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1 INTRODUZIONE

1.1 Questo manuale

Questo manuale descrive la configurazione dei messaggi dei bus di campo (Data Process Image) adottati negli impianti di saldatura automatizzati TIG Cebora, inclusi Plasma Welding.

Sono elencati e descritti tutti i segnali scambiati fra il sistema di saldatura TIG Cebora ed il controllo dell'impianto robotizzato (Robot Control).

Questo manuale deve essere inteso come parte integrante dei Manuali Istruzioni delle singole apparecchiature componenti il sistema di saldatura Cebora e pertanto potrà essere necessaria la contemporanea consultazione dei suddetti manuali. In Fig. 1 è riportato un esempio di impianto robot Cebora.

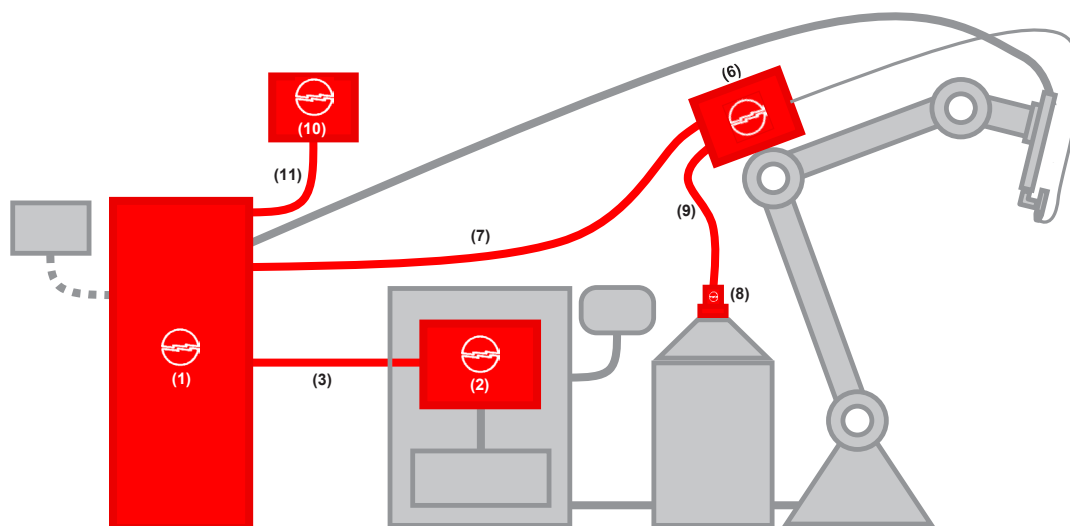


Fig. 1

Posizione	Descrizione	Articolo	Opzionale
1	Generatore serie WIN TIG Robot	380-381- 394-395- 396.80	-
2	Interfaccia Robot	428.XX, 448	(X)
3	Connessione Generatore - Interfaccia Robot	2063	-
6	Carrello trainafilo Robot	1649	X
7	Connessione Generatore - Carrello trainafilo Robot	2067	X
8	Portabobina/attacco rapido	121/173	X
9	Guaina guidafile	1935	X
10	Pannello di controllo remoto TIG	438	X
11	Connessione Generatore - Pannello di controllo remoto TIG	2065	X

NOTA

Se il controllo robot dispone di una porta di comunicazione di tipo CANopen master l'interfaccia (2) non è necessaria in quanto il generatore (1) può essere collegato direttamente tramite il cavo CANopen (3) più il cavo aggiuntivo CANopen art. 2054, da richiedere separatamente a Cebora

1.2 Bus di campo trattati in questo manuale

- CANopen
- DeviceNet
- Profibus DP-V1
- EtherCAT
- EtherNet/IP
- PROFINET

Per ogni bus di campo Cebora fornisce il corrispondente file di configurazione.

A fine manuale (par. 6 ÷ 9) sono riportate le tabelle dei messaggi scambiati fra generatore e controllo robot (Data Process Image), suddivise per tipologia di bus di campo. La Data Process Image è così composta:

	INPUT	OUTPUT
Digital [byte]	8	4
Analog [word]	8	8
Total Size [byte]	24	20

2 SEGNALI DIGITALI DA CONTROLLO ROBOT A GENERATORE (INPUT)

Elenco segnali digitali ed analogici in ingresso al generatore.

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Weld Start	X	X
2	1	Robot Ready	X	X
3 - 6	4	Operating Modes (bit 3 - 0)	X	X
7	1	Reserved (set to 0)	-	0
8	1	Protocol Mode	-	X
9	1	Gas Test/Gas Test Plasma	X	X
10	1	Wire Inching	X	X
11	1	Wire Retract	X	X
12	1	Source Error Reset	X	X
13	1	Touch Sensing	X	X
14	1	Gas Test Shield	X	X
15	1	Not used	-	-
16	1	Not used	-	-
17 - 23	7	Job Number (bit 6 - 0)	X	X
24	1	Job Number (bit 7)	-	X
25 - 31	7	Not used	-	-
32	1	Not used	-	-
33	1	Analog Setpoint Enable 0	-	X
34	1	Analog Setpoint Enable 1	-	X
35	1	Analog Setpoint Enable 2	-	X
36	1	Analog Setpoint Enable 3	-	X
37	1	Analog Setpoint Enable 4	-	X
38	1	Analog Setpoint Enable 5	-	X
39	1	Analog Setpoint Enable 6	-	X
40	1	Analog Setpoint Enable 7	-	X
41 - 48	8	Not used	-	-
49 - 55	7	Not used	-	-
56	1	Pilot Arc Start	X	X
57 - 64	8	Not used	-	-
65 - 80	16	Current Setpoint (AI0)	X	X
81 - 96	16	Pulse Frequency (AI1)	X	X
97 - 112	16	Current Pulse Ratio (AI2)	-	X
113 - 128	16	Pulse Duty Cycle (AI3)	-	X
129 - 144	16	Gas Plasma Flow (AI4)	-	X
145 - 160	16	Gas Shield Flow (AI5)	-	X
161 - 176	16	High Speed CW (AI6)	-	X
177 - 192	16	Low Speed CW (AI7)	-	X

2.1 Weld Start

Il bit *Weld Start* comanda l'accensione e lo spegnimento dell'arco di saldatura.

Weld Start = attivo alto

Weld Start	Descrizione
0 → 1	Il controllo robot comanda l'accensione dell'arco. Questo segnale viene accettato se il segnale di <i>Power Source Ready</i> è attivo.
1 → 0	Il controllo robot comanda lo spegnimento dell'arco.

NOTA

In modalità Robot con il bit Robot Ready attivo il generatore è automaticamente impostato in modalità 2-tempi.

2.2 Robot Ready

Il bit *Robot Ready* abilita la comunicazione tra generatore e controllo robot, una volta che la comunicazione è stabilita il generatore è pronto ad inviare e ricevere i dati dal CNC esterno.

Se il bit è impostato a zero il generatore permane nello stato di allarme *Warning 90-CNC non pronto* e l'icona sulla barra di stato del display lampeggia.



Se il bit *Robot Ready* non è attivo, nessun segnale digitale o analogico viene acquisito e le uscite del generatore sono tutte non attive.

Robot Ready = Attivo alto

Robot Ready	Descrizione
0	Il controllo robot non è pronto
1	Il controllo robot è pronto per lo scambio dati con l'esterno

AVVERTENZA:

Il bit *Robot Ready* non può essere utilizzato per un arresto di emergenza. Per tale funzione è disponibile un kit appositamente realizzato (Art. 449).

2.3 Operating Mode (bit 3 - 0)

La selezione della modalità operativa (Operating Mode) del generatore è effettuata tramite 4 bit:

Operating Mode					TIG
Bit 3	Bit 2	Bit 1	Bit 0	Mode	
0	0	0	0	0	DC
0	0	0	1	1	XP
0	0	1	0	2	JOB MODE
0	0	1	1	3	PAR. SEL. INT.
0	1	0	0	4	AC
0	1	0	1	5	MIX
0	1	1	0	6	/
0	1	1	1	7	/
1	0	0	0	8	DC PULSE
1	0	0	1	9	PULSE XP
1	0	1	0	10	/
1	0	1	1	11	/
1	1	0	0	12	AC PULSE
1	1	0	1	13	MIX PULSE
1	1	1	0	14	/
1	1	1	1	15	/

Tabella 1

2.3.1 Job Mode (Mode 2)

In questa modalità è possibile selezionare un Job precedentemente memorizzato nel generatore. E' possibile memorizzare nella macchina fino a 99 Job (vedi par.2.10).

Job mode = Attivo alto

2.3.2 Parameter Selection Internal (Mode 3)

La modalità *Parameter Selection Internal* abilita la selezione dei parametri di saldatura tramite il pannello di controllo del generatore. In tale modalità è possibile salvare i Job i quali potranno essere poi richiamati con l'opportuno numero identificativo nella modalità *Job mode*.

2.3.3 Modo TIG (Mode 0,1,4,5,8,9,12,13)

Il processo è impostato in TIG.

Con questa impostazione sono presi in considerazione i segnali digitali ed analogici. In questa modalità vengono accettati gli ingressi analogici AI0...AI7.

2.4 Protocol Mode

Il bit *Protocol Mode* consente di rappresentare le variabili dei setpoint analogici (Analog Set Point) e delle misure analogiche e (Analog Measure) in due modi diversi, trasformando comunque sempre le variabili che ammettono valori decimali in interi, tramite un fattore moltiplicatore 10 (es. 9.9 si considera come 99).

Protocol Mode	Descrizione
0	Ogni segnale analogico (setpoint o misura) è trasformato in un valore numerico e riscaloato fra il valore minimo e massimo utilizzando un campo a 16-bit senza segno (0 ÷ 65535)
1	I segnali analogici non subiscono alcuna messa in scala e quindi sono direttamente leggibili. Il valore numerico è rappresentato direttamente in binario con un campo a 16-bit con segno.

2.5 Gas Test

Il segnale opzionale *Gas Test* attiva l'elettrovalvola del gas.

Può essere usato anche per un gas Pre-Flow addizionale durante un posizionamento.

Gas Test = Attivo alto.

Gas Test	Descrizione
0	Valvola gas chiusa
1	Valvola gas aperta

Con il processo di saldatura attivo, i tempi di gas Pre-Flow e Post-Flow sono controllati direttamente dal generatore. Con l'accessorio Plasma Welding tale ingresso attiva la valvola del Gas di Plasma.

2.6 Wire Inching

Il segnale *Wire Inching* comanda l'avanzamento del filo di saldatura senza uscita di gas e senza generazione di corrente. La velocità di avanzamento viene programmata tramite il pannello del generatore, nel menù Test Filo.

Wire Inching = Attivo alto.

Wire Inching	Descrizione
0	Nessuna operazione
1	Avanzamento filo

AVVERTENZA:

Tenere la torcia lontano dal viso e dal corpo per evitare il rischio di ferite dovute alla fuoriuscita del filo di saldatura.

2.7 Wire Retract

Il segnale *Wire Retract* comanda l'arretramento del filo di una lunghezza fissa, dopo di che il motore si ferma.

La velocità di arretramento del filo è fissa a 1,0 m/min.

Wire Retract = Attivo alto.

Wire Retract	Descrizione
0	Nessuna operazione
1	Ritiro filo

2.8 Source Error Reset

Il segnale *Source Error Reset* attivo sul fronte 0→1 cancella solo gli errori ripristinabili (Warning), per i quali il bit di *Hard Fault* risulta essere non attivato (0).

Source Error Reset	Descrizione
0,1,1→0	Nessuna operazione
0→1	Reset di un errore ripristinabile (Warning)

Per l'elenco degli errori ripristinabili (Warning), fare riferimento al manuale d'uso del generatore WIN TIG.

2.9 Touch Sensing

Il segnale *Touch Sensing* ha il compito di individuare il cortocircuito del filo di saldatura con il pezzo e riportare l'informazione al controllo robot tramite il segnale Current Flow, con un ritardo di 10 ms max.

Touch Sensing = Attivo alto

Touch Sensing	Descrizione
0	Nessuna operazione
1	Procedura di <i>Touch Sensing</i> attiva.

NOTA

Il segnale *Current Flow* è inviato all'uscita per 0,2 s oltre la durata del cortocircuito.

Per tutto il tempo in cui il segnale *Touch Sensing* rimane attivo, la saldatura non può avvenire.

Se il controllo robot inizializza il segnale *Touch Sensing* durante la saldatura, l'operazione di saldatura è abortita.

2.10 Gas Test Shield

Disponibile solo in modalità P.W. esegue il test del gas di protezione

Gas_Shield_Test= attivo alto

Gas_Shield_Test	Descrizione
0	Valvola chiusa
1	Valvola aperta

2.11 Job Number (bit 7 - 0)

Tale byte è valido se è impostato il modo di funzionamento Job Mode (par. 2.3) e seleziona il numero del Job da eseguire.

Job Number	Descrizione
0	Job selezionato in modo manuale dal pannello del generatore
1 - 99	Job valido.
100 - 255	Job non valido.

Se da controllo robot viene selezionata una posizione di memoria vuota o non valida, sulla barra di stato del pannello principale appare l'icona evidenziata sotto:



Se nel menù delle impostazioni del generatore la voce **Consenti Modifica Job** è :

- **OFF** nessun parametro dei job selezionati può essere modificato
- **ON** alcuni dei parametri dei Job possono essere variati run-time dal pannello di controllo del generatore
- **ON Robot** alcuni dei parametri dei Job possono essere variati run-time tramite i corrispondenti ingressi analogici abilitati oppure dal pannello di controllo del generatore

2.12 Abilitazione Ingressi analogici

Abilitazione degli ingressi analogici AI0-AI7.

Ogni bit corrisponde al relativo ingresso analogico secondo la tabella di seguito riportata :

Analog Setpoint Enable bit (Function)	Value=0	Value=1
Analog Setpoint Enable AI0 (Current Setpoint)	Disabilitato	Abilitato
Analog Setpoint Enable AI1 (Pulse Frequency)	Disabilitato	Abilitato
Analog Setpoint Enable AI2 (Current Pulse Ratio)	Disabilitato	Abilitato
Analog Setpoint Enable AI3 (Pulse Duty Cycle)	Disabilitato	Abilitato
Analog Setpoint Enable AI4 (Gas Plasma Flow)	Disabilitato	Abilitato
Analog Setpoint Enable AI5 (Gas Shield Flow)	Disabilitato	Abilitato
Analog Setpoint Enable AI6 (High Speed CW)	Disabilitato	Abilitato
Analog Setpoint Enable AI7 (Low Speed CW)	Disabilitato	Abilitato

2.13 Pilot Arc Start

È il comando di accensione dell'arco pilota nel processo plasma welding.

Nell'impianto deve essere presente la console plasma, impostata per il funzionamento automatico, cioè gestito dal controllo robot: fare riferimento al manuale istruzioni della gas console digitale Art 465.01.

Funzione *Pilot Arc Start* = attivo alto.

Pilot Arc start	Descrizione
0	Arco pilota spento
1	Accensione arco pilota, se entro 3 s non è presente corrente di arco pilota tale ingresso viene ignorato dal generatore, anche se ancora attivo

3 SEGNALI ANALOGICI DA CONTROLLO ROBOT A GENERATORE (INPUT)

Il generatore è in grado di gestire 4 ingressi analogici per le regolazioni dei parametri di saldatura in tempo reale. Ogni ingresso analogico è composto da 16 bit. Il formato di ogni singola analogica dipende dal bit *Protocol Mode*. Questi ingressi non hanno effetto solamente nelle modalità di funzionamento Mode 3 (Parameter selection internal) e Mode 2 (Job Mode: vedere eccezione descritta al par. 2.10).

3.1 Analog Setpoint (AI0)

Analog Setpoint AI0 = *Current Setpoint*

Regolazione corrente di saldatura.

AI0	Valore [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	500.0	0xFFFF	0x01F4

3.2 Analog Setpoint (AI1)

Analog Setpoint AI1 = *Pulse Frequency*

Regolazione frequenza in TIG pulsato.

AI1	Valore [Hz]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	2500	0xFFFF	0x09C4

3.3 Analog Setpoint (AI2)

Analog Setpoint AI2 = *Current Pulse Ratio*

Regolazione ampiezza della corrente bassa in TIG pulsato in % rispetto alla corrente principale.

AI2	Valore [%]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.4 Analog Setpoint (AI3)

Analog Setpoint AI3 = *Pulse Duty Cycle*

Regolazione duty-cycle in TIG pulsato.

AI3	Valore [m/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.5 Analog Setpoint (AI4)

Analog Setpoint AI4 = *Gas Plasma Flow*.

Tale parametro regola il flusso di gas di plasma durante la saldatura ed è definito dai seguenti valori di fondo scala:

AI4	Valore [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

3.6 Analog Setpoint (AI5)

Analog Setpoint AI5 = *Gas Shield Flow*.

Tale parametro regola il flusso del gas di schermo durante la saldatura ed è definito dai seguenti valori di fondo scala:

AI5	Valore [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x0120

3.7 Analog Setpoint (AI6)

Analog Setpoint AI6 = *High Speed CW*.

Questa regolazione si riferisce alla velocità alta del motore durante il processo “filo freddo” ed è definito dai seguenti valori di fondo scala:

AI6	Valore [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

3.8 Analog Setpoint (AI7)

Analog Setpoint AI7 = *Low Speed CW*.

Questa regolazione si riferisce alla velocità bassa del motore durante il processo “filo freddo” ed è definito dai seguenti valori di fondo scala:

AI7	Valore [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

4 SEGNALI DIGITALI DA GENERATORE A CONTROLLO ROBOT (OUTPUT)

Nella tabella vengono riportati i segnali digitali ed analogici in uscita dal generatore di saldatura

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Current Flow	X	X
2	1	Not used	-	-
3	1	Process Active	X	X
4	1	Main Current	X	X
5	1	Torch Collision Protection	-	X
6	1	Power Source Ready	X	X
7	1	Communication Ready	X	X
8	1	Protocol Mode	-	X
9 - 16	8	Error Number (bit 7 - 0)	-	X
17	1	Pulse Sync	X	X
18 - 23	6	Not used	-	-
24	1	Pilot Arc	X	X
25 - 31	7	Not used	-	-
32	1	Hard Fault	-	X
33 - 48	16	Welding Voltage (AO0)	X	X
49 - 64	16	Welding Current (AO1)	X	X
65 - 80	16	Motor Current (AO2)	-	X
81 - 96	16	Motor Speed (AO3)	-	X
97 - 112	16	Gas Plasma Flow (AO4)	-	X
113 - 128	16	Gas Shield Flow (AO5)	-	X
129 - 144	16	Not used	-	-
145 - 162	16	Not used	-	-

NOTA

Se il collegamento fra generatore e interfaccia robot è interrotto, tutti i segnali digitali ed analogici dall'interfaccia robot verso il controllo robot vengono impostati a "0".

4.1 Current Flow

Current Flow viene attivato appena la corrente di saldatura inizia a circolare sul pezzo da saldare.

Current Flow = attivo alto.

Current Flow	Descrizione
0	Non circola corrente sul pezzo da saldare
1	Circola corrente sul pezzo da saldare

4.2 Process Active

Dall'inizio del gas pre-Flow fino alla fine del gas post-Flow, il generatore attiva il segnale *Process Active*.

Il segnale *Process Active* serve a garantire la protezione gassosa ottimale del bagno di saldatura, assicurando che il robot stazioni sufficientemente a lungo all'inizio e alla fine del cordone di saldatura.

Process Active = attivo alto.

Process Active	Descrizione
0	Processo di saldatura non in corso
1	Processo di saldatura in corso

4.3 Main Current

Il segnale *Main Current* è attivo durante il tratto di saldatura con corrente erogata pari al valore di setpoint impostato, escluse quindi le fasi di innesco arco, corrente iniziale, rampe di salita e discesa e corrente di cratere.
Main Current = attivo alto.

Main Current	Descrizione
0	Corrente circolante sul pezzo da saldare diversa dalla corrente di setpoint
1	Corrente circolante sul pezzo da saldare pari alla corrente di setpoint.

4.4 Collision Protection

Il robot può essere dotato di un sensore di collisione che, in caso di urto della torcia di saldatura, comanda basso il segnale *Collision Protection*. In corrispondenza di tale evento il controllo robot arresta immediatamente il robot ed interrompe il processo di saldatura disattivando il segnale *Robot Ready*.
Collision Protection = attivo basso.

Collision protection	Descrizione
0	Collisione tra torcia e pezzo
1	Nessuna collisione rilevata tra torcia e pezzo

4.5 Power Source Ready

Il segnale *Power Source Ready* si attiva quando il generatore è pronto per saldare. Appena interviene una condizione di errore nel generatore oppure il segnale *Robot Ready* è disattivato, il segnale *Power Source Ready* viene immediatamente disattivato.
Power Source Ready = attivo alto.

Power Source Ready	Descrizione
0	Il generatore non è abilitato alla saldatura.
1	Nessun errore rilevato: il generatore è pronto ad eseguire il processo di saldatura.

4.6 Communication Ready

Quando attivo indica che la comunicazione fra interfaccia robot e generatore è correttamente funzionante. Quando non attivo indica la mancanza di comunicazione fra interfaccia robot e generatore.
Communication Ready = attivo alto.

Communication Ready	Descrizione
0	Il generatore non è pronto per lo scambio dei dati (Es. si trova in stato di boot)
1	Il generatore è pronto per lo scambio dei dati.

4.7 Error Number (bit 7 - 0)

La configurazione dei bit corrisponde al codice di errore rilevato dal generatore (vedi paragrafo "Codici Errore" nel Manuale Istruzioni del generatore).

Error Number	Descrizione
0	Il generatore funziona correttamente.
1 - 255	Identifica il codice errore rilevato.

4.8 Pulse Sync

Il segnale *Pulse Sync* è attivo e sincronizzato con ogni impulso di corrente alta, solo quando è impostato il processo TIG Pulsato con una frequenza di pulsazione uguale o inferiore a 10 Hz.

Se il processo TIG Pulsato è impostato il segnale *Pulse Sync* è attivo:

- con frequenza di pulsazione uguale o inferiore a 10 Hz l'uscita *Pulse Sync* segue lo stato dell'impulso alto di corrente;
- con frequenza di pulsazione superiore a 10 Hz l'uscita *Pulse Sync* rimane fissa a livello alto.

Se il processo TIG Pulsato non è impostato il segnale *Pulse Sync* è tenuto a livello basso.

Pulse Sync = attivo alto.

Pulse Sync	Descrizione
0	Impulso di corrente basso
1	Impulso di corrente alto

4.9 Pilot Arc

Segnala l'accensione dell'arco pilota nel processo plasma welding, in conseguenza del comando Pilot Arc (par. 2.24).
Pilot Arc = attivo alto.

Pilot Arc	Descrizione
0	Arco pilota spento
1	Arco pilota acceso

4.10 Hard Fault

Il segnale viene settato ad 1 quando si verifica un errore non ripristinabile (vedi anche par. 2.8 Source Error Reset e par. 4.7 Error Number), mentre rimane a 0 in assenza di errori oppure in presenza di errori ripristinabili (Warning).

Hard fault = attivo alto.

Hard Fault	Descrizione
0	Nessun errore non ripristinabile presente
1	Si è verificato un errore non ripristinabile ed è quindi necessario spegnere il generatore di saldatura.

5 SEGNALI ANALOGICI DA GENERATORE A CONTROLLO ROBOT (OUTPUT)

Il generatore è in grado di gestire 4 uscite analogiche per le regolazioni dei parametri di saldatura in tempo reale. Ogni uscita analogica è composta da 16 bit. Il formato di ogni singola analogica dipende dal bit Protocol Mode.

5.1 Analog Measure (AO0)

Analog Measure (AO0) = *Welding Voltage*.

Misura della tensione di uscita del generatore ed è definito dai seguenti valori di fondo scala:

AO0	Valore [V]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

5.2 Analog Measure (AO1)

Analog Measure (AO1) = *Welding Current*.

Misura della corrente di uscita del generatore ed è definito dai seguenti valori di fondo scala:

AO1	Valore [A]	Protocol mode=0	Protocol mode=1
Min	0	0x0000	0x0000
Max	1000	0xFFFF	0x03E8

5.3 Analog Measure (AO2)

Analog Measure (AO2) = *Motor Current*.

Misura della corrente assorbita dal motore del trainafilo ed è definito dai seguenti valori di fondo scala:

AO2	Valore [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	5.0	0xFFFF	0x0032

5.4 Analog Measure (AO3)

Analog Measure (AO3) = *Motor Speed*.

Misura della velocità del filo di saldatura ed è definito dai seguenti valori di fondo scala:

AO3	Valore [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	12.5	0xFFFF	0x007D

5.5 Analog Measure (AO4)

Analog Measure (AO4) = *Gas Plasma Flow*.

Misura del flusso di gas plasma ed è definito dai seguenti valori di fondo scala:

AO4	Valore [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

5.6 Analog Measure (AO5)

Analog Measure (AO5) = *Gas Shield Flow*.

Misura del flusso di gas di protezione ed è definito dai seguenti valori di fondo scala:

AO5	Valore [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x012C

6 CANopen DATA PROCESS IMAGE

- IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto.
 EN The bit are ordered from less to most significant and each byte is delimited by a bold line.
 ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa.

6.1 Messaggi CANopen dal Controllo Robot al Generatore

6.1 CANopen messages from Robot Control to Power Source

6.1 Mensajes CANopen del Control Robot al Generador

- IT La dimensione totale dei dati è 24 byte (192 bit).
 EN The total data size is 24 bytes (192 bit).
 ES El tamaño total de los datos es 24 bytes (192 bit).

COBID = 0x200	n° bit	Size	Signal name
	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode (bit 3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
	9	1	Gas Test Plasma
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
	17 - 24	8	Job Number (bit 7 - 0)
	25 - 31	7	Not used
	32	1	Not used
	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
	41 - 48	8	Not used
	49 - 55	7	Not used
	56	1	Pilot Arc Start
	57 - 64	8	Not used

COBID = 0x300	n° bit	Size	Signal name
	1 - 16	16	Current Setpoint (AI0)
	17 - 32	16	Pulse Frequency (AI1)
	33 - 48	16	Current Pulse Ratio (AI2)
	49 - 64	16	Pulse Duty Cycle (AI3)

COBID = 0x400	n° bit	Size	Signal name
	1 - 16	16	Gas Plasma Flow (AI4)
	17 - 32	16	Gas Shield Flow (AI5)
	33 - 48	16	High Speed CW (AI6)
	49 - 64	16	Low Speed CW (AI7)

6.2 Messaggi CANopen dal Generatore al Controllo Robot

6.2 CANopen messages from Power Source to Robot Control

6.2 Mensajes CANopen del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

COBID = 0x180	n° bit	Size	Signal name
	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
	9 - 16	8	Error Number (bit 7 - 0)
	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
	25 - 31	7	Not used
	32	1	Hard Fault

COBID = 0x280	n° bit	Size	Signal name
	1 - 16	16	Welding Voltage (AO0)
	17 - 32	16	Welding Current (AO1)
	33 - 48	16	Motor Current (AO2)
	49 - 64	16	Motor Speed (AO3)

COBID = 0x380	n° bit	Size	Signal name
	1 - 16	16	Plasma Gas Flow (AO4)
	17 - 32	16	Shield Gas Flow (AO5)
	33 - 48	16	Not used
	49 - 64	16	Not used

7 PROFIBUS DATA PROCESS IMAGE ART. 428.01

IT I bit sono ordinati dal meno significativo al più significativo.
 EN The bit are ordered from less to most significant.
 ES Los bit están ordenados de menos significativo hacia más significativo.

7.1 Messaggi PROFIBUS dal Controllo Robot al Generatore

7.1 PROFIBUS messages from Robot Control to Power Source

7.1 Mensajes PROFIBUS del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit)
 ES El tamaño total de los datos es 24 bytes (192 bit)

Field	n° bit	Size	Signal name
8	I01	1	Gas Test
	I02	1	Wire Inching
	I03	1	Wire Retract
	I04	1	Source Error Reset
	I05	1	Touch Sensing
	I06	1	Gas Test Shield
	I07	1	Not used
	I08	1	Not used
8	I09	1	Weld Start
	I10	1	Robot Ready
	I11 - I14	4	Operating Mode (bit 3- 0)
	I15	1	Reserved (set to 0)
	I16	1	Protocol Mode
8	I17 - I23	7	Not used
	I24	1	Not used
8	I25 - I32	8	Job number
8	I33 - I40	8	Not used
8	I41 - I48	8	Analog Setpoint Enable (bit 7 - 0)
8	I49 - I56	8	Not used
8	I57 - I63	7	Not used
	I64	1	Pilot Arc Start
16	I65 - I72	8 high	Current Setpoint (AI0)
	I73 - I80	8 low	
16	I81 - I88	8 high	Pulse Frequency (AI1)
	I89 - I96	8 low	
16	I97 - I104	8 high	Current Pulse Ratio (AI2)
	I105 - I112	8 low	
16	I113 - I120	8 high	Pulse Duty Cycle (AI3)
	I121 - I128	8 low	
16	I129 - I136	8 high	Gas Plasma Flow (AI4)
	I137 - I144	8 low	
16	I145 - I152	8 high	Gas Shield Flow (AI5)
	I153 - I160	8 low	
16	I161 - I168	8 high	High Speed CW (AI6)
	I169 - I176	8 low	
16	I177 - I184	8 high	High Speed CW (AI7)
	I185 - I192	8 low	

7.2 Messaggi PROFIBUS dal Generatore al Controllo Robot

7.2 PROFIBUS messages from Power Source to Robot Control

7.2 Mensajes Profibus del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01 - O08	8	Error Number (bit 7 - 0)
8	O09	1	Current Flow
	O10	1	Not used
	O11	1	Process Active
	O12	1	Main Current
	O13	1	Collision Protection
	O14	1	Power Source Ready
	O15	1	Communication Ready
	O16	1	Protocol Mode
8	O17 - O23	7	Not used
	O24	1	Hard Fault
8	O25	1	Pulse Sync
	O26 - O31	6	Not used
	O32	1	Pilot Arc
16	O33 - O40	8 high	Welding Voltage (AO0)
	O41 - O48	8 low	
16	O49 - O56	8 high	Welding Current (AO1)
	O57 - O64	8 low	
16	O65 - O72	8 high	Motor Current (AO2)
	O73 - O80	8 low	
16	O81 - O88	8 high	Motor Speed (AO3)
	O89 - O96	8 low	
16	O97 - O104	8 high	Plasma Gas Flow (AO4)
	O105 - O112	8 low	
16	O113 - O120	8 high	Shield Gas Flow (AO5)
	O121 - O128	8 low	
16	O129 - O136	8 high	Not used
	O137 - O144	8 low	
16	O145 - O152	8 high	Not used
	O153 - O160	8 low	

8 DeviceNet DATA PROCESS IMAGE ART 428.02

IT I bit sono ordinati dal meno significativo al più significativo.
EN The bit are ordered from less to most significant.
ES Los bit están ordenados de menos significativo hacia más significativo

8.1 Messaggi DeviceNet dal Controllo Robot al Generatore

8.1 DeviceNet messages from Robot Control to Power Source

8.1 Mensajes DeviceNet del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
EN The total data size is 24 bytes (192 bit)
ES El tamaño total de los datos es 24 bytes (192 bit)

Field	n° bit	Size	Signal name
8	I01	1	Weld Start
	I02	1	Robot Ready
	I03 - I06	4	Operating Modes (bit 3 - 0)
	I07	1	Reserved (set to 0)
	I08	1	Protocol Mode
8	I09	1	Gas Test
	I10	1	Wire Inching
	I11	1	Wire Retract
	I12	1	Source Error Reset
	I13	1	Touch Sensing
	I14	1	Gas Test Shield
	I15	1	Not used
	I16	1	Not used
8	I17 - I24	8	Job Number (bit 7 - 0)
8	I25 - I31	7	Not used
	I32	1	Not used
8	I33 - I40	8	Analog Setpoint Enable (bit 7 - 0)
8	I41 - I48	8	Not used
8	I49 - I55	7	Not used
	I56	1	Pilot Arc Start
8	I57 - I64	8	Not used
16	I65 - I72	8 low	Current Setpoint (AI0)
	I73 - I80	8 high	
16	I81 - I88	8 low	Pulse Frequency (AI1)
	I89 - I96	8 high	
16	I97 - I104	8 low	Current Pulse Ratio (AI2)
	I105 - I112	8 high	
16	I113 - I120	8 low	Pulse Duty Cycle (AI3)
	I121 - I128	8 high	
16	I129 - I136	8 low	Gas Plasma Flow (AI4)
	I137 - I144	8 high	
16	I145 - I152	8 low	Gas Shield Flow (AI5)
	I153 - I160	8 high	
16	I161 - I168	8 low	High Speed CW (AI6)
	I169 - I176	8 high	
16	I177 - I184	8 low	Low Speed CW (AI7)
	I185 - I192	8 high	

8.2 Messaggi DeviceNet dal Generatore al Controllo Robot

8.2 DeviceNet messages transmitted from Power Source to Robot Control

8.2 Mensajes DeviceNet transmitidos del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)
 EN The total data size is 20 bytes (160 bit)
 ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01	1	Current Flow
	O02	1	Not used
	O03	1	Process Active
	O04	1	Main Current
	O05	1	Collision Protection
	O06	1	Power Source Ready
	O07	1	Communication Ready
	O08	1	Protocol mode
8	O09 - O16	8	Error Number (bit 7 - 0)
8	O17	1	Pulse Sync
	O18 - O23	6	Not used
	O24	1	Pilot Arc
8	O25 - O31	7	Not used
	O32	1	Hard Fault
16	O33 - O40	8 low	Welding Voltage (AO0)
	O41 - O48	8 high	
16	O49 - O56	8 low	Welding Current (AO1)
	O57 - O64	8 high	
16	O65 - O72	8 low	Motor Current (AO2)
	O73 - O80	8 high	
16	O81 - O88	8 low	Motor Speed (AO3)
	O89 - O96	8 high	
16	O97 - O104	8 low	Plasma Gas Flow (AO4)
	O105 - O112	8 high	
16	O113 - O120	8 low	Shield Gas Flow (AO5)
	O121 - O128	8 high	
16	O129 - O136	8 low	Not used
	O137 - O144	8 high	
16	O145 - O152	8 low	Not used
	O153 - O160	8 high	

9 EtherCAT-EtherNet/IP-PROFINET DATA PROCESS IMAGE ART. 428.03 - 428.04 - 428.05

IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto
EN The bit are ordered from less to most significant and each byte is delimited by a bold line
ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa

9.1 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Controllo Robot al Generatore

9.1 EtherCAT-EtherNet/IP-PROFINET messages from Robot Control to Power Source

9.1 Mensajes EtherCAT-EtherNet/IP-PROFINET del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
EN The total data size is 24 bytes (192 bit)
ES El tamaño total de los datos es 24 bytes (192 bit)

data	n° bit	Size	Signal name
DIN0	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode (bit 3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
DIN1	9	1	Gas Test
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
DIN2	17 - 24	8	Job Number (bit 7 - 0)
DIN3	25 - 31	7	Not used
	32	1	Not used
DIN4	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
DIN5	41 - 48	8	Not used
DIN6	49 - 55	7	Not used
	56	1	Pilot Arc Start
DIN7	57 - 64	8	Not used
AIN0	65 - 80	16	Current Setpoint (AI0)
AIN1	81 - 96	16	Pulse Frequency (AI1)
AIN2	97 - 112	16	Current Pulse Ratio (AI2)
AIN3	113 - 128	16	Pulse Duty Cycle (AI3)
AIN4	129 - 144	16	Gas Plasma Flow (AI4)
AIN5	145 - 160	16	Gas Shield Flow (AI5)
AIN6	161 - 176	16	High Speed CW (AI6)
AIN7	177 - 192	16	Low Speed CW (AI7)

9.2 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Generatore al Controllo Robot

9.2 EtherCAT-EtherNet/IP PROFINET messages from Power Source to Robot Control

9.2 Mensajes EtherCAT-EtherNet/IP PROFINET del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)
 EN The total data size is 20 bytes (160 bit)
 ES El tamaño total de los datos es 20 bytes (160 bit)

data	n° bit	Size	Signal name
DOUT0	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
DOUT1	9 - 16	8	Error Number (bit 7 - 0)
DOUT2	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
DOUT3	25 - 31	7	Not used
	32	1	Hard Fault
AOUT0	33 - 48	16	Welding Voltage (AO0)
AOUT1	49 - 64	16	Welding Current (AO1)
AOUT2	65 - 80	16	Motor Current (AO2)
AOUT3	81 - 96	16	Motor Speed (AO3)
AOUT4	97 - 112	16	Plasma Gas Flow (AO4)
AOUT5	113 - 128	16	Shield Gas Flow (AO5)
AOUT6	129 - 144	16	Not used
AOUT7	145 - 160	16	Not used

10

MODELLO DI SEGNALI

10

SIGNALS PATTERN

10

MODELO DE SEÑALES

Digital Inputs for Operating Mode 2 (JOB Mode)

Job Number
(bit 0 – 7)

Digital Inputs
(Robot → Power Source)

Robot Ready

Weld Start

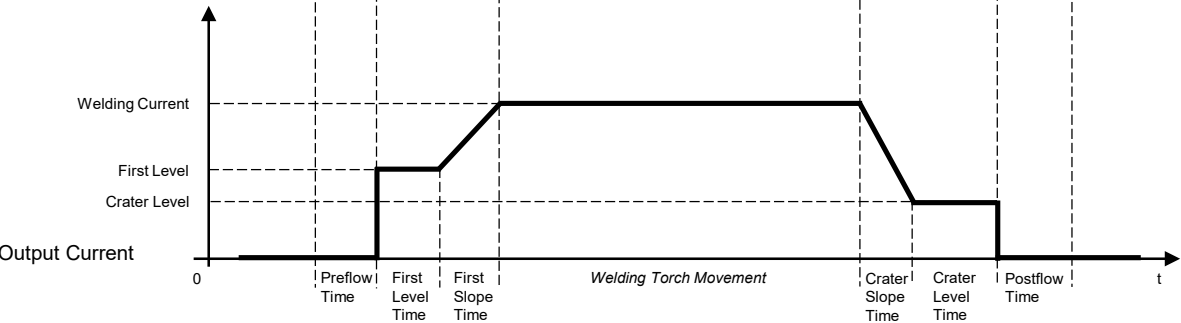
Digital Outputs
(Power Source → Robot)

Power Source Ready

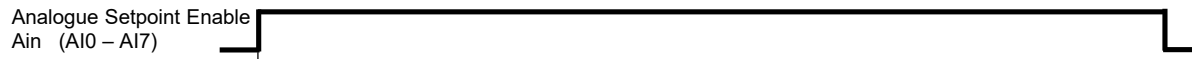
Process Active

Current Flow

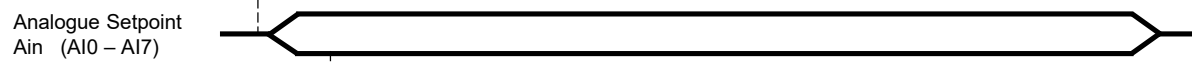
Main Current



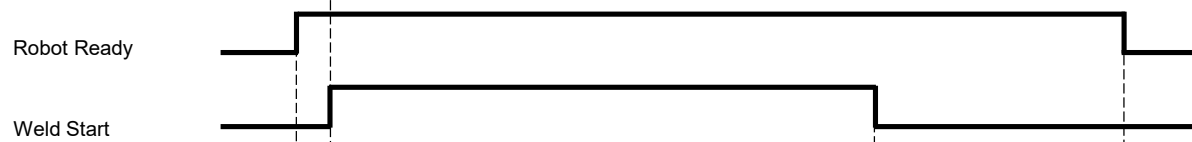
Digital Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



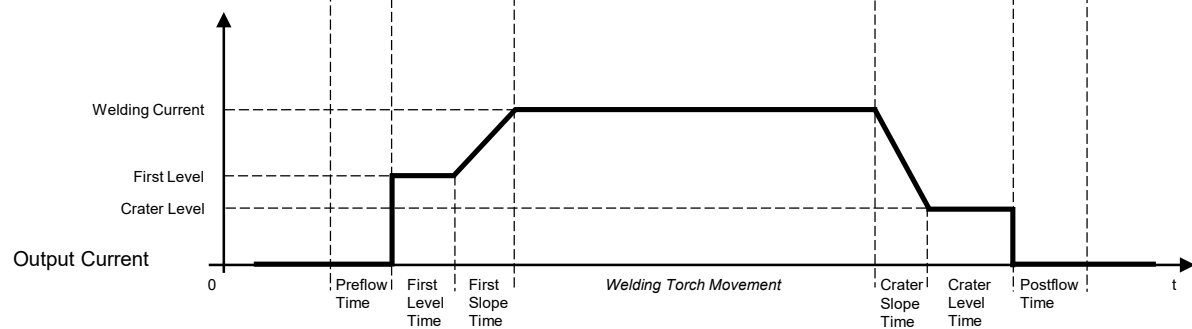
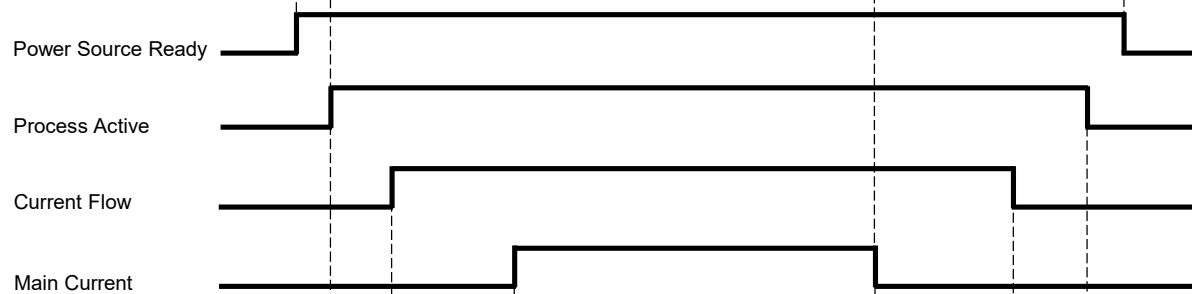
Analogue Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



Digital Inputs (Robot → Power Source)



Digital Outputs (Power Source → Robot)





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EN DIGITAL PROTOCOLS FOR CEBORA WIN TIG AUTOMATED SYSTEMS
Translation of the original instructions



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1 INTRODUCTION

1.1 This manual

This manual describes the configuration of fieldbus (Data Process Image) messages adopted in Cebora TIG automated welding systems.

All signals exchanged between the Cebora MIG welding system and the robotised system control (Robot Control) are listed and described.

This manual must be seen as an integral part of the Instruction Manuals of individual devices comprising the Cebora welding system and therefore simultaneous consultation of the above manuals may be necessary.

Fig. 1 shows an example of a Cebora robot system.

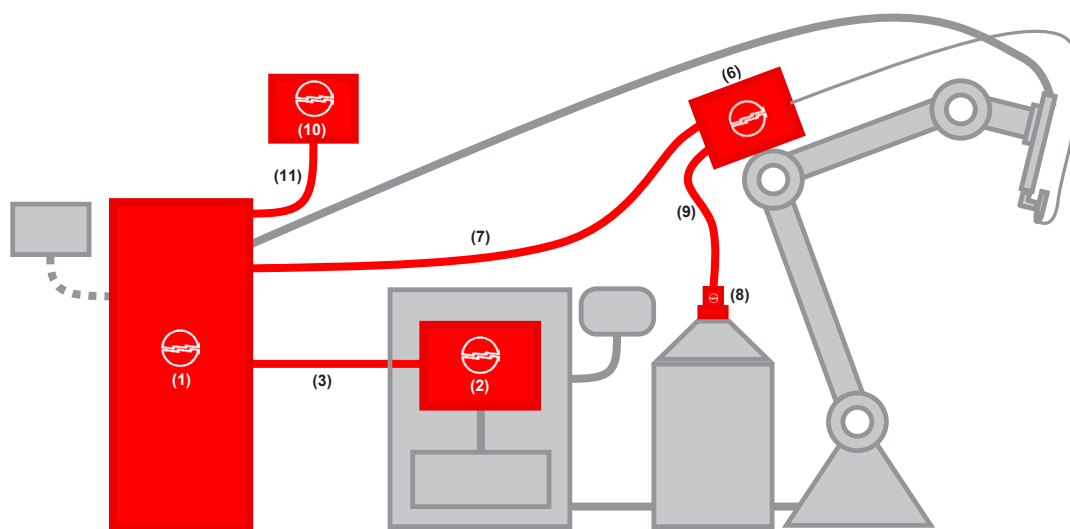


Fig. 1

Pos.	Description	Art.	Optional
1	WIN TIG Robot Power source	380-381- 394-395- 396.80	-
2	Robot Interface	428.XX, 448	(X)
3	Power source – Robot Interface connection	2063	-
6	Robot wire feeder	1649	X
7	Power source – robot wire feeder connection	2067	X
8	Wire spool holder/quick fitting	121/173	X
9	Wire guide sheath	1935	X
10	TIG remote control panel	438	X
11	Power source – TIG remote control panel connection	2065	X

NOTE

If the robot control is fitted with a CANopen master communication port the interface (2) is unnecessary because power source (1) can be connected directly via CANopen cable (3), which must be ordered separately from Cebora.

1.2 Fieldbuses covered in this manual

- CANopen DS401
- DeviceNet
- Profibus DP-V1
- EtherCAT
- EtherNet/IP
- PROFINET

Cebora provides the corresponding configuration file for each fieldbus.

At the end of the manual (sections 6 to 9) tables of messages exchanged between power source and robot control are provided (Data Process Image). These are subdivided by fieldbus type. A Data Process Image is made up as follows:

	INPUT	OUTPUT
Digital [byte]	8	4
Analog [word]	8	8
Total Size [byte]	24	20

2 DIGITAL SIGNALS FROM ROBOT CONTROL TO POWER SOURCE (INPUT)

List of digital and analog signals entering the power source

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Weld Start	X	X
2	1	Robot Ready	X	X
3 - 6	4	Operating Modes (bit 3 - 0)	X	X
7	1	Reserved (set to 0)	-	0
8	1	Protocol Mode	-	X
9	1	Gas Test/Gas Test Plasma	X	X
10	1	Wire Inching	X	X
11	1	Wire Retract	X	X
12	1	Source Error Reset	X	X
13	1	Touch Sensing	X	X
14	1	Gas Test Shield	X	X
15	1	Not used	-	-
16	1	Not used	-	-
17 - 23	7	Job Number (bit 6 - 0)	X	X
24	1	Job Number (bit 7)	-	X
25 - 31	7	Not used	-	-
32	1	Not used	-	-
33	1	Analog Setpoint Enable 0	-	X
34	1	Analog Setpoint Enable 1	-	X
35	1	Analog Setpoint Enable 2	-	X
36	1	Analog Setpoint Enable 3	-	X
37	1	Analog Setpoint Enable 4	-	X
38	1	Analog Setpoint Enable 5	-	X
39	1	Analog Setpoint Enable 6	-	X
40	1	Analog Setpoint Enable 7	-	X
41 - 48	8	Not used	-	-
49 - 55	7	Not used	-	-
56	1	Pilot Arc Start	X	X
57 - 64	8	Not used	-	-
65 - 80	16	Current Setpoint (AI0)	X	X
81 - 96	16	Pulse Frequency (AI1)	X	X
97 - 112	16	Current Pulse Ratio (AI2)	-	X
113 - 128	16	Pulse Duty Cycle (AI3)	-	X
129 - 144	16	Gas Plasma Flow (AI4)	-	X
145 - 160	16	Gas Shield Flow (AI5)	-	X
161 - 176	16	High Speed CW (AI6)	-	X
177 - 192	16	Low Speed CW (AI7)	-	X

2.1 Weld Start

The *Weld Start* bit controls weld arc start and stop.
Weld Start = (active high)

Weld Start	Description
0 → 1	The robot control controls arc start. This signal is accepted if the <i>Power Source Ready</i> signal is active.
1 → 0	The robot control controls arc stop

NOTE

In Robot mode with the *Robot Ready* bit active, the power source is automatically set to 2-step mode.

2.2 Robot Ready

The *Robot Ready* bit enables communication between power source and robot control. Once communication is established, the power source is ready to send and receive data from the external CNC.
If the bit is set to zero, the power source remains in alert status *Warning 90-CNC not ready* and the icon on the display status bar flashes.



If the *Robot Ready* bit is inactive, no digital or analog signal is acquired and the power source outputs are all inactive.
Robot Ready = Active high

Robot Ready	Description
0	The robot control is not ready
1	The robot control is ready to exchange data with the outside

WARNING:

The *Robot Ready* bit cannot be used for an emergency shut-down. A specially made kit is available for this purpose (Item 449).

2.3 Operating Mode (bit 3 - 0)

The power source operating mode is selected by means of 4 bits

Operating Mode					MIG
Bit3	Bit2	Bit1	Bit0	Mode	
0	0	0	0	0	DC
0	0	0	1	1	XP
0	0	1	0	2	JOB MODE
0	0	1	1	3	PAR. SEL. INT.
0	1	0	0	4	AC
0	1	0	1	5	MIX
0	1	1	0	6	/
0	1	1	1	7	/
1	0	0	0	8	DC PULSE
1	0	0	1	9	PULSE XP
1	0	1	0	10	/
1	0	1	1	11	/
1	1	0	0	12	AC PULSE
1	1	0	1	13	MIX PULSE
1	1	1	0	14	/
1	1	1	1	15	/

Table 1

2.3.1 Job Mode (Mode 2)

A job previously stored in the power source can be selected in this mode. Up to 99 jobs can be stored in the machine (see section 2.10). *Job Mode* = Active high.

2.3.2 Parameter Selection Internal (Mode 3)

Parameter Selection Internal mode enables weld parameter selection by means of the power source control panel. In this mode, jobs can be stored and then called up using the appropriate identification number in *Job mode*.

2.3.3 TIG Processes (Mode 0,1,4,5,8,9,12,13)

This process is set in TIG.

Digital and analogue signals are considered with this setting. Analogue inputs AI0...AI7 are accepted in this mode.

2.4 Protocol Mode

Protocol Mode can be used to represent analog setpoint variables (Analog Setpoint) as well as analog measurement variables (Analog Measure) in two different ways, always converting variables that allow decimal values to integers by means of a multiplication factor of 10 (e.g. 9.9 is considered to be 99).

Protocol Mode	Description
0	Each analog signal (setpoint or measurement) is converted to a numerical value and rescaled between the minimum and maximum value using a 16-bit field without a sign (0 through 65535)
1	Analog signals do not undergo any scale conversion and are therefore directly readable. The numerical value is shown directly in binary with a 16-bit field with a sign.

2.5 Gas Test

The optional *Gas Test* signal activates the gas solenoid.
It can also be used for additional pre-flow gas during positioning.
Gas Test = Active high.

Gas Test	Description
0	Gas valve closed
1	Gas valve open

With the welding process active, the pre-flow and post-flow gas times are controlled directly by the power source.
With the Plasma Welding accessory this input activates the Plasma Gas valve.

2.6 Wire Inching

The *Wire Inching* signal allows the wire to slide in the torch sheath without gas emerging and without current generation.
The incremental speed is set on the power source panel in the Wire Test menu.
Wire Inching = Active high.

Wire Inching	Description
0	No Operation
1	Wire feed

WARNING:

Hold the torch well away from your face and body to avoid the risk of injury due to the emerging welding wire.

2.7 Wire Retract

The *Wire Retract* signal causes the wire to retract by a fixed length, after which the motor stops.
Wire retraction speed is set at 1.0 m/min.
Wire Retract = Active high

Wire Retract	Description
0	No Operation
1	Wire retraction

2.8 Source Error Reset

The *Source Error Reset* signal active on the 0→1 front only deletes resettable errors (warnings), for which the *Hard Fault* bit is not activated (0).

Source Error Reset	Description
0,1, 1→0	No Operation
0→1	Reset of a resettable error (Warning)

Refer to the WIN TIG power source user manual for a list of resettable errors (warnings).

2.9 Touch Sensing

The *Touch Sensing* signal identifies a short circuit in the weld wire with the workpiece and relays the information to the robot control by means of the Current Flow signal with a delay of 10 ms max.
Touch Sensing = Active high

Touch Sensing	Description
0	No operation
1	<i>Touch Sensing</i> procedure active

NOTE

The *Current Flow* signal is sent to the output for 0.2 s beyond the short-circuit duration.

Welding cannot take place as long as the *Touch Sensing* signal remains active.

If the *Touch Sensing* signal is activated during welding, this event is ignored and does not interrupt the welding process in progress.

2.10 Gas Test Shield

Available only in P.W. mode, performs the shielding gas test

"Gas_Shield_Test"= active high

Gas Shield Test	Description
0	Gas valve closed
1	Gas valve open

2.11 Job Number (bit 7 - 0)

This byte is valid if Job Mode operating mode is set (section 2.3) and job number to be performed is selected.

Job Number	Description
0	Job selected manually from the power source panel
1 - 99	Job valid
100 - 255	Job invalid

If an empty or invalid memory position is selected by robot control, the icon shown below appears on the main panel status bar:



If the item **Allow job change** in the power source settings menu is:

- **OFF** none of the selected job parameters can be changed
- **ON** some job parameters can be modified run-time from the power source panel
- **ON Robot** some job parameters can be modified run-time by means of the enabled analog inputs or from the power source panel

2.12 Analogue input enablement

Enablement of analog inputs AI0-AI7.

Each bit corresponds to the associated analogue input according to the following table:

Analog Setpoint Enable bit (Function)	Value=0	Value=1
Analog Setpoint Enable AI0 (Current Setpoint)	Disabled	Enabled
Analog Setpoint Enable AI1 (Pulse Frequency)	Disabled	Enabled
Analog Setpoint Enable AI2 (Current Pulse Ratio)	Disabled	Enabled
Analog Setpoint Enable AI3 (Pulse Duty Cycle)	Disabled	Enabled
Analog Setpoint Enable AI4 (Gas Plasma Flow)	Disabled	Enabled
Analog Setpoint Enable AI5 (Gas Shield Flow)	Disabled	Enabled
Analog Setpoint Enable AI6 (High Speed CW)	Disabled	Enabled
Analog Setpoint Enable AI7 (Low Speed CW)	Disabled	Enabled

2.13 Pilot Arc Start

This is the pilot arc start command in the plasma welding process.

The plasma console set for automatic operation, i.e. managed by robot control, must be present in the system: refer to digital console gas instruction manual item 465.01.

Pilot Arc Start function = active high

Pilot Arc start	Description
0	Pilot arc off
1	Pilot arc start, if no pilot arc current is present within 3 s, this input is ignored by the power source, even if it is still active.

3 ANALOG SIGNALS FROM ROBOT CONTROL TO POWER SOURCE (INPUT)

The power source is able to manage 4 analog inputs for weld parameter settings in real time.

Each analog input consists of 16 bits. The format of each analog signal depends on the *Protocol Mode* bit.

This value is not effective only in operating mode 3 (Parameter selection internal) and Mode 2 (Job Mode: see exception described in paragraph 2.10).

3.1 Analog Setpoint (AI0)

Analog Setpoint AI0 = *Current Setpoint*

Main welding current regulation.

AI0	Value [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	500.0	0xFFFF	0x01F4

3.2 Analog Setpoint (AI1)

Analog Setpoint AI1 = *Pulse Frequency*

TIG Pulse frequency regulation.

AI1	Value [Hz]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	2500	0xFFFF	0x09C4

3.3 Analog Setpoint (AI2)

Analog Setpoint AI2 = *Current Pulse Ratio*

Low current amplitude regulation in Pulsed TIG as a percentage of the main current.

AI2	Value [%]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.4 Analog Setpoint (AI3)

Analog Setpoint AI3 = *Pulse Duty Cycle*

Duty-cycle regulation in Pulsed TIG.

AI3	Value [m/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.5 Analog Setpoint (AI4)

Analog Setpoint AI4 = *Gas Plasma Flow*.

This parameter regulates plasma gas flow during welding and is defined by the following full-scale deflection values:

AI4	Value [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

3.6 Analog Setpoint (AI5)

Analog Setpoint AI5 = *Gas Shield Flow*.

This parameter regulates plasma gas flow during welding and is defined by the following full-scale deflection values:

AI5	Value [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x0120

3.7 Analog Setpoint (AI6)

Analog Setpoint AI6 = *High Speed CW*.

This setting refers to motor high speed during the “cold wire” process and is defined by the following full-scale deflection values:

AI6	Value [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

3.8 Analog Setpoint (AI7)

Analog Setpoint AI7 = *Low Speed CW*.

This setting refers to motor low speed during the “cold wire” process and is defined by the following full-scale deflection values:

AI7	Value [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

4 DIGITAL SIGNALS FROM POWER SOURCE TO ROBOT CONTROL (OUTPUT)

The following table shows digital and analogue signals leaving the welding power source

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Current Flow	X	X
2	1	Not used	-	-
3	1	Process Active	X	X
4	1	Main Current	X	X
5	1	Torch Collision Protection	-	X
6	1	Power Source Ready	X	X
7	1	Communication Ready	X	X
8	1	Protocol Mode	-	X
9 - 16	8	Error Number (bit 7 - 0)	-	X
17	1	Pulse Sync	X	X
18 - 23	6	Not used	-	-
24	1	Pilot Arc	X	X
25 - 31	7	Not used	-	-
32	1	Hard Fault	-	X
33 - 48	16	Welding Voltage (AO0)	X	X
49 - 64	16	Welding Current (AO1)	X	X
65 - 80	16	Motor Current (AO2)	-	X
81 - 96	16	Motor Speed (AO3)	-	X
97 - 112	16	Gas Plasma Flow (AO4)	-	X
113 - 128	16	Gas Shield Flow (AO5)	-	X
129 - 144	16	Not used	-	-
145 - 162	16	Not used	-	-

NOTE

If the connection between power source and robot interface is broken, all digital and analog signals from the robot interface to the robot control are set to "0".

4.1 Current Flow

Current Flow is activated as soon as the welding current begins to flow through the workpiece.

Current Flow = active high.

Current flow	Description
0	No current flows through the workpiece
1	Current flows through the workpiece

4.2 Process Active

From the beginning of pre-flow gas to the end of post-flow gas, the power source activates the *Process Active* signal. The *Process Active* signal is used to ensure optimal gas shielding of the weld pool, ensuring that the robot stops for long enough at the beginning and end of the weld bead.

Process Active = active high.

Process Active	Description
0	Weld process not started
1	Weld process in progress

4.3 Main Current

The *Main Current* signal is activated during the weld section with current delivery equal to setpoint value, therefore excluding the arc strike, start current, ramp up, ramp down and crater filling current stages.

Main Current = active high.

Main Current	Description
0	Current flowing through workpiece other than setpoint current
1	Current flowing through workpiece same as setpoint current

4.4 Collision Protection

The robot can be equipped with a collision sensor that controls a low *Collision Protection* signal. If this happens the robot control stops the robot immediately and interrupts the welding process by deactivating the *Robot Ready signal*.

Collision Protection = active low.

Collision protection	Description
0	Collision between torch and workpiece
1	No collision between torch and workpiece detected

4.5 Power Source Ready

The *Power Source Ready* signal is activated when the power source is ready to weld.

As soon as an error status arises in the power source or the *Robot Ready* signal is deactivated, the *Power Source Ready* signal is immediately deactivated.

Power Source Ready = active high.

Power Source Ready	Description
0	The power source is not enabled for welding
1	No error detected: the power source is ready to perform the welding process

4.6 Communication Ready

When this is active, communication between robot interface and power source is working properly.

When this is inactive, it indicates a lack of communication between robot interface and power source.

Communication Ready = active high

Communication Ready	Description
0	Power source not ready for data exchange (e.g. in boot status)
1	Power source ready for data exchange

4.7 Error Number (bit 7 - 0)

The bit configuration corresponds to the error code detected by the power source (see "Error Codes" section in power source instruction manual).

Error Number	Description
0	The power source is working properly
1 - 255	Identifies the error code detected

4.8 Pulse Sync

The *Pulse Sync* signal is active and synchronised with each “high current” pulse, only when the “Pulsed TIG” processes is set, with a pulse frequency less than or equal to 10 Hz.

If the “Pulsed TIG” process is set, the Pulse Sync signal is active:

- with pulse frequency less than or equal to 10 Hz the Pulse Sync output follows the current “high” pulse status;
- with pulse frequency greater than 10 Hz, the Pulse Sync output remains fixed at a high level.

If the Pulsed Tig process is not set, the Pulse Sync signal is kept at low-level.

Pulse Sync = active high.

Pulse Sync	Description
0	Low current pulse
1	High current pulse

4.9 Pilot Arc

Indicates start of pilot arc in plasma welding process, as a consequence of the Pilot Arc command (section 2.24).

Pilot Arc = active high.

Pilot Arc	Description
0	Pilot arc off
1	Pilot arc on

4.10 Hard Fault

The signal is set at 1 when a non-resettable error occurs (see also section 2.8 Source error reset and section 4.7 Error Number) whereas it remains at 0 in the absence of errors or in presence of a non-resettable errors (Warning).

Hard fault = active high.

Hard Fault	Description
0	No non-resettable error present
1	A non-resettable error has occurred, the weld power source must be turned off.

5 ANALOG SIGNALS FROM POWER SOURCE TO ROBOT CONTROL (OUTPUT)

The power source is able to manage 4 analog outputs to adjust weld parameters in real time. Each analog output consists of 16 bits. The format of each analog signal depends on the Protocol Mode bit.

5.1 Analog Measure (AO0)

Analog Measure (AO0) = *Welding Voltage*.

Output voltage measure, it is defined by the following full-scale deflection values:

AO0	Value[V]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

5.2 Analog Measure (AO1)

Analog Measure (AO1) = *Welding Current*

Output current measure, it is defined by the following full-scale deflection values:

AO1	Value[A]	Protocol mode=0	Protocol mode=1
Min	0	0x0000	0x0000
Max	1000	0xFFFF	0x03E8

5.3 Analog Measure (AO2)

Analog Measure (AO2) = *Motor Current*

Measurement of the current taken up by the wire feed motor, it is defined by the following full-scale deflection values:

AO2	Value [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	5.0	0xFFFF	0x0032

5.4 Analog Measure (AO3)

Analog Measure (AO3) = *Motor Speed*

Welding wire speed measurement, it is defined by the following full-scale deflection values:

AO3	Value [l/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	12.5	0xFFFF	0x007D

5.5 Analog Measure (AO4)

Analog Measure (AO2) = *Gas Plasma Flow*

Console plasma gas flow measurement signal, it is defined by the following full-scale deflection values:

AO4	Value [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

5.6 Analog Measure (AO5)

Analog Measure (AO3) = *Gas Shield Flow*

Gas shield flow detector measurement, it is defined by the following full-scale deflection values:

AO5	Value [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x012C

6 CANopen DATA PROCESS IMAGE

- IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto.
 EN The bit are ordered from less to most significant and each byte is delimited by a bold line.
 ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa.

6.1 Messaggi CANopen dal Controllo Robot al Generatore

6.1 CANopen messages from Robot Control to Power Source

6.1 Mensajes CANopen del Control Robot al Generador

- IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit)
 ES El tamaño total de los datos es 24 bytes (192 bit)

COBID = 0x200	n° bit	Size	Signal name
	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode (bit 3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
	9	1	Gas Test Plasma
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
	17 - 24	8	Job Number (bit 7 - 0)
	25 - 31	7	Not used
	32	1	Not used
	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
	41 - 48	8	Not used
	49 - 55	7	Not used
	56	1	Pilot Arc Start
	57 - 64	8	Not used

COBID = 0x300	n° bit	Size	Signal name
	1 - 16	16	Current Setpoint (AI0)
	17 - 32	16	Pulse Frequency (AI1)
	33 - 48	16	Current Pulse Ratio (AI2)
	49 - 64	16	Pulse Duty Cycle (AI3)

COBID = 0x400	n° bit	Size	Signal name
	1 - 16	16	Gas Plasma Flow (AI4)
	17 - 32	16	Gas Shield Flow (AI5)
	33 - 48	16	High Speed CW (AI6)
	49 - 64	16	Low Speed CW (AI7)

6.2 Messaggi CANopen dal Generatore al Controllo Robot

6.2 CANopen messages from Power Source to Robot Control

6.2 Mensajes CANopen del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

COBID = 0x180	n° bit	Size	Signal name
	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
	9 - 16	8	Error Number (bit 7 - 0)
	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
	25 - 31	7	Not used
	32	1	Hard Fault

COBID = 0x280	n° bit	Size	Signal name
	1 - 16	16	Welding Voltage (AO0)
	17 - 32	16	Welding Current (AO1)
	33 - 48	16	Motor Current (AO2)
	49 - 64	16	Motor Speed (AO3)

COBID = 0x380	n° bit	Size	Signal name
	1 - 16	16	Plasma Gas Flow (AO4)
	17 - 32	16	Shield Gas Flow (AO5)
	33 - 48	16	Not used
	49 - 64	16	Not used

7 PROFIBUS DATA PROCESS IMAGE ART.428.01

IT I bit sono ordinati dal meno significativo al più significativo.
 EN The bit are ordered from less to most significant.
 ES Los bit están ordenados de menos significativo hacia más significativo.

7.1 Messaggi PROFIBUS dal Controllo Robot al Generatore

7.1 PROFIBUS messages from Robot Control to Power Source

7.1 Mensajes PROFIBUS del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit).
 ES El tamaño total de los datos es 24 bytes (192 bit)

Field	n° bit	Size	Signal name
8	I01	1	Gas Test
	I02	1	Wire Inching
	I03	1	Wire Retract
	I04	1	Source Error Reset
	I05	1	Touch Sensing
	I06	1	Gas Test Shield
	I07	1	Not used
	I08	1	Not used
8	I09	1	Weld Start
	I10	1	Robot Ready
	I11 - I14	4	Operating Mode (bit 3- 0)
	I15	1	Reserved (set to 0)
	I16	1	Protocol Mode
8	I17 - I23	7	Not used
	I24	1	Not used
8	I25 - I32	8	Job number
8	I33 - I40	8	Not used
8	I41 - I48	8	Analog Setpoint Enable (bit 7 - 0)
8	I49 - I56	8	Not used
8	I57 - I63	7	Not used
	I64	1	Pilot Arc Start
16	I65 - I72	8 high	Current Setpoint (AI0)
	I73 - I80	8 low	
16	I81 - I88	8 high	Pulse Frequency (AI1)
	I89 - I96	8 low	
16	I97 - I104	8 high	Current Pulse Ratio (AI2)
	I105 - I112	8 low	
16	I113 - I120	8 high	Pulse Duty Cycle (AI3)
	I121 - I128	8 low	
16	I129 - I136	8 high	Gas Plasma Flow (AI4)
	I137 - I144	8 low	
16	I145 - I152	8 high	Gas Shield Flow (AI5)
	I153 - I160	8 low	
16	I161 - I168	8 high	High Speed CW (AI6)
	I169 - I176	8 low	
16	I177 - I184	8 high	Low Speed CW (AI7)
	I185 - I192	8 low	

7.2 Messaggi PROFIBUS dal Generatore al Controllo Robot

7.2 PROFIBUS messages from Power Source to Robot Control

7.2 Mensajes PROFIBUS del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01 - O08	8	Error Number (bit 7 - 0)
8	O09	1	Current Flow
	O10	1	Not used
	O11	1	Process Active
	O12	1	Main Current
	O13	1	Collision Protection
	O14	1	Power Source Ready
	O15	1	Communication Ready
	O16	1	Protocol Mode
8	O17 - O23	7	Not used
	O24	1	Hard Fault
8	O25	1	Pulse Sync
	O26 - O31	6	Not used
	O32	1	Pilot Arc
16	O33 - O40	8 high	Welding Voltage (AO0)
	O41 - O48	8 low	
16	O49 - O56	8 high	Welding Current (AO1)
	O57 - O64	8 low	
16	O65 - O72	8 high	Motor Current (AO2)
	O73 - O80	8 low	
16	O81 - O88	8 high	Motor Speed (AO3)
	O89 - O96	8 low	
16	O97 - O104	8 high	Plasma Gas Flow (AO4)
	O105 - O112	8 low	
16	O113 - O120	8 high	Shield Gas Flow (AO5)
	O121 - O128	8 low	
16	O129 - O136	8 high	Not used
	O137 - O144	8 low	
16	O145 - O152	8 high	Not used
	O153 - O160	8 low	

8 DeviceNet DATA PROCESS IMAGE ART 428.02

IT I bit sono ordinati dal meno significativo al più significativo.
 EN The bit are ordered from less to most significant.
 ES Los bit están ordenados de menos significativo hacia más significativo.

8.1 Messaggi DeviceNet dal Controllo Robot al Generatore

8.1 DeviceNet messages from Robot Control to Power Source

8.1 Mensajes DeviceNet del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit).
 EN The total data size is 24 bytes (192 bit).
 ES El tamaño total de los datos es 24 bytes (192 bit).

Field	n° bit	Size	Signal name
8	I01	1	Weld Start
	I02	1	Robot Ready
	I03 - I06	4	Operating Modes (bit 3 - 0)
	I07	1	Reserved (set to 0)
	I08	1	Protocol Mode
8	I09	1	Gas Test
	I10	1	Wire Inching
	I11	1	Wire Retract
	I12	1	Source Error Reset
	I13	1	Touch Sensing
	I14	1	Gas Test Shield
	I15	1	Not used
	I16	1	Not used
8	I17 - I24	8	Job Number (bit 7 - 0)
8	I25 - I31	7	Not used
	I32	1	Not used
8	I33 - I40	8	Analog Setpoint Enable (bit 7 - 0)
8	I41 - I48	8	Not used
8	I49 - I55	7	Not used
	I56	1	Pilot Arc Start
8	I57 - I64	8	Not used
16	I65 - I72	8 low	Current Setpoint (AI0)
	I73 - I80	8 high	
16	I81 - I88	8 low	Pulse Frequency (AI1)
	I89 - I96	8 high	
16	I97 - I104	8 low	Current Pulse Ratio (AI2)
	I105 - I112	8 high	
16	I113 - I120	8 low	Pulse Duty Cycle (AI3)
	I121 - I128	8 high	
16	I129 - I136	8 low	Gas Plasma Flow (AI4)
	I137 - I144	8 high	
16	I145 - I152	8 low	Gas Shield Flow (AI5)
	I153 - I160	8 high	
16	I161 - I168	8 low	High Speed CW (AI6)
	I169 - I176	8 high	
16	I177 - I184	8 low	Low Speed CW (AI7)
	I185 - I192	8 high	

8.2 Messaggi DeviceNet dal Generatore al Controllo Robot

8.2 DeviceNet messages from Power Source to Robot Control

8.2 Mensajes DeviceNet del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01	1	Current Flow
	O02	1	Not used
	O03	1	Process Active
	O04	1	Main Current
	O05	1	Collision Protection
	O06	1	Power Source Ready
	O07	1	Communication Ready
	O08	1	Protocol mode
8	O09 - O16	8	Error Number (bit 7 - 0)
8	O17	1	Pulse Sync
	O18 - O23	6	Not used
	O24	1	Pilot Arc
8	O25 - O31	7	Not used
	O32	1	Hard Fault
16	O33 - O40	8 low	Welding Voltage (AO0)
	O41 - O48	8 high	
16	O49 - O56	8 low	Welding Current (AO1)
	O57 - O64	8 high	
16	O65 - O72	8 low	Motor Current (AO2)
	O73 - O80	8 high	
16	O81 - O88	8 low	Motor Speed (AO3)
	O89 - O96	8 high	
16	O97 - O104	8 low	Plasma Gas Flow (AO4)
	O105 - O112	8 high	
16	O113 - O120	8 low	Shield Gas Flow (AO5)
	O121 - O128	8 high	
16	O129 - O136	8 low	Not used
	O137 - O144	8 high	
16	O145 - O152	8 low	Not used
	O153 - O160	8 high	

9 EtherCAT-EtherNet/IP-PROFINET DATA PROCESS IMAGE ART. 428.03 - 428.04- 428.05

IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto
EN The bit are ordered from less to most significant and each byte is delimited by a bold line
ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa

9.1 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Controllo Robot al Generatore

9.1 EtherCAT-EtherNet/IP-PROFINET messages from Robot Control to Power Source

9.1 Mensajes EtherCAT-EtherNet/IP PROFINET del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
EN The total data size is 24 bytes (192 bit)
ES El tamaño total de los datos es 24 bytes (192 bit)

data	n° bit	Size	Signal name
DIN0	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode bit (3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
DIN1	9	1	Gas Test
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
DIN2	17 - 24	8	Job Number (bit 7 - 0)
DIN3	25 - 31	7	Not used
	32	1	Not used
DIN4	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
DIN5	41 - 48	8	Not used
DIN6	49 - 55	7	Not used
	56	1	Pilot Arc Start
DIN7	57 - 64	8	Not used
AIN0	65 - 80	16	Current Setpoint (AI0)
AIN1	81 - 96	16	Pulse Frequency (AI1)
AIN2	97 - 112	16	Current Pulse Ratio (AI2)
AIN3	113 - 128	16	Pulse Duty Cycle (AI3)
AIN4	129 - 144	16	Gas Plasma Flow (AI4)
AIN5	145 - 160	16	Gas Shield Flow (AI5)
AIN6	161 - 176	16	High Speed CW (AI6)
AIN7	177 - 192	16	Low Speed CW (AI7)

9.2 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Generatore al Controllo Robot
9.2 EtherCAT-EtherNet/IP-PROFINET messages from Power Source to Robot Control
9.2 Mensajes EtherCAT-EtherNet/IP-PROFINET del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)
 EN The total data size is 20 bytes (160 bit)
 ES El tamaño total de los datos es 20 bytes (160 bit)

data	n° bit	Size	Signal name
DOUT0	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
DOUT1	9 - 16	8	Error Number (bit 7 - 0)
DOUT2	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
DOUT3	25 - 31	7	Not used
	32	1	Hard Fault
AOUT0	33 - 48	16	Welding Voltage (AO0)
AOUT1	49 - 64	16	Welding Current (AO1)
AOUT2	65 - 80	16	Motor Current (AO2)
AOUT3	81 - 96	16	Motor Speed (AO3)
AOUT4	97 - 112	16	Plasma Gas Flow (AO4)
AOUT5	113 - 128	16	Shield Gas Flow (AO5)
AOUT6	129 - 144	16	Not used
AOUT7	145 - 160	16	Not used

10

MODELLO DI SEGNALI

10

SIGNALS PATTERN

10

MODELO DE SEÑALES

Digital Inputs for Operating Mode 2 (JOB Mode)

Job Number
(bit 0 – 7)

Digital Inputs
(Robot → Power Source)

Robot Ready

Weld Start

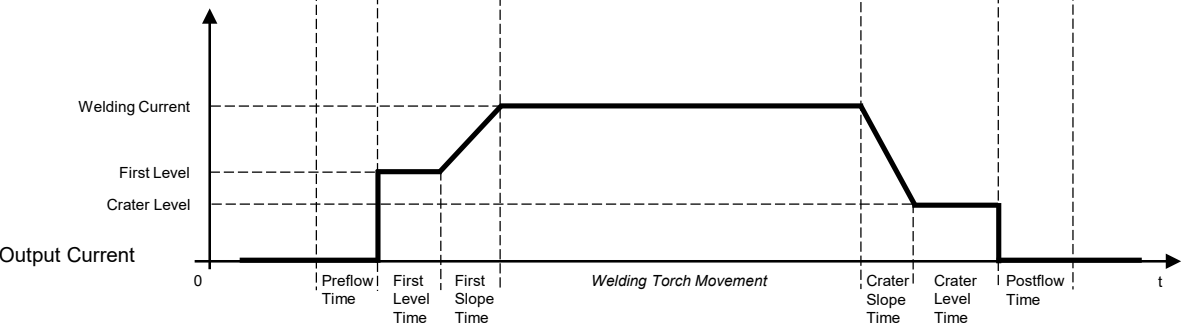
Digital Outputs
(Power Source → Robot)

Power Source Ready

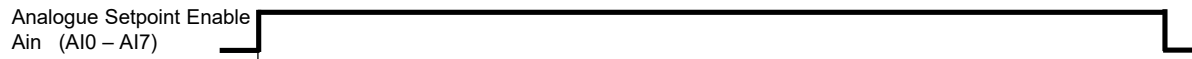
Process Active

Current Flow

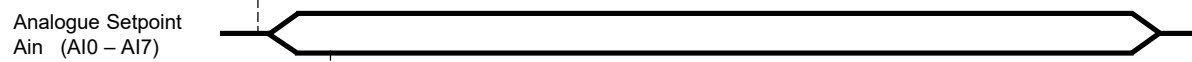
Main Current



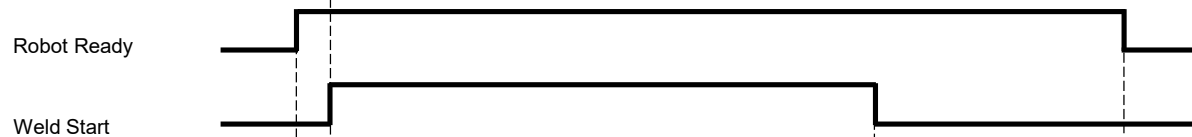
Digital Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



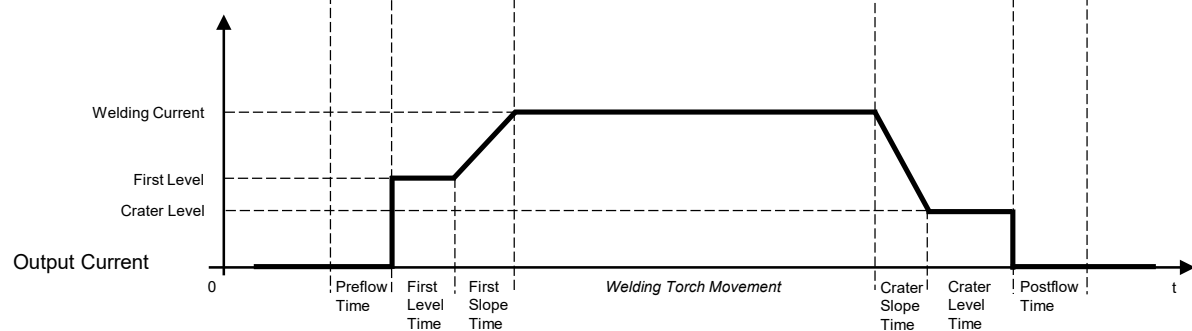
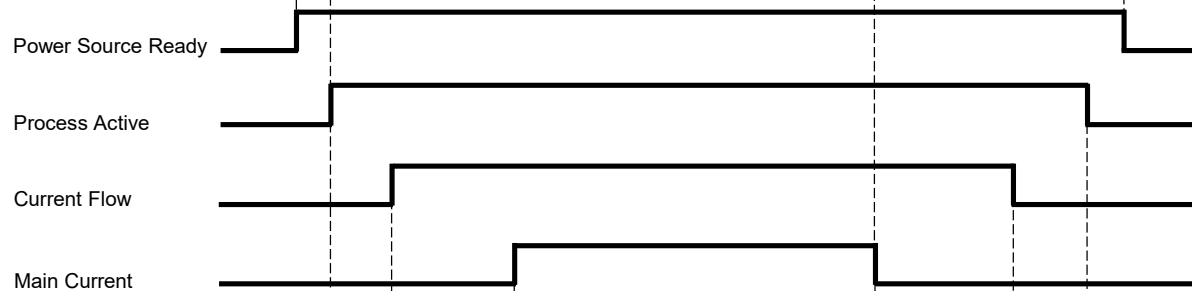
Analogue Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



Digital Inputs (Robot → Power Source)



Digital Outputs (Power Source → Robot)





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ES PROTOCOLOS DIGITALES PARA SISTEMAS AUTOMATIZADOS WIN TIG CEBORA
Traducción de las instrucciones originales

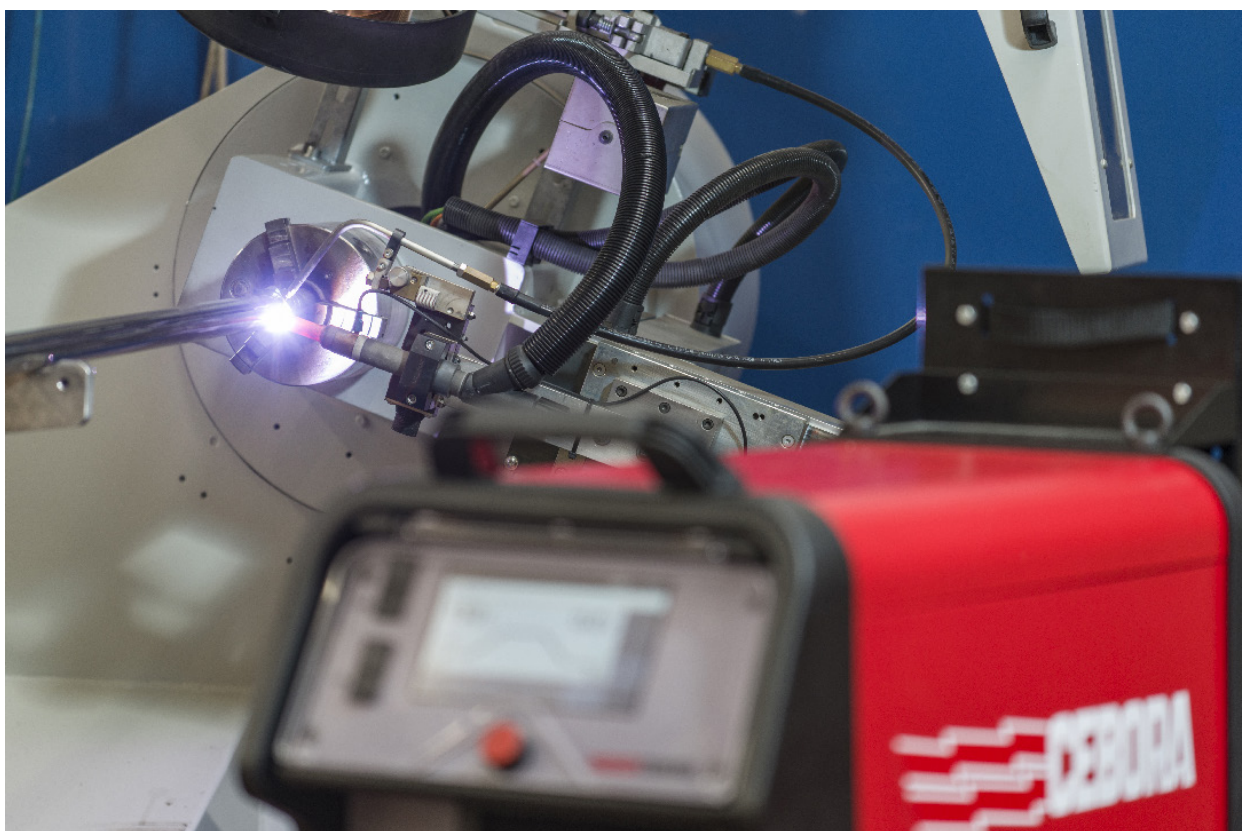


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1 INTRODUCCIÓN

1.1 Este manual

Este manual presenta la configuración de los mensajes de los buses de campo (Data Process Image) adoptados en los sistemas de soldadura automatizados TIG Cebora, incluidos Plasma Welding.

Se indican y describen todas las señales intercambiadas entre el sistema de soldadura TIG Cebora y el control del sistema robotizado (Robot Control).

Este manual ha de considerarse parte integrante de los manuales de instrucciones de cada uno de los aparatos que componen el sistema de soldadura Cebora, por tanto podrá requerirse la consulta simultánea de los mismos.

En Fig. 1 se presenta un ejemplo de sistema robot Cebora.

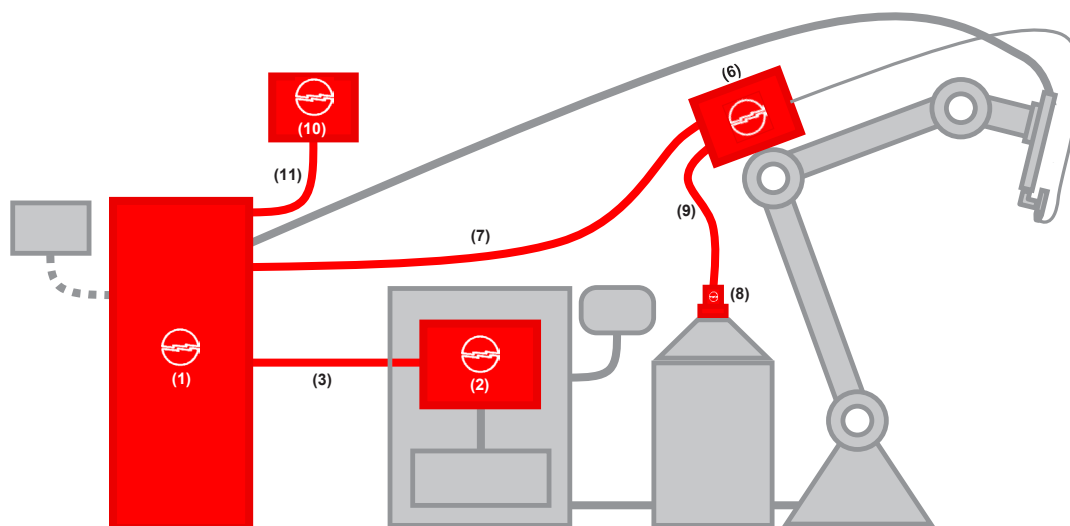


Fig. 1

Posición	Descripción	Artículo	Opcional
1	Generador serie WIN TIG Robot	380-381- 394-395- 396.80	-
2	Robot Interfaz	428.XX, 448	(X)
3	Conexión Generador - Robot Interfaz	2063	-
6	Carro arrastrahilo Robot	1649	X
7	Conexión generador - Carro arrastrahilo Robot	2067	X
8	Portabobinas/ acoplamiento rápido	121/173	X
9	Envoltura guíahilos	1935	X
10	Panel de control remoto TIG	438	X
11	Conexión Generador - Panel de control remoto TIG	2065	X

1.2 Buses de campo tratados en este manual

- CANopen DS401
- DeviceNet
- Profibus DP-V1
- EtherCAT
- EtherNet/IP
- PROFINET

Para cada bus de campo Cebora suministra el correspondiente archivo de configuración.

Al final del manual (apart. 6 ÷ 9) aparecen las tablas de los mensajes intercambiados entre generador y control robot (Data Process Image), subdivididas según tipo de bus de campo. La Data Process Image está compuesta de la siguiente forma:

	INPUT	OUTPUT
Digital [byte]	8	4
Analog [word]	8	8
Total Size [byte]	24	20

2 SEÑALES DIGITALES DESDE CONTROL ROBOT A GENERADOR (INPUT)

Lista de señales digitales y analógicas en entrada al generador.

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Weld Start	X	X
2	1	Robot Ready	X	X
3 - 6	4	Operating Modes (bit 3 - 0)	X	X
7	1	Reserved (set to 0)	-	0
8	1	Protocol Mode	-	X
9	1	Gas Test/Gas Test Plasma	X	X
10	1	Wire Inching	X	X
11	1	Wire Retract	X	X
12	1	Source Error Reset	X	X
13	1	Touch Sensing	X	X
14	1	Gas Test Shield	X	X
15	1	Not used	-	-
16	1	Not used	-	-
17 - 23	7	Job Number (bit 6 - 0)	X	X
24	1	Job Number (bit 7)	-	X
25 - 31	7	Not used	-	-
32	1	Not used	-	-
33	1	Analog Setpoint Enable 0	-	X
34	1	Analog Setpoint Enable 1	-	X
35	1	Analog Setpoint Enable 2	-	X
36	1	Analog Setpoint Enable 3	-	X
37	1	Analog Setpoint Enable 4	-	X
38	1	Analog Setpoint Enable 5	-	X
39	1	Analog Setpoint Enable 6	-	X
40	1	Analog Setpoint Enable 7	-	X
41 - 48	8	Not used	-	-
49 - 55	7	Not used	-	-
56	1	Pilot Arc Start	X	X
57 - 64	8	Not used	-	-
65 - 80	16	Current Setpoint (AI0)	X	X
81 - 96	16	Pulse Frequency (AI1)	X	X
97 - 112	16	Current Pulse Ratio (AI2)	-	X
113 - 128	16	Pulse Duty Cycle (AI3)	-	X
129 - 144	16	Gas Plasma Flow (AI4)	-	X
145 - 160	16	Gas Shield Flow (AI5)	-	X
161 - 176	16	High speed CW (AI6)	-	X
177 - 192	16	Low speed CW (AI7)	-	X

2.1 Weld Start

El bit *Weld Start* manda el encendido y apagado del arco de soldadura.

Weld Start = activo alto

Weld Start	Descripción
0 → 1	El control robot manda el encendido del arco. Esta señal es aceptada si la señal de <i>Power Source Ready</i> está activada.
1 → 0	El control robot manda el apagado del arco.

NOTA

En modalidad Robot con el bit Robot Ready activo, el generador es automáticamente programado en modalidad 2-tiempos.

2.2 Robot Ready

El bit *Robot Ready* habilita la comunicación entre generador y control robot; una vez que la comunicación ha sido establecida, el generador queda listo para enviar y recibir los datos desde el CNC externo.

Si el bit está programado en cero, el generador permanece en el estado de alarma *WARNING 90 CNC no listo* y el icono en la barra de estado del display parpadea.



Si no está activado el bit *Robot Ready*, tampoco se adquiere alguna señal digital o analógica ni están activadas las salidas del generador.

Robot Ready = Activo alto

Robot Ready	Descripción
0	El control robot no está listo
1	El control robot está listo para el intercambio de datos con el exterior

ADVERTENCIA:

El bit *Robot Ready* no puede ser utilizado para efectuar una parada de emergencia. Para esta función hay un kit específico (Art. 449).

2.3 Operating Mode (bit 3 - 0)

La selección de la modalidad operativa (Operating Mode) del generador se efectúa mediante 4 bits:

Operating Mode					MIG
Bit 3	Bit 2	Bit 1	Bit 0	Mode	
0	0	0	0	0	DC
0	0	0	1	1	XP
0	0	1	0	2	JOB MODE
0	0	1	1	3	PAR. SEL. INT.
0	1	0	0	4	AC
0	1	0	1	5	MIX
0	1	1	0	6	/
0	1	1	1	7	/
1	0	0	0	8	DC PULSE
1	0	0	1	9	PULSE XP
1	0	1	0	10	/
1	0	1	1	11	/
1	1	0	0	12	AC PULSE
1	1	0	1	13	MIX PULSE
1	1	1	0	14	/
1	1	1	1	15	/

Tabla 1

2.3.1 Job Mode (Mode 2)

En esta modalidad es posible seleccionar un Job precedentemente memorizado en el generador. En la máquina es posible memorizar hasta 99 Jobs (véase apartado 2.10).

Job Mode = Activo alto.

2.3.2 Parameter Selection Internal (Mode 3)

La modalidad *Parameter Selection Internal* habilita la selección de los parámetros de soldadura a través del panel de control del generador. En esta modalidad es posible guardar los Jobs, los cuales podrán ser sucesivamente convocados mediante el respectivo número identificativo en la modalidad *Job mode*.

2.3.3 Modo TIG (Modo 0, 1, 4, 5, 8, 9, 12, 13)

El proceso es programado en TIG.

Con esta programación son tomadas en consideración las señales digitales y analógicas. En esta modalidad son aceptadas las entradas analógicas AI0...AI7.

2.4 Protocol Mode

El bit *Protocol Mode* permite representar las variables de los setpoints analógicos (Analog Set Point) y de las medidas analógicas (Analog Measure) de dos maneras diferentes, transformando de todas formas en enteros las variables que admiten valores decimales, mediante un factor multiplicador 10 (por ej. 9.9 se considera como 99).

Protocol Mode	Descripción
0	Cada señal analógica (setpoint o medida) es transformada en un valor numérico y redeterminada entre los valores mínimo y máximo utilizando un campo de 16-bits sin signo (0 ÷ 65535)
1	Las señales analógicas no se someten a ninguna conversión, por tanto se visualizan directamente. El valor numérico es representado directamente en binario con un campo de 16-bits con signo.

2.5 Gas Test

La señal opcional, *Gas Test* activa la electroválvula del gas. También puede usarse para un gas Pre-flow adicional durante un posicionamiento. *Gas Test* = Activo alto.

Gas Test	Descripción
0	Válvula gas cerrada
1	Válvula gas abierta

Con el proceso de soldadura activo, los tiempos de gas Pre-flow y Post-flow son controlados directamente por el generador. Con el accesorio Plasma Welding este ingreso esta entrada activa la válvula de gas plasma.

2.6 Wire Inching

La señal *Wire Inching* acciona el avance del hilo de soldadura sin salida de gas y sin que se genere corriente. La velocidad de avance se programa en el panel del generador, mediante el menú Test hilo. *Wire Inching* = Activo alto.

Wire Inching	Descripción
0	Ninguna operación
1	Avance hilo

ADVERTENCIA:

Mantener la antorcha lejos del rostro y del cuerpo para evitar el riesgo de sufrir heridas debido a la salida del hilo de soldadura.

2.7 Wire Retract

La señal *Wire Retract* acciona el retroceso del hilo por una longitud determinada, tras lo cual se para el motor. La velocidad de retroceso del hilo está fijada en 1,0 m/min. *Wire Retract* = Activo alto.

Wire Retract	Descripción
0	Ninguna operación
1	Retiro hilo

2.8 Source Error Reset

La señal *Source Error Reset* activada en el frente 0→1 elimina solo los errores rectificables (Warning), para los cuales no resulta activado (0) el bit de *Hard Fault*.

Source Error Reset	Descripción
0,1,1→0	Ninguna operación
0→1	Reseteo de un error rectificable. (Warning)

Para la lista de los errores rectificables (Warning) véase el manual de uso del generador WIN TIG.

2.9 Touch Sensing

La señal *Touch Sensing* cumple la función de identificar el cortocircuito del hilo de soldadura con la pieza y pasar la información al control robot mediante la señal Current Flow, con un retraso máximo de 10 ms. *Touch Sensing* = Activo alto

Touch Sensing	Descripción
0	Ninguna operación
1	Procedimiento de Touch Sensing activado

NOTA

La señal *Current Flow* se envía a la salida durante 0,2 s más que la duración del cortocircuito.

Durante todo el tiempo de activación de la señal *Touch Sensing* no es posible efectuar la soldadura.

Si la señal de *Touch Sensing* se activa durante la soldadura, se ignora el evento y no se interrumpe el proceso de soldadura en acto.

2.10 Gas Test Shield

Disponible solo en modo P.W. realiza el test de gas de protección

Gas_Shield_Test= activo alto

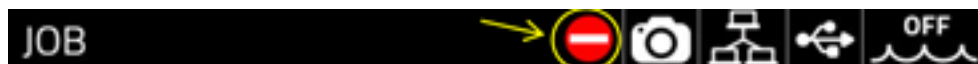
Gas Shield Test	Descripción
0	Válvula cerrada
1	Válvula abierta

2.11 Job Number (bit 7 - 0)

Este byte es válido si está programado el modo de funcionamiento Job Mode (apart. 2.3) y selecciona el número de Job a ejecutar.

Job Number	Descripción
0	Job seleccionado de modo manual desde el panel del generador
1 - 99	Job válido.
100 - 255	Job no válido

Si desde el control robot se selecciona una posición de memoria vacía o no válida, en la barra de estado del panel principal se visualiza el siguiente icono:



Si en el menú de las programaciones del generador la opción Permitir **Modificación Job** está:

- **OFF** entonces ningún parámetro de los jobs seleccionados puede ser modificado,
- **ON** algunos de los parámetros de los Jobs pueden variarse run-time bien desde el panel de control del generador
- **ON ROBOT** algunos de los parámetros de los Jobs pueden variarse run-time bien desde el panel de control del generador

2.12 Welding Simulation

Modalidad de funcionamiento no implementada.

2.13 Habilitación Entradas Analógicas

Habilitación de las entradas analógicas AI0-AI7.

Cada bit corresponde a la respectiva entrada analógica según se indica en la siguiente tabla:

Analog Setpoint Enable bit (Function)	Valor=0	Valor=1
Analog Setpoint Enable AI0 (Current Setpoint)	Inhabilitado	Habilitado
Analog Setpoint Enable AI1 (Pulse Frequency)	Inhabilitado	Habilitado
Analog Setpoint Enable AI2 (Current Pulse Ratio)	Inhabilitado	Habilitado
Analog Setpoint Enable AI3 (Pulse Duty Cycle)	Inhabilitado	Habilitado
Analog Setpoint Enable AI4 (Gas Plasma Flow)	Inhabilitado	Habilitado
Analog Setpoint Enable AI5 (Gas Shield Flow)	Inhabilitado	Habilitado
Analog Setpoint Enable AI6 (High Speed CW)	Inhabilitado	Habilitado
Analog Setpoint Enable AI7 (Low Speed CW)	Inhabilitado	Habilitado

2.14 Pilot Arc Start

Es el mando de encendido del arco piloto en el proceso plasma welding.

En el sistema debe estar presente la consola plasma, programada para el funcionamiento automático, es decir, gestionada por el control robot: véase el manual de instrucciones de la consola digital gas Art 465.01.

Función *Pilot Arc Start* = activo alto.

Pilot Arc Start	Descripción
0	Arco piloto apagado
1	Encendido arco piloto; si dentro de 3 s no hay presencia de corriente de arco piloto, ese ingreso es ignorado por el generador, aunque esté aún activo.

3 SEÑALES ANALÓGICAS DESDE CONTROL ROBOT A GENERADOR (INPUT)

El generador está en condiciones de gestionar 4 entradas analógicas para las regulaciones de los parámetros de soldadura en tiempo real.

Cada entrada analógica está compuesta por 16 bits. El formato de cada analógica depende del bit Protocol Mode.

Estas entradas no son efectivas solo en las modalidades de funcionamiento Mode 3 (Parameter selection internal) y Mode 2 (Job Mode: véase la excepción descrita en el párrafo 2.10).

3.1 Analog Setpoint (AI0)

Analog Setpoint AI0 = *Current Setpoint*.

Regulación corriente de soldadura.

AI0	Valor [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	500.0	0xFFFF	0x01F4

3.2 Analog Setpoint (AI1)

Analog Setpoint AI1 = *Pulse Frequency*.

Regulación de frecuencia en TIG pulsado.

AI1	Valor [Hz]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	2500	0xFFFF	0x09C4

3.3 Analog Setpoint (AI2)

Analog Setpoint AI2 = *Current Pulse Ratio*.

Regulación de amplitud de la corriente baja en TIG pulsado en porcentaje respectivamente a la corriente principal

AI2	Valor [%]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.4 Analog Setpoint (AI3)

Analog Setpoint AI3 = *Pulse Duty Cycle*.

Regulación duty-cycle en TIG pulsado.

AI3	Valor [m/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

3.5 Analog Setpoint (AI4)

Analog Setpoint AI4 = *Gas Plasma Flow*.

Regulación del flujo de gas plasma durante la soldadura y es definido por los siguientes valores de plena escala:

AI4	Valor [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

3.6 Analog Setpoint (AI5)

Analog Setpoint AI5 = *Gas Shield Flow*.

Regulación del flujo de gas de pantalla durante la soldadura y es definido por los siguientes valores de plena escala:

AI5	Valor [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x0120

3.7 Analog Setpoint (AI6)

Analog Setpoint AI6 = *High Speed CW*.

Esta regulación se refiere a la velocidad “alta” del motor durante el proceso “hilo frío” y es definida por los siguientes valores de plena escala:

AI6	Valor [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

3.8 Analog Setpoint (AI7)

Analog Setpoint AI7 = *Low Speed CW*.

Esta regulación se refiere a la velocidad baja del motor durante el proceso “hilo frío” y es definida por los siguientes valores de plena escala:

AI7	Valor [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	+12.5	0xFFFF	0x007D

4 SEÑALES DIGITALES DEL GENERADOR A CONTROL ROBOT (OUTPUT)

En la tabla se indican las señales digitales y analógicas en salida desde el generador de soldadura

n° bit	Size [bit]	Name	Analog interface Art. 448	Digital interface Art. 428.XX
1	1	Current Flow	X	X
2	1	Not used	-	-
3	1	Process Active	X	X
4	1	Main Current	X	X
5	1	Torch Collision Protection	-	X
6	1	Power Source Ready	X	X
7	1	Communication Ready	X	X
8	1	Protocol Mode	-	X
9 - 16	8	Error Number (bit 7 - 0)	-	X
17	1	Pulse Sync	X	X
18 - 23	6	Not used	-	-
24	1	Pilot Arc	X	X
25 - 31	7	Not used	-	-
32	1	Hard Fault	-	X
33 - 48	16	Welding Voltage (AO0)	X	X
49 - 64	16	Welding Current (AO1)	X	X
65 - 80	16	Motor Current (AO2)	-	X
81 - 96	16	Motor Speed (AO3)	-	X
97 - 112	16	Gas Plasma Flow (AO4)	-	X
113 - 128	16	Gas Shield Flow (AO5)	-	X
129 - 144	16	Not used	-	-
145 - 162	16	Not used	-	-

NOTA

Si la conexión entre generador e interfaz robot está interrumpida, todas las señales digitales y analógicas desde la interfaz robot hacia el control robot quedan programadas en "0".

4.1 Current Flow

Current Flow es activado apenas la corriente de soldadura comienza a circular en la pieza por soldar.

Current Flow = activo alto

Current flow	Descripción
0	No hay presencia de corriente en la pieza de soldadura
1	Circula corriente en la pieza de soldadura.

4.2 Process Active

Desde el inicio del gas pre-flow hasta el fin del gas post-flow, el generador activa la señal *Process Active*.

La señal *Process Active* sirve para garantizar la protección gaseosa ideal del baño de soldadura, asegurando que el robot permanezca en medida suficientemente prolongada al principio y al fin del cordón de soldadura.

Process Active = activo alto.

Process Active	Descripción
0	Proceso de soldadura inactivo
1	Proceso de soldadura en acto

4.3 Main Current

La señal *Main Current* permanece activa durante el tramo de soldadura con corriente suministrada igual al valor de setpoint programado, excluidas por lo tanto las fases de activación arco, corriente inicial, rampas de subida y bajada y corriente de cráter.

Main Current = activo alto.

Main Current	Descripción
0	Corriente circulante en la pieza por soldar diferente de la corriente de setpoint
1	Corriente circulante en la pieza por soldar igual a la corriente de setpoint.

4.4 Collision Protection

El robot puede dotarse de un sensor de colisión que, en caso de impacto de la antorcha de soldadura, pone baja la señal *Collision Protection*. En ese caso, el control robot para inmediatamente el robot e interrumpe el proceso de soldadura desactivando la señal Robot Ready.

Collision Protection = activo bajo.

Collision protection	Descripción
0	Colisión entre antorcha y pieza
1	No detectada colisión entre antorcha y pieza

4.5 Power Source Ready

La señal *Power Source Ready* se activa cuando el generador está listo para soldar.

Apenas se verifica una situación de error en el generador o bien la señal Robot Ready es desactivada, la señal *Power Source Ready* es desactivada inmediatamente.

Power Source Ready = activo alto.

Power Source Ready	Descripción
0	El generador no está habilitado para soldar.
1	Ningún error detectado: el generador está listo para ejecutar el proceso de soldadura.

4.6 Communication Ready

Activado indica el funcionamiento correcto de la comunicación entre la interfaz robot y el generador.

Cuando no está activado, indica ausencia de comunicación entre la interfaz robot y el generador.

Communication Ready = activo alto

Communication Ready	Descripción
0	El generador no está listo para el intercambio de los datos (por ej. se encuentra en estado de boot)
1	El generador está listo para el intercambio de los datos.

4.7 Error Number (bit 7 - 0)

La secuencia de bits comunica el código error del generador (véase el apartado “Códigos Error” en el Manual de Instrucciones del generador).

Error Number	Descripción
0	El generador funciona correctamente.
1 - 255	Identifica el código del error detectado.

4.8 Pulse Sync

La señal *Pulse Sync* está activada y sincronizada con cada impulso de “corriente alta”, solo cuando está programado el proceso TIG Pulsado con una frecuencia de pulsación igual o inferior a 10 Hz.

Si el proceso “TIG Pulsado” está programado, la señal *Pulse Sync* está activada:

- con frecuencia de pulsación igual o inferior a 10 Hz, la salida “*Pulse Sync*” sigue el estado del impulso “alto” de corriente;
- con frecuencia de pulsación superior a 10 Hz la salida *Pulse Sync* permanece fija a nivel alto.

Si el proceso Tig Pulsado no está programado, la señal *Pulse Sync* es mantenida a nivel bajo.

Pulse Sync = activo alto.

Pulse Sync	Descripción
0	Impulso de corriente bajo
1	Impulso de corriente alto

4.9 Pilot Arc

Señala el encendido del arco piloto en el proceso plasma welding, como efecto del mando Pilot Arc (apart. 2.24).

Pilot Arc = activo alto.

Pilot Arc	Descripción
0	Arco piloto apagado
1	Arco piloto encendido.

4.10 Hard Fault

La señal va alta cuando se verifica un error no rectificable (véase también apart. 2.8 Source error reset y apart. 4.7 Error Number) mientras que permanece baja en ausencia de error no rectificable o bien en presencia de warning.

Hard fault = activo alto.

Hard Fault	Descripción
0	Ningún error rectificable presente
1	Se ha verificado un error grave y es necesario apagar el generador de soldadura.

5 SEÑALES ANALÓGICAS DESDE GENERADOR A CONTROL ROBOT (OUTPUT)

El generador está en condiciones de gestionar 4 salidas analógicas para las regulaciones de los parámetros de soldadura en tiempo real. Cada salida analógica está compuesta por 16 bits. El formato de cada analógica depende del bit *Protocol Mode*.

5.1 Analog Measure (AO0)

Analog Measure (AO0) = *Welding Voltage*.

Es la señal relativa a la tensión de salida del generador, definida mediante los siguientes valores de fondo escala:

AO0	Valor [V]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	100.0	0xFFFF	0x0064

5.2 Analog Measure (AO1)

Analog Measure (AO1) = *Welding Current*.

Medida de la tensión de salida del generador, definida mediante los siguientes valores de fondo escala:

AO1	Valor [A]	Protocol mode=0	Protocol mode=1
Min	0	0x0000	0x0000
Max	1000	0xFFFF	0x03E8

5.3 Analog Measure (AO2)

Analog Measure (AO2) = *Motor Current*.

Medida de la corriente absorbida por el motor de arrastre hilo, definida por los siguientes valores de fondo escala:

AO2	Valor [A]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	5.0	0xFFFF	0x0032

5.4 Analog Measure (AO3)

Analog Measure (AO3) = *Motor Speed*.

Medida de la velocidad del hilo de soldadura, definida mediante los siguientes valores de fondo escala:

AO3	Valor [m/min]	Protocol mode=0	Protocol mode=1
Min	-12.5	0x0000	0xFF83
Max	12.5	0xFFFF	0x007D

5.5 Analog Measure (AO4)

Analog Measure (AO4) = *Gas Plasma Flow*.

Medida de flujo de gas plasma en la consola, definida mediante los siguientes valores de plena escala:

AO4	Valor [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	10.0	0xFFFF	0x0064

5.6 Analog Measure (AO5)

Analog Measure (AO5) = *Gas Shield Flow*.

Medida de flujo de gas protector, definida mediante los siguientes valores de plena escala:

AO5	Valor [l/min]	Protocol mode=0	Protocol mode=1
Min	0.0	0x0000	0x0000
Max	30.0	0xFFFF	0x012C

6 CANopen DATA PROCESS IMAGE

- IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto.
 EN The bit are ordered from less to most significant and each byte is delimited by a bold line.
 ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa.

6.1 Messaggi CANopen dal Controllo Robot al Generatore

6.1 CANopen messages from Robot Control to Power Source

6.1 Mensajes CANopen del Control Robot al Generador

- IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit)
 ES El tamaño total de los datos es 24 bytes (192 bit)

COBID = 0x200	n° bit	Size	Signal name
	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode (bit 3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
	9	1	Gas Test Plasma
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
	17 - 24	8	Job Number (bit 7 - 0)
	25 - 31	7	Not used
	32	1	Not used
	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
	41 - 48	8	Not used
	49 - 55	7	Not used
	56	1	Pilot Arc Start
	57 - 64	8	Not used

COBID = 0x300	n° bit	Size	Signal name
	1 - 16	16	Current Setpoint (AI0)
	17 - 32	16	Pulse Frequency (AI1)
	33 - 48	16	Current Pulse Ratio (AI2)
	49 - 64	16	Pulse Duty Cycle (AI3)

COBID = 0x400	n° bit	Size	Signal name
	1 - 16	16	Gas Plasma Flow (AI4)
	17 - 32	16	Gas Shield Flow (AI5)
	33 - 48	16	High Speed CW (AI6)
	49 - 64	16	Low Speed CW (AI7)

6.2 Messaggi CANopen dal Generatore al Controllo Robot

6.2 CANopen messages from Power Source to Robot Control

6.2 Mensajes CANopen del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

COBID = 0x180	n° bit	Size	Signal name
	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
	9 - 16	8	Error Number (bit 7 - 0)
	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
	25 - 31	7	Not used
	32	1	Hard Fault

COBID = 0x280	n° bit	Size	Signal name
	1 - 16	16	Welding Voltage (AO0)
	17 - 32	16	Welding Current (AO1)
	33 - 48	16	Motor Current (AO2)
	49 - 64	16	Motor Speed (AO3)

COBID = 0x380	n° bit	Size	Signal name
	1 - 16	16	Plasma Gas flow (AO4)
	17 - 32	16	Shield Gas flow (AO5)
	33 - 48	16	Not used
	49 - 64	16	Not used

7 PROFIBUS DATA PROCESS IMAGE ART.428.01

IT I bit sono ordinati dal meno significativo al più significativo.
 EN The bit are ordered from less to most significant.
 ES Los bit están ordenados de menos significativo hacia más significativo.

7.1 Messaggi PROFIBUS dal Controllo Robot al Generatore

7.1 PROFIBUS messages from Robot Control to Power Source

7.1 Mensajes PROFIBUS del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit)
 ES El tamaño total de los datos es 24 bytes (192 bit)

Field	n° bit	Size	Signal name
8	I01	1	Gas Test
	I02	1	Wire Inching
	I03	1	Wire Retract
	I04	1	Source Error Reset
	I05	1	Touch Sensing
	I06	1	Gas Test Shield
	I07	1	Not used
	I08	1	Not used
8	I09	1	Weld Start
	I10	1	Robot Ready
	I11 - I14	4	Operating Mode (bit 3- 0)
	I15	1	Reserved (set to 0)
	I16	1	Protocol Mode
8	I17 - I23	7	Not used
	I24	1	Not used
8	I25 - I32	8	Job number
8	I33 - I40	8	Not used
8	I41 - I48	8	Analog Setpoint Enable (bit 7 - 0)
8	I49 - I56	8	Not used
8	I57 - I63	7	Not used
	I64	1	Pilot Arc Start
16	I65 - I72	8 high	Current Setpoint (AI0)
	I73 - I80	8 low	
16	I81 - I88	8 high	Pulse Frequency (AI1)
	I89 - I96	8 low	
16	I97 - I104	8 high	Current Pulse Ratio (AI2)
	I105 - I112	8 low	
16	I113 - I120	8 high	Pulse Duty Cycle (AI3)
	I121 - I128	8 low	
16	I129 - I136	8 high	Gas Plasma Flow (AI4)
	I137 - I144	8 low	
16	I145 - I152	8 high	Gas Shield Flow (AI5)
	I153 - I160	8 low	
16	I161 - I168	8 high	High Speed CW (AI6)
	I169 - I176	8 low	
16	I177 - I184	8 high	Low Speed CW (AI7)
	I185 - I192	8 low	

7.2 Messaggi PROFIBUS dal Generatore al Controllo Robot

7.2 PROFIBUS messages from Power Source to Robot Control

7.2 Mensajes Profibus del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)
 EN The total data size is 20 bytes (160 bit)
 ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01 - O08	8	Error Number (bit 7 - 0)
8	O09	1	Current Flow
	O10	1	Not used
	O11	1	Process Active
	O12	1	Main Current
	O13	1	Collision Protection
	O14	1	Power Source Ready
	O15	1	Communication Ready
	O16	1	Protocol Mode
8	O17 - O23	7	Not used
	O24	1	Hard Fault
8	O25	1	Pulse Sync
	O26 - O31	6	Not used
	O32	1	Pilot Arc
16	O33 - O40	8 high	Welding Voltage (AO0)
	O41 - O48	8 low	
16	O49 - O56	8 high	Welding Current (AO1)
	O57 - O64	8 low	
16	O65 - O72	8 high	Motor Current (AO2)
	O73 - O80	8 low	
16	O81 - O88	8 high	Motor Speed (AO3)
	O89 - O96	8 low	
16	O97 - O104	8 high	Plasma Gas Flow (AO4)
	O105 - O112	8 low	
16	O113 - O120	8 high	Shield Gas flow (AO5)
	O121 - O128	8 low	
16	O129 - O136	8 high	Not used
	O137 - O144	8 low	
16	O145 - O152	8 high	Not used
	O153 - O160	8 low	

8 DeviceNet DATA PROCESS IMAGE ART 428.02

ITI I bit sono ordinati dal meno significativo al più significativo.
 EN The bit are ordered from less to most significant.
 ES Los bit están ordenados de menos significativo hacia más significativo.

8.1 Messaggi DeviceNet dal Controllo Robot al Generatore

8.1 DeviceNet messages from Robot Control to Power Source

8.1 Mensajes DeviceNet del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
 EN The total data size is 24 bytes (192 bit)
 ES El tamaño total de los datos es 24 bytes (192 bit)

Field	n° bit	Size	Signal name
8	I01	1	Weld Start
	I02	1	Robot Ready
	I03 - I06	4	Operating Modes (bit 3 - 0)
	I07	1	Reserved (set to 0)
	I08	1	Protocol Mode
8	I09	1	Gas Test
	I10	1	Wire Inching
	I11	1	Wire Retract
	I12	1	Source Error Reset
	I13	1	Touch Sensing
	I14	1	Gas Test Shield
	I15	1	Not used
	I16	1	Not used
8	I17 - I24	8	Job Number (bit 7 - 0)
8	I25 - I31	7	Not used
	I32	1	Not used
8	I33 - I40	8	Analog Setpoint Enable (bit 7 - 0)
8	I41 - I48	8	Not used
8	I49 - I55	7	Not used
	I56	1	Pilot Arc Start
8	I57 - I64	8	Not used
16	I65 - I72	8 low	Current Setpoint (AI0)
	I73 - I80	8 high	
16	I81 - I88	8 low	Pulse Frequency (AI1)
	I89 - I96	8 high	
16	I97 - I104	8 low	Current Pulse Ratio (AI2)
	I105 - I112	8 high	
16	I113 - I120	8 low	Pulse Duty Cycle (AI3)
	I121 - I128	8 high	
16	I129 - I136	8 low	Gas Plasma Flow (AI4)
	I137 - I144	8 high	
16	I145 - I152	8 low	Gas Shield Flow (AI5)
	I153 - I160	8 high	
16	I161 - I168	8 low	High Speed CW (AI6)
	I169 - I176	8 high	
16	I177 - I184	8 low	Low Speed CW (AI7)
	I185 - I192	8 high	

8.2 Messaggi DeviceNet dal Generatore al Controllo Robot

8.2 DeviceNet messages from Power Source to Robot Control

8.2 Mensajes DeviceNet del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)

EN The total data size is 20 bytes (160 bit)

ES El tamaño total de los datos es 20 bytes (160 bit)

Field	n° bit	Size	Signal name
8	O01	1	Current Flow
	O02	1	Not used
	O03	1	Process Active
	O04	1	Main Current
	O05	1	Collision Protection
	O06	1	Power Source Ready
	O07	1	Communication Ready
	O08	1	Protocol mode
8	O09 - O16	8	Error Number (bit 7 - 0)
8	O17	1	Pulse Sync
	O18 - O23	6	Not used
	O24	1	Pilot Arc
8	O25 - O31	7	Not used
	O32	1	Hard Fault
16	O33 - O40	8 low	Welding Voltage (AO0)
	O41 - O48	8 high	
16	O49 - O56	8 low	Welding Current (AO1)
	O57 - O64	8 high	
16	O65 - O72	8 low	Motor Current (AO2)
	O73 - O80	8 high	
16	O81 - O88	8 low	Motor Speed (AO3)
	O89 - O96	8 high	
16	O97 - O104	8 low	Plasma Gas Flow (AO4)
	O105 - O112	8 high	
16	O113 - O120	8 low	Shield Gas Flow (AO5)
	O121 - O128	8 high	
16	O129 - O136	8 low	Not used
	O137 - O144	8 high	
16	O145 - O152	8 low	Not used
	O153 - O160	8 high	

9 EtherCAT-EtherNet/IP-PROFINET DATA PROCESS IMAGE ART. 428.03 - 428.04 - 428.05

IT I bit sono ordinati dal meno significativo al più significativo e ogni byte è delimitato da linea in grassetto
EN The bit are ordered from less to most significant and each byte is delimited by a bold line
ES Los bit están ordenados de menos significativo hacia más significativo y cada byte se delimita de línea gruesa

9.1 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Controllo Robot al Generatore

9.1 EtherCAT-EtherNet/IP-PROFINET messages from Robot Control to Power Source

9.1 Mensajes EtherCAT-EtherNet/IP-PROFINET del Control Robot al Generador

IT La dimensione totale dei dati è 24 byte (192 bit)
EN The total data size is 24 bytes (192 bit)
ES El tamaño total de los datos es 24 bytes (192 bit)

data	n° bit	Size	Signal name
DIN0	1	1	Weld Start
	2	1	Robot Ready
	3 - 6	4	Operating Mode (bit 3 - 0)
	7	1	Reserved (set to 0)
	8	1	Protocol Mode
DIN1	9	1	Gas Test
	10	1	Wire Inching
	11	1	Wire Retract
	12	1	Source Error Reset
	13	1	Touch Sensing
	14	1	Gas Test Shield
	15	1	Not used
	16	1	Not used
DIN2	17 - 24	8	Job Number (bit 7 - 0)
DIN3	25 - 31	7	Not used
	32	1	Not used
DIN4	33 - 40	8	Analog Setpoint Enable (bit 7 - 0)
DIN5	41 - 48	8	Not used
DIN6	49 - 55	7	Not used
	56	1	Pilot Arc Start
DIN7	57 - 64	8	Not used
AIN0	65 - 80	16	Current Setpoint (AI0)
AIN1	81 - 96	16	Pulse Frequency (AI1)
AIN2	97 - 112	16	Current Pulse Ratio (AI2)
AIN3	113 - 128	16	Pulse Duty Cycle (AI3)
AIN4	129 - 144	16	Gas Plasma Flow (AI4)
AIN5	145 - 160	16	Gas Shield Flow (AI5)
AIN6	161 - 176	16	High Speed CW (AI6)
AIN7	177 - 192	16	Low Speed CW (AI7)

9.2 Messaggi EtherCAT-EtherNet/IP-PROFINET dal Generatore al Controllo Robot
9.2 EtherCAT-EtherNet/IP-PROFINET messages from Power Source to Robot Control
9.2 Mensajes EtherCAT-EtherNet/IP-PROFINET del Generador al Control Robot

IT La dimensione totale dei dati è 20 byte (160 bit)
 EN The total data size is 20 bytes (160 bit)
 ES El tamaño total de los datos es 20 bytes (160 bit)

data	n° bit	Size	Signal name
DOUT0	1	1	Current Flow
	2	1	Not used
	3	1	Process Active
	4	1	Main Current
	5	1	Collision Protection
	6	1	Power Source Ready
	7	1	Communication Ready
	8	1	Protocol mode
DOUT1	9 - 16	8	Error Number (bit 7 - 0)
DOUT2	17	1	Pulse Sync
	18 - 23	6	Not used
	24	1	Pilot Arc
DOUT3	25 - 31	7	Not used
	32	1	Hard Fault
AOUT0	33 - 48	16	Welding Voltage (AO0)
AOUT1	49 - 64	16	Welding Current (AO1)
AOUT2	65 - 80	16	Motor Current (AO2)
AOUT3	81 - 96	16	Motor Speed (AO3)
AOUT4	97 - 112	16	Plasma Gas Flow (AO4)
AOUT5	113 - 128	16	Shield Gas Flow (AO5)
AOUT6	129 - 144	16	Not used
AOUT7	145 - 160	16	Not used

Digital Inputs for Operating Mode 2 (JOB Mode)

Job Number
(bit 0 – 7)

Digital Inputs
(Robot → Power Source)

Robot Ready

Weld Start

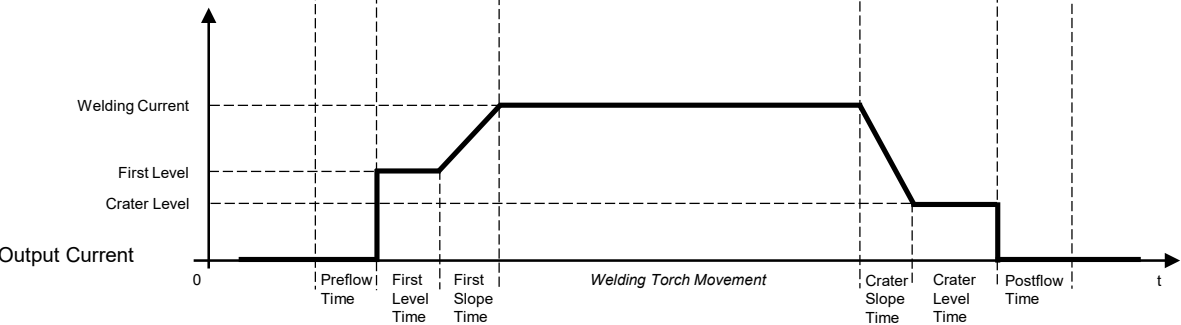
Digital Outputs
(Power Source → Robot)

Power Source Ready

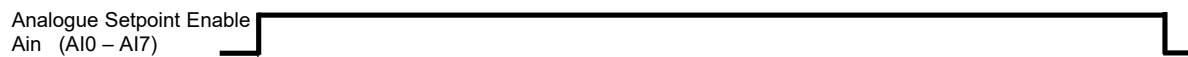
Process Active

Current Flow

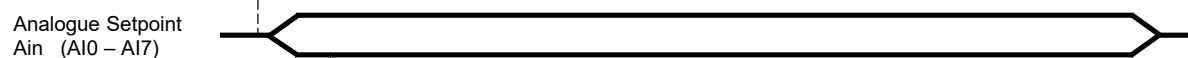
Main Current



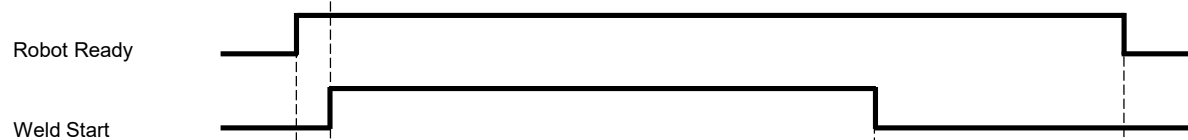
Digital Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



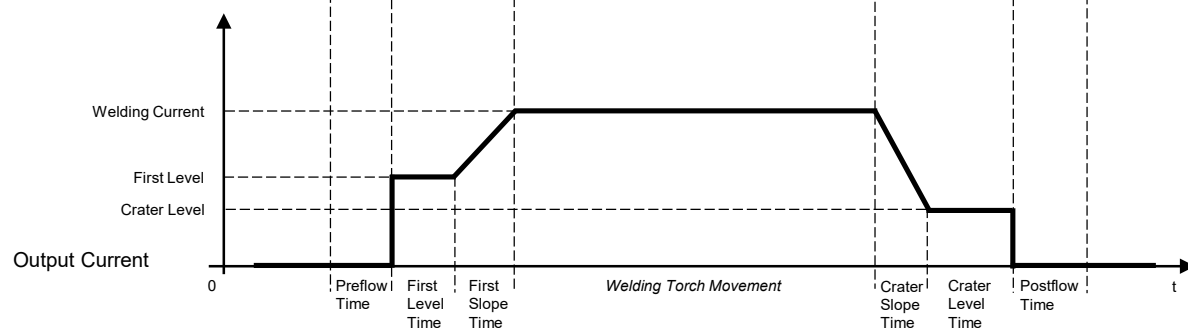
Analogue Inputs for Operating Mode 0, 1, 4, 5, 8, 9, 12, 13



Digital Inputs (Robot → Power Source)



Digital Outputs (Power Source → Robot)





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