CSA C US   CE   UL C US   DeviceNet   TÜV

File No. LR90200

MiniSafe®
MS4600

- Resolution: 14 mm (0.55 in.), 19 mm (0.75 in.) or 30 mm (1.18 in.) resolution

- Range: 7.5 m (25 ft.) range for the 14 mm resolution 20 m (65 ft.) range for the 19 and 30 mm resolutions

- Protected Heights: 14 mm and 19 mm protected heights from 263 to 1393 mm (10 to 55 in.); or 30 mm protected heights from 351 to 2095 mm (14 to 83 in.)

- Compact size — 35 x 50 mm (1.4 x 2 in.)

- Simple "two-box" design — no separate control box required

- No cable required between transmitter and receiver

- Two PNP safety outputs designed to directly switch machine primary control elements

- Available with one NPN or one PNP auxiliary output

- Individual Beam Indicators

- Exact Channel Select

- Floating Blanking

- Choice of operating modes

- MPCE monitoring

- Choice of in-line cable with QD connector or QD connector only

- Adjustable mounting brackets

Options

- DeviceNet™ Interface

- Machine Test Signal (MTS)

- Auxiliary Outputs Alarm/Follow Mode

- Versions for darkroom applications (940 nm), consult factory

- Muting through RM-3 module

Description

A MiniSafe MS4600 system consists of a transmitter and receiver of equal height. Since the control reliable circuitry is contained in the receiver and transmitter, no separate control box is required.

Despite its compact dimensions, the MS4600 comes with a complete feature set. Individual Beam Indicators are included to simplify alignment. When an infrared beam is out of alignment, the corresponding Individual Beam Indicator will glow red.

Two solid-state safety outputs provide 500 mA of current at 24 VDC.

The ability to select Automatic Start and Start/Restart Interlock modes means that the MS4600 can be configured for either point-of-operation or perimeter guarding.

Exact Channel Select allows the MS4600 detection zone to have permanently blocked beams. This is valuable if tooling or other machine parts must permanently obstruct a portion of the zone. Exact Channel Select programming is as easy as pushing a button.

Floating Blanking is useful when process material or parts must transit through the detection zone. Floating Blanking allows up to two beams to be blocked anywhere in the zone.

Machine primary control element monitoring is required for control reliable safety. MPCE

monitoring is built into the MS4600 rather than being required externally.

In-line connector cables and adjustable mounting brackets allow the MS4600 to fit in space-constrained locations and simplify installation.

DeviceNet Option

This optional interface allows an MS4600 system to communicate non-safety related data across this popular fieldbus. As the de facto standard for fieldbus communications, DeviceNet is widely employed in the automotive, semiconductor and other industries.

Monitoring of a DeviceNet equipped light curtain provides the process control system with the following non-safety information: manufacturer; product name; operating mode; detection zone status; solid-state safety output status; signal strength; number of beams installed; number of beams selected; MPCE monitoring enabled/disabled; floating blanking active/inactive; exact channel select active/inactive; blanking pattern for exact channel select; receiver diagnostic codes; error codes and descriptions.

DeviceNet and the MiniSafe MS4600 provide a powerful automation solution.

MTS Option

Machine Test Signal (MTS) is an optional feature on the MS4600 series light curtain. MTS allows the machine control system to check for the proper operation of the light curtain safety outputs by simulating a beam blocked state on the transmitter.

Alarm/Follow Mode Option

The non-safety output can be configured to have either "alarm" or "follow" functionality. "Alarm" mode means that the non-safety outputs will be de-energized if the system is behaving normally and energized if the system is in a faulted/interlocked state and will remain this way until the condition is cleared. "Follow" mode mimics the state of the solid-state safety outputs, meaning they will be active when the system is in the machine run state and inactive when the system is in the machine stopped state.

■ Applications

Application ❶

With a range of 20 m a MiniSafe MS4600 system could be used to guard the perimeter of a large filter press. In this application the small 19 mm (0.75 in.) minimum object resolution would allow the curtain to be mounted closer than many perimeter guarding systems and since there is no separate control box, long cable runs are not required.
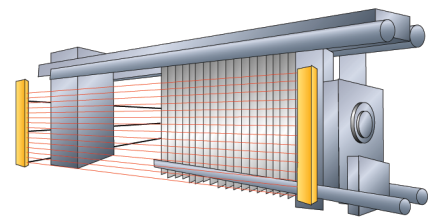
Application ❷

The small minimum object resolution, quick response time, and feature set of the MS4600 make it perfect for guarding metal forming equipment. In this application, floating blanking allows the material to bend up through the detection zone without sending a stop signal to the guarded machine.
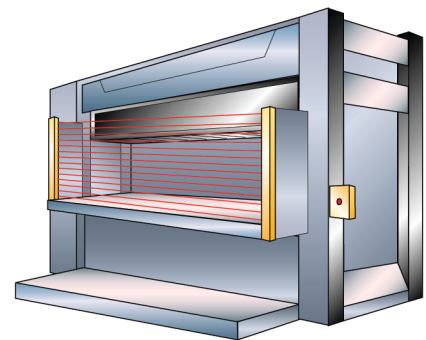
■ *Module Dimensions—mm/in.*

RM-1

RM-2

RM-3

RM-4

■ *Available Modules*

The following relay modules are available to extend the function of the MS4600 series:

RM-1: Provides force-guided safety relay outputs using input from MS4600 system. Receives required 24 VDC power direct from MS4600 solid-state safety outputs. DIN rail mount. Removable terminal blocks.

RM-2: Provides a single location to terminate all inputs and outputs to MS4600 system. Also provides force-guided safety relay outputs using input from MS4600 system. Requires external 24 VDC power supply which also provides power to the MS4600. DIN rail mount. Removable terminal blocks.
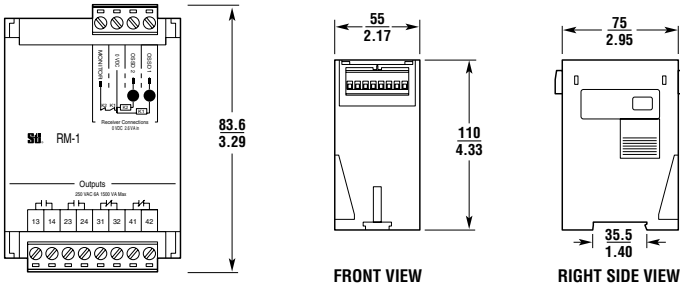
RM-3: Provides muting, the temporary automatic suspension of the safety function, for up to two safety light curtains. Requires external 24 VDC power supply. It has DIN-rail mount and removable terminal blocks.

RM-4: Up to four MS4600 systems can be connected to the RM-4. It provides two PNP safety outputs and one user selectable NPN or PNP non-safety, auxiliary output. Additionally, connections are provided for the auxiliary output of each safety device. It requires external 24 VDC power supply which also provides power to the MS4600.
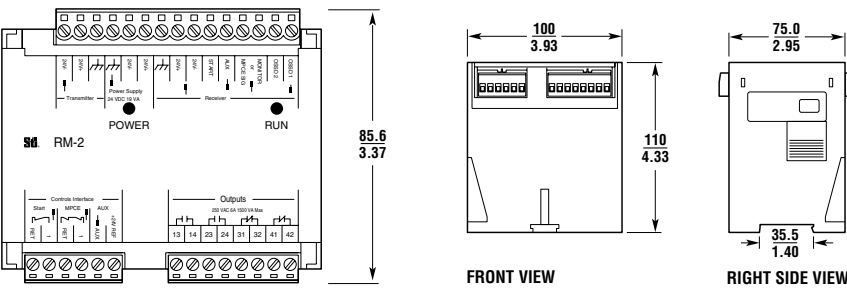
In addition to the above modules, the **RM-X, RM2-AC** and **RM2-AC-IP** are also compatible with the MS4600.

OMRON
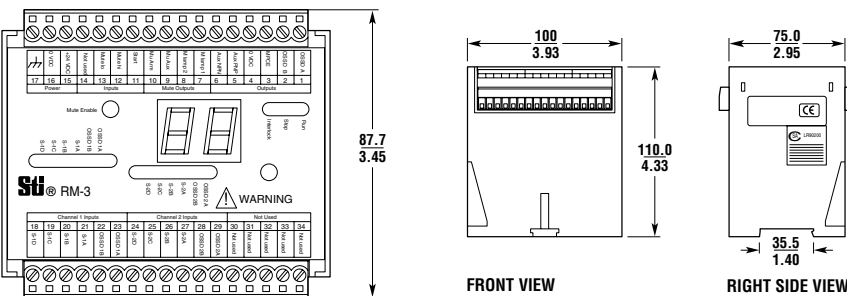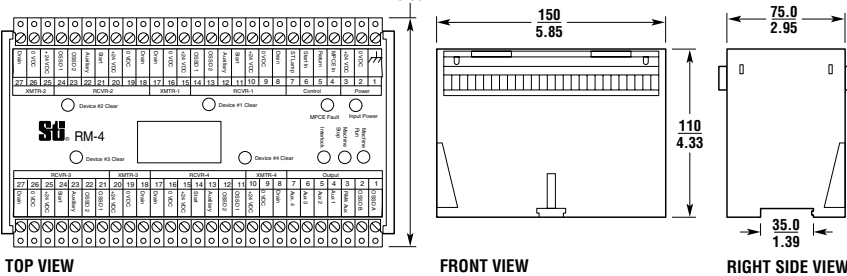
■ *Specifications for Transmitter and Receiver*

Performance	
Protected Height: 14 and 19 mm — 263 to 1393 mm in 86 mm increments	
(10.3 to 54.5 inches in 3.4 inch increments)	
30 mm — 350 to 2090 mm (13.8 to 82.6 in.)	

Operating Range	
MS46SR: 0.3 to 7.5 m (1 to 25 ft.) for 14 mm resolution	
0.3 to 9 m (1 to 30 ft.) for 19 mm and 30 mm resolutions	
MS46LR: 0.3 to 20 m (1 to 65 ft.)/Not available with 14 mm resolution	

Resolution: 14 mm (0.55 in.), 19 mm (0.75 in.) or 30 mm (1.18 in.). Use of Exact Channel Select and/or Floating Blanking may increase this value.

Response Time (varies by protected height): See tables at right

Input Voltage (V_{in}): 24 VDC ± 20%

Input Power: 14 watts (without load on the outputs)

Safety Output Ratings: Two PNP outputs sourcing 500 mA max @ V_{in} (see note 1). Short circuit protected.

Auxiliary (Non-Safety) Output Ratings: One NPN output sinking 100 mA max @ V_{in} or one PNP output sourcing 100 mA @ V_{in} (see notes 1 and 2)

Power Supply: 24 VDC ± 20%. The rating depends on the current requirements of the loads attached to the outputs (see note 3). The power supply must meet the requirements of IEC 60204-1 and 61496-1. Omron STI part number 42992 or equivalent.

MPCE Monitoring Circuit: 50 mA steady state @ 24 VDC

Start/Restart Input: N.C. or N.O. momentary contact (20 mA consumption)

Effective Aperture Angle: ±2.5° maximum, transmitter and receiver at operating range greater than 3 m (9.8 ft.).

Light Source: GaAlAs Light Emitting Diode, 850 nm

Indicators	
Transmitter: power applied	
Receiver: machine run, machine stop, interlock/fault; channel select/floating blanking, individual beam	

Mechanical	
Enclosure: Polyurethane powder-painted aluminum	
Cable Length: Optional cables are available in 10, 15, 30 and 50 m lengths	

Cable Connections	
Receiver: 8-pin	
Transmitter: 3-pin standard, 5-pin with MTS	

Environmental	
Protection Rating: NEMA 4, 12; IP65	
Operating Temperature: 0 to 55°C (32 to 131°F)	
Relative Humidity: 95% maximum, non-condensing	
Vibration: 5-60 Hz maximum on all three axes	
Shock: 10 g for 0.016 seconds, 1,000 shocks for each axes on two axes	

Conformity/Approvals	
Conforming to Standards: ANSI/RIA R15.06-1999, ANSI B11.19-2003, OSHA 1910.217(c), OSHA 1910.212	
Other Approvals: All MS4600 systems have been EC type examined to the requirements of IEC 61496-1, -2 for a Type 4 ESPE. TUV Registration No: BB991007101. UL1998	

Response Times for Systems With 14 mm and 20 mm Resolutions

Protected Height (mm/in.)	No. of Beams	Response Time (seconds)
263/10.4	24	<0.016
350/13.8	32	<0.017
437/17.2	40	<0.019
524/20.6	48	<0.021
611/24.1	56	<0.023
698/27.5	64	<0.025
785/30.9	72	<0.027
872/34.3	80	<0.031
959/37.7	88	<0.033
1046/41.2	96	<0.035
1133/44.6	104	<0.035
1220/48.0	112	<0.037
1306/51.4	120	<0.039
1393/54.9	128	<0.040

Response Times for Systems With 30 mm Resolutions

Protected Height (mm/in.)	No. of Beams	Response Time (seconds)
350/13.8	16	<0.014
524/20.6	24	<0.016
698/27.5	32	<0.017
872/34.3	40	<0.019
1046/41.2	48	<0.021
1220/48.0	56	<0.023
1393/54.9	64	<0.025
1570/61.8	72	<0.027
1741/68.6	80	<0.029
1915/75.4	88	<0.031
2090/82.3	96	<0.033

Specifications are subject to change without notice.

Note 1: Voltage available at the outputs is equal to V_{in} - 2.0 VDC.

Note 2: Total current required by the two solid-state outputs and the aux. output should not exceed 1.1 A.
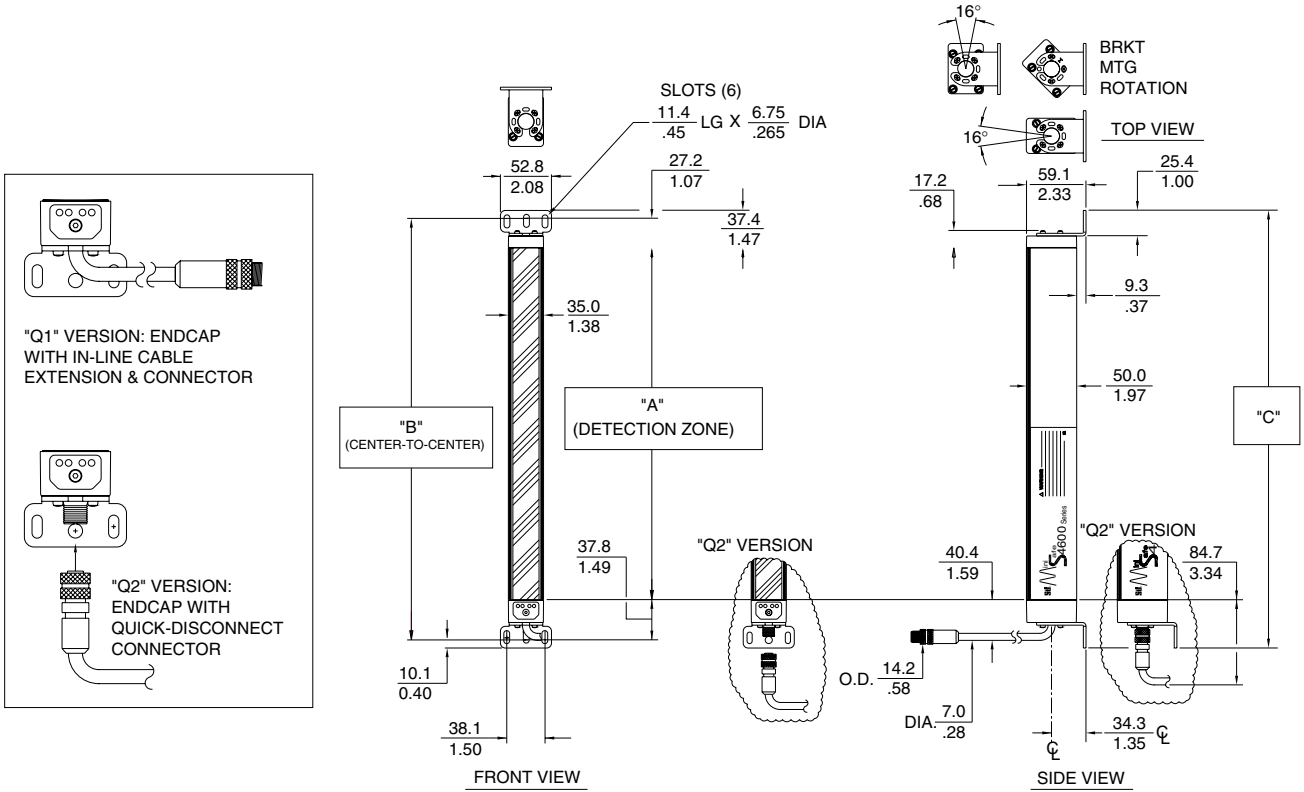
Note 3: Total system current requirement is the sum of the transmitter 285 mA and receiver 1.4 A max. (Receiver 300 mA + OSSD1 load + OSSD2 load + Aux. output load)

D

safety light curtains

■ *MS4600-14 and -20 Dimensions—mm/in.*

"Q1" VERSION: ENDCAP WITH IN-LINE CABLE EXTENSION & CONNECTOR

"Q2" VERSION: ENDCAP WITH QUICK-DISCONNECT CONNECTOR

SLOTS (6)
$\frac{11.4}{.45}$ LG X $\frac{6.75}{.265}$ DIA

$\frac{52.8}{2.08}$

$\frac{27.2}{1.07}$

$\frac{37.4}{1.47}$

$\frac{35.0}{1.38}$

"B"
(CENTER-TO-CENTER)

"A"
(DETECTION ZONE)

$\frac{37.8}{1.49}$

"Q2" VERSION

$\frac{10.1}{0.40}$

$\frac{38.1}{1.50}$

FRONT VIEW

16°
BRKT MTG ROTATION

16°
TOP VIEW

$\frac{17.2}{.68}$

$\frac{59.1}{2.33}$

$\frac{25.4}{1.00}$

$\frac{9.3}{.37}$

$\frac{50.0}{1.97}$

"C"

S4600 Series

"Q2" VERSION

$\frac{40.4}{1.59}$

$\frac{84.7}{3.34}$

O.D. $\frac{14.2}{.58}$

DIA. $\frac{7.0}{.28}$

$\frac{34.3}{1.35}$

SIDE VIEW

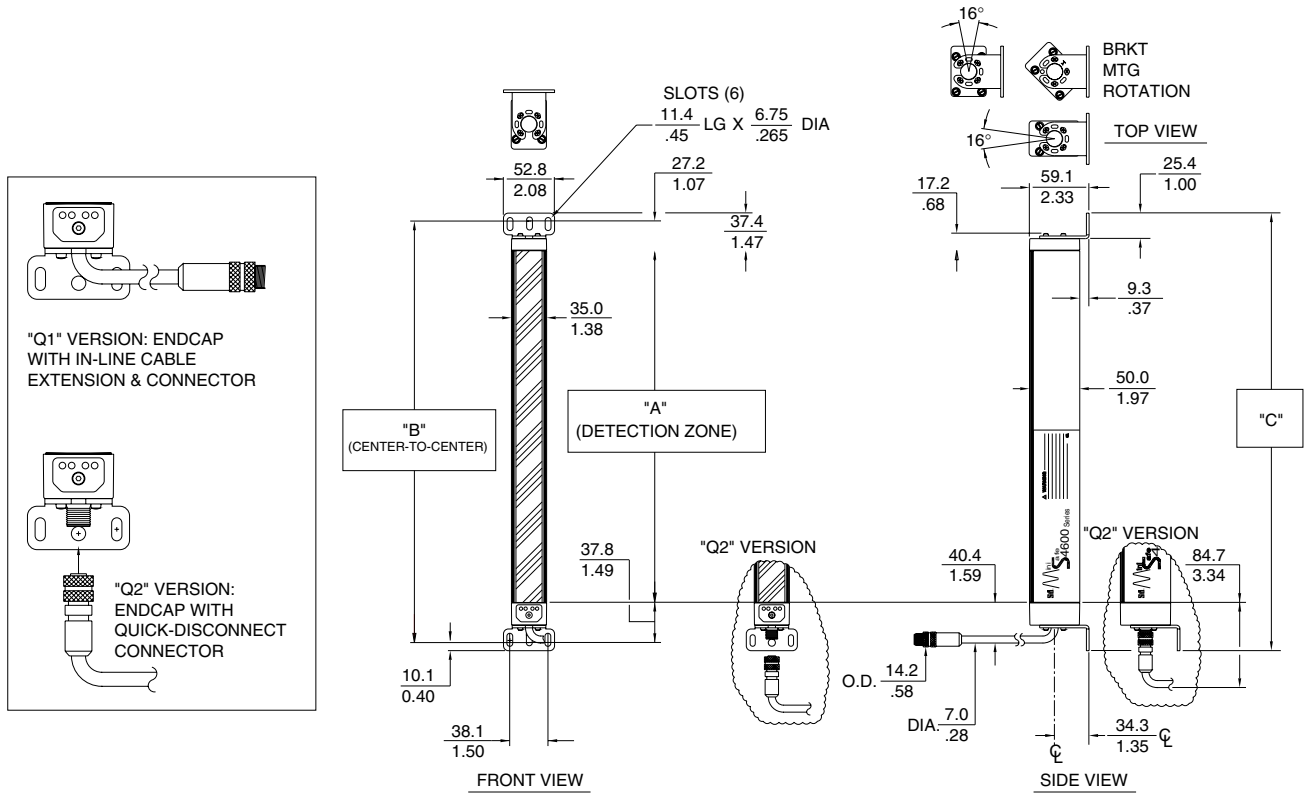DIMENSIONS: $\frac{mm \, (+\backslash-.3)}{INCHES \, (+\backslash-.01)}$

A = DETECTION ZONE   B = A + $\frac{65.0}{2.56}$ C = A + $\frac{85.4}{3.36}$

MiniSafe MS4600-14 and MS4600-20 Dimensions

	MS46-X-260-14 MS46-R-260-14 MS46-X-260-20 MS46-R-260-20	MS46-X-350-14 MS46-R-350-14 MS46-X-350-20 MS46-R-350-20	MS46-X-435-14 MS46-R-435-14 MS46-X-435-20 MS46-R-435-20	MS46-X-520-14 MS46-R-520-14 MS46-X-520-20 MS46-R-520-20	MS46-X-610-14 MS46-R-610-14 MS46-X-610-20 MS46-R-610-20	MS46-X-700-14 MS46-R-700-14 MS46-X-700-20 MS46-R-700-20	MS46-X-785-14 MS46-R-785-14 MS46-X-785-20 MS46-R-785-20
A mm/in.	263/10.4	350/13.8	437/17.2	524/20.6	611/24.1	698/27.5	785/30.9
B mm/in.	328/12.9	415/16.3	502/19.8	589/23.1	676/26.6	763/30.0	851/33.5
C mm/in.	348/13.7	435/17.1	522/20.6	609/24.0	696/27.4	783/30.8	870/34.3
System Shipping Weight							
kg/lb.	4.5/10	4.8/11	5.2/11	5.6/12	5.9/13	6.2/14	6.6/15

	MS46-X-870-14 MS46-R-870-14 MS46-X-870-20 MS46-R-870-20	MS46-X-955-14 MS46-R-955-14 MS46-X-955-20 MS46-R-955-20	MS46-X-1045-14 MS46-R-1045-14 MS46-X-1045-20 MS46-R-1045-20	MS46-X-1130-14 MS46-R-1130-14 MS46-X-1130-20 MS46-R-1130-20	MS46-X-1215-14 MS46-R-1215-14 MS46-X-1215-20 MS46-R-1215-20	MS46-X-1305-14 MS46-R-1305-14 MS46-X-1305-20 MS46-R-1305-20	MS46-X-1390-14 MS46-R-1390-14 MS46-X-1390-20 MS46-R-1390-20
A mm/in.	872/34.3	959/37.7	1046/41.2	1133/44.6	1220/48.0	1306/51.4	1393/54.9
B mm/in.	937/36.9	1024/40.3	1111/43.7	1198/47.2	1285/50.6	1372/54.0	1459/57.4
C mm/in.	957/37.7	1044/41.1	1131/44.5	1218/48.0	1305/51.4	1392/54.8	1479/58.2
System Shipping Weight							
kg/lb.	6.9/15	7.3/16	8.2/18	8.5/19	8.9/20	9.2/20	9.6/21

■ *MS4600-30 Dimensions—mm/in.*

DIMENSIONS: $\dfrac{mm\ (+\backslash-.3)}{INCHES\ (+\backslash-.01)}$

A = DETECTION ZONE   B = A + $\dfrac{65.0}{2.56}$ C = A + $\dfrac{85.4}{3.36}$

MiniSafe MS4600-30 Dimensions

	MS46-X-350-30 MS46-R-350-30	MS46-X-520-30 MS46-R-520-30	MS46-X-700-30 MS46-R-700-30	MS46-X-870-30 MS46-R-870-30	MS46-X-1045-30 MS46-R-1045-30	MS46-X-1215-30 MS46-R-1215-30
A mm/in.	350/13.8	524/20.6	698/27.5	872/34.3	1046/41.2	1220/48.0
B mm/in.	415/16.3	589/23.2	763/30.0	938/36.9	1111/43.7	1285/50.6
C mm/in.	435/17.1	609/24.0	783/30.8	957/37.7	1131/44.5	1305/51.4
System Shipping Weight						
kg/lb.	4.8/11	5.6/12	6.2/14	6.9/15	8.2/18	8.9/20

	MX46-X-1390-30 MX46-R-1390-30	MS46-X-1570-30 MS46-R-1570-30	MS46-X-1745-30 MS46-R-1745-30	MS46-X-1920-30 MS46-R-1920-30	MS46-X-2095-30 MS46-R-2095-30
A mm/in.	1393/54.9	1570/61.8	1741/68.6	1915/75.4	2090/82.3
B mm/in.	1459/57.4	1635/64.4	1807/71.1	1981/78.0	2155/84.8
C mm/in.	1479/58.2	1655/65.2	1827/71.9	2001/78.8	2175/85.6
System Shipping Weight					
kg/lb.	9.6/21	10.0/22	10.4/23	10.9/24	11.8/26