Innovative, cost-saving joining technology in hall construction

Coupling purlins

Coupling purlins lie on binders and carry the load of the roofing (e.g. slabs, profiled sheeting, etc.). They are also called rafter purlins, as they act both as a rafter and a purlin. If the upper edge of the binder is inclined, the rafter purlins are deflecting in two directions, as they are usually arranged vertically to the upper edge of the binder.
In hall construction, the rafter purlins are usually constructed as continuous beams, as this continuous effect leads to more favorable cross-sections than do single span beams.
Coupling girders used in timber construction are girders that lie on at least three binders, and are coupled bend-proof via staggered splicing on these supporting points. This technology ensures construction with single cross-sections in midspan and double cross-sections over the supporting points. The desired effect is an even bending moment, leading to optimum cross-section utilization of the coupled girders.
The space between purlins is usually 1.0 - 1.5 m. Generally, distance between supports can be up to a maximum of 8.0 m. Load assumptions are to be carried out according to DIN 1055, and static confirmation according to DIN 1052.

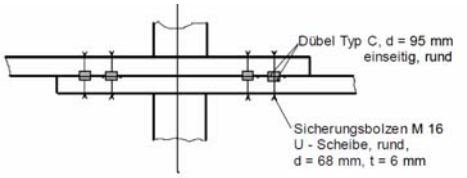
Conventional connector types to date

Nails

One of the oldest connector types is nails. As nailing is nowadays done with pneumatic nail guns, the nail length is limited to 160 mm. This requires a great deal of nails, and the rafters have to be pulled together with a screw clamp or similar device.

Specially constructed dowels

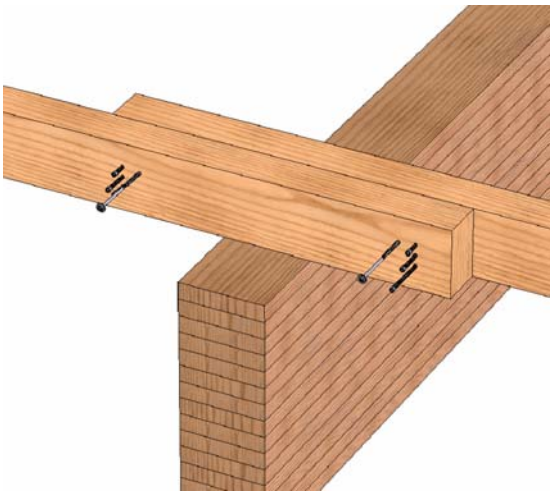
When using specially constructed dowels for connecting, the shearing forces are transferred to dowels by Geka, Bulldog or Appel. Traction strain is absorbed by a bolt with plain washers according to DIN 1052.



Patented SFS system with WT screws

Traction and shearing forces are divided up into a triangle of forces. This assigns just one point of traction to the screws. The compressive forces are transferred via contact pressure between the rafters. Assembly requires a screw-in mechanism. As at least one pair of screws needs to be applied each side, an even amount of screws is always required.

Why complicate things that can be so easy?



The new, innovative connector was developed by ***SWG*** and is intriguingly simple. Our designers made use of the so-called "hang-in effect" of the screws, which can be applied according to the new DIN 1052 standard.
The ingenious feature for carpenters is that one washer head screw and, depending on the ensuing load, two to six full thread screws respectively are screwed in at a right angle to the rafter purlin. This eliminates the need for complex drilling and milling on the purlins. Only the screws and a suitable tool are required for assembly work. High-power cordless drills can also be used as long as they are well charged, thus additionally eliminating the need for lugging electric cables around.

A bulky screwing device is therefore not required.
It is not necessary to pull together the coupling purlins as traction can be provided by the ***ASSY*** *washer head with partially threaded.* This connection can be made by a worker. With the low minimum distances to edge of the ASSY VG full thread screws, this can save material on the purlins. The right-angled screw joint leads to a reduced use of screws, which in turn has a favorable effect on the individual costs of the connections.

Summary of arguments:

- Setting times become shorter, purlins need only be cut into sections
- Assembly-friendly, all screws need only be screwed in at a right angle
- No need for any additional screwing aids or clamping tools
- ***ASSY****SK* acts as a screw clamp (pulls the purlins together)
- Shorter screws than with SFS
- Uneven number of screws also possible, SFS requires pairs of screws
- No retightening or resetting necessary, as is the case, for instance, with bolt connectors
- Full thread screws act like armoring
- No need for rafter purlin anchors —> ***ASSY****VG* acts as suction safeguard

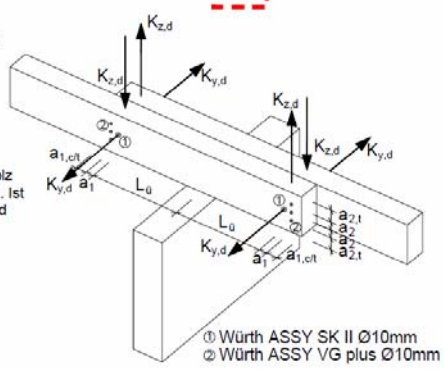
Measurement tables according to the new DIN 1052 standard
To facilitate matters for planners and structural designers, ***SWG*** has created a measurement table for this type of connector, based on the new DIN 1052 standard.

KLED	b_{Pf} [cm]	8						9					
	$n_{VG,90}$	1	2	3	4	5	6	1	2	3	4	5	6
	Min h_{Pf} [cm]	160	160	160	184	208	232	160	160	160	184	208	232
	$K_{v,d}$ [kN]	$K_{z,d}$ [kN]						$K_{z,d}$ [kN]					
	0,0	5,79	8,77	11,76	14,74	17,72	20,71	5,90	9,00	12,09	15,19	18,29	21,39
	0,5	5,77	8,76	11,75	14,73	17,72	20,70	5,88	8,99	12,09	15,19	18,29	21,38
	4,0	5,96	9,97	13,75	17,45	21,12	24,77	6,23	10,36	14,27	18,11	21,92	25,71
	5,0	5,68	8,82	13,65	17,37	21,05	24,71	6,00	10,23	14,18	18,04	21,86	25,66
	0,0	7,53	11,44	15,34	19,24	23,15	27,05	7,70	11,78	15,85	19,92	24,00	28,07
	0,5	7,52	11,43	15,34	19,24	23,15	27,05	7,69	11,77	15,85	19,92	23,99	28,07
	1,0	7,48	11,41	15,32	19,23	23,14	27,04	7,67	11,75	15,83	19,91	23,98	28,06
	1,5	7,44	11,38	15,30	19,21	23,12	27,03	7,62	11,73	15,81	19,90	23,97	28,05
kurz	2,0	7,87	11,34	15,27	19,19	23,10	27,01	7,56	11,69	15,70	19,87	23,95	28,04
	2,5	7,28	11,28	15,23	19,16	23,08	26,99	7,48	11,64	15,75	19,85	23,93	28,02
	3,0	7,17	11,21	15,18	19,12	23,04	26,96	7,38	11,58	15,71	19,81	23,91	27,99
	3,5	7,03	11,13	15,12	19,07	23,00	26,93	7,26	11,51	15,66	19,77	23,88	27,97
	4,0	6,87	11,03	15,05	19,02	22,96	26,89	7,11	11,43	15,60	19,73	23,84	27,94
	4,5	6,68	10,92	14,97	18,95	22,91	26,85	6,95	11,33	15,53	19,68	23,80	27,90
	5,0	6,47	10,80	14,88	18,89	22,85	26,80	6,76	11,22	15,46	19,62	23,75	27,86

Schraubenabstände gem. Skizze:

$a_{1,c}$	=	10,0 cm
$a_{1,t}$	=	12,0 cm
a_1	=	5,0 cm
$a_{2,t}$	=	7,0 cm
a_2	=	3,0 cm

Bei Übertragung von Längskräfte (Verbandspfetten) muss vom Hirnholz der Abstand $a_{1,t}$ eingehalten werden. Ist dies nicht der Fall, so ist der Abstand $a_{1,c}$ ausreichend



Using known values like width of the purlins, and the coupling strength, the optimum number of screws needed in each case can be read off. The tables can be obtained from SWG.

The applications engineer advises:
Demonstrate this innovation to your customers. We have had so much positive experience with it and see ample potential in the named areas of application. On construction sites, our system has always been completely convincing! We will be only too pleased to provide you with additional sales arguments and/or to support you on site at your customers.