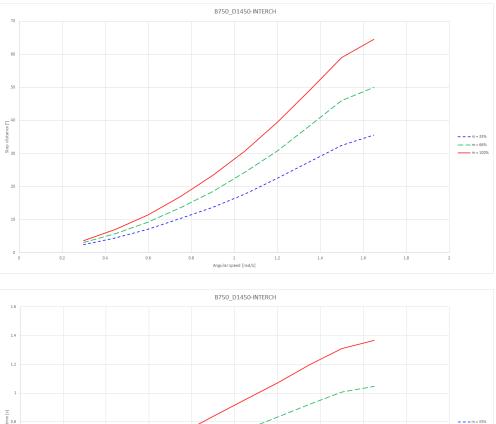
Category 0, PLATE

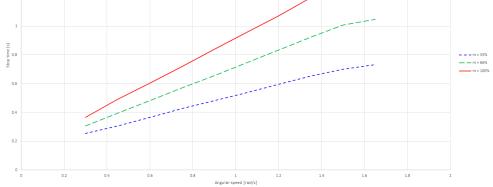




26.3 B750_D1450 *Continued*

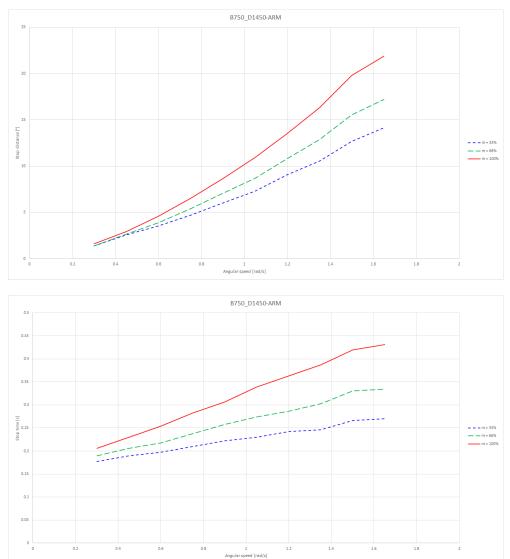
Category 1, INTERCH





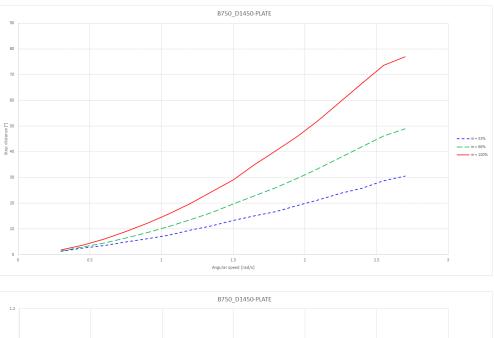
26.3 B750_D1450 Continued

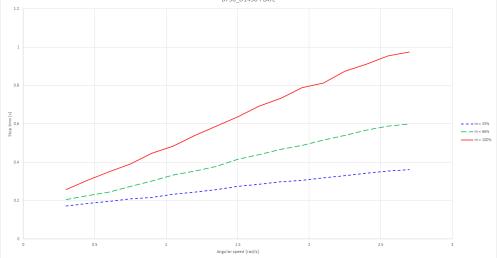
Category 1, ARM



26.3 B750_D1450 *Continued*

Category 1, PLATE



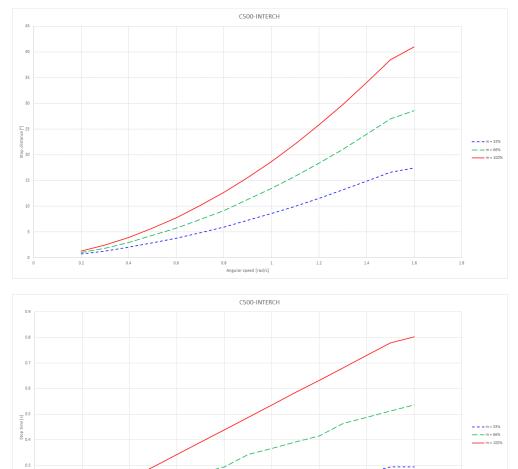


27 IRBP C

27.1 C500

Category 0, INTERCH

Stopping distance and stopping time



0.4

0.6

0.8 Angular speed [rad/s] 1.2

1.4

1.6

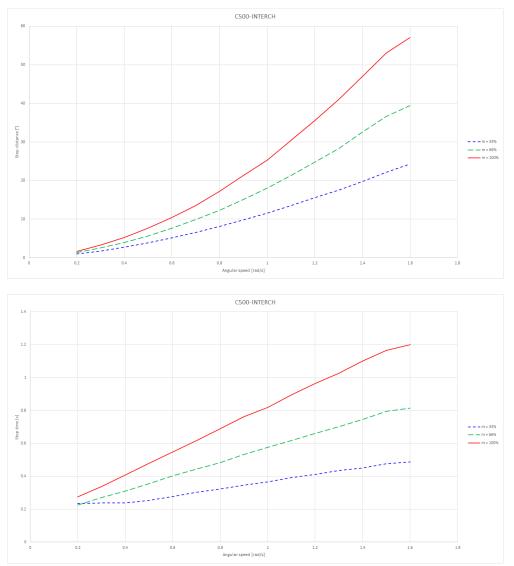
0.2

0

27 IRBP C

27.1 C500 *Continued*

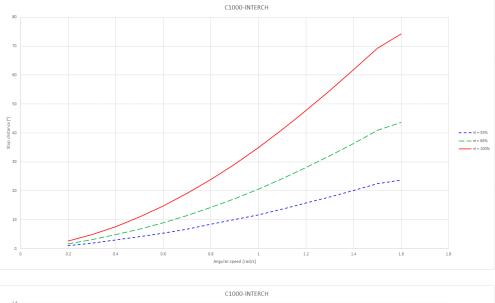
Category 1, INTERCH

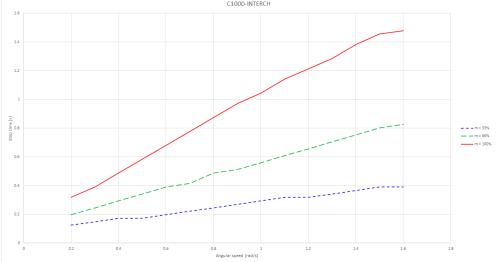


27.2 C1000

27.2 C1000

Category 0, INTERCH

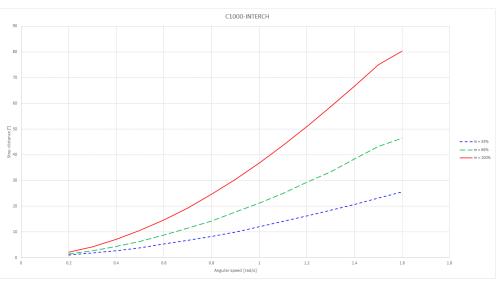


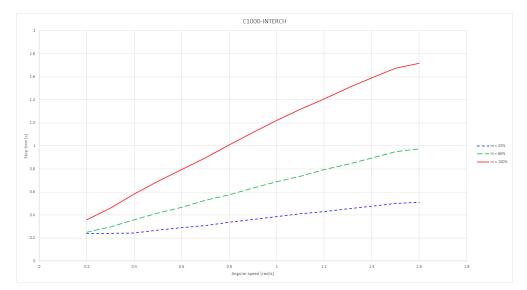


27 IRBP C

27.2 C1000 *Continued*

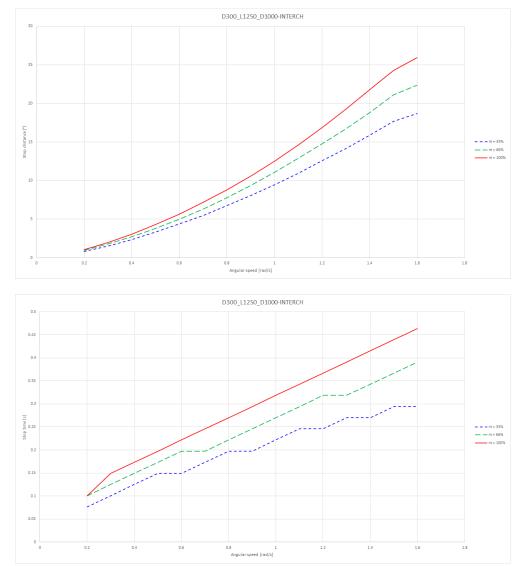
Category 1, INTERCH





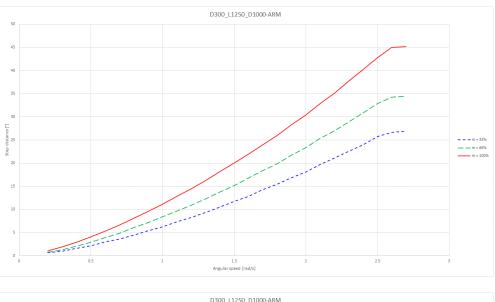
28.1 D300_L1250_D1000

Category 0, INTERCH



28.1 D300_L1250_D1000 Continued

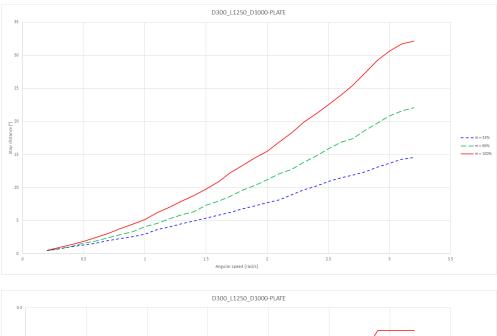
Category 0, ARM





28.1 D300_L1250_D1000 Continued

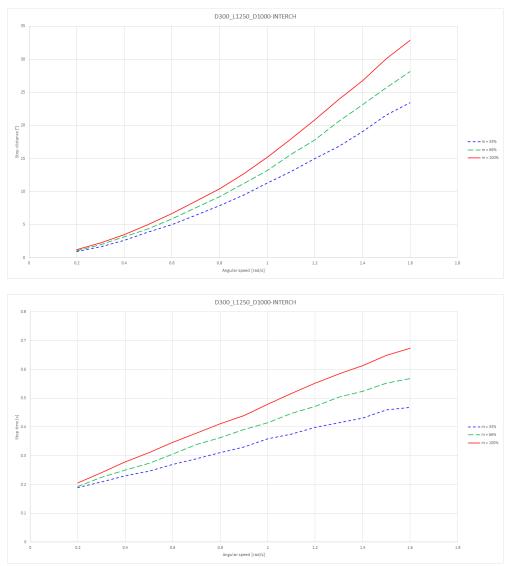
Category 0, PLATE





28.1 D300_L1250_D1000 Continued

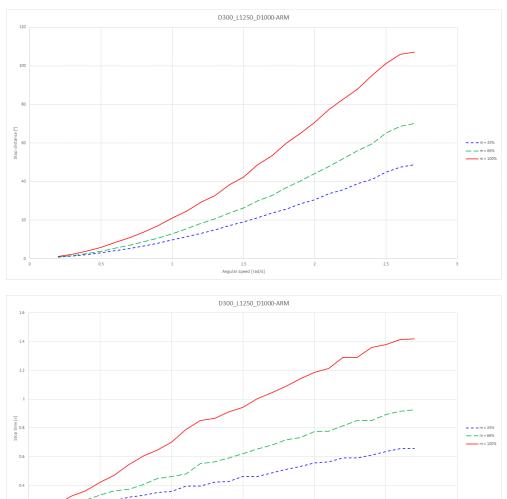
Category 1, INTERCH



28.1 D300_L1250_D1000 Continued

Category 1, ARM

Stopping distance and stopping time



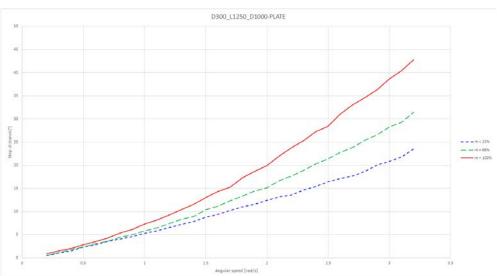
1.5 Angular speed [rad/s]

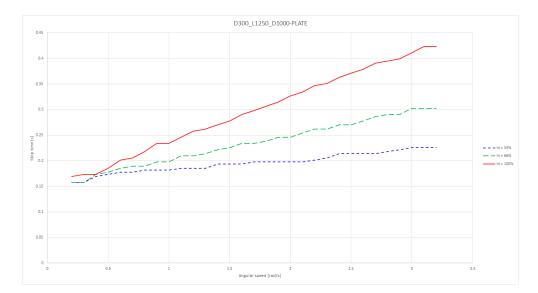
0.5

2.5

28.1 D300_L1250_D1000 Continued

Category 1, PLATE



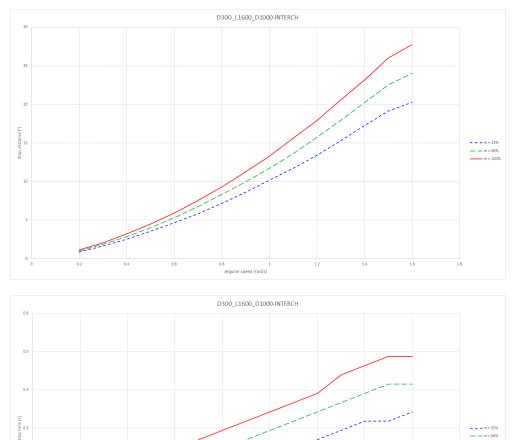


28.2 D300_L1600_D1000

28.2 D300_L1600_D1000

Category 0, INTERCH

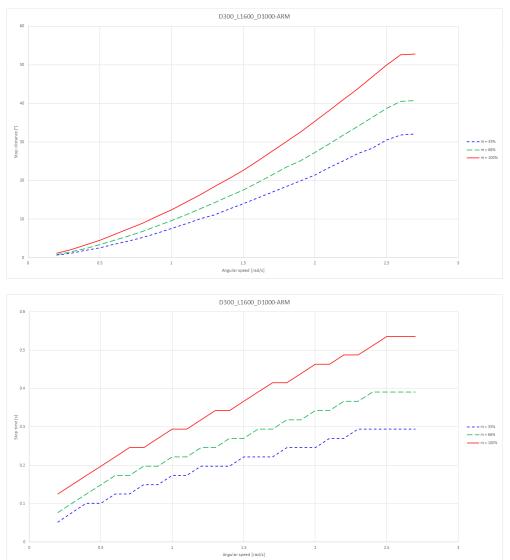
Stopping distance and stopping time



0.6

0.8 Angular speed [rad/s] 28.2 D300_L1600_D1000 *Continued*

Category 0, ARM



28.2 D300_L1600_D1000 Continued

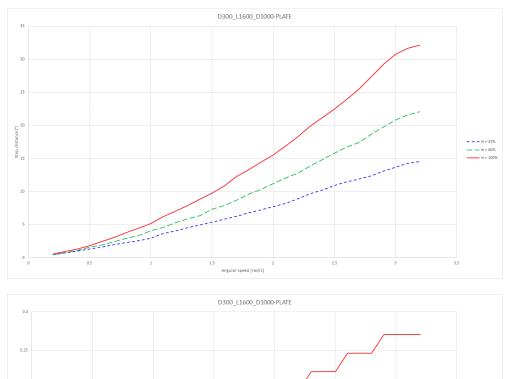
Category 0, PLATE

Stopping distance and stopping time

Stop time

0.05

0.5



1.5

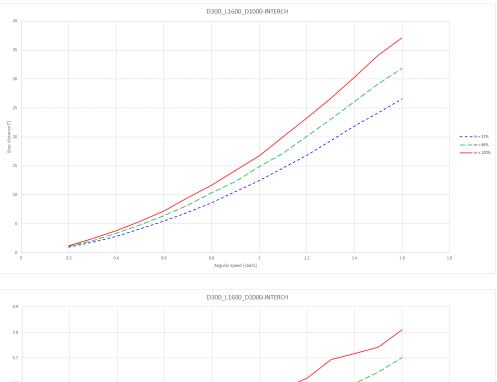
Angular speed [rad/s]

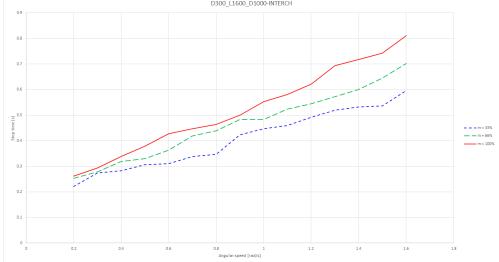
2.5

- - m = 33% - m = 65% m = 1009

28.2 D300_L1600_D1000 *Continued*

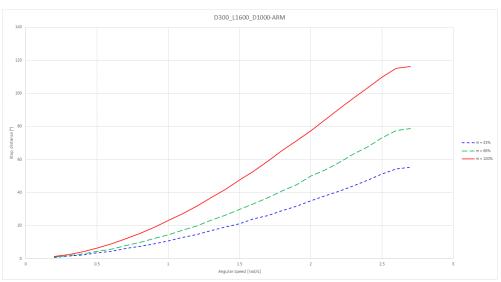
Category 1, INTERCH

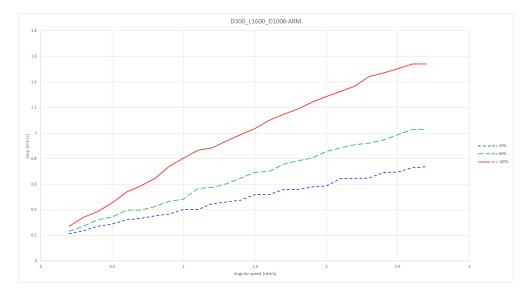




28.2 D300_L1600_D1000 Continued

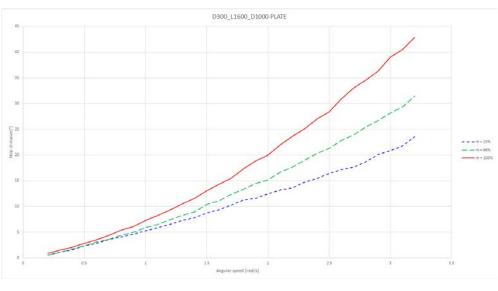
Category 1, ARM

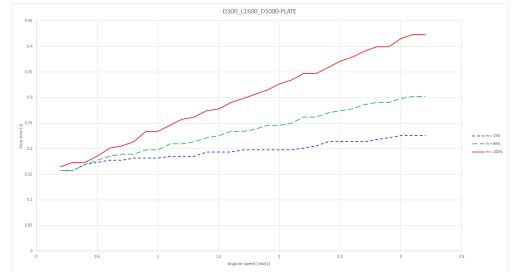




28.2 D300_L1600_D1000 Continued

Category 1, PLATE

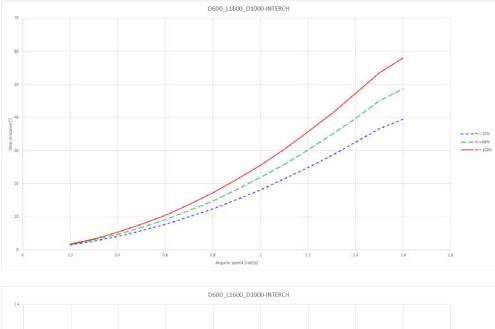


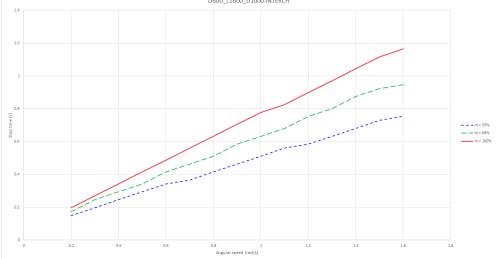


28.3 D600_L1600_D1000

28.3 D600_L1600_D1000

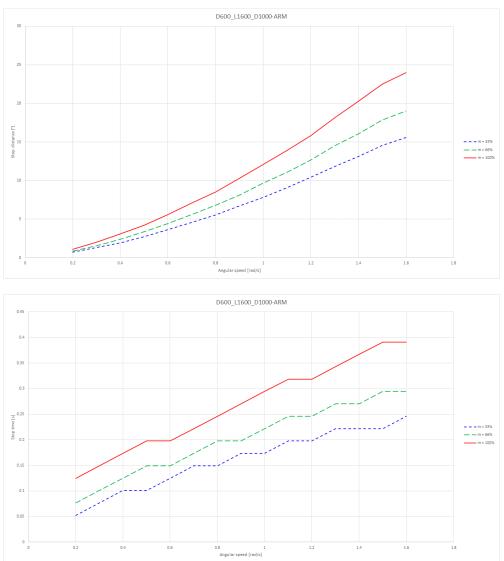
Category 0, INTERCH





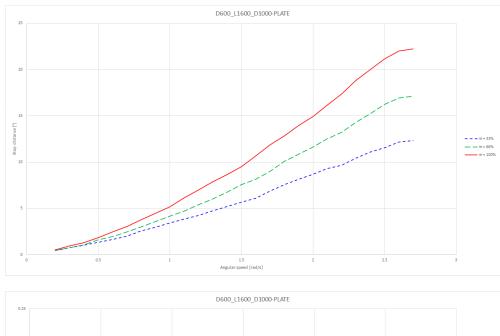
28.3 D600_L1600_D1000 Continued

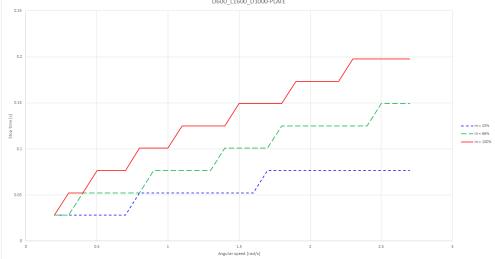
Category 0, ARM



28.3 D600_L1600_D1000 Continued

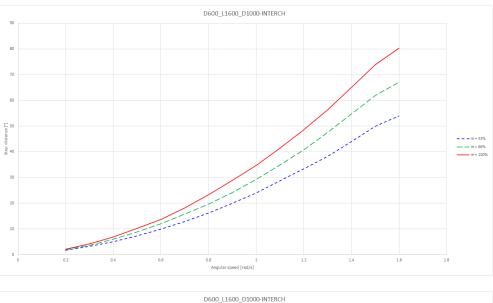
Category 0, PLATE

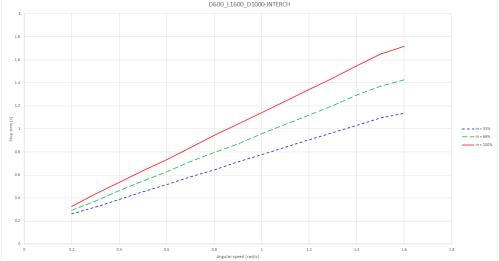




28.3 D600_L1600_D1000 Continued

Category 1, INTERCH

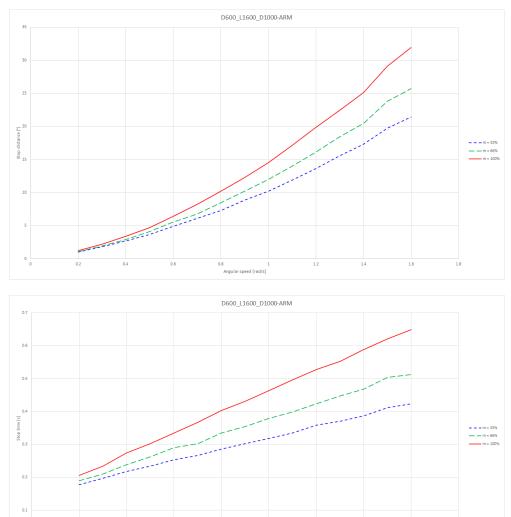




28.3 D600_L1600_D1000 Continued

Category 1, ARM

Stopping distance and stopping time



0.8 Angular speed [rad/s]

1.4

1.6

1.8

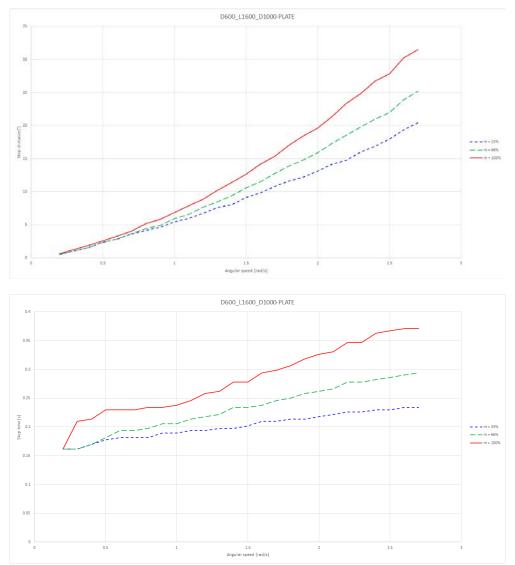
0.2

0.4

0.6

28.3 D600_L1600_D1000 Continued

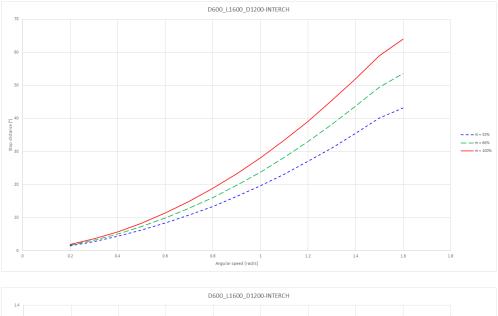
Category 1, PLATE

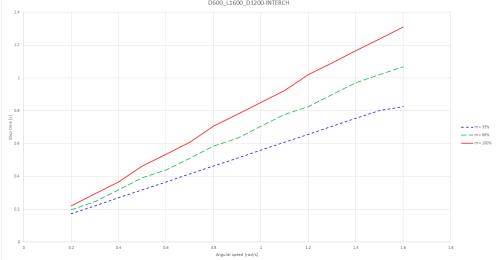


28.4 D600_L1600_D1200

28.4 D600_L1600_D1200

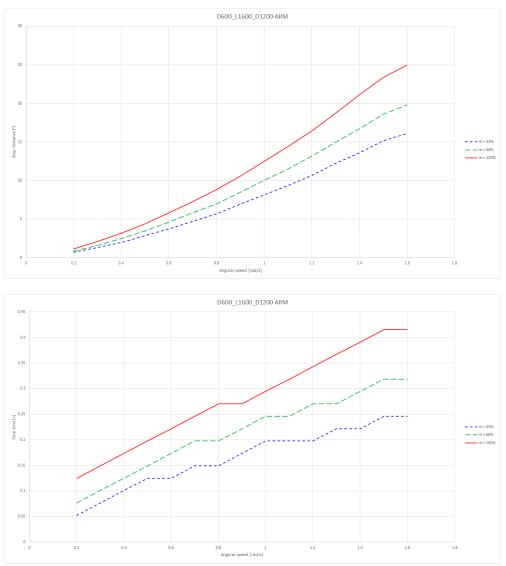
Category 0, INTERCH





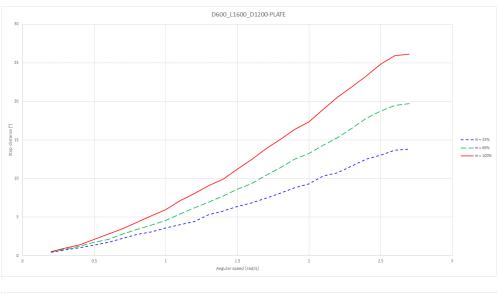
28.4 D600_L1600_D1200 Continued

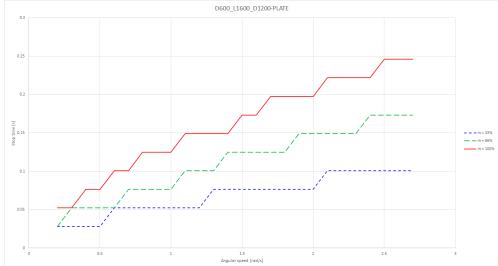
Category 0, ARM



28.4 D600_L1600_D1200 Continued

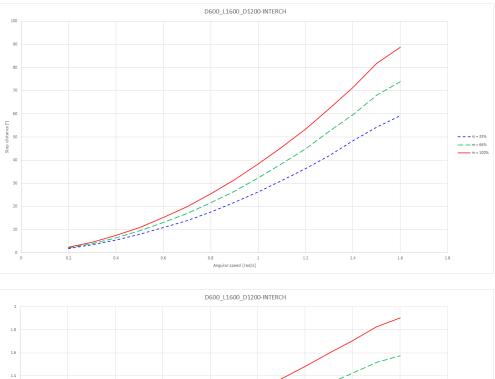
Category 0, PLATE

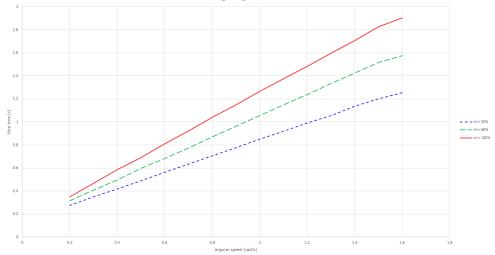




28.4 D600_L1600_D1200 Continued

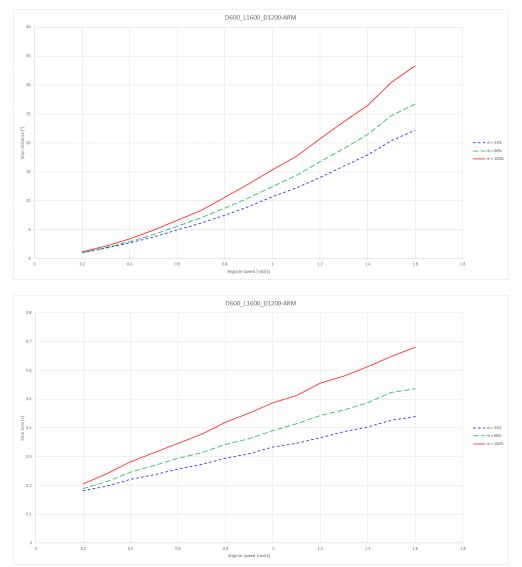
Category 1, INTERCH





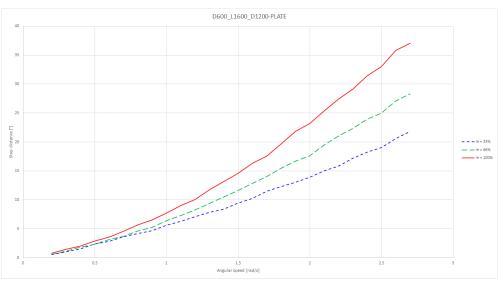
28.4 D600_L1600_D1200 Continued

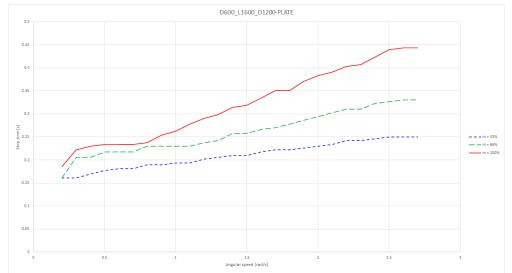
Category 1, ARM



28.4 D600_L1600_D1200 Continued

Category 1, PLATE

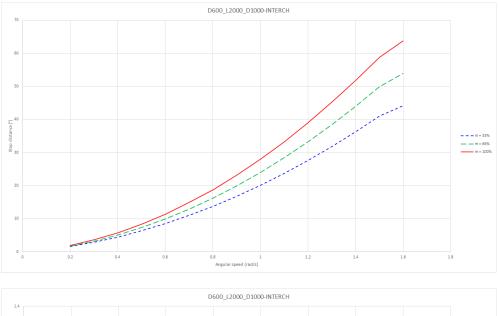


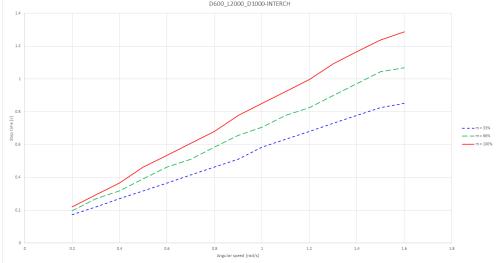


28.5 D600_L2000_D1000

28.5 D600_L2000_D1000

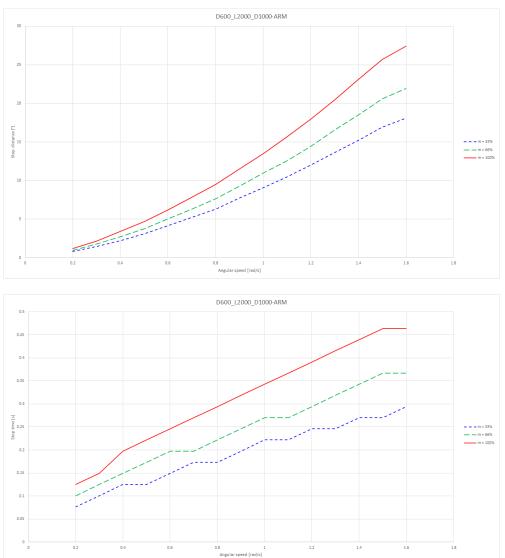
Category 0, INTERCH





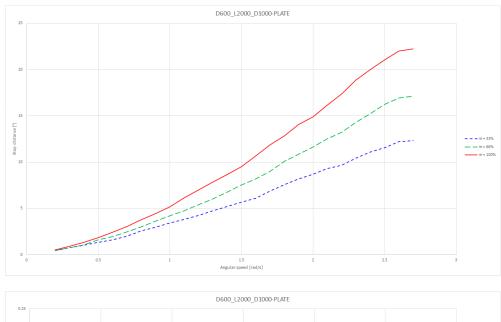
28.5 D600_L2000_D1000 Continued

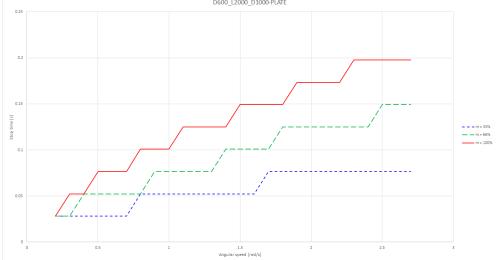
Category 0, ARM



28.5 D600_L2000_D1000 Continued

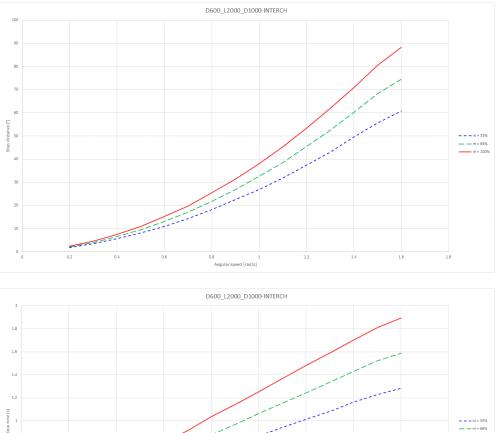
Category 0, PLATE

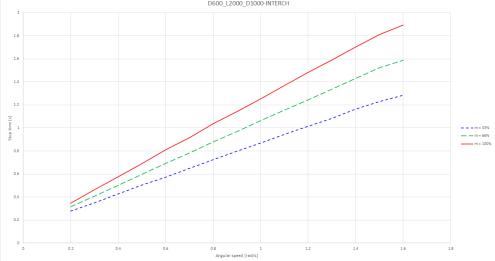




28.5 D600_L2000_D1000 Continued

Category 1, INTERCH

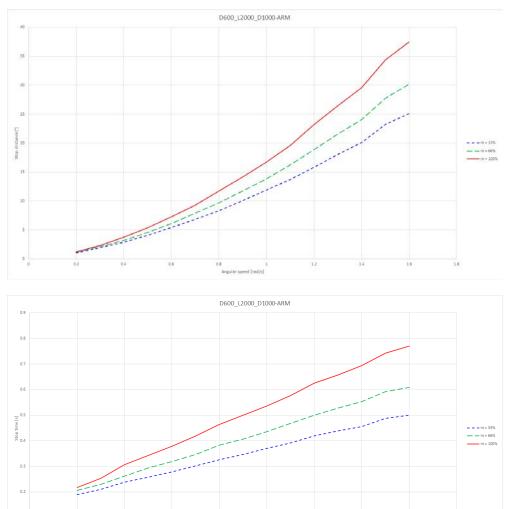




28.5 D600_L2000_D1000 Continued

Category 1, ARM

Stopping distance and stopping time



0.8 Angular speed [rad/s]

1.2

1.4

1.6

1.8

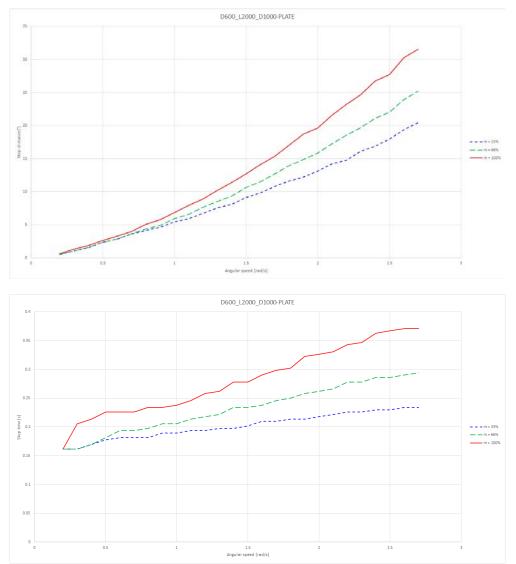
0.2

0.4

0.6

28.5 D600_L2000_D1000 Continued

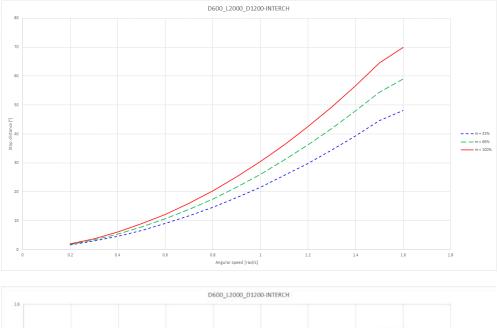
Category 1, PLATE

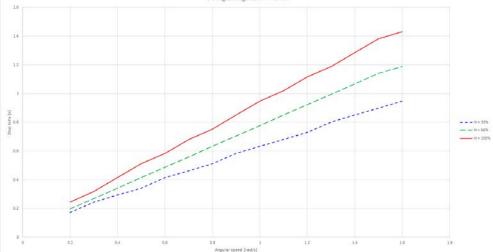


28.6 D600_L2000_D1200

28.6 D600_L2000_D1200

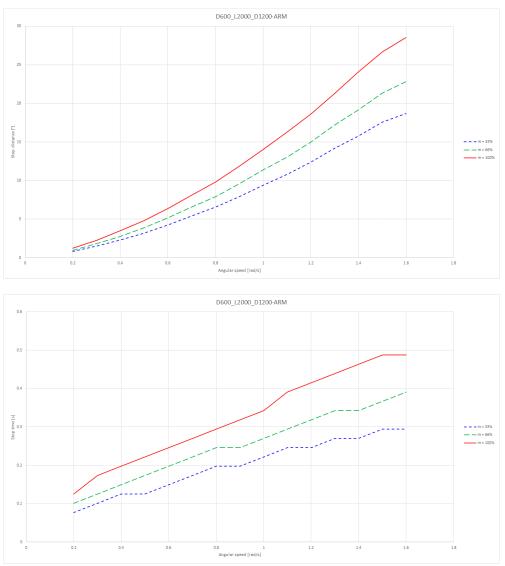
Category 0, INTERCH





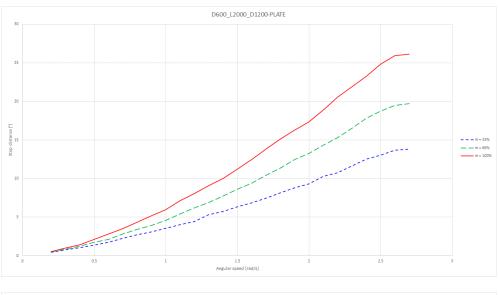
28.6 D600_L2000_D1200 Continued

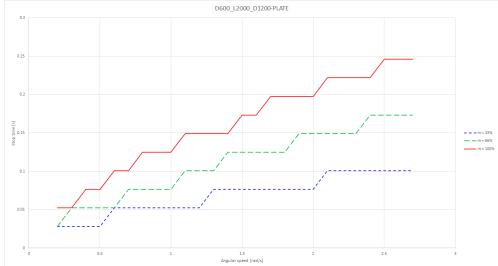
Category 0, ARM



28.6 D600_L2000_D1200 Continued

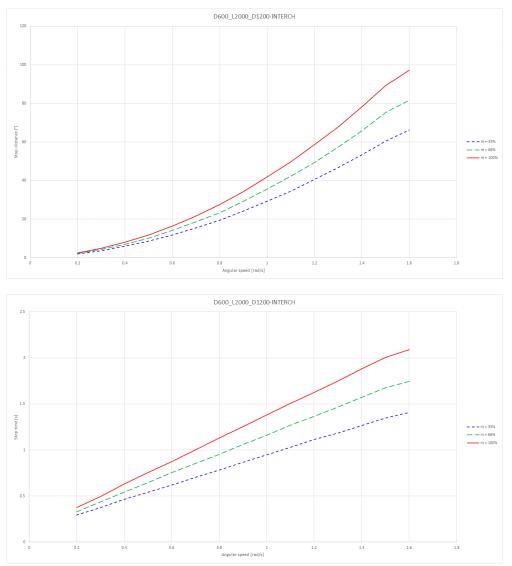
Category 0, PLATE





28.6 D600_L2000_D1200 Continued

Category 1, INTERCH



28.6 D600_L2000_D1200 Continued

Category 1, ARM

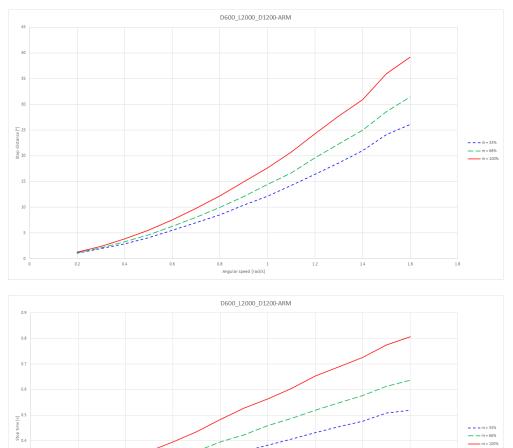
Stopping distance and stopping time

0.3

0.4

0.6

0.2



0.8 Angular speed [rad/s]

1.2

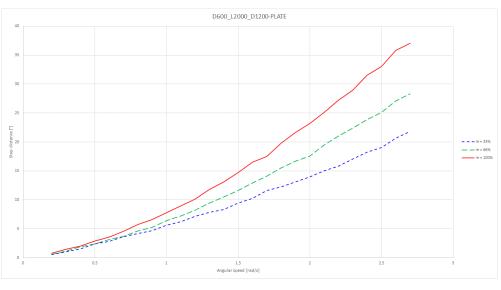
1.4

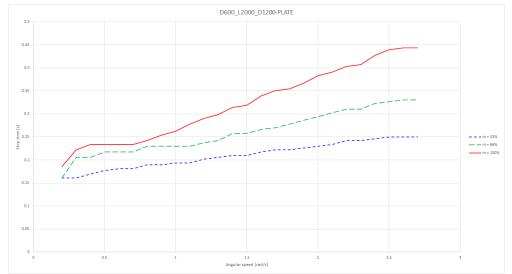
1.6

1.8

28.6 D600_L2000_D1200 Continued

Category 1, PLATE

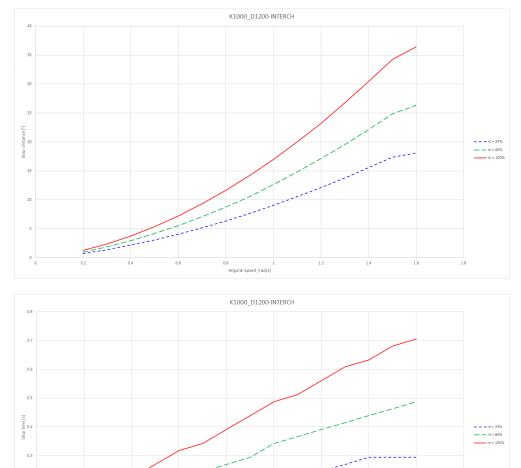




29.1 K1000_D1200

Category 0, INTERCH

Stopping distance and stopping time



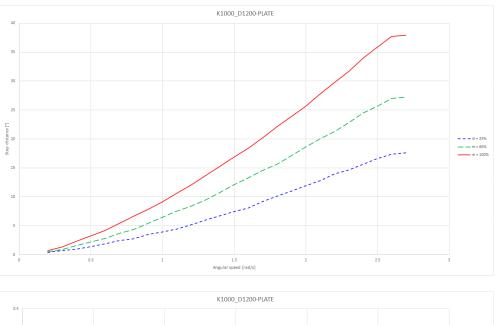
0.6

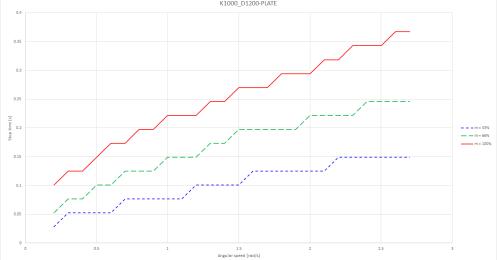
0.8 Angular speed [rad/s] 1.2

29.1 K1000_D1200 *Continued*

Category 0, PLATE

Stopping distance and stopping time

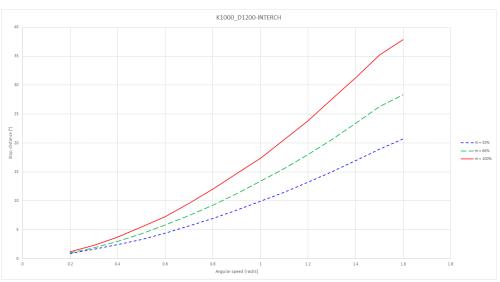


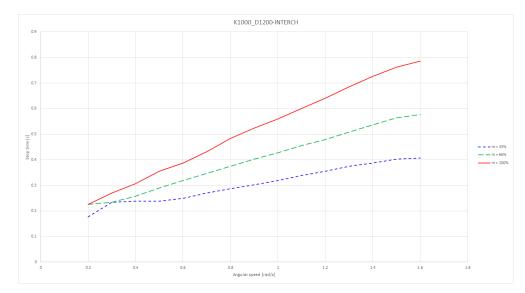


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29.1 K1000_D1200 Continued

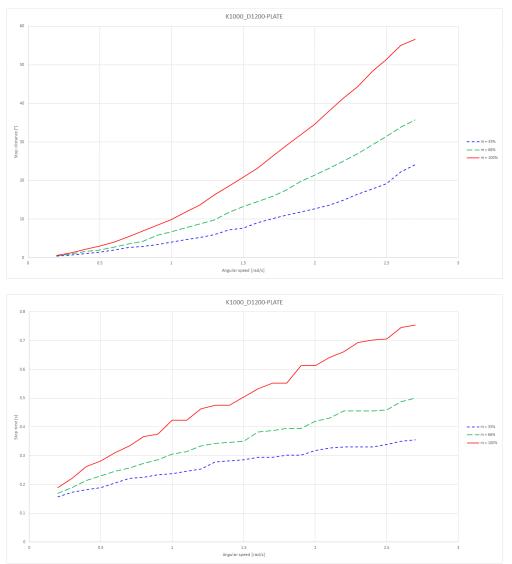
Category 1, INTERCH





29.1 K1000_D1200 *Continued*

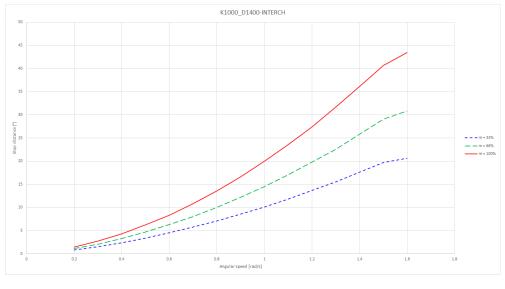
Category 1, PLATE

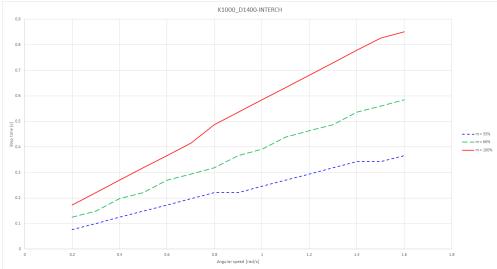


29.2 K1000_D1400

29.2 K1000_D1400

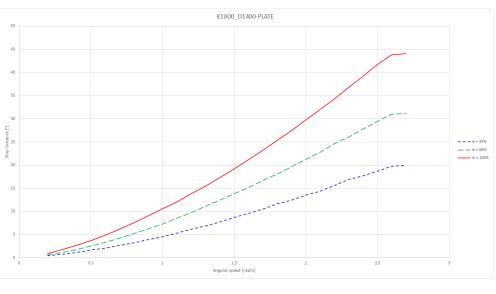
Category 0, INTERCH





29.2 K1000_D1400 Continued

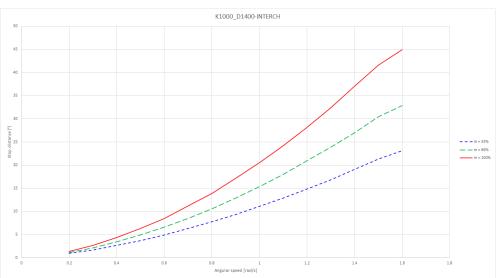
Category 0, PLATE

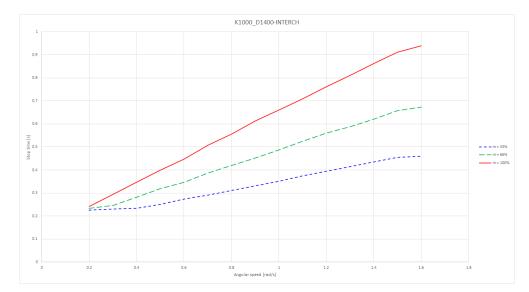




29.2 K1000_D1400 Continued

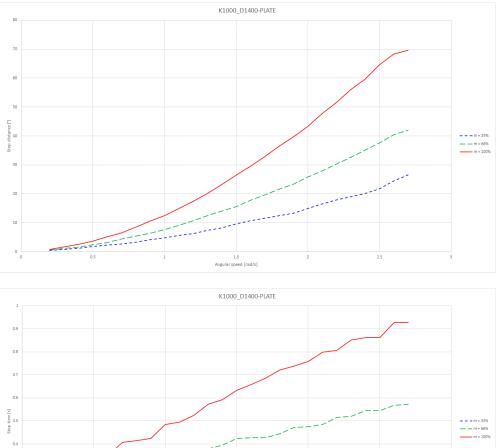
Category 1, INTERCH

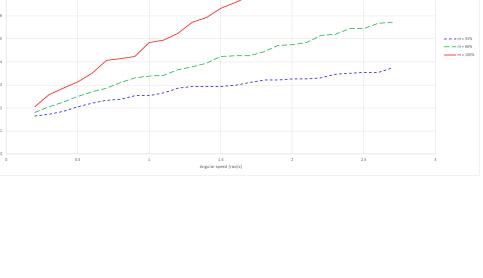




29.2 K1000_D1400 *Continued*

Category 1, PLATE

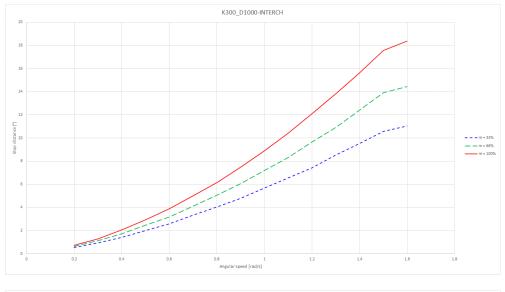


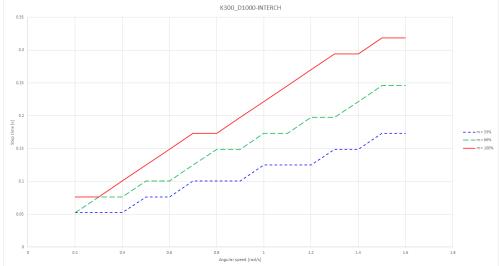


29.3 K300_D1000

29.3 K300_D1000

Category 0, INTERCH

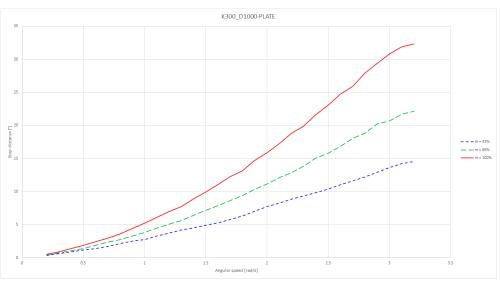


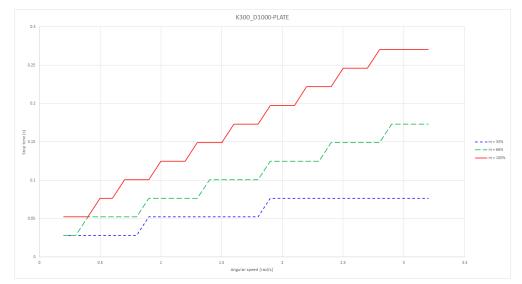


29.3 K300_D1000 Continued

Category 0, PLATE

Stopping distance and stopping time

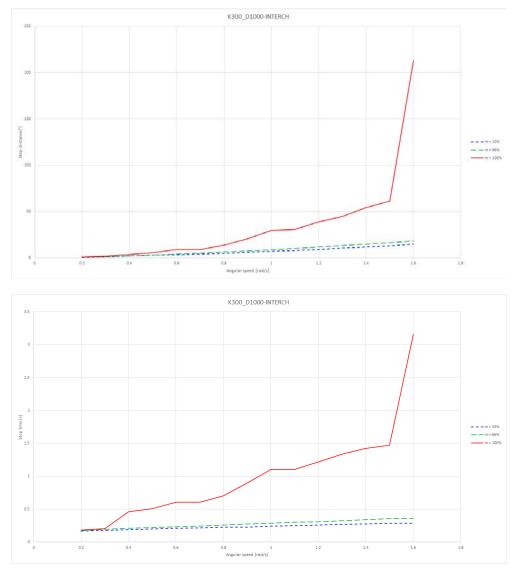




Continues on next page 820

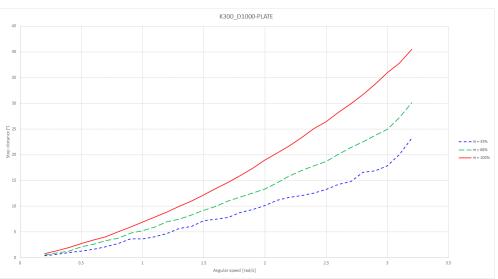
29.3 K300_D1000 Continued

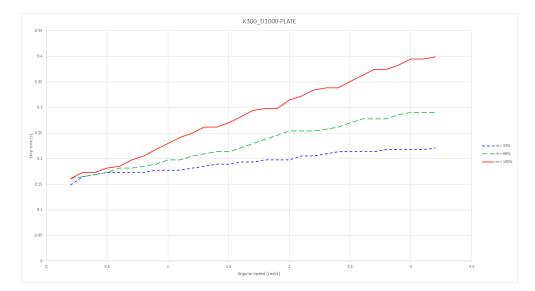
Category 1, INTERCH



29.3 K300_D1000 *Continued*

Category 1, PLATE

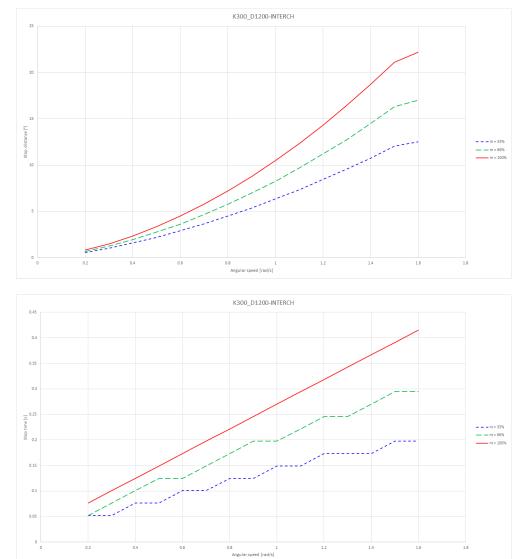




29.4 K300_D1200

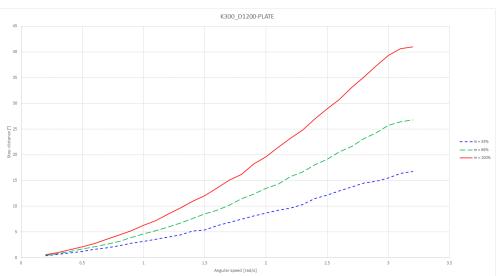
29.4 K300_D1200

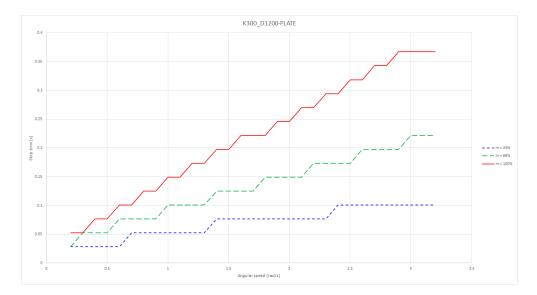
Category 0, INTERCH



29.4 K300_D1200 Continued

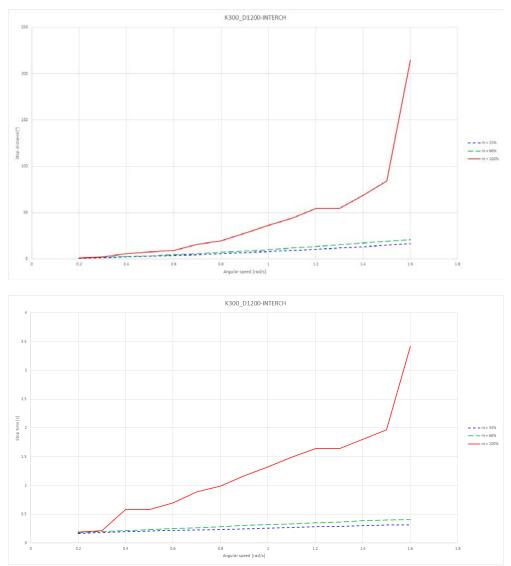
Category 0, PLATE





29.4 K300_D1200 Continued

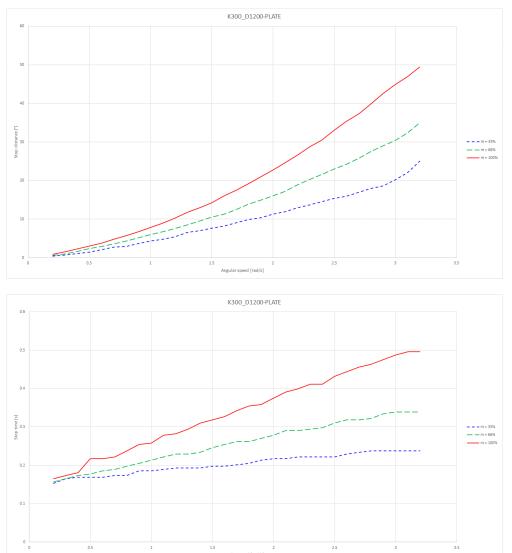
Category 1, INTERCH



29.4 K300_D1200 Continued

Category 1, PLATE

Stopping distance and stopping time



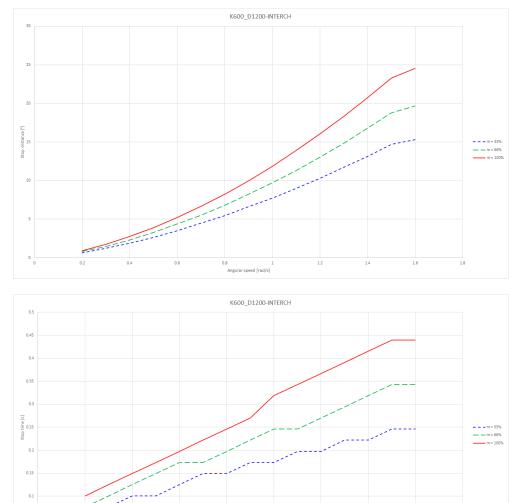
Angular speed [rad/s]

29.5 K600_D1200

29.5 K600_D1200

Category 0, INTERCH

Stopping distance and stopping time



0.6

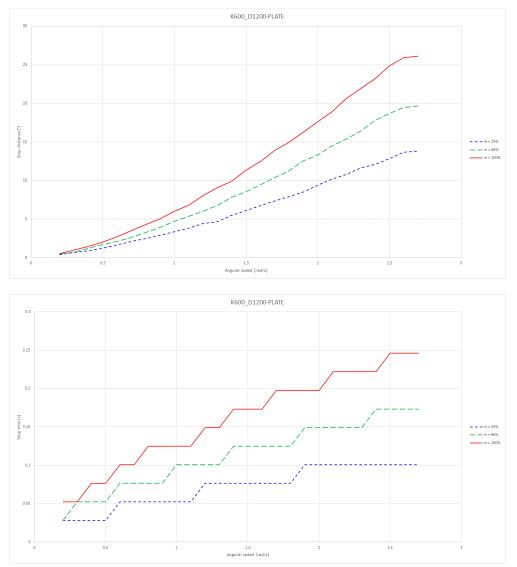
0.4

0.8 Angular speed [rad/s]

0.05

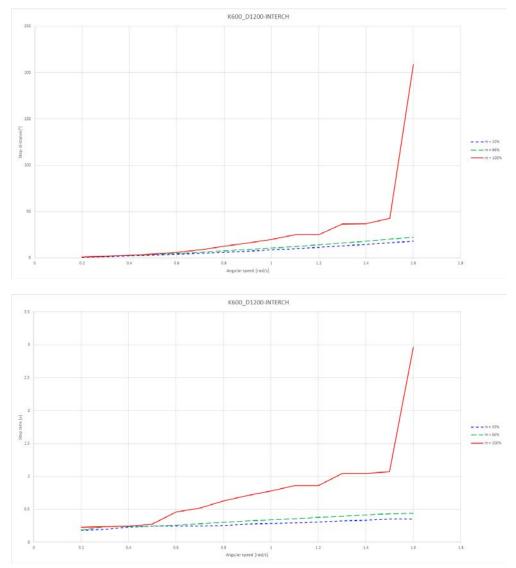
29.5 K600_D1200 *Continued*

Category 0, PLATE



29.5 K600_D1200 Continued

Category 1, INTERCH



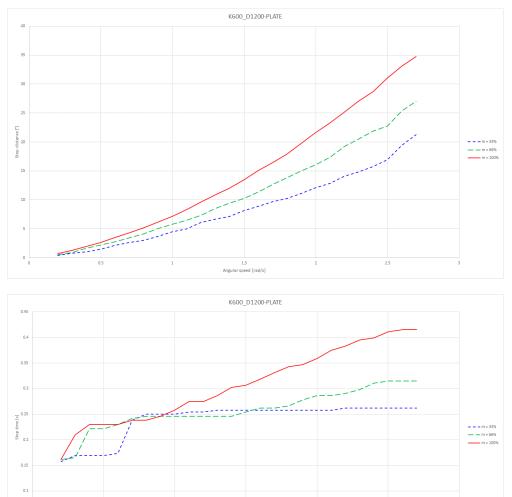
29.5 K600_D1200 *Continued*

Category 1, PLATE

Stopping distance and stopping time

0.0

0.5

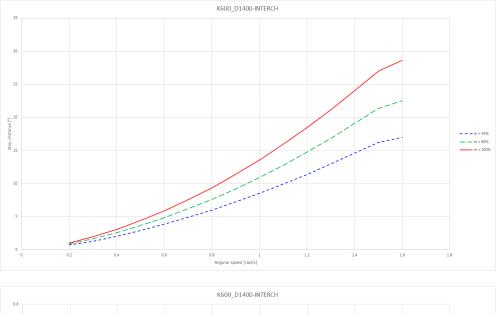


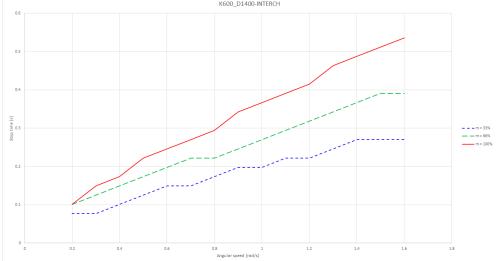
1.5 Angular speed [rad/s] 2.5

29.6 K600_D1400

29.6 K600_D1400

Category 0, INTERCH





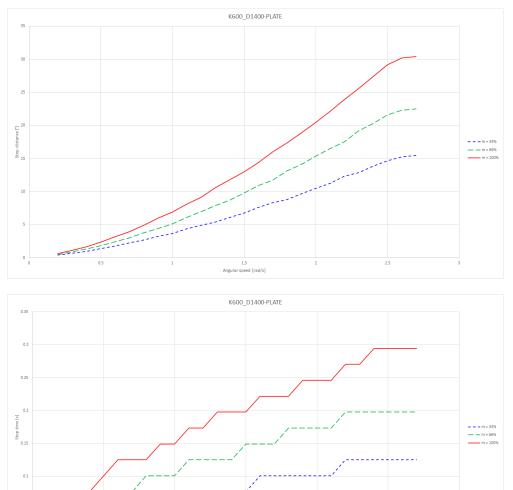
29.6 K600_D1400 *Continued*

Category 0, PLATE

Stopping distance and stopping time

0.03

0.5



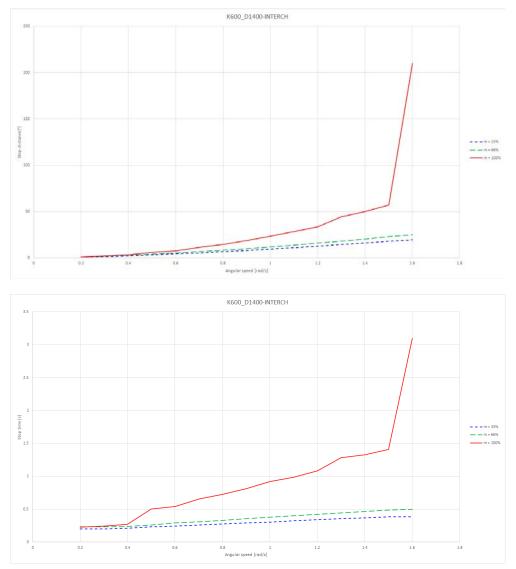
1.5 Angular speed [rad/s]

Continues on next page 832

2.5

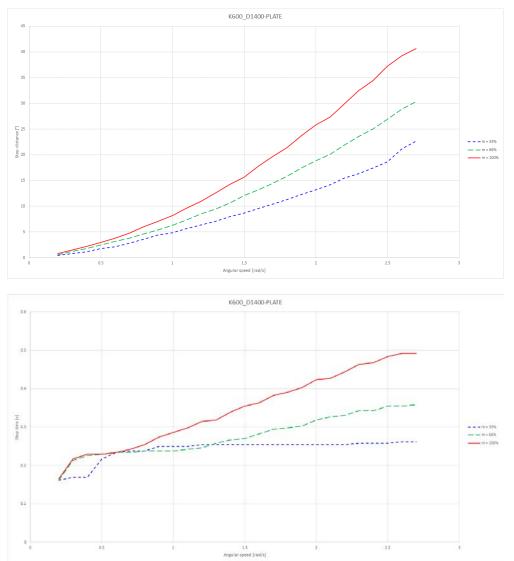
29.6 K600_D1400 Continued

Category 1, INTERCH



29.6 K600_D1400 *Continued*

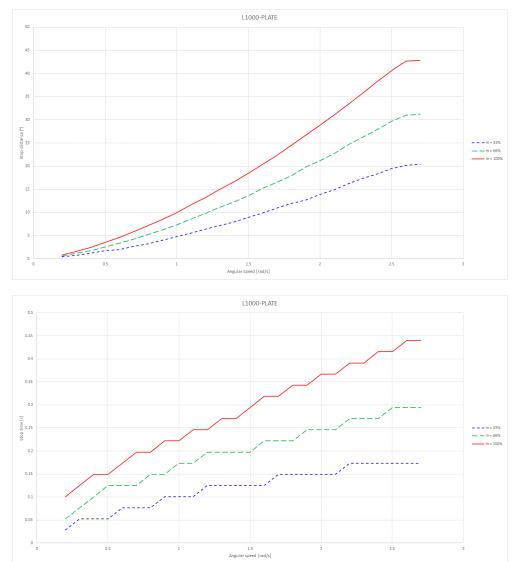
Category 1, PLATE



30 IRBP L

30.1 L1000

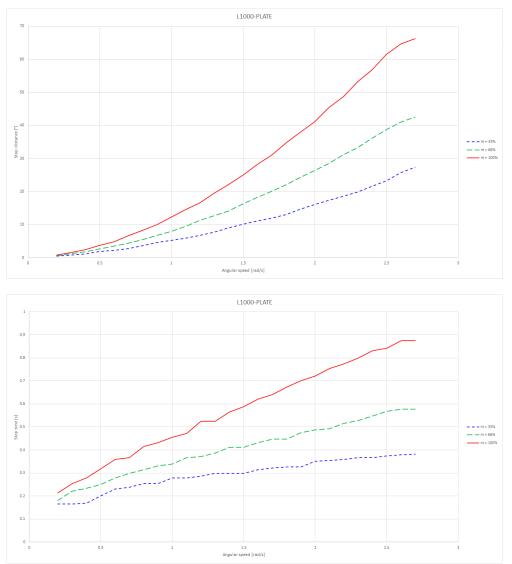
Category 0, PLATE



30 IRBP L

30.1 L1000 Continued

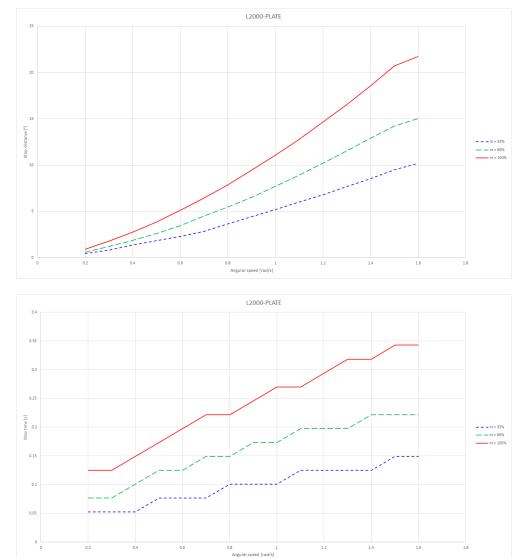
Category 1, PLATE



30.2 L2000

30.2 L2000

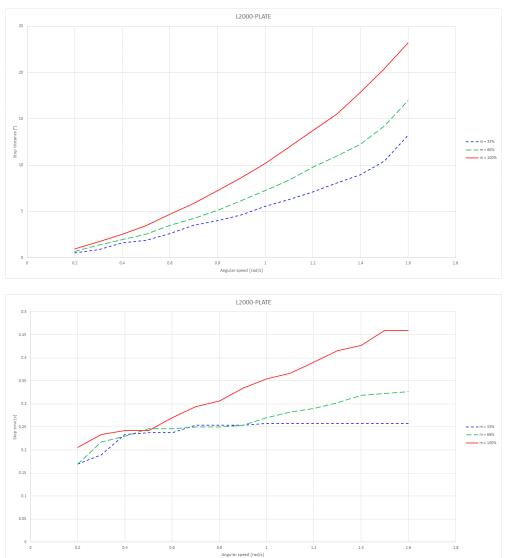
Category 0, PLATE



30 IRBP L

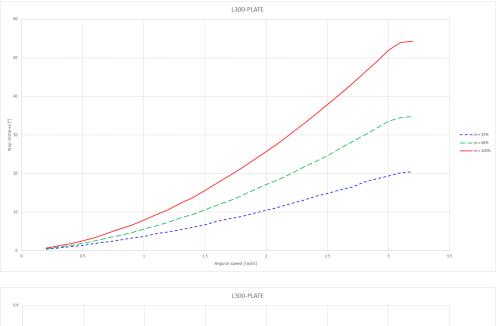
30.2 L2000 Continued

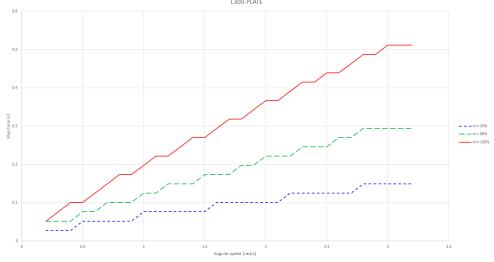
Category 1, PLATE



30.3 L300

Category 0, PLATE





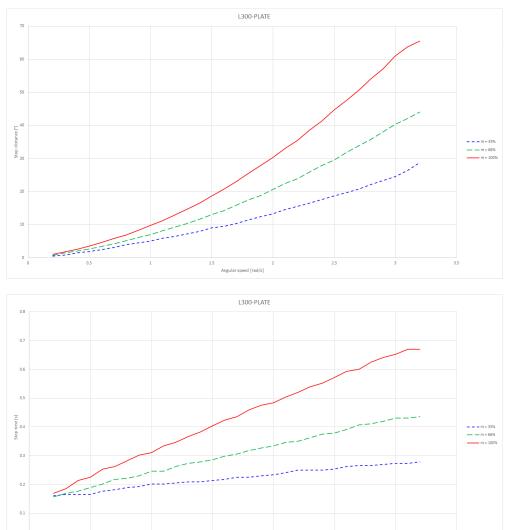
30 IRBP L

30.3 L300 *Continued*

Category 1, PLATE

Stopping distance and stopping time

0.5



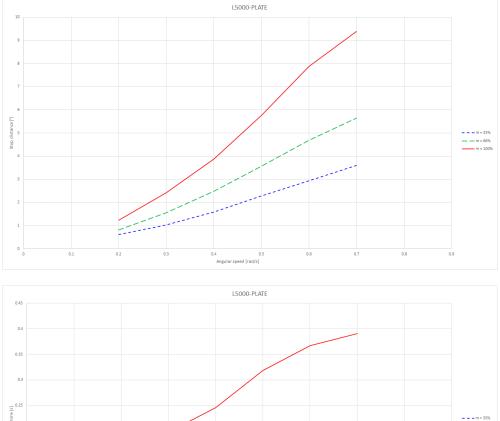
1.5

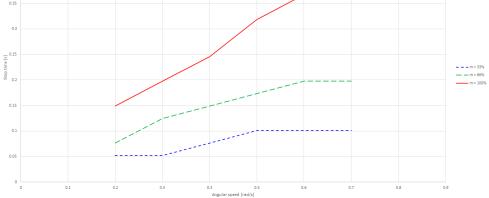
Angular speed [rad/s]

2.5

30.4 L5000

Category 0, PLATE

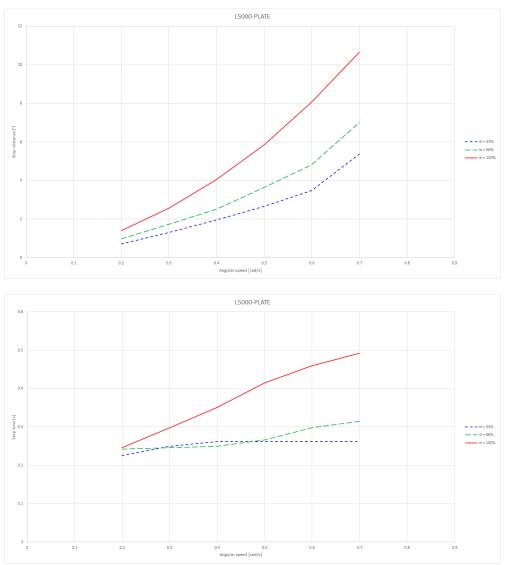




30 IRBP L

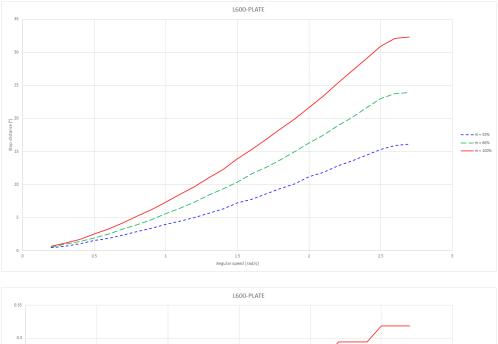
30.4 L5000 Continued

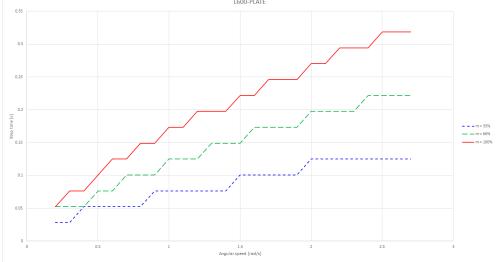
Category 1, PLATE



30.5 L600

Category 0, PLATE

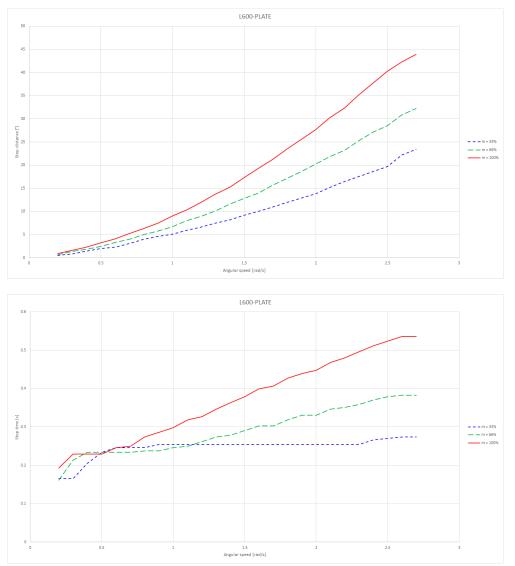




30 IRBP L

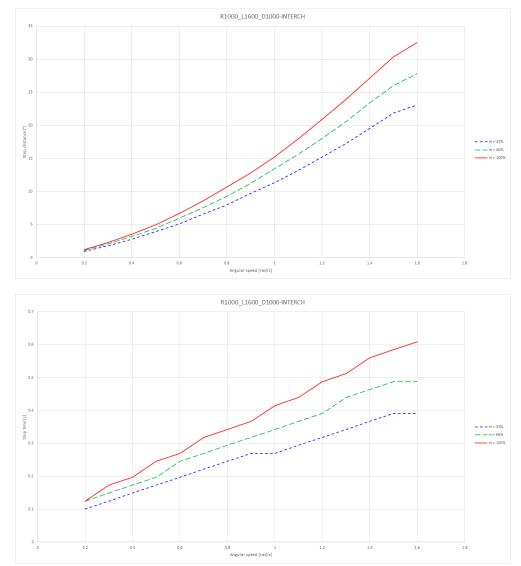
30.5 L600 *Continued*

Category 1, PLATE



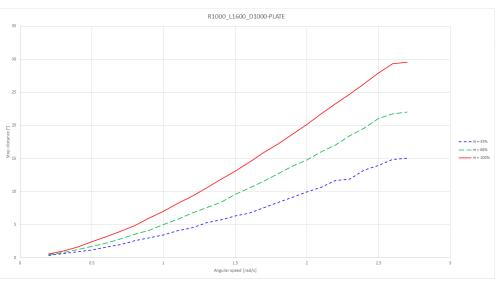
31.1 R1000_L1600_D1000

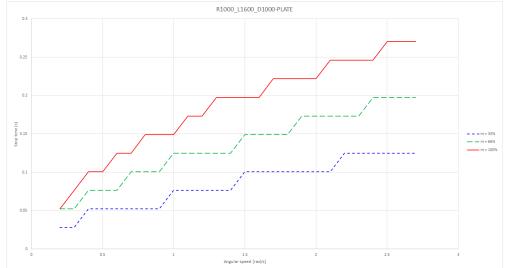
Category 0, INTERCH



31.1 R1000_L1600_D1000 *Continued*

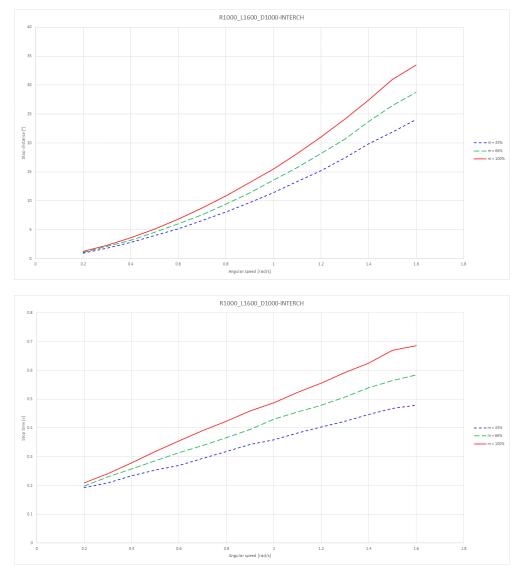
Category 0, PLATE





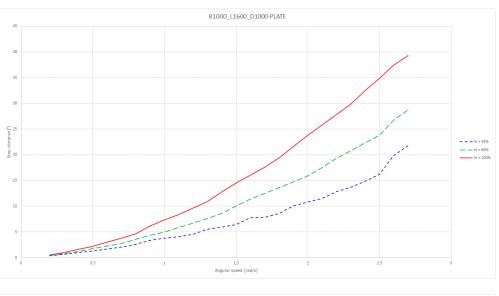
31.1 R1000_L1600_D1000 Continued

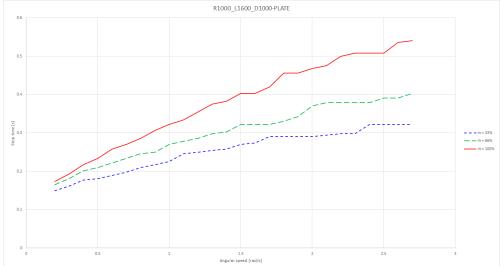
Category 1, INTERCH



31.1 R1000_L1600_D1000 *Continued*

Category 1, PLATE

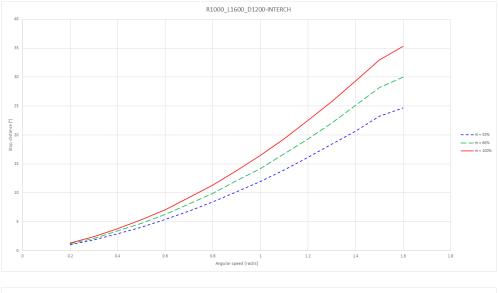


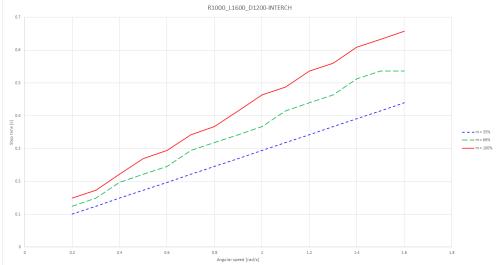


31.2 R1000_L1600_D1200

31.2 R1000_L1600_D1200

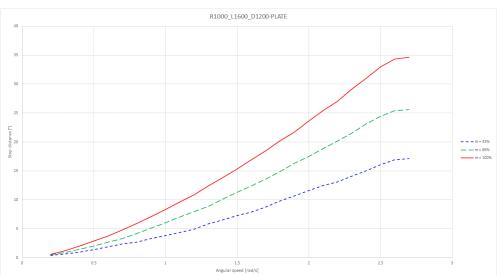
Category 0, INTERCH

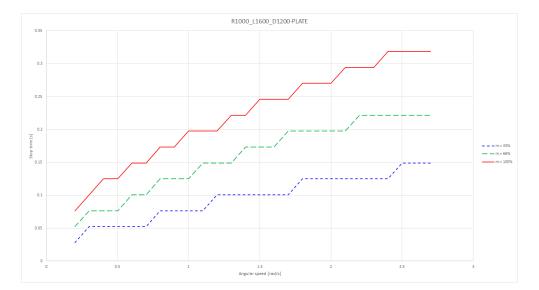




31.2 R1000_L1600_D1200 *Continued*

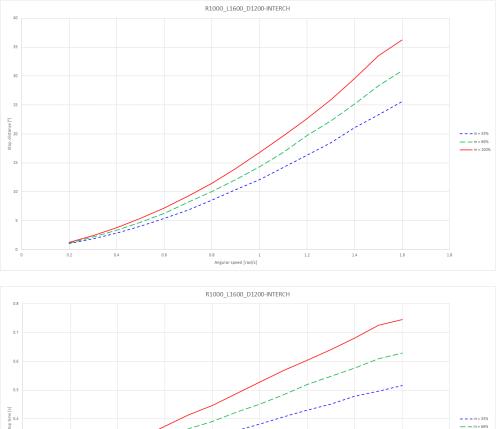
Category 0, PLATE

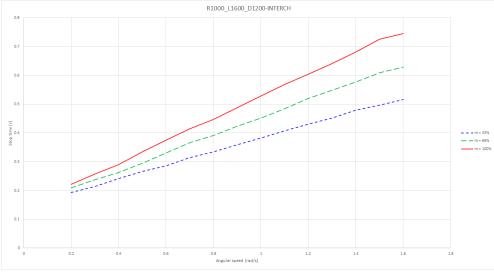




31.2 R1000_L1600_D1200 Continued

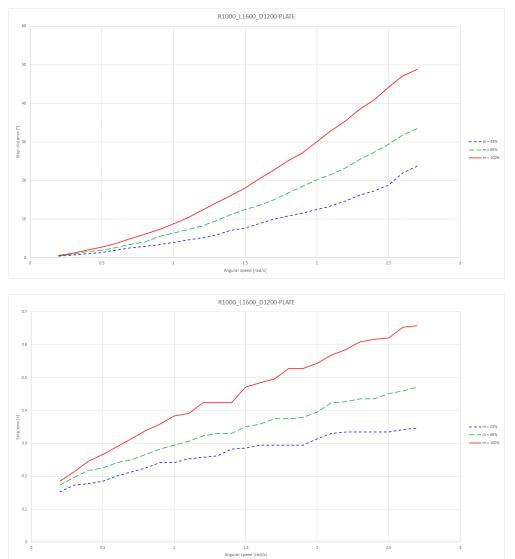
Category 1, INTERCH





31.2 R1000_L1600_D1200 *Continued*

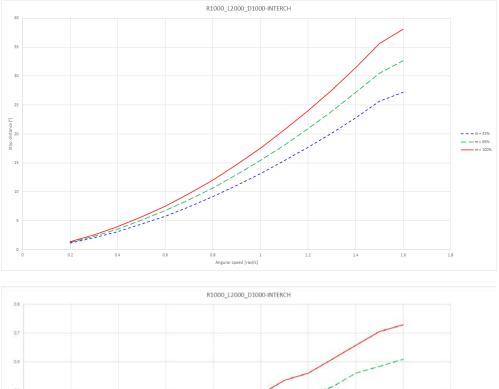
Category 1, PLATE

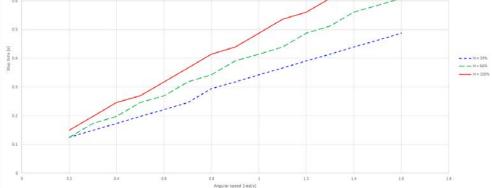


31.3 R1000_L2000_D1000

31.3 R1000_L2000_D1000

Category 0, INTERCH

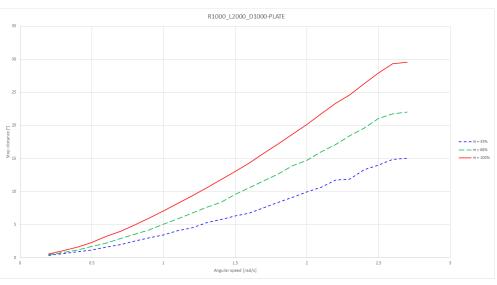


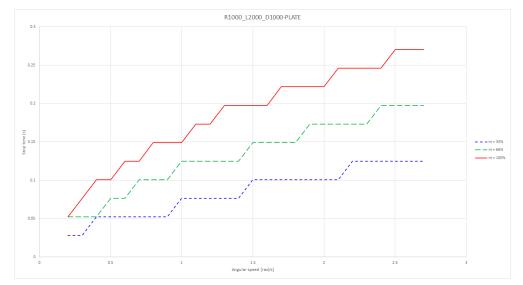


31.3 R1000_L2000_D1000 *Continued*

Category 0, PLATE

Stopping distance and stopping time

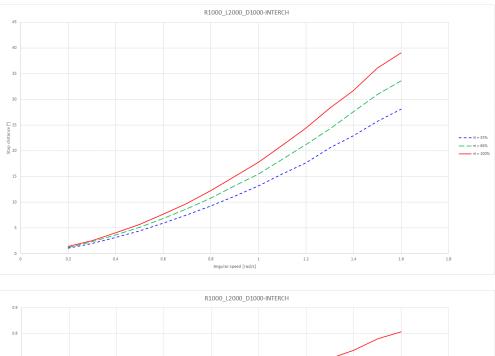


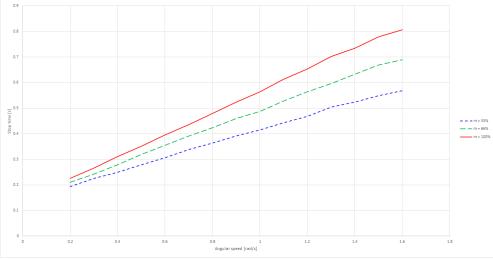


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31.3 R1000_L2000_D1000 Continued

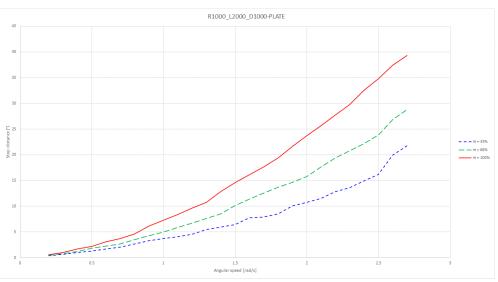
Category 1, INTERCH

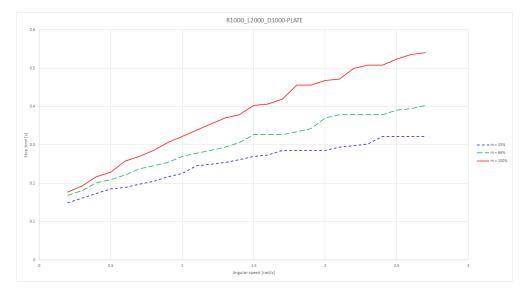




31.3 R1000_L2000_D1000 *Continued*

Category 1, PLATE

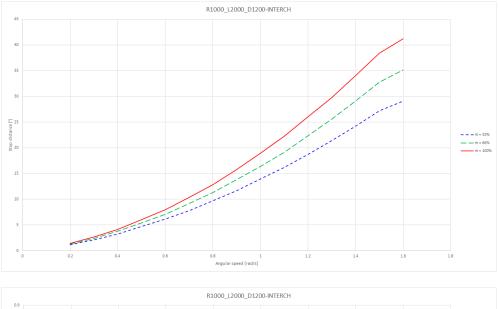


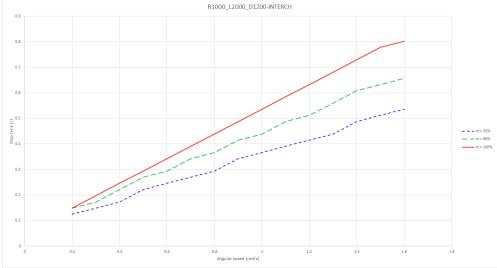


31.4 R1000_L2000_D1200

31.4 R1000_L2000_D1200

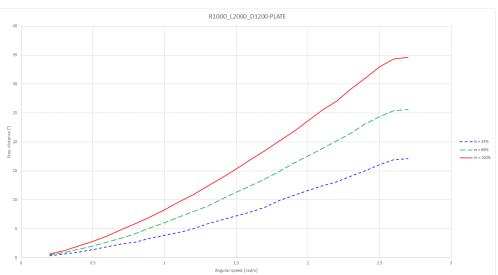
Category 0, INTERCH

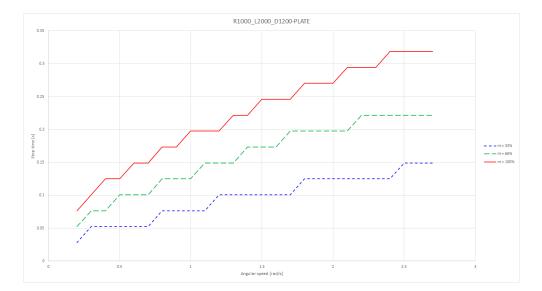




31.4 R1000_L2000_D1200 Continued

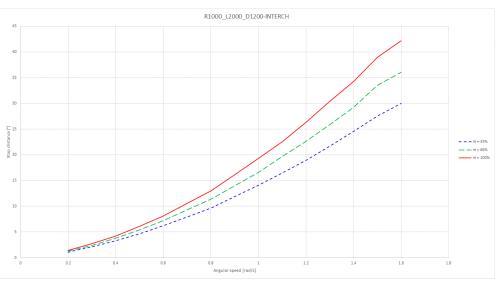
Category 0, PLATE

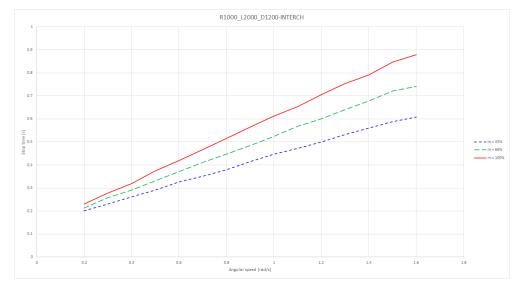




31.4 R1000_L2000_D1200 Continued

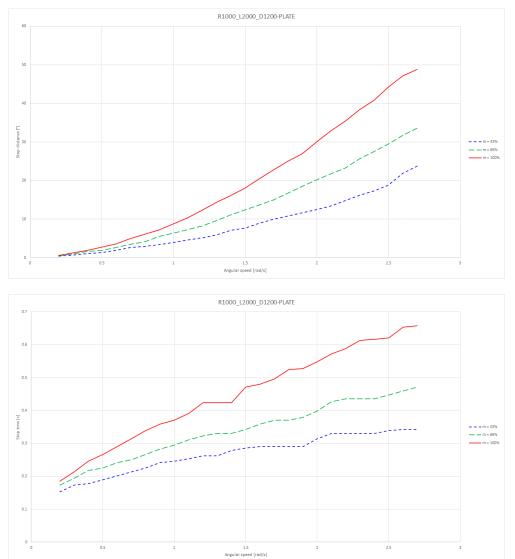
Category 1, INTERCH





31.4 R1000_L2000_D1200 *Continued*

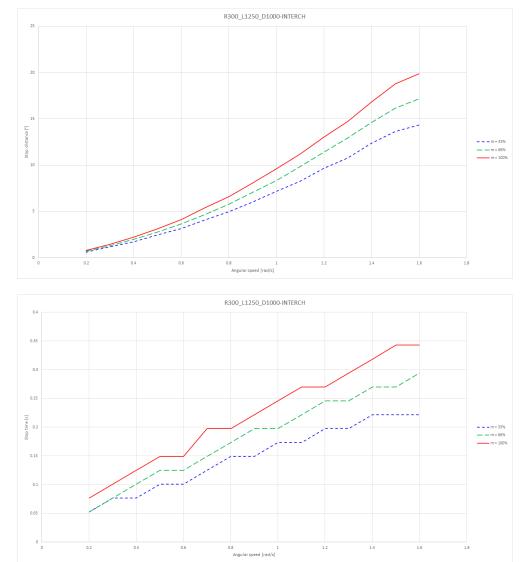
Category 1, PLATE



31.5 R300_L1250_D1000

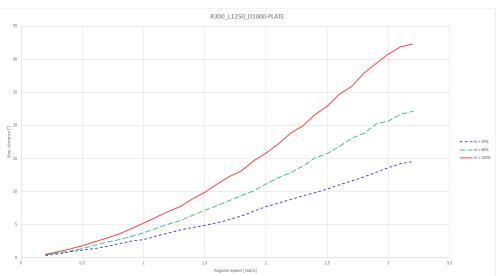
31.5 R300_L1250_D1000

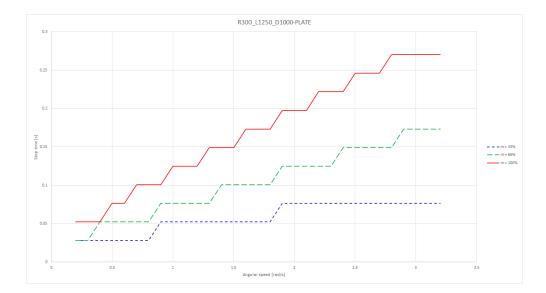
Category 0, INTERCH



31.5 R300_L1250_D1000 *Continued*

Category 0, PLATE

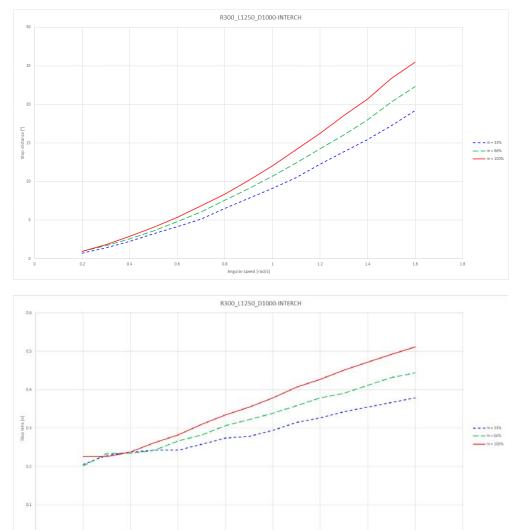




31.5 R300_L1250_D1000 Continued

Category 1, INTERCH

Stopping distance and stopping time



0.8 Angular speed [rad/s]

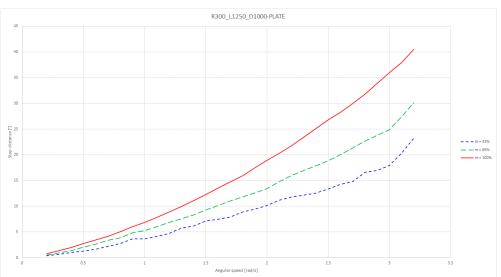
1.4

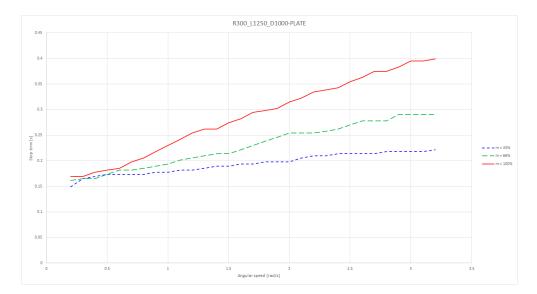
5.6

1.8

31.5 R300_L1250_D1000 *Continued*

Category 1, PLATE

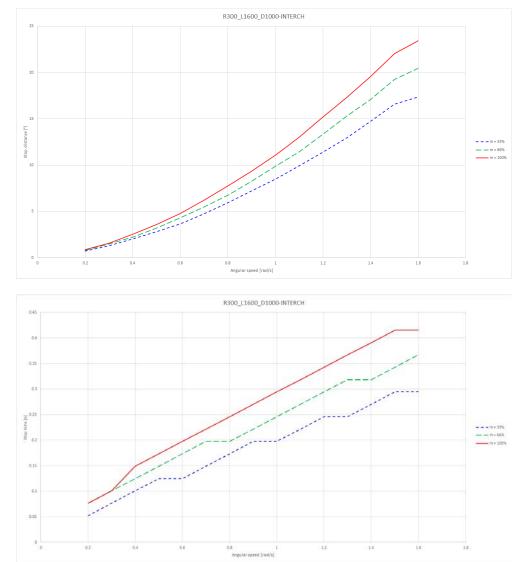




31.6 R300_L1600_D1000

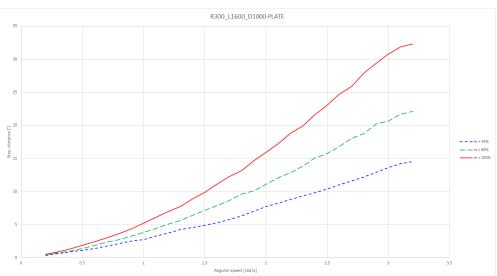
31.6 R300_L1600_D1000

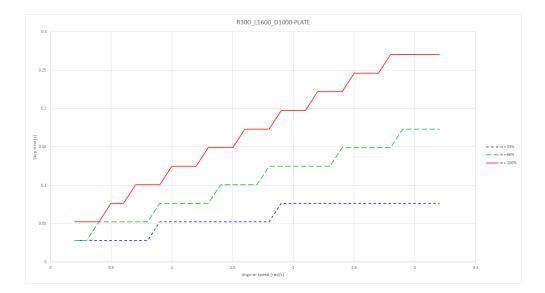
Category 0, INTERCH



31.6 R300_L1600_D1000 Continued

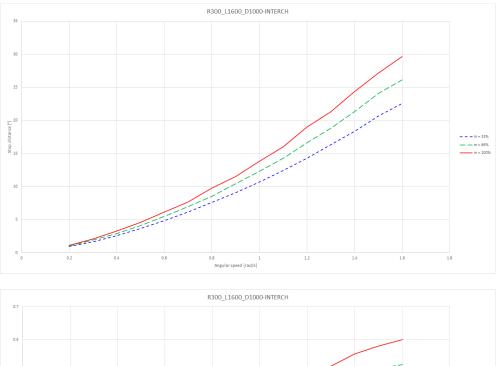
Category 0, PLATE

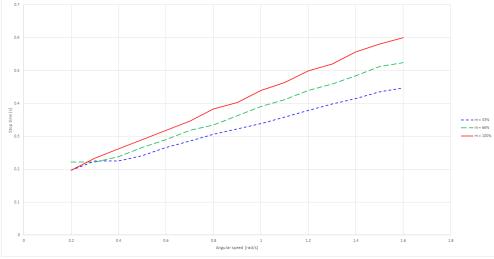




31.6 R300_L1600_D1000 Continued

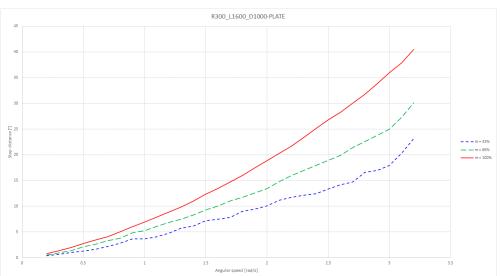
Category 1, INTERCH

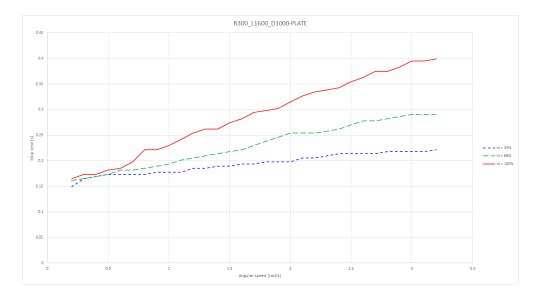




31.6 R300_L1600_D1000 *Continued*

Category 1, PLATE



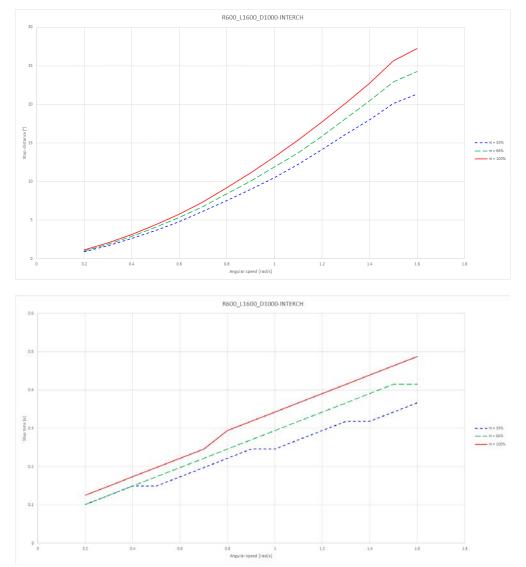


31.7 R600_L1600_D1000

31.7 R600_L1600_D1000

Category 0, INTERCH

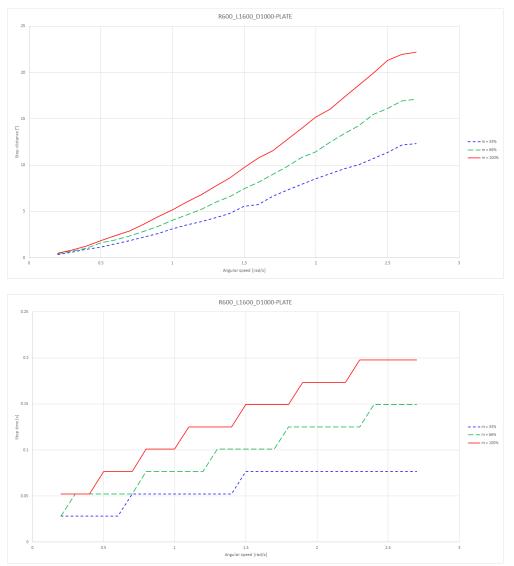
Stopping distance and stopping time



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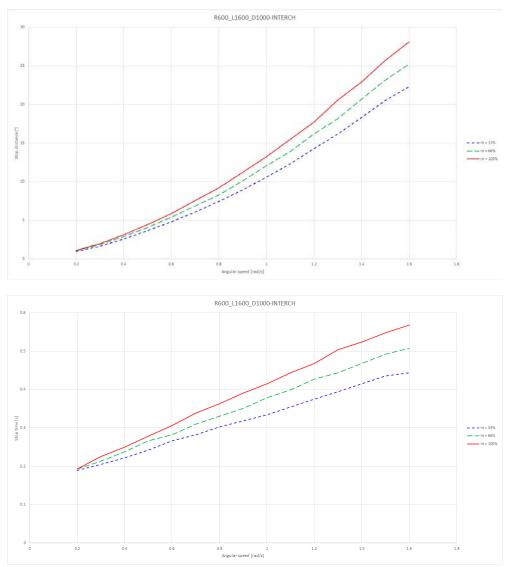
31.7 R600_L1600_D1000 *Continued*

Category 0, PLATE



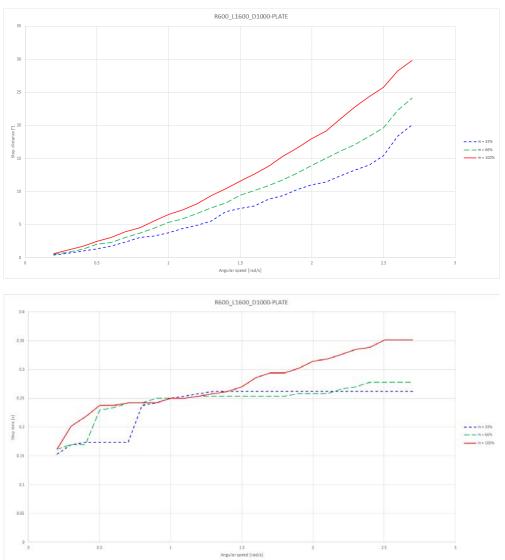
31.7 R600_L1600_D1000 Continued

Category 1, INTERCH



31.7 R600_L1600_D1000 *Continued*

Category 1, PLATE

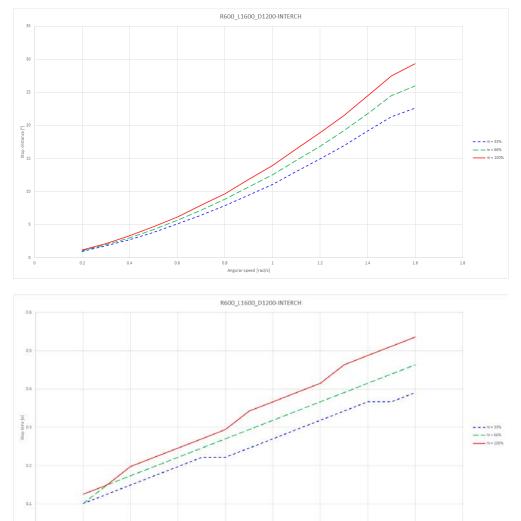


31.8 R600_L1600_D1200

31.8 R600_L1600_D1200

Category 0, INTERCH

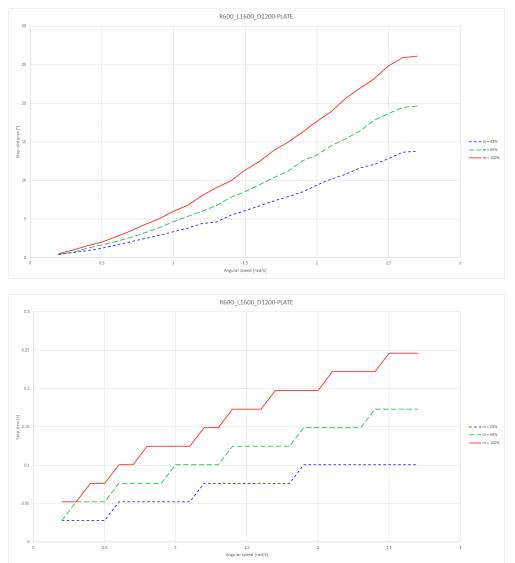
Stopping distance and stopping time



0.8 Angular speed [rad/s]

31.8 R600_L1600_D1200 *Continued*

Category 0, PLATE



- - m = 33% - m = 66% - m = 1009

1.8

31.8 R600_L1600_D1200 Continued

Category 1, INTERCH

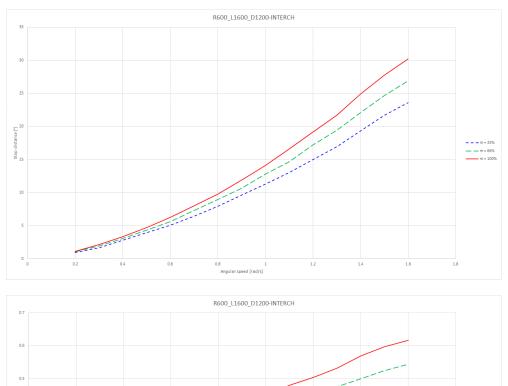
Stopping distance and stopping time

Stop tir

0.4

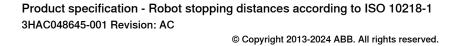
0.6

0.2



0.8 Angular speed [rad/s]

1.4



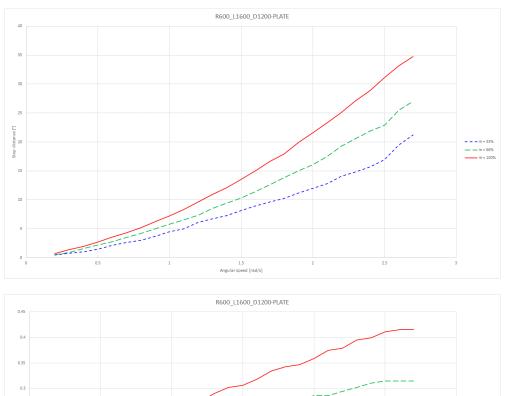
31.8 R600_L1600_D1200 *Continued*

Category 1, PLATE

Stopping distance and stopping time

0.1

0.5



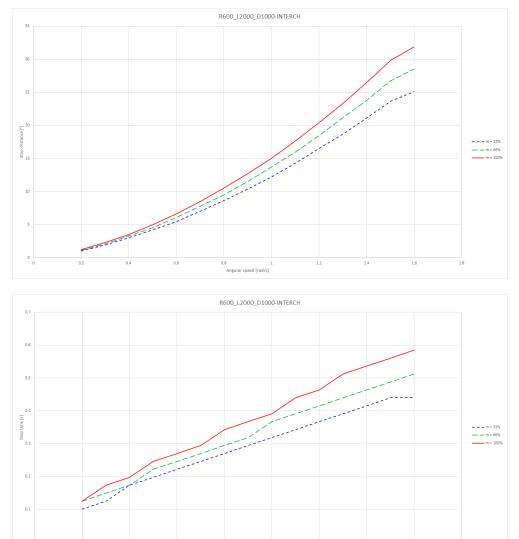
1.5 Angular speed [rad/s] - - m = 33% - m = 66% - m = 100%

31.9 R600_L2000_D1000

31.9 R600_L2000_D1000

Category 0, INTERCH

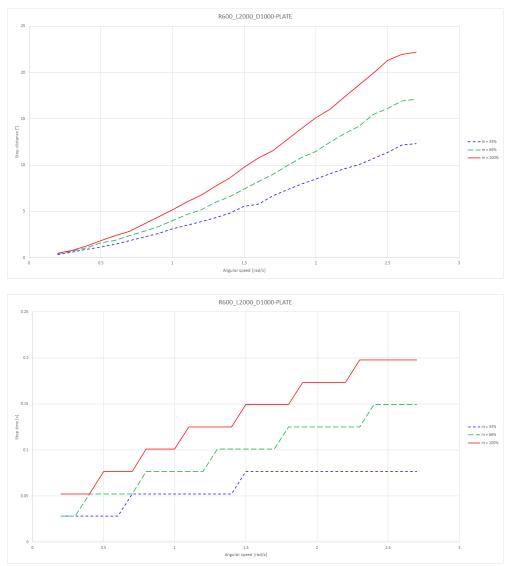
Stopping distance and stopping time



0.8 Angular speed [rad/s]

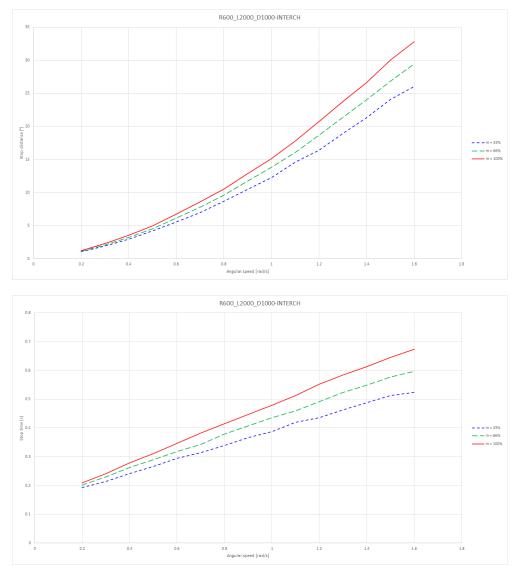
31.9 R600_L2000_D1000 *Continued*

Category 0, PLATE



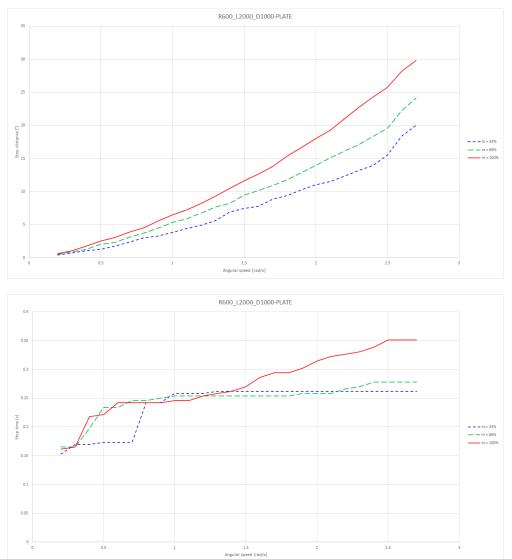
31.9 R600_L2000_D1000 Continued

Category 1, INTERCH



31.9 R600_L2000_D1000 *Continued*

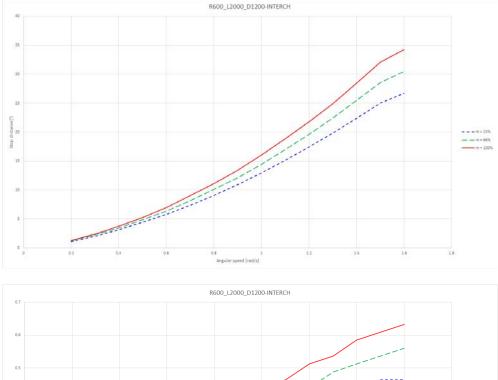
Category 1, PLATE

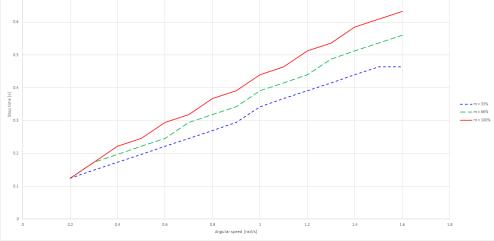


31.10 R600_L2000_D1200

31.10 R600_L2000_D1200

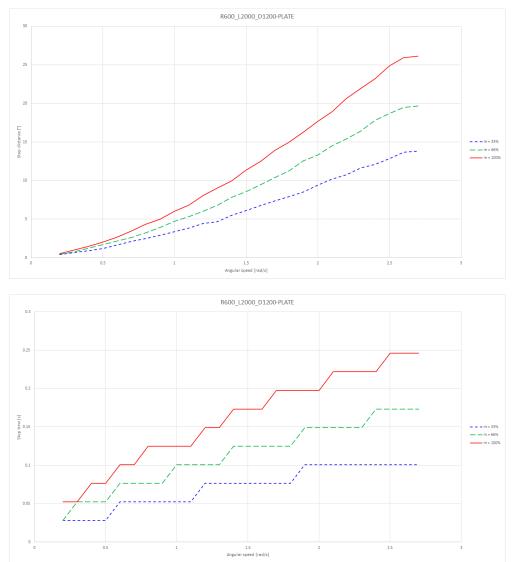
Category 0, INTERCH





31.10 R600_L2000_D1200 *Continued*

Category 0, PLATE



31.10 R600_L2000_D1200 Continued

Category 1, INTERCH

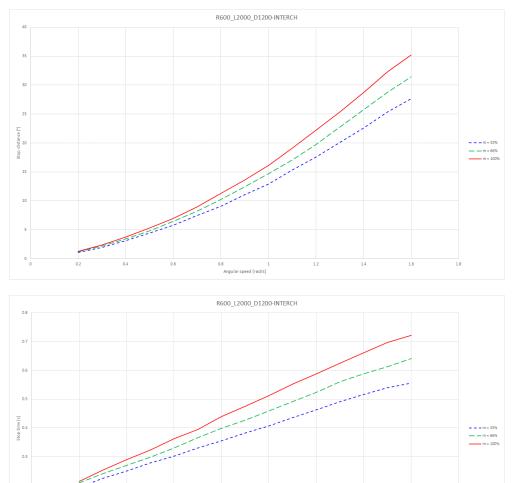
Stopping distance and stopping time

0.2

0.2

0.4

0.6



0.8 Angular speed [rad/s]

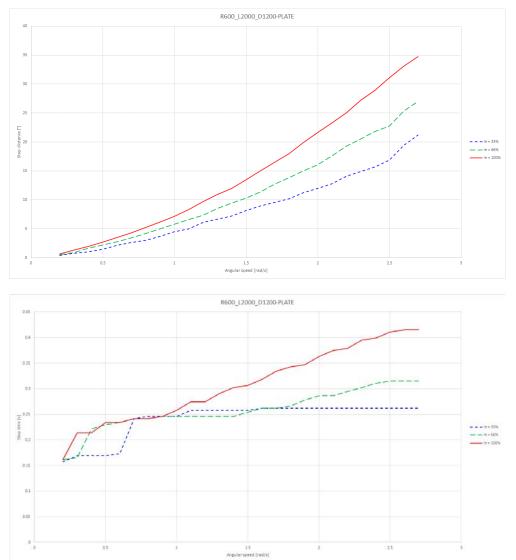
1.2

1.4

1.6

31.10 R600_L2000_D1200 *Continued*

Category 1, PLATE



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