



ottobock.

Quality for life

Infrared ovens for the orthopaedic workshop

Heat plastics in a manner appropriate for the material –
quickly, evenly and energy-efficiently.





What counts is the highest quality –
the infrared ovens from Ottobock

Higher productivity with infrared ovens

Infrared ovens are the first choice when plastics need to be heated in the orthopaedic workshop.

The way they work makes the difference:

In conventional convection ovens an object is heated by absorbing ambient heat in a closed compartment. In contrast, the heat in an infrared oven is generated in the form of electromagnetic waves absorbed by the material directly. This has many advantages: Higher speed, greater productivity and a significantly greater energy efficiency are the result.

Heat more quickly – consume less energy

An Ottobock infrared oven heats plastics in a very short time. A 4 mm thick polypropylene sheet can be heated in just 4 to 6 minutes. Infrared ovens do not need to be pre-heated – the radiant heat is fully available in an instant. This significantly reduces energy consumption in the orthopaedic workshop.

This is how quickly it can be done:

Material heating times and temperatures

The standard material heating times and temperatures for sheet materials made of Ottobock polyethylene (PE 200) or polypropylene (PP-H and PP-C) are:

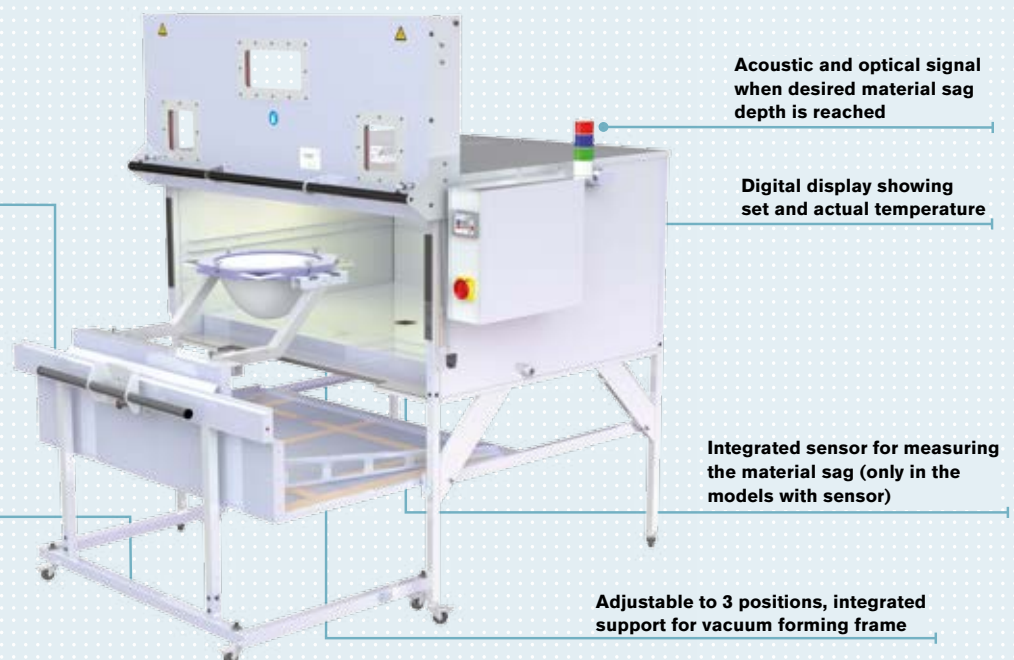


Plastic	Temperature range		Heating time
	PE 200	PP-H/PP-C	
3 mm	165 °C	185 °C	3 – 5 min
4 mm	165 °C	185 °C	4 – 6 min
5 mm	165 °C	185 °C	5 – 8 min
6 mm	165 °C	185 °C	6 – 9 min
8 mm	165 °C	185 °C	8 – 12 min
10 mm	165 °C	185 °C	10 – 15 min
12 mm	165 °C	185 °C	12 – 18 min
15 mm	165 °C	185 °C	15 – 22 min

These specifications are basic information for Ottobock PE and PP plastics. Please ask your plastics suppliers about other material-specific heating temperatures and times.

Ottobock infrared ovens – all benefits at a glance

- Sensor for exact measurement of the material sag depth with acoustic and optical signal (only for models 701E40=S, 701E41=S and 701E44=S)
- Mobile material cart with rotation function facilitates switching between Teflon-covered work surface and vacuum forming frame quickly and saves space
- State-of-the-art infrared quartz tubes with single reflectors ensure an even heating
- Optical temperature sensor permits continuous monitoring of the material surface temperature
- Simple operation via a central element with temperature setpoint entry and timer function
- Storage function for user-defined heating processes
- Graphical progress indicator for monitoring
- Heat insulated housing (except for infrared oven 701E43), enclosed on all sides
- Space-saving sliding door
- Stainless steel front panel with 3 viewing windows



Infrared oven with rotatable material cart 701E40=WS/701E40=S

The top model scores points for well-thought-out solutions in every detail. In particular, the rotatable material cart and the sensor integrated into model 701E40=S guarantee optimal user convenience.

The material cart can be rotated 180° in one easy step. The plastics are warmed either on the Teflon-coated work surface or the practical rack with space to fit 3 vacuum forming frame sizes. If the user wants, the integrated sensor measures exactly how deep the material is sagging in the oven. Optical and acoustic signals notify the user when the pre-defined sag depth has been reached.

Versions at a glance

- Model 701E40=S with integrated sensor for measuring the material sag depth
- Model 701E40=WS is supplied without sensor
- Material cart, rotatable by 180°
- Stainless steel front panel



Technical data

Equipment	<ul style="list-style-type: none"> • Opto-electronic IR measuring head for measuring the surface temperature • PID controller, temperature continuously adjustable from 30 °C to 250 °C • Temperature indicator with setpoint and actual value and programmable timer function • SPS controller with touchpanel
Material cart	<ul style="list-style-type: none"> • With rotation function for switching between sheet materials and vacuum formed sockets • Mobile with 4 castors with brakes • Usable area on material cart W x D 1,260 mm x 1,040 mm • Working height 1,080 mm
Dimensions W x D x H	1.600 mm x 1.270 mm x 1.430 mm
Material	Steel, stainless steel
Electrical connection	3 x 400 V N/PE/50–60 Hz/8.5 kW
Power cord	4 m power cord with CEE plug 5 x 16 A and CEE socket 5 x 16 A
Infrared heating element	Panel heating via 18 infrared quartz tubes with single reflectors ensures that the material is heated evenly



Infrared oven with removable support plate 701E41=WS/701E41=S

All advantages of the top models 701E40=WS/ 701E40=S are combined here with a slightly modified material cart design: The work surface of this oven can be removed effortlessly.

The extendible material cart has a large Teflon-coated work surface. If plastics are heated in a vacuum forming frame, the plate can be removed in one easy step. 3 different vacuum forming frame sizes can be used. The advantage: The plastic sheets are always located in the perfect position for starting the heating process.

Technical data

Equipment	<ul style="list-style-type: none"> • Opto-electronic IR measuring head for measuring the material surface temperature • PID controller, temperature continuously adjustable from 30 °C to 250 °C • Temperature indicator with setpoint and actual value and programmable timer function • SPS controller with touchpanel
Materialwagen	<ul style="list-style-type: none"> • Work frame with removable Teflon-coated support plate for switching between sheet material and material in the vacuum forming frame • Mobile with 4 castors with brakes • Usable area on material cart W x D 1,260 mm x 1,040 mm • Working height 1,080 mm
Dimensions W x D x H	1,600 mm x 1,270 mm x 1,430 mm
Material	Steel, stainless steel
Electrical connection	3 x 400 V N/PE/50–60 Hz/8,5 kW
Power cord	4 m power cord with CEE plug 5 x 16 A and CEE socket 5 x 16 A
Infrared heating element	Panel heating via 18 infrared quartz tubes with single reflectors ensures that the material is heated evenly

Versions at a glance

- Model 701E41=S with integrated sensor for measuring the material sag depth
- Model 701E41=WS is supplied without sensor
- Removable support plate
- Designed for 3 vacuum forming frame sizes
- Stainless steel front panel

Infrared oven with height-adjustable material cart 701E43

The middle size in Ottobock's infrared oven series: The material cart offers a usable area of 920 mm x 720 mm.

The 12 infrared quartz tubes are equipped with single reflectors, which ensures uniform heating of the thermoplastic material. This makes it easy to shape and bend around edges and undercuts.

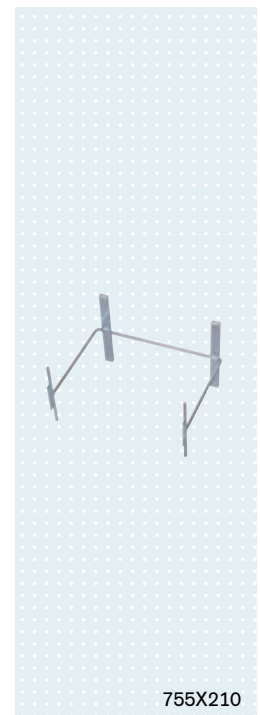
The opto-electronic sensor measures the surface temperature continuously: Thus the user has control of the degree of heating of the material at all times and can prevent overheating safely.

The design at a glance

- Mobile material cart with continuous height adjustment via gas pressure spring
- Optical measurement of material surface temperature
- Excl. 755X210 stand

Technical data

Equipment	<ul style="list-style-type: none"> • Opto-electronic IR measuring head for measuring the material surface temperature • PID controller, temperature continuously adjustable from 30 °C to 250 °C • Temperature indicator with setpoint and actual value and programmable timer function • SPS controller with touchpanel
Material cart	<ul style="list-style-type: none"> • Mobile with 4 castors with brakes and with continuous height adjustment via gas pressure spring • Usable area on material cart W x D 1,260 mm x 1,040 mm • Working height 1,050 mm
Dimensions W x D x H	1.320 mm x 970 mm x 1.420 mm
Material	Steel, stainless steel
Electrical connection	3 x 400 V N/PE/50–60 Hz / 7,7 kW
Power cord	4 m power cord with CEE plug 5 x 16 A and CEE socket 5 x 16 A
Infrared heating element	Panel heating with 12 infrared quartz tubes, with single reflectors



755X210



Infrared oven for small plastic sizes

701E44=S/701E44=WS

Perfect for heating small thermoplastic materials evenly, quickly and safely: The material is simply placed on the removable metal tray or in a vacuum forming frame. In addition, a sensor is built into the 701E44=S which informs the user both optically and acoustically when the pre-defined material sag depth has been reached.

The modern design of the "small" infrared oven is completed by the distinctive stainless steel front panel.



Technical data

Equipment	<ul style="list-style-type: none"> • Opto-electronic IR measuring head for measuring the material surface temperature • PID controller, temperature continuously adjustable from 30 °C to 250 °C • Temperature indicator with setpoint and actual value and programmable timer function • SPS controller with touchpanel
Dimensions W x D x H	900 mm x 700 mm x 920 mm
Material	Steel, stainless steel
Interior dimensions W x D x H	810 mm x 580 mm x 510 mm
Interior volume	240 l
Electrical connection	3 x 400 V N/PE/50–60 Hz/3.7 kW
Power cord	4 m power cord with CEE plug 5 x 16 A and CEE socket 5 x 16 A
Weight	135 kg
Infrared heating element	Panel heating with 8 infrared quartz tubes, with single reflectors

Versions at a glance

- Model 701E44=S with sensor for exact measurement of the material sag depth with acoustic and optical signal
- Model 701E44=WS is supplied without sensor
- 8 infrared quartz tubes with single reflectors ensure uniform heating
- Stainless steel front panel with 2 doors and viewing windows



Ideal for making the
work easier: the accessories







Everything important at a glance:

Technical data

An overview of the key data for all Ottobock infrared ovens.

Infrared ovens

Model	701E40=S, 701E40=WS	701E41=S, 701E41=WS	701E43	701E44=S, 701E44=WS
				
Outer dimensions W x D x H	1,600 mm x 1,270 mm x 1,430 mm	1,600 mm x 1,270 mm x 1,430 mm	1,320 mm x 970 mm x 1,420 mm	900 mm x 700 mm x 920 mm
Rotatable material cart	Yes	No	No	No
Material cart usable area W x D	1,260 mm x 1,040 mm	1,260 mm x 1,040 mm	920 mm x 720 mm	Panel W x D: 810 mm x 580 mm
Sensor for measuring the material sag	701E40=S: Yes 701E40=WS: No	701E41=S: Yes 701E41=WS: No	No	701E44=S: Yes 701E44=WS: No
Closed underbody	Yes	Yes	No	Yes
Infrared quartz heating element with single reflectors	18 above	18 above	12 above	8 above
Measurement of material surface temperature, programmable timer function, logged heating process	Yes	Yes	Yes	Yes
Interior volume	709 l	709 l	400 l	240 l
Material	Steel, stainless steel	Steel, stainless steel	Steel	Steel, stainless steel
Number of viewing windows	3	3	1	2

Vacuum forming accessories

Perfectly adapted additional materials make it possible to create even complex solutions when forming thermoplastics.

1 755T4=360 tensioning frame for thermoplastic forming

- Material: aluminium
- Inner diameter: 360 mm
- Suitable for material thicknesses up to 20 mm
- Coating prevents plastic material from sticking

2 755X84=260X8 frame plate (add-on to 755T4=360)

- Material: aluminium
- Inner diameter: 260 mm
- For vacuum forming of small models
- Accessories for 755T4=360 tensioning frame

3 711M53 vacuum forming tool

- Inner diameter 250 mm
- Outer diameter 260 mm
- Suitable for vacuum forming of small models and arm prostheses

4 755T50 vacuum forming tool kit

- (a) 755X210 stand
W x H x D: 360 mm x 460 mm x 260 mm
- (b) 755T4=360 aluminium tensioning frame, inside Ø 360 mm, material thickness up to 20 mm
- (c) 755X223 bracket
- (d) 755X221 vacuum pipe with 755X222=360 vacuum forming plate
- (e) 755X23 two-way exhaust pipe

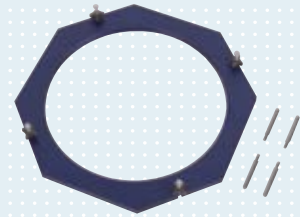
5 641H3 thermal protection gloves for work with heated plastic sheets

- Material: cotton loop fabric with coarse surface structure, impregnated with flame-retardant, with gauntlet
- Length: approx. 280 mm
- Weight (pair): 0.17 kg

6 641H13 thermal protection gloves for work with heated plastic sheets

- Material: cotton jersey gloves, with smooth surface, napped inside, fluffy, heavy quality, good fit, breathable
- Length: approx. 240 mm
- Weight (pair): 0.11 kg

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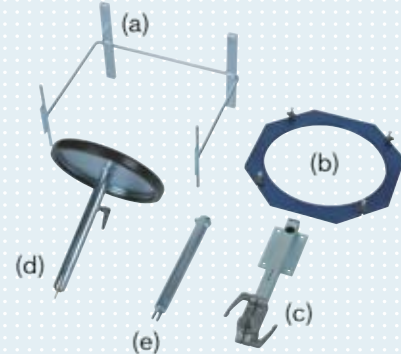
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3



4



5



6



Vacuum forming workstations

Made to continue processing of heated material: The high-quality processing of the vacuum forming workstations is equipped to support orthopaedic technicians in modelling thermoplastics optimally. The vacuum is controlled with the foot pedal, while the water trap and particle filter protect the vacuum pump. In addition, special attention was paid to ensuring that enough shelves for the vacuum forming accessories are available.

755T6=1 and 755T6=2 vacuum forming workstation with integrated vacuum pump

755T6=1: vacuum pipe above and with vacuum forming plate on the side

- Vacuum pipe above that can be folded 90°, (can be locked in 3 intermediate positions)
- Vacuum pipe on the side with exchangeable vacuum forming plate (diameter: 360 mm)
- Dimensions W x D x H:
1,000 mm x 450 mm x 1,100 mm

755T6=2: vacuum pipe with vacuum forming plate on both sides

- Vacuum pipe on both sides with exchangeable vacuum forming plate (diameter: 360 mm)
- Dimensions W x D x H:
1,500 mm x 450 mm x 955 mm

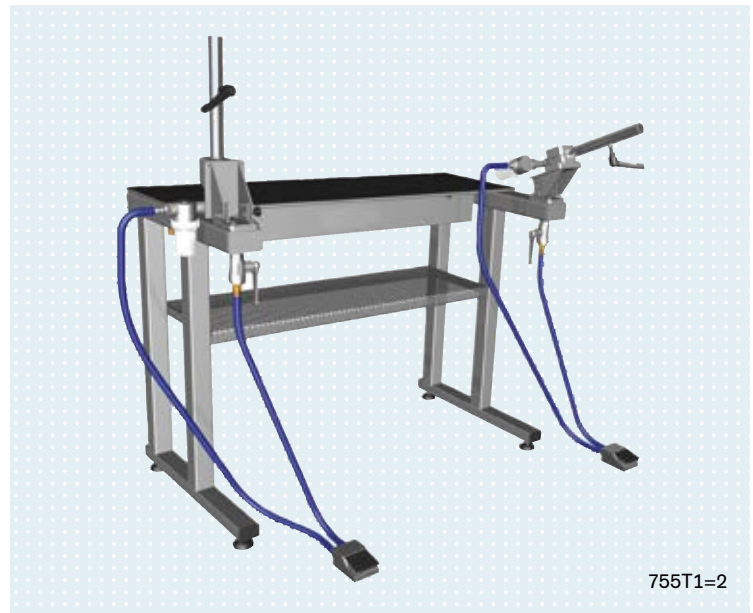
Integrated vacuum pump

- Delivery rate: 100 l/min or 6 m³/h
- Tank volume: 15 l
- Foot switch to control the vacuum
- Vacuum filter to trap dust and other small particles and thus reduce the risk of operating failures

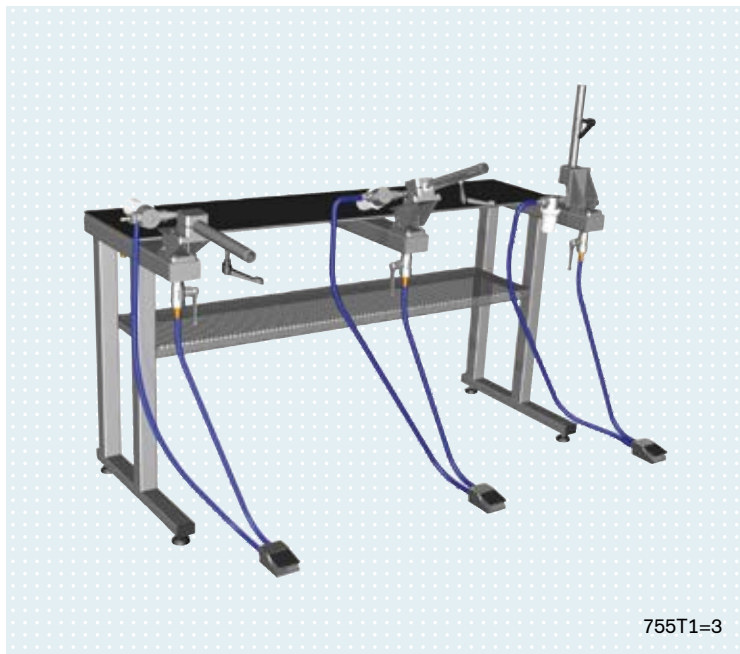
Further product features

- Tool shelf
- Material: steel
- Sound intensity level: 60 dB(A)
- Electrical connection in V/Hz/kW: 1x 230/50/0.25
- Colour: light grey (RAL 7035)





755T1=2



755T1=3



755T1=4

755T1=2, 755T1=3, 755T1=4 vacuum forming workstation with integrated tank

755T1=2: 2 vacuum forming workstations

- Dimensions W x D x H:
1,250 mm x 750 mm x 750 mm

755T1=3: 3 vacuum forming workstations

- Dimensions W x D x H:
1,750 mm x 750 mm x 750 mm

755T1=4: 4 vacuum forming workstations

- Dimensions W x D x H:
2,500 mm x 750 mm x 750 mm

Further product features

- Integrated tank in the rack as vacuum accumulator so a vacuum is always available for vacuum forming work
- Connection to an external vacuum unit such as 755E70=1/755E70=2 vacuum pump without accumulator
- Shelf with grate
- Exchangeable HPME work surface, especially suited for cutting and gluing work
- Foot pedals to control the vacuum
- Vacuum pipes can be tilted 90° (can be locked in 3 intermediate positions)
- Vacuum pipes exchangeable (for example with 755X180=LR vacuum forming adapter or 755X230=65/755X230=85/755X23=110 conical vacuum pipe)
- Material: steel
- Colour: light grey (RAL 7035)

Accessories for vacuum forming workstations

When vacuum forming is part of everyday work, the right accessories make life much easier: With clever solutions from Ottobock, working with thermoplastics is as pleasant, easy and efficient as possible.

755E70=1/755E70=2

vacuum pump without vacuum accumulator

755E70=1

- Suction power 100 l/min or 6 m³/h

755E70=2

- Suction power 200 l/min or 12 m³/h

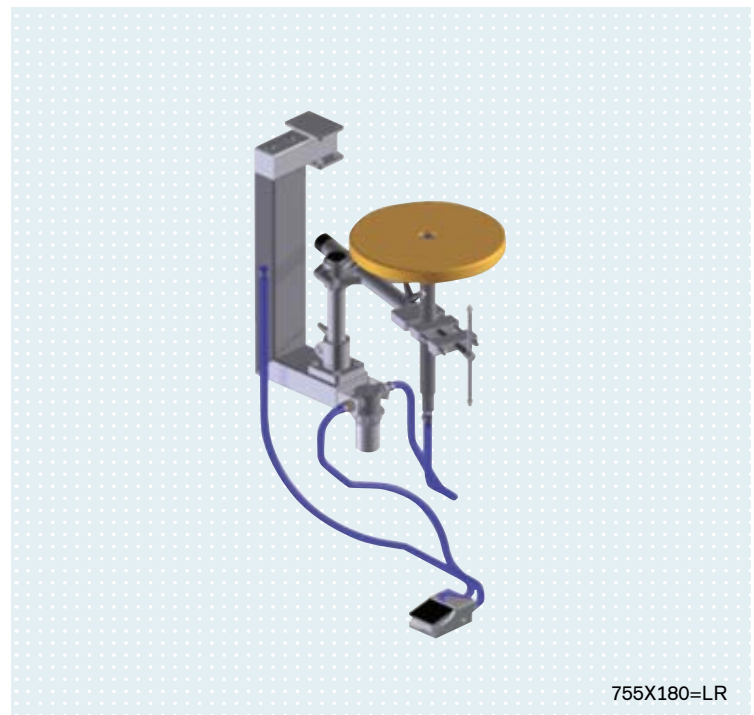
Further product features

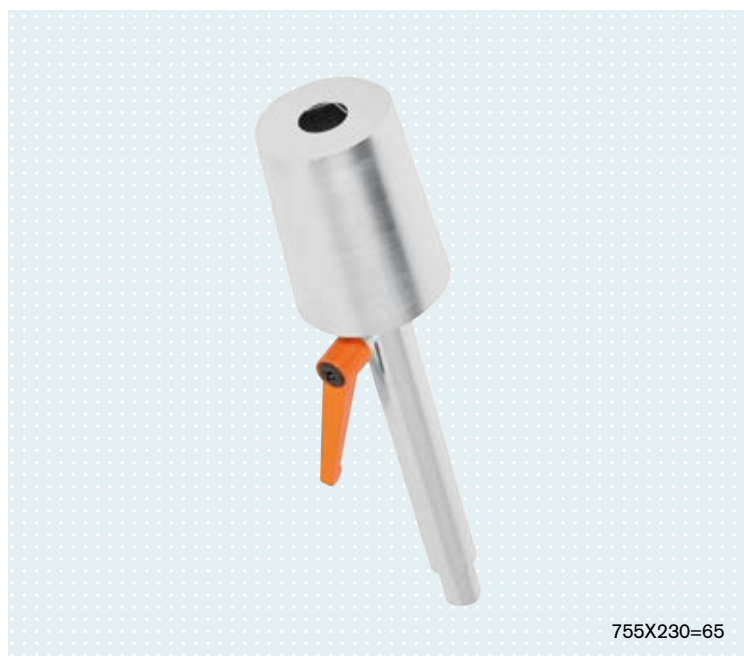
- Water trap, filter, vacuum meter, ball valve for compressed air extraction
- End pressure: 50 mbar
- Vacuum connection diameter: 13 mm
- Sound intensity level: 60 dB(A)
- Material: steel
- Colour: light grey (RAL 7035)



755X180=LR vacuum forming adapter

- Suitable for attachment to the right or left side of 755T1=2/755T1=3/755T1=4 vacuum forming workstation with integrated tank
- Foot pedal for controlling the vacuum
- Particle filter
- Water trap
- Vacuum pipe with exchangeable vacuum forming plate (diameter: 360 mm)
- "Orthofix" clamping fixture for switching the vacuum pipe quickly
- Vacuum connection diameter: 13 mm
- Material: steel
- Dimensions W x D x H:
360 mm x 700 mm x 600 mm





755X230=65

**755X230=65/755X230=85/755X230=110
conical vacuum pipe**

755X230=65

- Conical vacuum pipe with 65 mm diameter

755X230=85

- Conical vacuum pipe with 85 mm diameter

755X230=110

- Conical vacuum pipe with 110 mm diameter
- Suitable for connection to
755T1=2/755T1=3/755T1=4 and
755T6=1/755T6=2 vacuum forming workstations
- Material: galvanised steel
- Vacuum connection diameter 25 mm
(includes adapter for 6 mm and 13 mm)
- The vacuum-formed model can be pulled off the
vacuum pipe with just a few turns – it doesn't need
to be cut free



755X220

**755X220 vacuum pipe with 2 exchangeable
vacuum forming plates**

- Pedilan vacuum forming plate surface prevents the
plastic from sticking to the vacuum forming plate
- Quick-change system for exchanging the vacuum
forming plate in next to no time

1 set consisting of:

- 755X221 vacuum pipe
- 755X222=260 vacuum forming plate
(diameter 260 mm)
- 755X222=360 vacuum forming plate
(diameter 360 mm)
- Vacuum connection diameter 25 mm
(includes adapter for 6 mm and 13 mm connection)

Optional accessories

- 755X222=180 vacuum forming plate
(diameter 180 mm)

Suitable processing materials: thermo-plastics

The best materials for the best results:
Ottobock offers a wide variety of top-class materials with various chemical compositions.

Vacuum forming materials

Vacuum forming materials	Reference number	Chemical composition
ThermoLyn Trolene	616T3	Polyethylene
ThermoLyn PP-C	616T120	Polypropylene Copolymer
ThermoLyn PP-H	616T20/616T56	Polypropylene homopolymer
ThermoLyn PE 200	616T95/616T19/616T58	Polyethylene 200
ThermoLyn RCH 500	616T22/616T44	Polyethylene
ThermoLyn RCH 1000	616T16	Polyethylene
ThermoLyn PETG clear	616T183	Copolyester
Antibacterial ThermoLyn clear	616T283	Copolyester
ThermoLyn clear	616T83	Copolyester
Antibacterial ThermoLyn rigid	616T252	Styrene butadiene
ThermoLyn rigid	616T52	Styrene butadiene
ThermoLyn SilverShield®	616T200	Ethyl vinyl acetate
Antibacterial ThermoLyn soft, skin colour	616T269	Ethylene vinyl acetate
ThermoLyn soft, skin colour	616T69	Ethylene vinyl acetate
ThermoLyn soft, black	616T690	Polyethylene copolymer
Antibacterial ThermoLyn soft, colourless	616T253	Ethylene vinyl acetate
ThermoLyn soft, colourless	616T53	Ethylene vinyl acetate
ThermoLyn supra soft	616T59	Ethylene vinyl acetate
ThermoLyn supra soft plus silicone	616T111	Ethylene vinyl acetate with silicone
ThermoLyn supra flexible	616T112/616T113	Ethylene vinyl acetate



Thermoplastic prepreg

Thermoplastic prepreg	Reference number	Matrix
TP.C carbon fibre cloth	617R15	TPU
TP.C textile	617R18	PP



SilverShield® is a registered trademark of North Sea Plastics.



Padding materials

Padding materials	Reference number	Chemical composition/ structure
Pedilin SilverShield®	617S203	PE foam, closed-cell
Pedilin	617S3	PE foam, closed-cell
Pedilin, perforated	617S6	PE foam, closed-cell
Pedilin cone for soft socket	6T2	PE foam, closed-cell
Plastazote®	617S7	PE foam, closed-cell
Plastazote®, perforated	617S8/617S21/ 617S17/617S18	PE foam, closed-cell
Evazote®	617S9/617S13/ 617S14	EVA copolymer, closed-cell
Nora® Aero sorb, medium	617S174	Light cellular rubber, closed-cell
Nora® Aero sorb, soft	617S173	Light cellular rubber, closed-cell
Nora® Lunasoft SL	617S191	EVA copolymer, closed-cell
Nora® Lunasoft SLW	617S192	EVA copolymer, closed-cell
nora® Lunatec combi 7	617S187=7	EVA copolymer, closed-cell
Nora® Lunairflex	617S188	EVA copolymer, closed-cell
Nora® Lunairflex, perforated	617S190	EVA copolymer, closed-cell
Nora® Lunairmed	617S181	EVA copolymer, closed-cell
Nora® Lunairmed, perforated	617S180	EVA copolymer, closed-cell
Nora® Lunalastik	617S189	EVA copolymer, closed-cell
Dynofom	617S70	PE foam, closed-cell
Dynofom, perforated	617S71	PE foam, closed-cell
Multicolor OD	617S92	PE foam, closed-cell
Dino foam	617S90/617S91/ 617S93/617S94	EVA copolymer, closed-cell

Additional thermoformable materials from Ottobock: 620P4 micro-cork, 621X9 carbon synthetic leather

SilverShield® is a registered trademark of North Sea Plastics.
 Plastazote® is a registered trademark of Zotefoams.
 Evazote® is a registered trademark of Zotefoams.
 Nora® is a registered trademark of Freudenberg.

Storage for vacuum forming materials

The shelf systems are designed to take advantage of the free space around the infrared oven that would otherwise remain completely unused. The well-thought-out design ensures that users always have all vacuum forming materials and frequently used accessories such as vacuum forming frames close at hand.

758R16=1425 rack for infrared oven

- Dimensions W x D x H:
1,425 mm x 1,100 mm x 1,450 mm/1,800 mm
- Material: steel
- Colour: light grey (RAL 7035)
- 3 shelves on top:
max. sheet size 1,300 mm x 1,100 mm
- Rack suitable for 701E43 infrared oven

758R16=1700 rack for infrared oven

- Dimensions W x D x H:
1,700 mm x 1,100 mm x 1,450 mm/1,800 mm
- Material: steel
- Colour: light grey (RAL 7035)
- 3 shelves on top:
max. sheet size 1,600 mm x 1,100 mm
- Rack suitable for 701E40=S/701E40=WS
and 701E41=S/701E41=WS infrared oven

758R17=2265 rack for infrared oven

- Dimensions W x D x H:
2,265 mm x 1,100 mm x 1,450/1,800 mm
- Material: steel
- Colour: light grey (RAL 7035)
- 3 shelves on top:
5 compartments for max. sheet dimensions
400 mm x 400 mm
2 compartments for max. sheet dimensions
1,300 mm x 1,100 mm
- 1 shelf on the right:
max. sheet width 510 mm
- 1 shelf on the left: max. sheet width 410 mm
- Rack suitable for 701E43 infrared oven





758R17=2600

758R17=2600 rack for infrared oven

- Dimensions W x D x H:
2,600 mm x 1,100 mm x 1,450 mm/1,800 mm
- Material: steel
- Colour: light grey (RAL 7035)
- 3 shelves on top:
5 compartments for max. sheet dimensions
400 mm x 400 mm
2 compartments for max. sheet dimensions
2,450 mm x 1,100 mm
- 1 shelf on the right:
max. sheet width 510 mm
- 1 shelf on the left:
max. sheet width 410 mm
- Rack suitable for 701E40=S/701E40=WS
and 701E41=S/701E41=WS infrared oven



758R27

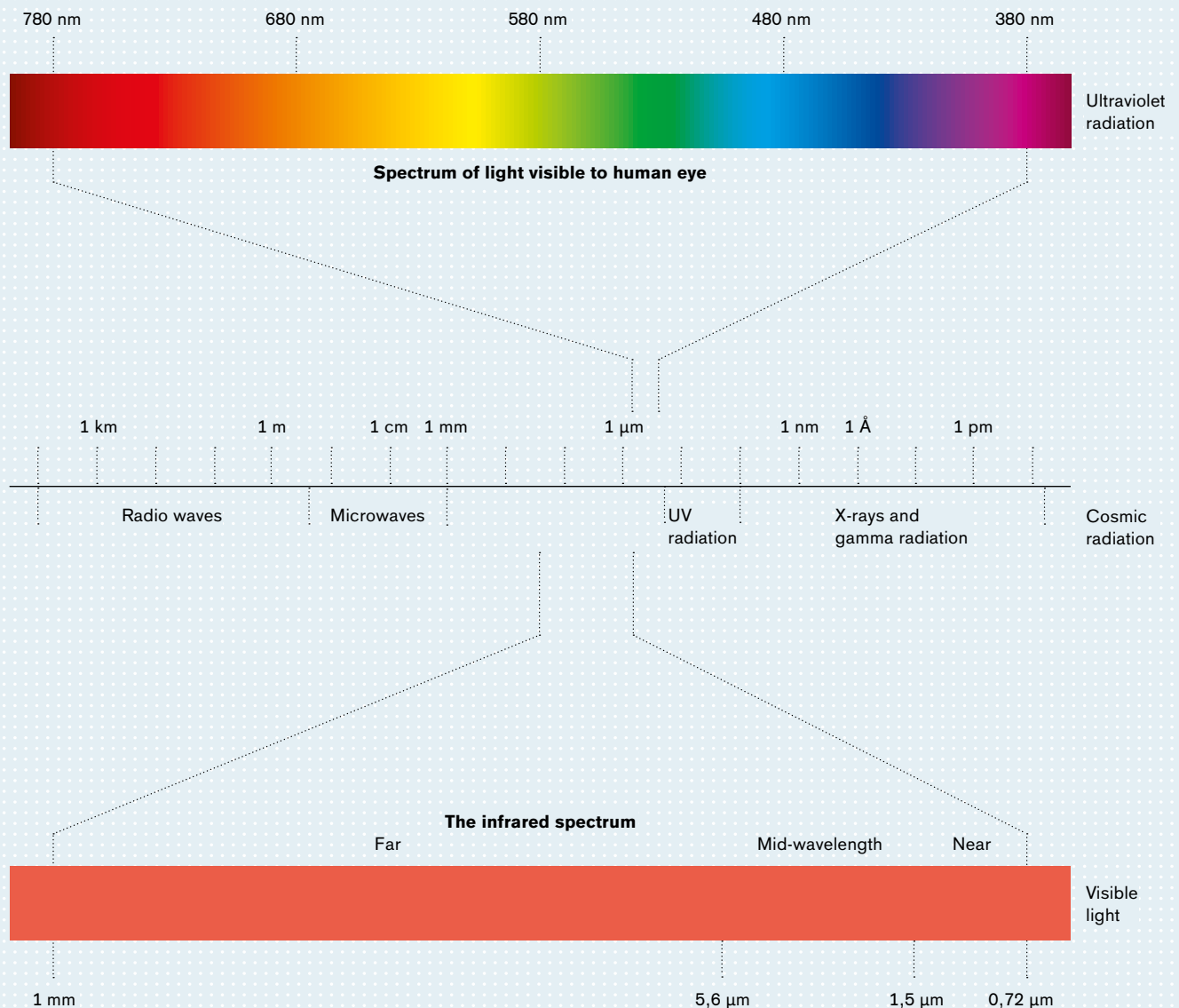
758R27 material cart

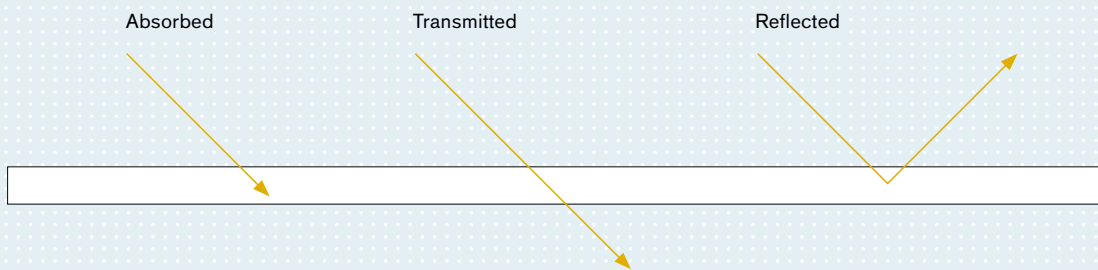
- 6 compartments, 4 castor wheels
- Dimensions W x D x H:
1,000 mm x 650 mm x 600 mm
- Material: steel
- Weight: 74 kg
- Colour: light grey (RAL 7035)

The functionality of infrared heat

The term "infrared radiation" is used in physics to describe electromagnetic waves in the spectral range between visible light and terahertz radiation, which is no longer visible to humans. Heating with infrared light can be used to soften and form plastics in a targeted manner.

The electromagnetic spectrum





Absorption

The absorption refers to conversion of radiation energy into another type of energy during simultaneous interaction with the matter.

One distinguishes between:

- Degree of absorption: The ratio of the absorbed radiation power to the incident radiation power
- Spectral degree of absorption: Degree of absorption as function of the radiation wavelength

Degree of absorption

The radiation energy generated e.g. by the sun is either absorbed, transmitted or reflected as soon as it hits an object. All materials are characterised by specific absorption curves that describe the relationship between wavelength and absorption (degree of absorption). To determine which infrared radiation is optimal for an infrared oven with respect to wavelength and frequency, it is necessary to know the absorption spectrum of the materials to be heated. In orthopaedic technology, plastic materials belonging to thermoplastic polyolefins such as PE or PP are mainly used. The absorption curves of these materials show that the ideal absorption of infrared radiation energy lies in the mid-wavelength infrared range of the spectrum at a wavelength of approx. 3.5 μm (μm = micrometre).

Example

When standing on a cold day in the sun facing the sun, your face and front body parts warm up, but your back, which is not exposed to the sunshine, remains cold. The reason for this is that the sun is emitting heat radiation in form of electromagnetic waves. This energy does not heat the air around an object but rather the objects which are hit by the energy of electromagnetic waves.

Electromagnetic waves

Electromagnetic waves are described by their propagation speed, wavelength and frequency. The electromagnetic wave spectrum is divided into the ranges of infrared waves, microwaves, radio waves, X-ray waves and visible light.

The only distinguishing features of these wave ranges are their wavelengths and frequencies. Thus the electromagnetic spectrum consists of a list of waves of various lengths and frequencies. The infrared range borders the light visible by human eye on one side and microwaves on the other.

This range is defined by a wavelength of 0.72 μm up to 1000 μm . There are 3 infrared range components. "Near-infrared" is the range from 0.72 μm to 1.5 μm . "Mid-wavelength infrared" is the range from 1.5 μm to 6.6 μm , and "far-infrared" is the range between 5.6 μm and 1,000 μm .

Visitor address for the Ottobock Planning & Equipping showroom

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