DC311: Directional Coupler 5.8 GHz for R58 Waveguide

General Description

DC311 is a small-housing loop-type directional coupler intended for sampling of the powers of the incident or reflected waves in high-power 5.8 GHz industrial applications using the rectangular waveguide WR159 (R58).

Standard coupling factor is -60 dB, allowing maximal waveguide working power 30 kW. Optional coupling factors are -50 dB (3 kW) and -70 dB (50 kW).

The output connector can be either Nf or SMAf.

Fig. 1. Directional coupler DC311.

The coupler module is fastened to a parent waveguide with a set of M3 or similar-diameter screws after machining of appropriate openings in the waveguide wall according to the waveguide machining template. Alternatively, a calibrated assembly consisting of the coupler module fixed to a precisely machined parent waveguide with standard length of 200 mm can be provided.

Reversing the coupler causes it to sample the wave propagating in the opposite direction.

The waveguide machining template is shown in Fig. 4 on page 4.

Specifications

Waveguide of destination	R58 (WR159)
Waveguide wall thickness	1.6 mm ± 0.1 mm
Frequency range	5700 – 5900 MHz
Coupling factor	-60 dB standard -50 dB available on special order -70 dB available on special order
Coupling factor uncertainty limits (3-σ deviation)	±1dB
Directivity	25 dB min
Coupled port impedance	50 Ω
Coupled port connectors	DC311N: N-female (Nf) DC311S: SMA-female (SMAf)
Dimensions (L x W x H)	DC311N: 31.5 × 42 × 36.7 mm DC311S: 31.5 × 42 × 25.5 mm
Mass	60 g
Waveguide surface flatness required at DC interface	0.04 mm
Surface finish	E-CLPS 4600
Operating temperature range	-40 °C to +80 °C
Storage temperature range	-20 °C to +80 °C

Dimensional Drawing

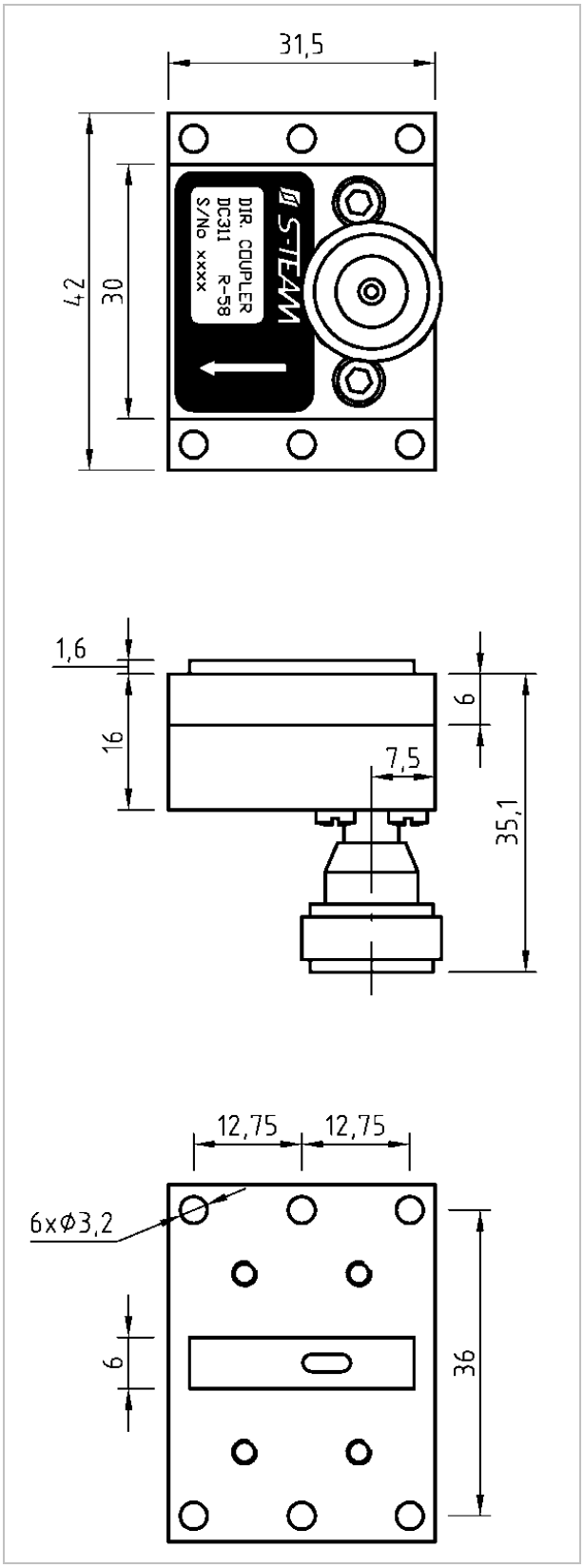

Fig. 2. Basic DC311N dimensions in millimeters.

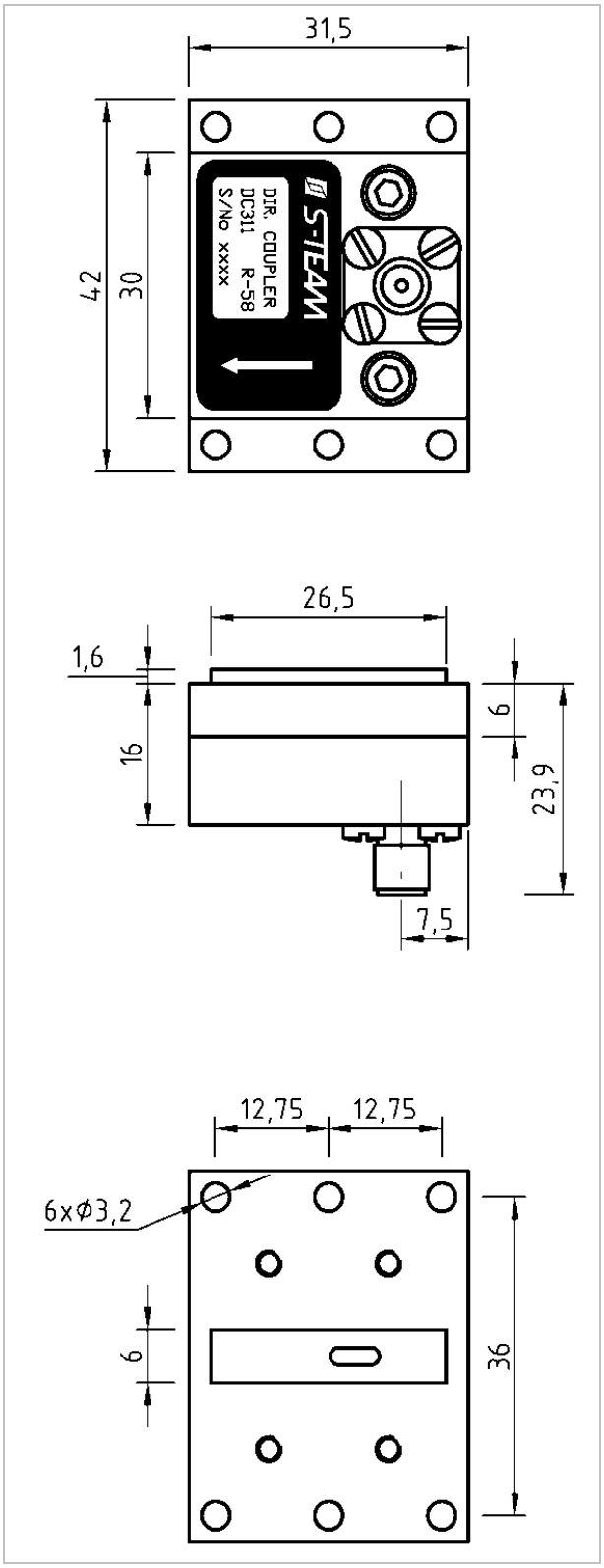

Fig. 3. Basic DC311S dimensions in millimeters.

Waveguide Machining Template

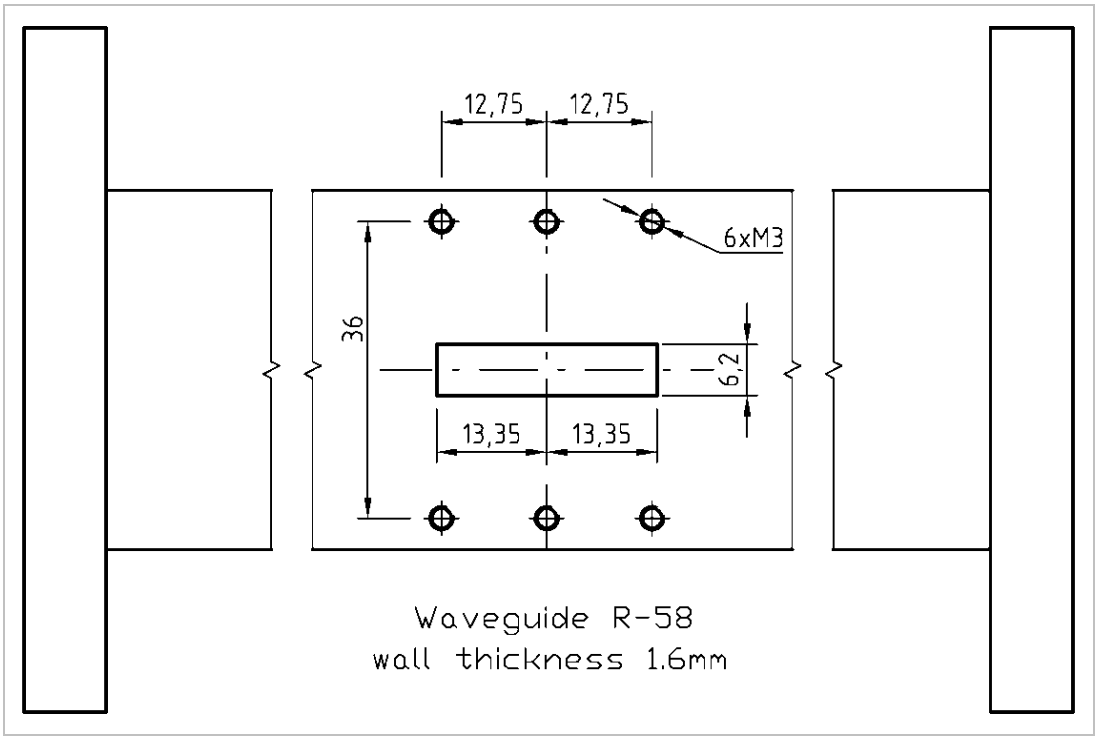

Fig. 4. Waveguide machining template. All dimensions are in millimeters. The pattern is centered about the waveguide axis. The waveguide wall thickness must be 1.6 mm.

Important Note

Complying with the specified waveguide wall thickness and flatness of its surface interfacing with the coupler module is essential for the specified coupling factor. The slope of the coupling factor as a function of the wall thickness is about -6 dB/mm (i.e., increasing the wall thickness decreases the coupled power).

If the wall thickness differs from the specified figure but is known, one can apply a user-defined correction based on the above slope. Nevertheless, the wall thickness should not deviate from the specification by more than ±0.3 mm, otherwise the coupler module's directivity will deteriorate.

To avoid problems with manufacturing precision waveguide components, one can order a calibrated assembly consisting of the coupler module fixed to a precision parent waveguide. The standard waveguide length is 200 mm.