Avesta Welding

Welding flux

Features

- **Flux for submerged arc welding with stainless wire or strip electrodes**
- **Agglomerated Cr and non-Cr alloyed fluxes**
- **Excellent weldability and easy slag removal**
- **Good moisture resistance**
- **Both neutral and basic fluxes**

Products and applications

Flux 801 is a neutral (B.I. 1.0), chromium-compensated, agglomerated flux. It is a general purpose flux designed for joint welding of stainless steel and also for weld cladding of unalloyed or low-alloy steel. Flux 801 can be used in combination with all types of stabilised and non-stabilised Cr-Ni and Cr-Ni-Mo steels.

Flux 805 is a basic (B.I. 1.7), slightly chromium-compensated, agglomerated flux, primarily designed for welding with high-alloy stainless fillers such as Avesta P12, 904L and 2205. Standard Cr-Ni and Cr-Ni-Mo fillers can also be welded with excellent results. Flux 805 is especially suitable for applications where high impact strength is required.

Flux 807 is a highly basic flux (B.I. 2.7) for butt welding all types of stabilised and non-stabilised Cr-Ni and Cr-Ni-Mo steels, as well as duplex steels. The flux is not chromium alloyed and produces a weld metal with a chromium content on a level with that of the welding wire.

Flux 301 is an agglomerated flux designed for submerged arc strip cladding with Cr-Ni and Cr-Ni-Mo stainless strips. Both stabilised and non-stabilised strips can be welded with excellent results.

General characteristics

There are two main groups of fluxes: agglomerated and fused. With the advantage over fused flux that it can be alloyed, agglomerated is the modern choice. All Avesta Welding's fluxes are agglomerated.

To obtain the desired weld metal composition and mechanical properties, it is of utmost importance that the right combination of wire/strip electrode and flux is selected and that the optimum welding parameters are used.

The standard fluxes for Cr-Ni and Cr-Ni-Mo steels are commonly alloyed with chromium, giving a slightly higher chromium content in the weld compared to the welding wire, and are normally neutral to slightly basic.

In most cases, fluxes used for strip surfacing differ slightly from wire welding fluxes, mainly in terms of current capacity and slag density.

Standard designations

Flux	Standard designations, EN 760
801	SA CS 2 Cr DC
805	SA AF 2 Cr DC
807	SA AB 2 DC
301	SA Z 2 DC

Approvals

Flux	TÜV	DNV
801	308L/MVR 316L/SKR 318/SKNb 347/MVNb	308L/MVR 316L/SKR 309L-HF P5 P7
805	308L/MVR 316L/SKR 2304 2205 904L	316L/SKR 309L-HF P5 2205
807	–	–
301	–	–

Packaging data

Avesta Welding's fluxes are packed in plastic lined paper sacks. Flux 801, 805 and 807 in 25 kg and Flux 301 in 20 kg sacks. Unopened sacks should be stored indoors (>10°C) in a dry environment (relative humidity <70%). Unused flux from opened sacks or other containers must be stored at 150°C ± 25°C. Moist flux can be redried at 250 – 300°C for 2 hours.

Weld metal composition

Mechanical properties, typical values

Flux	SAW wire	C	Si	Mn	Cr	Ni	Mo	FN	Rp0.2 N/mm²	Rm N/mm²	A5 %	Impact strength, J + 20°C	Impact strength, J Low temp.
801	308L/MVR	0.02	0.9	1.0	20.0	10.0	–	15*	400	570	35	65	–
	316L/SKR	0.02	0.9	1.0	19.0	12.0	2.5	15*	400	570	35	65	–
805	308L/MVR	0.02	0.6	1.2	21.0	10.0	–	13*	410	590	35	75	60 (– 70°C)
	316L/SKR	0.02	0.5	1.0	19.0	12.0	2.5	13*	410	590	35	75	60 (– 70°C)
	2205	0.02	0.6	1.1	23.0	8.5	3.0	50**	590	800	28	90	70 (– 40°C)
	P12-0Nb	0.01	0.10	0.10	22.0	65	8.5	–	400	620	35	110	110 (– 70°C)
807	308L/MVR	0.02	0.6	1.2	19.5	10.0	–	8*	380	550	37	100	30 (–196°C)
	316L/SKR	0.02	0.6	1.2	18.5	12.0	2.6	8*	380	540	40	90	30 (–196°C)
	2205	0.02	0.6	1.2	22.5	8.5	3.0	45**	580	790	25	100	70 (– 40°C)

(Chemical composition, typical values, %)

* According to Schaeffler-DeLong ** According to WRC-92

Weld metal composition

Flux	Strip	Layer	C	Si	Mn	Cr	Ni	Others	FN*
301	309L	1st	0.03	0.5	1.2	19.0	10.5	–	5
	309LNb	1st	0.04	0.5	1.3	19.5	10.5	Nb 0.60	6
	308L	2nd	0.02	0.6	0.8	18.5	10.5	–	7
	316L	2nd	0.02	0.5	1.2	18.0	12.0	Mo 2.3	6
	347	2nd	0.02	0.5	1.2	19.0	11.0	Nb 0.35	7

(Chemical composition, typical values, %)

* According to Schaeffler-DeLong

Welding data
(DC, straight or reverse polarity)

Wire diam., mm	Current A	Voltage V
2.40	200–350	27–33
3.20	300–600	30–36
4.00	400–700	30–36

Welding recommendations

Both positive and negative polarity direct current can be used, but positive polarity is normally used for optimum arc stability and weld bead appearance. However, when the electrode is connected to the negative pole, the wire speed, at any given current, is higher and, as a result, dilution is lower and the deposition rate higher.

When using the SAW method the heat input and dilution with the parent metal are generally higher than for other arc welding methods, which increases the risk of hot cracking. Particularly when welding high-alloy stainless steels or unalloyed to stainless steel, great care must be taken. It is necessary to use a lower amperage and to strive for a width/depth ratio of 1.5 – 2. The risk of hot cracking may also be reduced by welding the first beads manually using covered electrodes or solid wire.

Basicity

The basicity index (B.I.) is normally used to describe the chemical/metallurgical nature of a welding flux. The index has regard to the relation between the basic and acid oxides of which a flux is composed. In this respect, the fluxes can be divided into three groups:

Acid flux	B.I.	< 0.9
Neutral flux	B.I.	0.9 – 1.2
Basic flux	B.I.	1.2 – 3.0

Basicity has a great influence on impact strength. Compared to a more acid flux, a flux of higher basicity produces a weld metal with fewer spherical micro-inclusions and consequently, higher impact strength. This is particularly important for high alloyed grades, which are somewhat more sensitive to micro cracking.

Information 1172EN-GB; supersedes inf. 270402GB. Teknisk information / Centrum Tryck Avesta 2004

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