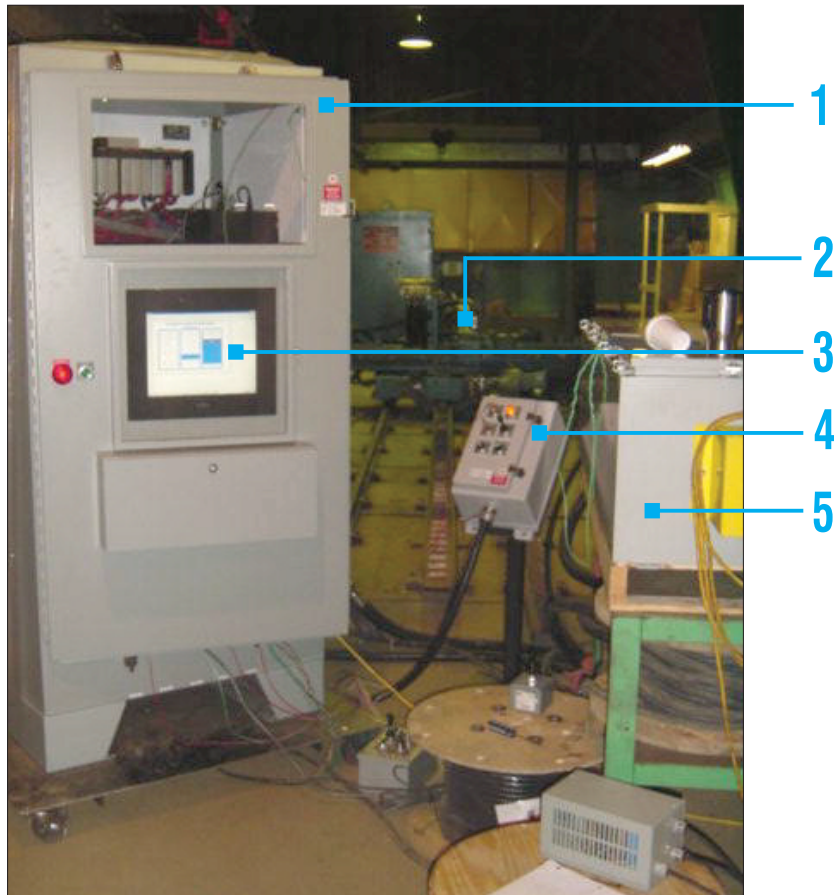


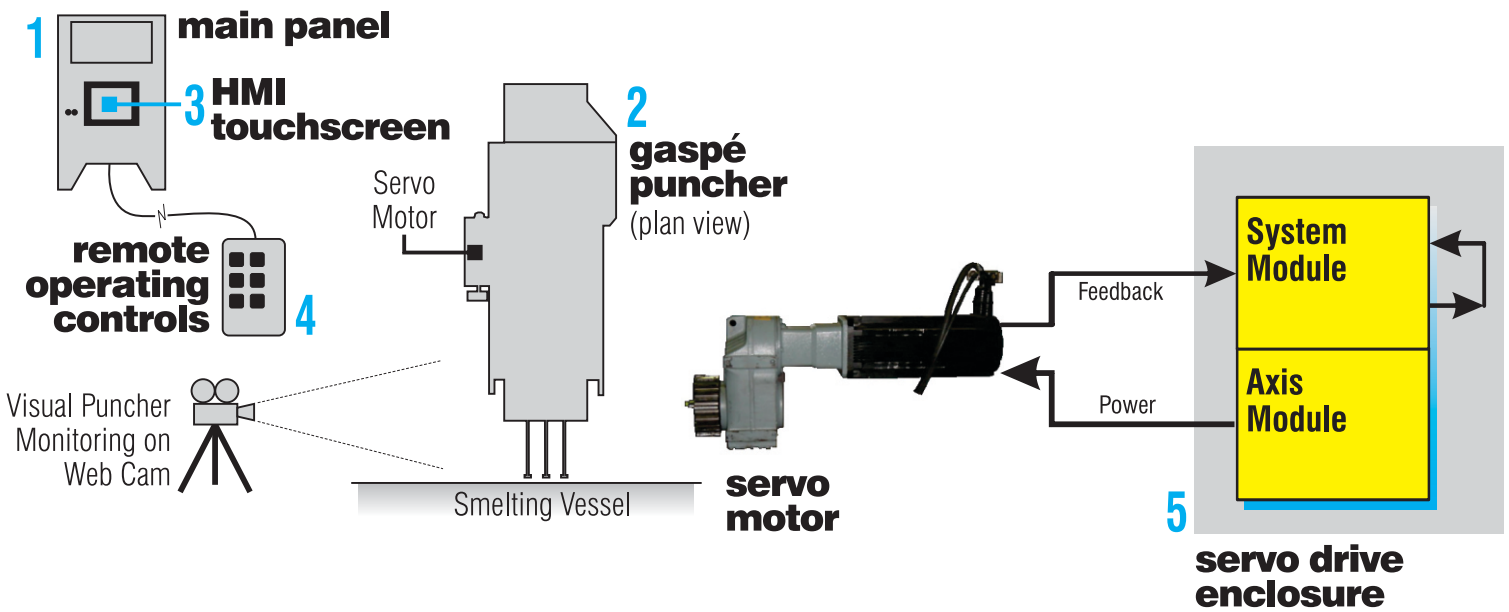
controls diagram

primary automation components

- Allen-Bradley Contrologix 1756 series PLC and software
 - others available
- Stealth operator interface
 - software to suit smelter
- 19" touch monitor
 - knowledge of Windows-type programs not required
 - multi-language suitable
- Stealth Industrial Computer
 - PLC access for programming and maintenance (field computer not required)
- Allen-Bradley 5.9 kW servo motor
- remote operator's station
 - for remote control/manual operation
- ethernet communication connections
- customized programming for each installation

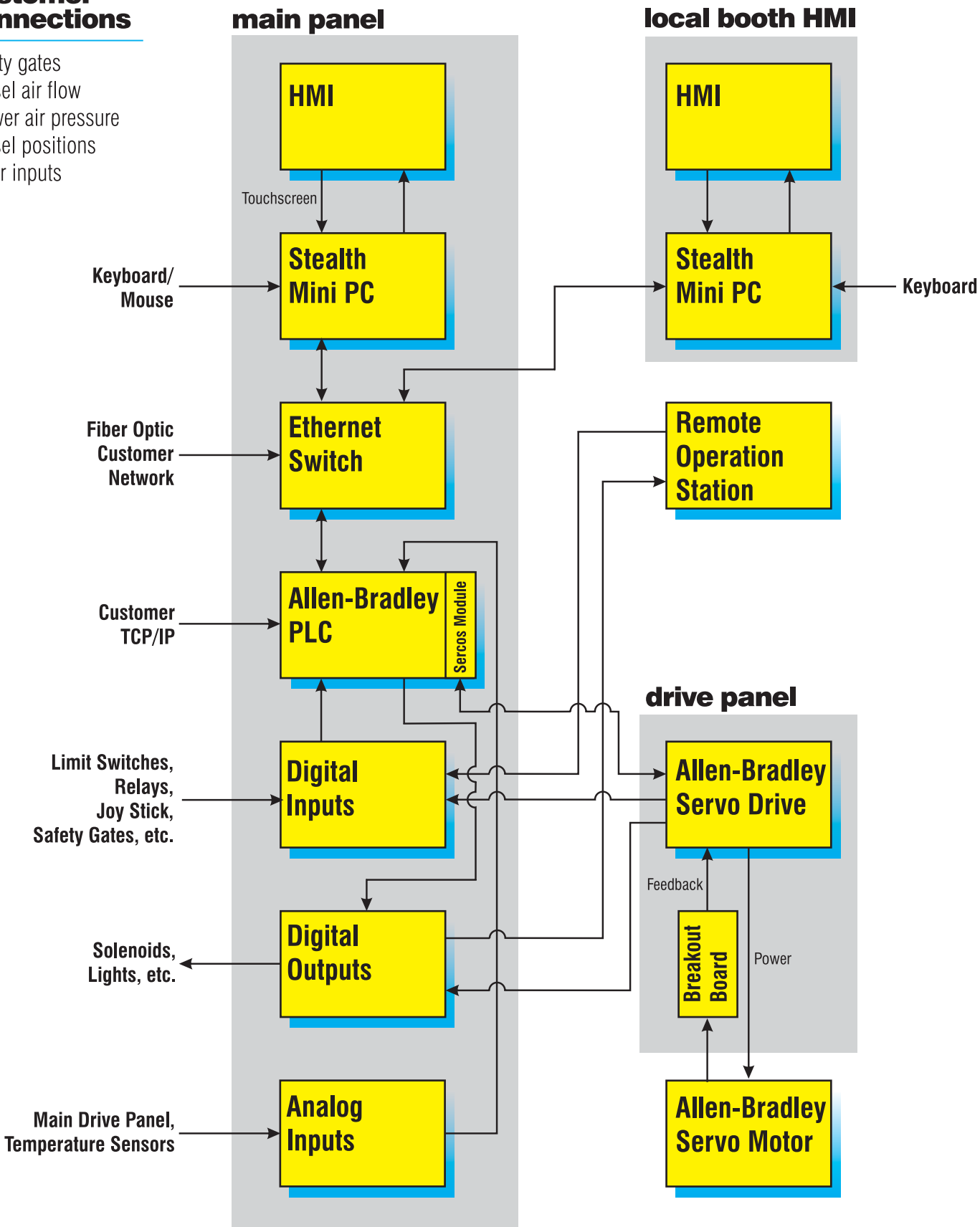


*gaspé puncher (background) and control enclosure:
pre-testing and programming at our test facility*



customer connections

- safety gates
- vessel air flow
- blower air pressure
- vessel positions
- other inputs



gaspé tuyère puncher

Automated System



operator control settings

- operator inputs
 - individual tuyère "punch/no punch"
 - number of punch bars used, ie. 1, 2, or 3
 - number of re-punches for unsuccessfully punched tuyères
 - punch bar depth control
- puncher starting inputs
 - bustle air flow
 - blower air pressure
 - time
 - operator on demand
 - combo

servo drive features

- accurate and fast positioning
 - capable of ± 0.1 mm
 - typical range ± 1.0 to 2.5 mm
- delays due to jogging or position searching are eliminated
 - 46 tuyères punched in 68 seconds reported
- puncher traversing speed up to 850 mm/s
- program execution 10 times faster than older versions of automatic puncher

options

- punch bar cooling
 - air (recommended) or water spray
- cameras
 - puncher or remote mounted
 - web camera
- 7" diameter Heath & Sherwood punching cylinder
 - for installations with low plant air pressure
- Heath & Sherwood custom festooning system
- high capacity air receiver

customer requirements

Power Requirements

- main panel: 110-120 VAC, 50/60 Hz, 15A max.
- servo drive: 200-600 VAC, 50/60 Hz 15A max.

Air Requirements

- dry compressed air (dewpoint = ambient temperature -18°F (-10°C))
- minimum free air delivery = 200 SCFM ($5.7 \text{ Nm}^3/\text{min}$)
- minimum pressure = 90 PSI (621 kPa)

Digital Devices and Signals

- vessel position
- pyrometer position
- safety gates (2)
- remote "send puncher home" pushbuttons

Analog Devices & Signals

- bustle pipe total airflow
- bustle pipe pressure
- flue temperature

other tuyère line products

- Gaspé Puncher, manual version
- Refractory Drills
- Tuyère Silencers
- Tuyère Pyrometer
- Tuyère Assemblies

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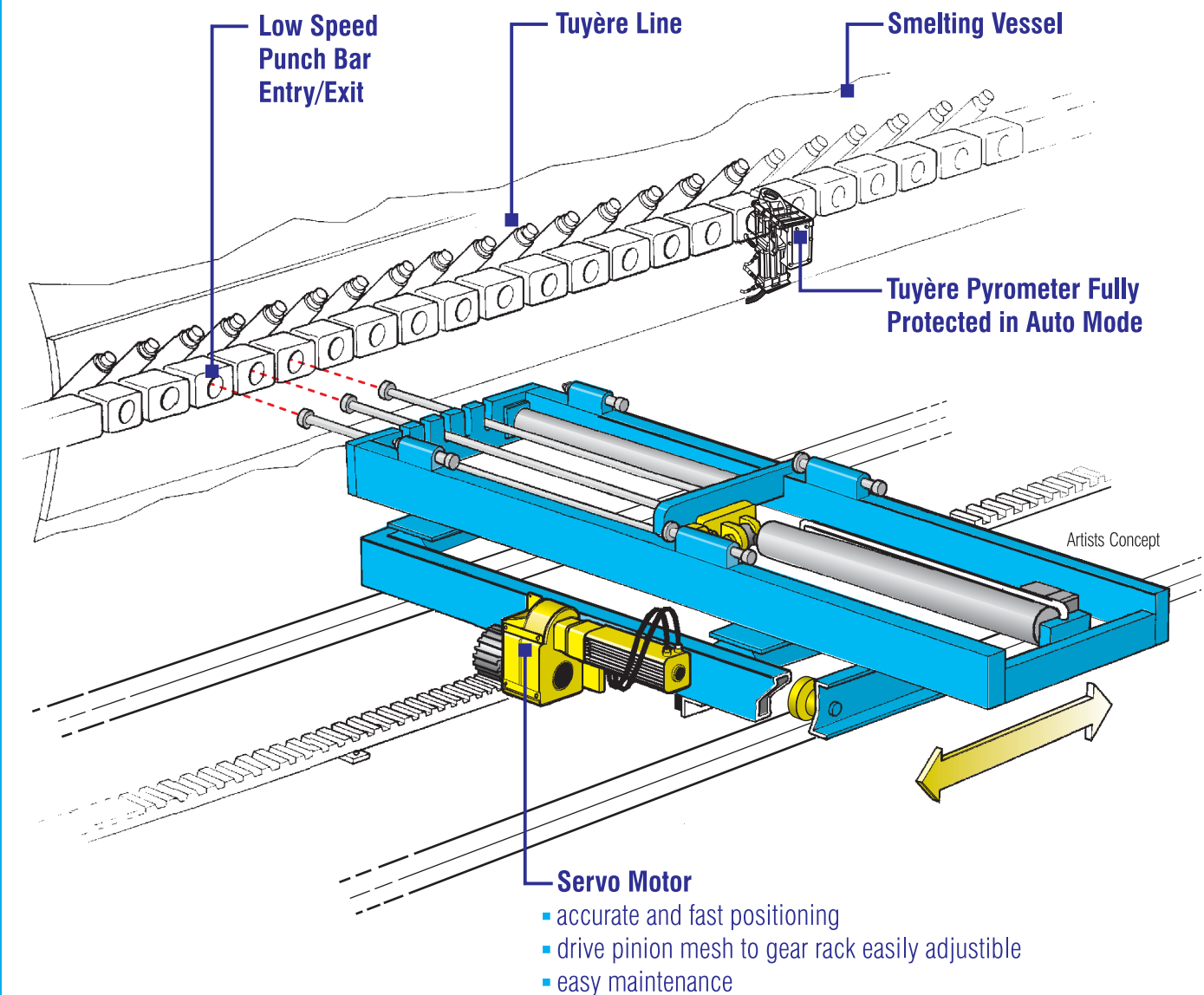


HEATH & SHERWOOD

gaspé tuyère puncher

Automated System

- enhanced process uniformity
- increased blowing rate up to 12% reported
- extended refractory life
- helps to minimize vessel distortion
- reduced damage to tuyères
- full-time operator not required
- 46 tuyères punched in 68 seconds
- local area network ready
- intelligent punch sequencing



AVR-4 Printed in Canada